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In The News

Shri Narendra Modi, Prime Minister of India, is new President of CSIR



On 27 May 2014, Shri Narendra Damodardas Modi assumed office as the Fifteenth Prime Minister of India. And, as per convention, Shri Narendra Modi also became the President of the Council of Scientific and Industrial Research (CSIR), one of the largest networks of scientific laboratories in the world.

Soon after taking over as the Prime Minister of the country, Shri Modi sent out a message: “As we devote ourselves to take India’s development journey to newer heights, we seek your support, blessings and active participation. Together we will script a glorious future for India. Let us together dream of a strong, developed and inclusive India that actively engages with

the global community to strengthen the cause of world peace and development.”

Before taking over as Prime Minister of India, Shri Narendra Modi was Chief Minister of Gujarat. He transformed Gujarat into a growth engine and restructured and simplified the bureaucracy of government to make it work efficiently, honestly and humanely. Under his leadership the Gujarat government won over 300 awards at the domestic and international level including those from bodies such as the UN.

In Gujarat, Shri Modi introduced several schemes and programmes such as the Jyotigram Yojana (for 24/7 electricity); Pani Samitis (where citizens took the lead in managing and operating drinking water supply); Shala Praveshotsav and Kanya

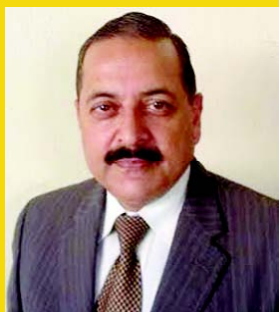


Kelavani Abhiyan (to boost literacy, especially female literacy); and SWAGAT (where grievance redressal was integrated with technology), among many others. He also created something called 'One Day Governance.' This model focused on providing time-bound services to citizens

through e-governance eliminating red tape.

A techno-savvy leader, Shri Modi uses the web to reach people. He is very active on social media, including Facebook, Twitter, Google+ and other forums. Beyond politics, Shri Narendra Modi enjoys writing and is the author of several books, including poetry.

Dr Jitendra Singh is Vice President of CSIR



On 28 May 2014, Dr. Jitendra Singh took charge of his new assignment as Minister of State (Independent Charge) for Science & Technology and Earth Sciences and Vice-President, Council of Scientific & Industrial Research (CSIR) at the Anusandhan Bhavan, Rafi Marg, New Delhi.

Dr. Shailesh Nayak, Secretary, Ministry of Earth Sciences, Dr. K. Vijay Raghavan, Secretary, Department of Biotechnology and Secretary (Additional Charge), Department of Science & Technology, and Dr. P.S. Ahuja, Director General, CSIR, were among those present on the occasion.

Later, while addressing the galaxy of scientists and senior officials of the two Ministries at the Shanti Swarup Sabhaghar at CSIR, the Hon'ble Minister emphasized that his two Ministries, through a well-defined road map, would work for scaling up scientific research to help address key socio-economic problems faced by the nation by collaborating with other relevant ministries as also the stakeholders.

Dr. Jitendra Singh said that our country possesses ample and diverse research opportunities, and the canvass with us is unique in terms of addressing the problems with desired R&D endeavours. There is need to focus on appropriately leveraging this

advantage that would help not only in facilitating Indian scientists to have world class research in India but also in reversing the much talked about brain drain in the area of science and technology, he emphasized.

Dr. Singh, while reiterating the significant role of science and technology in making our nation a developed country by 2020, said that there is a strong need to involve the public, particularly the youth, in the entire process of transfer of benefits of science and technology to the society at large, and also private players to utilize the proceeds of R&D for commercial purpose. To achieve this, we need to explore the concept of PPP in terms of Public People Partnership and Public Private Partnership, he said. As a precursor to this, concerted efforts would be made to build scientific temper amongst all the participating sections of the society, he added.

Earlier, while interacting with the media persons, Dr. Singh emphasized the need for proper and regular communication of the results of science and technology to the public at large. For this purpose, he sought the assistance of the media and called for their regular interaction with the constituents of the two Ministries.

CSIR-NAL hands over Lab-scale Aerospace Autoclave to IIT-Kanpur – A Moment to Cherish

Yet another autoclave story was successfully scripted when the aerospace-grade, lab-scale autoclave was formally handed over by Shri Shyam Chetty, Director, CSIR-NAL, to Prof. Indranil Manna, Director, IIT-Kanpur on the bright sunny morning of 25 March 2014.

It was a moment to cherish not only for CSIR-NAL and its autoclave PPP (Public Private Partnership) consortium but also for IIT-Kanpur, who are the first academic institution in the country to acquire such an advanced facility.

The compact lab-scale autoclave (0.9 m diameter and 1.0 m length work space) provides all the features of a large autoclave. It provides the right process conditions (temperature upto 200 °C, pressure upto 7 bar and a choice of vacuum levels) that are controlled as per the user-programmed ‘cure cycle’ to cook or cure advanced polymeric composites. The entire cure process is controlled by a computer along with tamper-proof data recorder and Programmable Logic Controller (PLC). In short, it is built to meet the stringent quality requirements of aircraft structures enforced by the certifying authorities.

The autoclave was supplied along with all the sub-systems, such as compressor, air receiver, water softener, water cooling system, cooling tower, etc. on a turn-key basis. The other salient features include state-of-art safety features, electrically operated



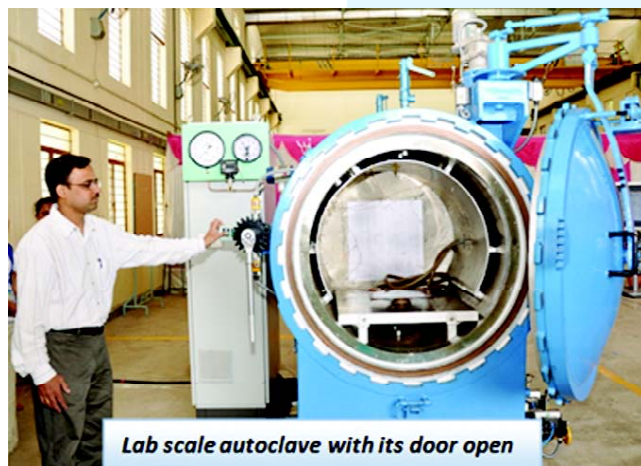
Sri. Shyam Chetty, Director, CSIR-NAL inaugurating the autoclave facility

Davit-arm door with steering mechanism, door lock safety device with wedge lock, pressurized fan motor, thyristor controller, three modes of operation and open communication architecture.

This ‘cute little device’ was successfully conceived, developed and commissioned by the NAL lead PPP consortium, in which NAL is responsible for the design, software development, integration and prove out. The other two partners M/s UCE, Mumbai and M/s DATASOL Bangalore are responsible for the manufacture, erection and installation of mechanical systems and electrical, control and instrumentation system respectively. In



Computer controlled lab scale autoclave



Lab scale autoclave with its door open

addition, M/s UCE takes care of marketing and project handling.

It is heartening to note that IIT-Kanpur has lead the way in the educational sector, by establishing the first, indigenous, aerospace grade, lab scale autoclave. Manipal Institute of Technology and VSSC have followed suit and would get their autoclaves shortly from the PPP consortium.

CSIR-NAL has thus successfully

translated a home-grown special technology into a cost effective, societal mission product of greater outreach. It is hoped that the use of lab scale autoclave at academia would continue to grow and empower much more students and research scholars to translate their design into an advanced composite product.

G M Kamalakannan & J Ramaswamy Setty, CSMST; NAL

R&D Highlights

CSIR-IHBT Utilizing Geospatial Techniques for Survey, Mapping and Database Development on Bioresources of Western Himalaya

The CSIR-Institute of Himalayan Bioresources Technology (IHBT), Palampur, Himachal Pradesh is providing R&D services on bioresources in the western Himalayan region leading to value-added plants, products and processes for industrial, societal and environmental benefit.

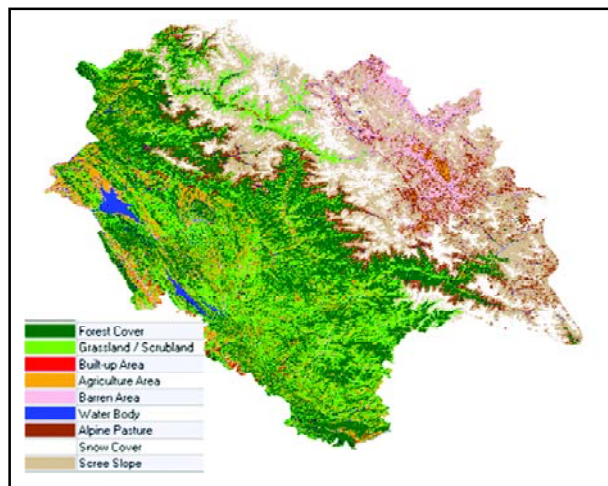
In this context, it is required to know the distribution pattern and availability of bioresources in the region. In order to achieve this, CSIR-IHBT has established state-of-art Remote Sensing (RS) and Geographic Information System (GIS) facilities, which is utilised in the crucial task of surveying, mapping and inventorization of bioresources of the western Himalayan region using geospatial tools and techniques.

The Institute has now come out with species specific distribution maps of floral resources prepared using geographical coordinates of the locations of their occurrences recorded using GPS.

Also, a seamless Landuse/landcover map of Himachal Pradesh has been prepared using LANDSAT multispectral satellite images. The detailed ground truth based forest type maps of Kangra, Kinnaur and Lahaul-Spiti districts, Solang nala watershed in Kullu district, and Pangi area in Chamba district of H.P. have already been finalized using IRS 1D, IRS P6 and Quick bird satellite data. Maps of apple orchards in Spiti valley

NATURE OF RS-GIS MAPPING @ CSIR-IHBT

- GPS BASED DISTRIBUTION MAPS**
- MAPPING OF INVASIVE SPECIES**
- LANDUSE/LANDCOVER MAPPING**
- RESOURCE MAPPING**
- LANDSCAPE CHARACTERISATION**
- NICHE / HABITAT MODELING**
- WEB GIS**
- HYPERSPECTRAL REMOTE SENSING**



Landuse land cover map of Himachal Pradesh

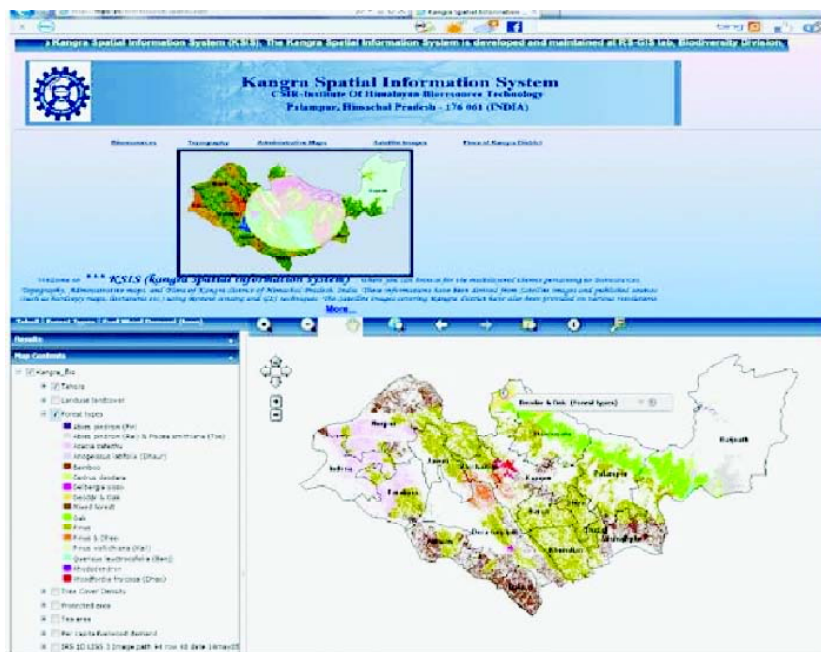
and bamboo resources in Kangra, Hamirpur and Una districts have also been generated.

As compared to these multi-spectral sensors the new generation hyperspectral sensors collect reflectance from objects simultaneously in hundreds of narrow adjacent spectral bands and thus are more efficient in extracting biophysical, yield and species level information on plants. Therefore, a spectral library of commonly occurring Himalayan plant species has been developed using ASD handheld FieldSpec Spectroradiometer in collaboration with Space Application Centre, ISRO, Ahmedabad. The menu driven Graphic User Interface (GUI) has been developed in .Net programming environment that helps in retrieving of information related to plant species such as spectral details, spectral graphs, general information of species, observation details, plant photographs, species spectral narrowband indices, species biochemical parameters.

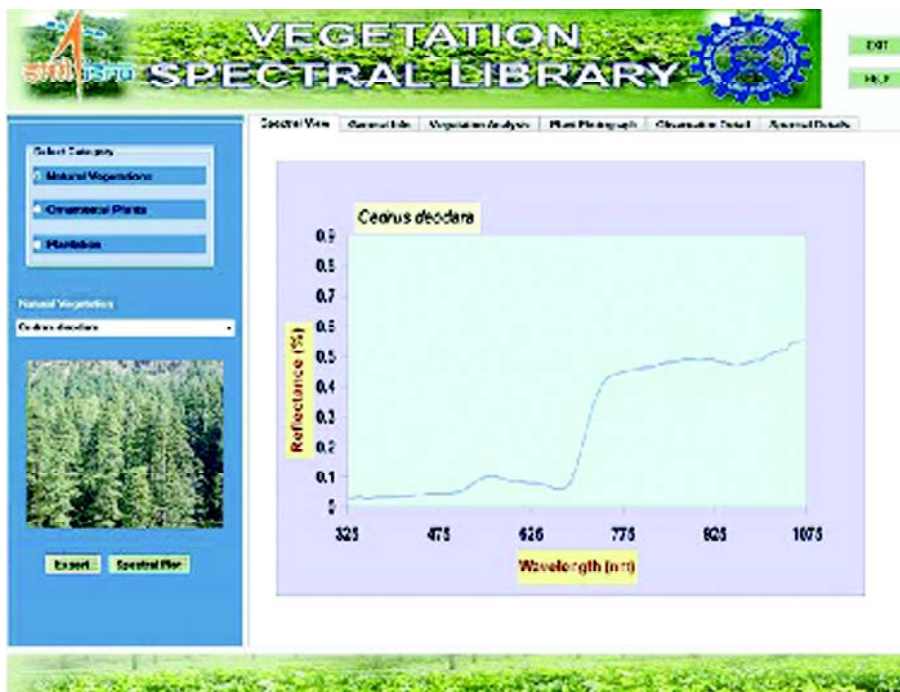
The field hyperspectral data was also analyzed in a non-destructive way to monitor and manage tea plantations (*Camellia sinensis*) owing to their ability to detect parameters influencing tea garden management viz., plant type, age, growth stage, pruning, light conditions, and disease incidence.

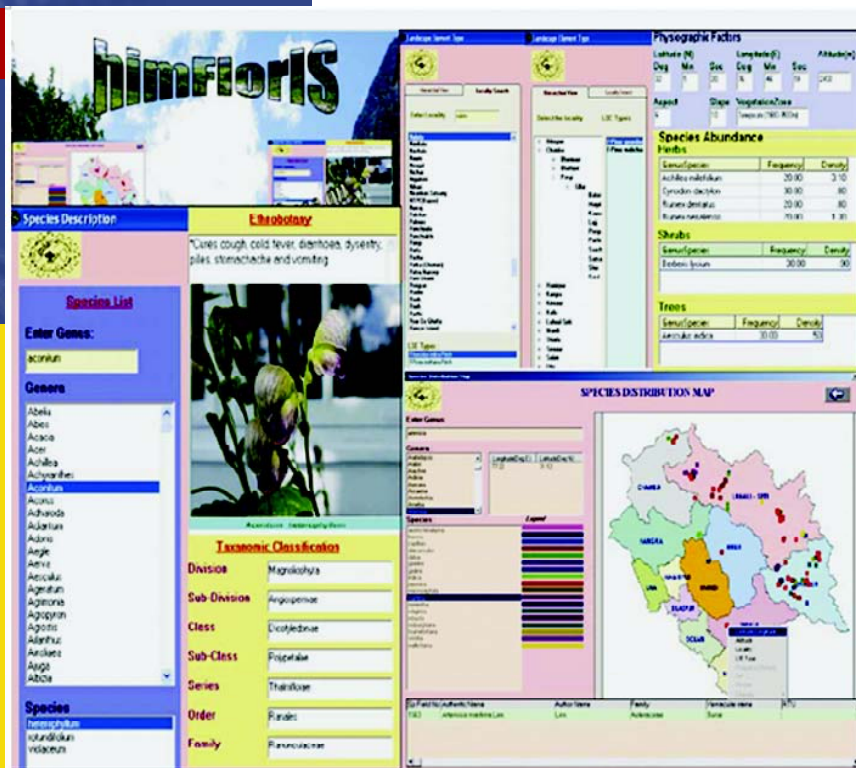
A first of its kind web GIS application (KSIS) was developed for Kangra district of H.P. on ArcGIS Server 9.3 platform, which can be used for multilayered GIS queries pertaining to primary and secondary types of spatial and non-spatial data viz., flora, topography, administrative maps and satellite images.

The ecological niche modelling has also been performed to map the potential



Spectral signatures of *Camellia sinensis*





Database on floral resources

distribution of invasive tree species (*Sapium sebiferum*) in western Himalaya.

The Institute has also prepared digital forest fire maps of Dharamshala, Nurpur, Palampur and Chamba forest divisions of H.P. for the Himachal Pradesh state forest department.

Various databases on floral resources have also been developed by the Institute, which display and retrieve the information gathered from the field surveys as well as from published literatures. These GUI have been developed using visual basic and .net programming languages with MS-Access database in the backend. It is useful to researchers, teachers, planners, policy makers, NGOs and entrepreneurs.

The 'himFlorIS' is an information system for flora in H.P. based on floristic survey. At present, it provides information on 1141 plant species distributed across 49 landscape elements (LSE) in the state. It provides information regarding LSE, LSE types, physiographic factors, abundance of the species at a particular location, geographical locations of a plant on the map, taxonomic classification of the species along with its photographs and ethno-botanical uses.

'TRAMPIS' can be queried for traditional information on medicinal uses of plants in western Himalaya. Database on medicinal plants in Indian Himalayan region has also been created for NMPB, AYUSH, New Delhi.

The 'him-Padap-Sankalan' is a digital directory of floral resources of Himachal Pradesh, which provides information on nomenclature, taxonomic classification, local name(s), trade name(s) and uses of 3348 plant species along with maps showing their distribution in H.P.



Digital directory of floral resources of Himachal Pradesh

Parts of Andhra Pradesh Could Become a Desert if the Past Repeats Itself – CSIR-NGRI Scientists Report



Sand dunes in deserts form during a transition from arid to semi-arid conditions and represent short time intervals, due to the need for a synergistic convergence in sand supply, transport and preservation. A research by CSIR-NGRI scientists in collaboration with scientists from the Geological Survey of India and Physical Research Laboratory on the occurrence of “peculiar” sand dunes in Prakasam district of Andhra Pradesh has found evidence of short-lived desert phases over the past 90,000 years.

The climatic conditions of southern India are different from northwestern India. Though semi-humid with highly seasonal rainfall, southern India is not expected to show a desertic environment, and hence presence of sands/ramps appeared anomalous here. The paleoclimatic signatures in southern India are preserved in different forms. The scientists report occurrence of inland-aggraded sandramps/dunes in an area with rainfall of 700 mm/yr. Optical ages range from 50 ka to the present and suggest that this sand aggradation belongs to a climate system that recurs at regular intervals. The mode of sediment transport and source area was identified using grain sizes and heavy minerals assemblages.

The CSIR-NGRI scientists report inland sand dunes from Andhra Pradesh spread

over an area of ~500 sq km, ~75 km inland from the east coast. The dune sands were examined to understand their provenance, transportation, timing of sand aggradation and their relationship to past climates. The dune distribution, grain morphology and the grain-size studies on sands suggest an aeolian origin. Physiography of the study area, heavy mineral assemblage, and abundance of quartz in the parent rocks indicate that the dune sands are largely derived from first-order streams emanating from hills in the region and from weathering of the Nellore schist belt.

It appears that the geomorphology and wind direction pattern both facilitated and restricted the dune aggradation and preservation to a limited area. OSL dating of 47 dune samples ranged from the present to ~50 ka, thereby suggesting a long duration of sand-dune aggradation and/or reworking history.

Ref : D. Venkat Reddy, Vuddaraju Singaraju^a, Rakesh Mishra^a, Devender Kumar, Puthusserry Joseph Thomas, Karra Kameshwa Rao^a, Ashok Kumar Singhvi^b, *Quaternary Research* 80 (2013) 265–273

^a Geological Survey of India, Southern Region, Bandlaguda, Hyderabad

^b Physical Research Laboratory, Navrangpura, Ahmedabad

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Chronic Kidney Disease in Two Coastal Districts of Andhra Pradesh: CSIR-NGRI Scientists Explore Role of Drinking Water

A number of people of a few coastal regions of Srikakulam district and Chimakurthy mandal (~30 to 40 km away from the coast) in the Prakasham district of Andhra Pradesh, India have been suffering from Chronic Kidney Disease (CKD). Some medical experts and the local population have apprehensions

that the drinking water is the sole reason for this disease in these areas.

As the source of drinking water for these two regions is only groundwater, scientists of the CSIR-National Geophysical Research Institute (NGRI) measured major ions and trace elements in water from different sources

to identify the causative element(s), if any. Comparison of hydrochemical data of both the areas indicates that groundwater in Srikakulam coastal region is less mineralised than that of the Prakasham region, which may be due to geological, hydrological and climatic reasons.

The concentrations of various inorganic chemicals such as Cl, F and NO₃ are within the permissible limits and are thus not expected to lead to any deleterious effects on human health, including any effect on the kidneys. Though the concentration of most of the chemical constituents is relatively higher in Chimakurthy area, the renal problems are much more severe in the

Uddanam area (Srikakulam dist). Thus, it is doubtful whether drinking water quality has any bearing on CKD and it is unlikely that the inorganic chemicals cause ill health, including CKD, in the study areas.

However, as there is a continuing suspicion that the kidney damage in people living in the study areas is due to chemicals in drinking water, it is necessary to investigate for other organic and inorganic chemicals known to be associated with kidney damage.

Ref : D. V. Reddy and A. Gunasekar, *Environ Geochem Health* (2013) 35:439–454, DOI 10.1007/s10653-012-9506-7), WHO Country Office for India, New Delhi.

MoUs

CSIR & IMD Join Hands to Facilitate Safe Aircraft Landing & Takeoff in Very Low Visibility Conditions

A milestone has been achieved in the field of aviation safety with the CSIR-National Aerospace Laboratories (CSIR-NAL), Bangalore and Indian Meteorological Department (IMD) signing a partnership agreement for joint production of Drishti system – a sophisticated instrument for assessment of runway visual range, which is a critical parameter for safe landing and takeoff of aircraft in poor visibility.

This is a fine example of collaboration between two government sector entities leading to indigenisation of a technology

which so far was the exclusive domain of a few developed countries. The indigenous production of this high-end instrument will not only result in substantial saving of foreign exchange but will also make the country self-reliant in the field of front-end technology.

The agreement which was signed by Dr. Shyam Chetty, Director, CSIR-NAL and Dr L.S. Rathore, Director General of Meteorology, IMD, encompasses a wide range of research and development activities for further development of various meteorological sensors. The agreement paves the way for operational deployment of Drishti system at airports where IMD provides aeronautical meteorological services. A mega project for installing nearly 70 such systems at various airports of the country is being jointly undertaken by the two organisations.

Drishti Transmissometer, a visibility measuring system, is an innovative, indigenous product – the first of its kind, designed and developed by CSIR-NAL to cover the wide span of lowest to highest visibility (< 25 to > 2000 meters) aiding pilots for safe landing and take-off. This



cost-effective product is a mandatory system required at all airports as per International Civil Aviation Organisation (ICAO) and World Meteorological Organisation (WMO). The system is extremely robust with high mean time between failures. Seven Drishti systems are working in three international airports, viz., Choudhary Charan Singh International Airport, Lucknow for the last three years, Netaji Subhash Chandra Bose International Airport for the last one-and-a-half years and five systems in the country's most stringent CAT IIIB airport – the Indira Gandhi International Airport, New Delhi, for the last two years.

Web-enabled health monitoring, remote control of the system from any location in the country for accessing the data and for maintenance are the other important features of this state-of-the-art system. Servicing is made user friendly and cost-effective by

modular electronics and virtual instrumentation concepts in the design.

Drishti has also received several prestigious awards during 2013-14 from the National Research Development Corporation (NRDC), Institution of Electronics and Telecommunication Engineers (IETE), India, and Indian Electronics & Semiconductor Association (IESA) as the most innovative, meritorious product of the year.



New Facilities

High Resolution Inductively Coupled Plasma Mass Spectrometry Facility Inaugurated at CSIR-NGRI

A new High Resolution Inductively Coupled Plasma Mass Spectrometry (HR-ICP-MS) facility was inaugurated by Prof. B.B. Bhattacharya, Chairman, Research Council, CSIR-NGRI in the presence of Prof. Mrinal K. Sen, Director, CSIR-NGRI.

The instrument is attached with a laser ablation (LA) system, a desolvating

nebulizer system and an auto-sampler for precise determination of trace elements and isotopic ratios in rock samples, and for conducting geochemical/geochronological applications. It is the third such system available in the country, and the first high-resolution device to have been coupled with laser ablation system and fully funded by CSIR at NGRI.



Prof. B. B. Bhattacharya at the inauguration of the new HR-ICP-MS Lab along with Prof. Mrinal Sen, Director, NGRI



Laser Ablation, Desolvating Nebulizer unit, autosampler (L to R) and HR-ICP-MS systems inside the Lab

Training Programmes**Summer School Programme-2014
Concludes at CFTRI**

The CSIR-Central Food Technological Research Institute (CFTRI), Mysore conducted a Summer School Programme for government high school students hailing from Mysore district from 21 April 2014 to 2 May 2014. The main aim was to instill an aspiration towards science in these young students.

A drift from careers in science, especially in the rural areas, triggered this programme. Generation of inquisitiveness and scientific curiosity was one of the main objectives. Nineteen students from five government high schools participated in this unique initiative. Food and transportation were provided ensuring no financial burden was imposed on the students.

The program was inaugurated by Prof. Ram Rajasekharan, Director, CSIR-CFTRI. He urged the students to be fearless, cheerful, attentive and very curious. He told them about how vast and dynamic the realm of science is and how innumerable people have and can contribute to its development.

The students were introduced to scientists from various disciplines, their laboratory endeavors and state-of-art

instrumentation facilities. Hands-on sessions enabled the students to feel closer to experimentation. Motivational lectures aimed towards promoting science and its prospects were delivered by various scientists. The students visited all the departments in the institute and got a flavor of various aspects of food research.

They were given an educational kit comprising of a back-pack and stationery items. A “what we learnt” session was held every afternoon to figure out how well the students connected to what was being taught. The sessions were very refreshing as the students narrated various aspects they had just learnt. Their enthusiasm, to say the least, was contagious. This platform gave them enormous confidence and ability to articulate.

On the concluding day, the students expressed how happy they felt being part of the programme and how much they enjoyed learning science. They individually thanked many scientists who demonstrated experiments pertaining to their expertise. Mr. K.S. Shiva Kumar, Head Master of Govt.

High School, Someshwarapura on behalf of all the head masters of the schools involved, congratulated the Director and staff of CFTRI for engaging the children in scientific pursuits and keeping them very absorbed in the programme.

Prof. Ram Rajasekharan, Director CFTRI presented certificates and mementoes to the participating children. He said that the future of science is indeed bright and acknowledged the energy and enthusiasm the children brought with them to the campus over the past two weeks. He thanked all the staff involved in making the Summer School Programme a grand success.



Prof. Ram Rajasekharan, Director, CFTRI (Centre) is seen with the participants of the summer school programme held from 15-26 April 2014 at CSIR-CFTRI

CSIR-CLRI Celebrates 67th Foundation Day



From left: Dr. Balachandran Unni Nair; Dr. G. Thyagarajan; Prof. S.P. Thyagarajan; Shri Ramjee Yogasundaram; Shri P. Gopalakrishnan; Prof. Dr. Asit Baran Mandal

The world's largest leather research institute, CSIR-Central Leather Research Institute (CLRI), Chennai celebrated its 67th Foundation Day on 23 April 2014 at the Triple Helix Auditorium, CSIR-CLRI, Chennai.

Established in 1948 with the mandate to provide R&D support to the Indian leather sector, over the years CSIR-CLRI has contributed very significantly in providing education, research and training; testing and designing; planning and forecasting related to leather. The institute also kept its commitment with social empowerment by way of collaborating with rural artisans and augmenting their skills and products through technological interventions. The state-of-art facilities at CSIR-CLRI support innovation in leather processing, creative designing of leather products viz. leather garment, leather goods, footwear and development of novel environmental technologies for leather sector.

Prof. Dr. Asit Baran Mandal, Director, CSIR-CLRI in his welcome address presented the achievements of CSIR-CLRI over the years. He recalled with gratitude the seeds sown by Dr. Sir A. Lakshmanaswamy Mudaliar, the then Vice-Chancellor of Madras University in starting a Degree course in Leather Technology in 1945 and the recommendations of Dr. B.M. Das, the then Chairman of the Leather

Research Committee to establish a strong research support for the efficiency and progress of the leather industry. Its international reach is well recognized through its Bench Marking (Technology Upgradation) Programme in the Ethiopian tanning industry and the Twinning programme to transform Leather Industry Development Institute (LIDI), Ethiopia into a globally competitive center of excellence in the field of leather sector.

The Director congratulated the scientists/technologists for generating 15 patents, 11 technology transfers and publishing several papers in high impact journals. CSIR-CLRI has also signed Memoranda of Understanding with several Indian and international partners significantly with South Africa, Common Market for Eastern and Southern Africa (COMESA), Ethiopia, Vietnam and The University of Northampton (UK). The Director was pleased to announce the signing of an Agreement between CSIR-CLRI and Ranipet Tannery Effluent Treatment Company Ltd (RANITEC) for implementation of cleaner technologies to control pollution at source.

During the year, several scientists/researchers have won laurels for their contributions in their respective fields. Notably, Dr. V. Subramanian, Sr. Principal

The state-of-art facilities at CSIR-CLRI support innovation in leather processing, creative designing of leather products viz. leather garment, leather goods, footwear and development of novel environmental technologies for leather sector.

CSIR-CLRI was successful in transforming the traditional leather industry into a modern chemical process industry.

To stimulate innovation, India needs to increase its public funding for R&D and adopt international models for professionally managing the funding and evaluation.

Scientist, has been elected as Fellow of the National Academy of Sciences (FNASc), Allahabad and Fellow of the Indian Academy of Sciences (FASc), Bangalore; Dr. J. Raghava Rao, Chief Scientist has been elected as a Fellow of the Andhra Pradesh Akademi of Sciences, Hyderabad and Prof. Dr. A. B. Mandal has been elected as a Fellow of the Indian National Academy of Engineering (FNAE).

Dr. G. Thyagarajan, Former Director, CSIR-CLRI in his presidential address recalled the contributions of several eminent personalities including Sir Shanti Swaroop Bhatnagar, the first Director General of CSIR, Dr. Sir A. Lakshmanaswamy Mudaliar, the then Vice-Chancellor of Madras University, Sir Muttaiya Annamalai Muthiah Chettiar, Dr. R.M. Alagappa Chettiar and the successive Chief Ministers of the State in making CSIR-CLRI a “*Jewel in the crown of CSIR*”. CSIR-CLRI was successful in transforming the traditional leather industry into a modern chemical process industry. He advised the young generation to value the principles of “*Transparency at work and independence of mind*” practiced by the successive leaders of the institute.

Speaking on this occasion, the Guest of Honour Shri P. Gopalakrishnan, Managing Director, Sellam Chemicals, Chennai, fondly remembered the value-education he had through inspiring teachers at CSIR-CLRI. As a student of CSIR-CLRI, he had acquired necessary skills and confidence to commercialize the first product of his company from his M.Tech thesis. Now his company has over 50 products lined up in the market in the area of leather upgradation.

Shri Ramjee Yogasundaram, Managing Partner, Ramjee Leathers & Supplies, Chennai complimented CSIR-CLRI for making the young students of this institute into entrepreneurs. He also mentioned that his brother, one of the founder partners of the company, obtained B.Tech degree from this Institute and with the technical skills acquired

at CSIR-CLRI they could establish and succeed as entrepreneurs in this field.

The Foundation Day Lecture on the theme “*Innovations and the Youth*” was delivered by Prof. S.P. Thyagarajan, Former Vice-Chancellor, University of Madras & Professor of Eminence & Dean (Research), Sri Ramachandra University, Chennai. Prof. Thyagarajan recalled his enriching collaboration with Dr. B.U. Nair, Chief Scientist, CSIR-CLRI on “*Scientific evaluation of copper containing herbomineral formulation for the management of ulcers*”. Listing some of the weaknesses in the Indian R&D scenario like lack of application-oriented research and limited industry experience, he suggested that establishing industry R&D centres at Universities, technology transfer offices and contract R&D centres in institutions may leverage innovation potential of the nation.

Citing the famous quote from Einstein, “*If at first, the idea is not absurd, then there is no hope for it*”, Prof. Thyagarajan highlighted that several seemingly improbable but very useful innovations are coming from young innovators. To stimulate innovation, India needs to increase its public funding for R&D and adopt international models for professionally managing the funding and evaluation. Formation of trans-institutional groups for coordinating and building competence needs to be encouraged. A transparent monitoring policy will accelerate the phase of innovation, he said. Rejuvenating the scores of poorly funded State university laboratories, which are presently provided with only 10% of the country’s R&D budget, is very crucial.

Prof. S.P. Thyagarajan also highlighted the significant contributions made by CSIR-CLRI in the field of collagen-based biomaterials for wound care such as Kollagen, NeuSkin, etc. Prof. Thyagarajan, concluded his lecture with a message to the youth of this nation to lead the innovation crusade for the country!

CSIR-NCL Celebrates its Foundation Day



CSIR-National Chemical Laboratory (CSIR-NCL), Pune celebrated its foundation day on 3 January 2014. Prof. Ajay Sood of the Department of Physics, IISc, Bangalore delivered the foundation day lecture on *Driven Soft and Granular Matter*. The event was organised under the auspices of the NCL Research Foundation.

Prof. Sood focused on soft matter systems, effect of shearing on soft matter and collective motion of active matter. He first introduced the audience to soft matter systems used in day-to-day life like milk, chocolates, shampoos, and paints. He also talked about some biological soft matter systems as lipid bilayer membrane. Prof. Sood explained various interesting behaviours of soft matter under shear in non-equilibrium condition.

He said that “driven” refers to the external or internal force application to the soft matter. To explain the phenomenon of shearing and importance of shearing, he gave examples of chocolate industry. In chocolate the basic component is cocoa butter. This cocoa butter gives six different forms of crystallization under shearing, out of which only one form can give the specific taste and texture which is important to the chocolate industry. Making of chocolate is stabilizing that structure of crystallizing cocoa butter. In this way shear-induced crystallisation in soft matter systems plays an important role in the taste of chocolates,

margarines, etc.

Another phenomenon explained by Prof. Sood was shear thinning of soft matter. Shear thinning is used in toothpaste and shampoo to take these materials out of their containers. Prof. Sood also talked about thickening of soft matter under shear. He gave examples



Prof. Sood delivering the lecture

of walking on the water surface in the swimming pool and also the very beautiful dancing of soft matter particles while shearing is applied through sound sources. This phenomenon is being explored for body armours to make bullet-proof vests and shock absorbers.

Earlier, Dr. Sourav Pal, Director, CSIR-NCL in his welcome remarks remembered the historical background that led to the establishment of NCL. He also read the quotes by eminent personalities who were present while the lab was being dedicated to the nation on 3 January 1950. Prominent among them include Pandit Jawaharlal Nehru, Dr. S.S. Bhatnagar, Prof. Mc Bain, and Sir C.V. Raman.

The NCL Research Foundation Awards were also given away by Prof. Sood on this occasion.



Dr. Sourav Pal welcoming Prof. Sood

“Ocean belongs to them, we are simply encroachers”: World Ocean Day Celebrated at CSIR-NIO

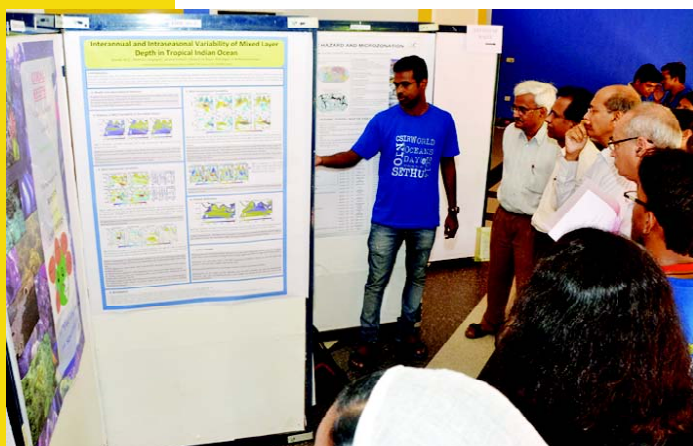
Although we keep talking about the importance of oceans, it took 16 long years for the United Nations to accept the suggestion of Canada and Rio-1992 congregation to officially declare 8th June as the World Ocean Day during the Earth-2008

summit. This day gives an opportunity to the people to learn more about the ocean and how to take action to help conserve it. No country will be more interested than India, which is surrounded by water-bodies from three sides, to commit to sustainable upkeep of the ocean.

Covering a wide range of issues that are vital to the support for a healthy ocean, Dr. Mahesh D. Zingde, former director of the Goa based CSIR-National Institute of Oceanography (CSIR-NIO), in an eloquent manner identified global and regional causes of various stresses that ocean is impounded every day. Dr. Zingde was speaking on the impact of human-induced alteration on marine ecology of India at a function organized by *Sethu* – the student forum of CSIR-NIO – to celebrate the World Ocean Day at Cardium, Dona Paula on 9 June 2014.

Drawing the major global concerns that include destruction of near-shore habitats, eutrophication and associated anoxia, harmful algal blooms, exploitation of coastal mineral resources, modification to hydrological cycles, transfer of alien species, marine debris (plastics, wood, etc), classical contaminants and climate change and sea level rise Dr. Zingde lamented inadequacy in enforcement of laws to save the ocean for vested reasons. It is better to stop experimenting on the ocean, he said.

A host of programmes (quiz, oral & poster presentations, art out of waste, photography, group discussions, treasure hunt and cultural programmes) were organized by *Sethu* during the day to renew the commitment of the scientific community to continue working for the betterment of the ocean and for its optimum use. Students and researchers from NCAOR and Goa University also took part.



Glimpses of the event

CSIR-CLRI Celebrates World Intellectual Property (IP) Day



The World Intellectual Property (IP) Day 2014 was celebrated at the CSIR-Central Leather Research Institute (CLRI), Chennai on 28 April 2014. The day is celebrated in this Institute every year to increase awareness and understanding of Intellectual Property among the R&D community.

Mr. T.V. Madhusudhan, Assistant Controller of Patents & Designs, Chennai Patent Office, was the Chief Guest during this year's celebration. Dr. Subhendu Chakrabarti, Sr. Principal Scientist, CSIR-CLRI in his welcome speech, briefed about the genesis of the World Intellectual Property Organization (WIPO) as well as the World IP Day. CSIR-CLRI management modalities on Intellectual Property Rights (IPR) were highlighted.

Prof. Dr. A.B. Mandal, Director, CSIR-CLRI presided over the function and spoke about the importance of IPR. The Director also found it relevant to mention

that Sir Jagadish Chandra Bose did not get Nobel Prize as he did not seek patent for his invention of wireless telephony due to his conviction that intellectual property should not be privatised. The Director encouraged the researchers to come forward to file patents for genuine inventions and also to make efforts to commercialize the same.

Mr. Madhusudhan, delivered an informative lecture on "Introduction to Intellectual Property Rights". Various types of IP Rights and their features were deliberated. He also highlighted Inventions that are not patentable.

During the programme, short video films on "India needs Innovation", obtained from IPR Aware World and "Creating the Future", obtained from WIPO were screened depicting an overall picture of IPR regime and India's achievements. In this connection, a Quiz Programme on IP was also conducted and the winners were given prizes.



Snippets of the function

National Technology Day Celebrations

CSIR-Advanced Materials and Processes Research Institute, Bhopal

CSIR-Advanced Materials and Processes Research Institute (AMPRI), Bhopal celebrated the National Technology Day on 9 May 2014, with Er. S.R. Prasad, Executive Director, BHEL Bhopal being the Chief Guest and Er. R.K. Pandey, Chief Engineer, Ministry of Road Transport and Highways, GOI, New Delhi being the Guest of Honour.



Seated on the dais from left to right
Dr. S. Das, Er. R.K. Pandey, Er. SR Prasad,
Dr. Navin Chandra

Dr. Navin Chandra, Acting Director CSIR-AMPRI, in his address stressed the need and importance of technology development and said that technology drives the industry and industry drives the economy. He also informed the gathering that in the last year CSIR-AMPRI has transferred two technologies to industries and this year also the institute is intending to transfer some technologies for use in the society.

Er. R.K. Pandey, in his address, said that the transport infrastructure is the key for

development of a nation. He also dealt with the importance of highways in our country and stressed the need of R&D in this sector.

Er. S.R. Prasad talked about the achievements of BHEL in the recent past and mentioned with pride the interaction and collaborative work carried out between BHEL, Bhopal and CSIR-AMPRI, Bhopal since many years in material and component development. He said that BHEL is spending about 2% of its turnover on R&D and stressed on the need for indigenisation at BHEL. He stressed on the need to strengthen collaboration between CSIR-AMPRI and BHEL, Bhopal.

The inaugural function was followed by a technical lecture on *Development of National Highways: Emerging Issues* by Er. R.K. Pandey. Er. Pandey elaborated on the achievements of his Ministry and mentioned the challenges faced by them and how R&D and interaction between R&D centres like CSIR-AMPRI, Bhopal and the Ministry could help in meeting these challenges.

In the afternoon, CSIR-AMPRI, jointly with IIM, Bhopal chapter organised a workshop on *Technological Innovations through R&D-Industry Interaction*. The workshop was intended to provide a platform to researchers, academicians and entrepreneurs to exchange



The Workshop on "Technology Innovations Through R&D-Industry Interaction". Left to Right: Dr Sanjiv Saxena, Shri G. Ramakrishna, Shri C.P. Sharma, Shri Sushil Prakash and Dr. Navin Chandra

ideas and share experiences/expertise for mutual benefit and growth through the possible translation of ideas into engineering applications. Dr. S. Das, Chairman of IIM Bhopal chapter in his welcome address spoke about the role of IIM in harnessing the interest of Indians engaged in the field of materials science. He mentioned the different and varied activities of the Institute and also the theme of the workshop.

The other lectures delivered during the workshop included *BHEL Bhopal: Product at a Glance* by Shri G. Ramakrishna, Addl. General Manager, BHEL, Bhopal; *India – A Technological Marvel* by Shri C.P. Sharma, Managing Director & Chairman, CII Bhopal Zone, MP State Office, Daulat Ram Engineering Services Private Limited, Raisen, Bhopal; *Bearing Technology: World Scenario* by Shri Sushil Prakash, Managing Director,

Omega Renk Bearings Pvt. Ltd, Bhopal and *Use of Fracture Mechanics and FEM in Materials and Component Assessment* by Dr. Sanjeev Saxena, Principal Scientist, CSIR-AMPRI Bhopal.



A view of the audience

CSIR-Central Building Research Institute, Roorkee

The CSIR-Central Building Research Institute, Roorkee celebrated the National Technology Day on 12 May 2014. Prof. Tushar Kanti Datta, FNAE & Emeritus Professor IIT-Delhi graced the occasion as Chief Guest and delivered a special lecture.

Prof. Datta highlighted various scientific achievements and motivated the S&T staff to take interest in understanding the principles and practical applications of science so that

the future of our country may be bright. He further stressed that science should be explored so as to improve health, income and living standards of the common masses.

He talked about a study on productivity of Scientists and Engineers in R&D Laboratories in six European Countries conducted by UNESCO, revealing a number of interesting findings which are helpful in boosting productivity of Scientists (including



Dignitaries releasing CBRI publications



Engineers engaged in research) in the laboratories. Some of the findings show that (i) Restricted freedom with visibility of consequence is conducive to productivity; (ii) Intrinsic motivation stands the erosion of age in productivity, while extrinsic motivation largely depends on the reward system to maintain productivity; (iii) Diversity is helpful for creativity; (iv) Informal communication with colleagues leads to better productivity and (v) Job satisfaction is the key to higher productivity. A similar study was conducted in Indian academic settings with no difference in results. Quite a few of the findings are not startling but they confirmed the hypothesis and pinned down the strategies to improve organizational climate for better productivity.

Earlier, Prof. S.K. Bhattacharyya, Director, CSIR-CBRI, Roorkee in his Presidential address talked about the

importance of the National Technology Day, which is observed to commemorate technological breakthroughs like mastering of nuclear weapons technology (Pokharan II) through a series of controlled tests at Pokharan, test firing of the indigenously developed Trishul missile and test flight of the indigenous aircraft Hansa-3. The day is celebrated to inspire young minds to achieve high goals and excel at innovations. He also highlighted R&D achievements of CSIR-CBRI and its contribution in improvement of economy, health and living standard of the masses.

On this occasion, various CBRI publications viz. *CSIR-CBRI Annual Report 2012-13*, *Bilingual Newsletter Bhavnika* (Jan-March 2014), and Hindi version of the *Proceedings of National Workshop on Engineering Geophysics for Civil Engineering and Geo-hazards* were released.

CSIR-Central Glass and Ceramic Research Institute, Kolkata

In keeping with the spirit of the National Technology Day, on 9 May 2014, CSIR-Central Glass and Ceramic Research Institute, Kolkata, signed an agreement with CDE Asia Limited and also, organized a

programme to mark the occasion.

Dr. A. Bandyopadhyay, President (Technology & Business Development), CDE Asia Limited presented a talk entitled *Infrastructure Development in India & Role of Minerals Technology*. This was followed by a talk by Dr. I. N. Chakraborty, President R&D and QPC, Calderys India Refractories Limited, who spoke on *Collaborative Work between Calderys India and CSIR-CGCR*.

Dr. Bandyopadhyay spoke about the enormous spurt in infrastructure development in India, a development that has implications for other sectors such as Iron and Steel, Aluminium (demand for Bauxite), Copper, Manganese, Zinc, Molybdenum and the Platinum group of metals. He said that the increase in demand puts strain on the resources which are not only finite and dwindling rapidly but there is also a severe shortage of high quality ores. In the 70s when the demand increased lumps were used; then sintering fines began to be



Dr. A. Bandyopadhyay (left) with Mr. Kamal Dasgupta, Acting Director, CSIR-CGCR

used as the supply of lumps ran down. However, not all fines are of equally good quality. Currently, pelletization of fines is coming in a big way.

Dr. Bandyopadhyay said that CDE-Asia focused on washings and showed that low-grade ores could be used in certain furnaces. He explained in detail the nitty-gritty involved in the process of “washing” and how CDE-Asia began to wash the fines at its Washing Plants in India to make these usable. Washing ensures clean feed which, in turn, improves productivity of furnaces. This may sound a small improvement but when there is a resource crunch and cost pressures, even marginal improvements matter, he said, explaining in exquisite detail the nitty-gritty of iron ore beneficiation.

Paying equal attention to detail he explained the Aluminium scenario in India saying that although Bauxite reserves are high in India, the quality of the deposits at different sites is not uniformly excellent. Besides, even with the large quantities of reserves falling short, given the demands, beneficiation is an option that cannot be ignored.

He said that inadequate quantum of resources, lower than optimum quality, huge demand and high costs were the common constraints for the concrete, cement and specialty glass sectors. He lamented the fact that even with such a huge rise in the infrastructure sector concrete has remained neglected. There are only two plants for the beneficiation of limestone used in concrete. Similar plants for specialty glass in India can be counted on the fingers, whereas China has about 300.

CDE Asia has pioneered the concept of Sand & Aggregate washing in the Indian market. Dr. Bandyopadhyay compared river sand to manufactured sand and said that the manufacture of concrete depended on both these types. Foundry sand and glassmaking sands are important, said. India is the second largest producer of cement and 70 per cent of the production goes to meet demands of the housing sector; only 30 per cent is used for industrial purposes. And although limestone available in India is of good quality the reserves are dwindling fast because of

the demand. CDE- Asia has limestone washing facilities for the cement industry, he said.

Dr. I.N. Chakraborty, who spoke about the collaborative work between Caldeys India and CSIR-CGCRI, briefly described the genesis and evolution of Caldeys India, its history, activities, facilities, interactions with Caldeys Global and CSIR-CGCRI. He said that Caldeys’s association with CSIR-CGCRI went back to the 1990s. This association stemmed from the association for production of dolo-sinter, a technology developed by CSIR-CGCRI. This technology significantly lowered sintering temperature. The second time the two institutes came together involved lime refractories. Unfortunately, this association could not be taken further as there was a change in management at Caldeys.



Dr. I. N. Chakraborty delivering his talk

Dr. Chakraborty gave valuable suggestions, based on his enormous expertise, about the need to upgrade to better equipment for more authentic results that could match global standards.

Mr. Kamal Dasgupta, Acting Director, CSIR-CGCRI presented mementoes to both the Speakers.



CSIR-National Botanical Research Institute, Lucknow

The National Technology Day was celebrated by the CSIR-National Botanical Research Institute on 13 May 2014. The day was observed as 'Open Day' – the Exposition, Herbarium, Library, Botanic Garden, and various R&D Laboratories were visited by a large number of students drawn from various local schools and colleges.

knowledge. He further added that the spread of tumor is also linked to molecular and genetic knowledge as size of tumor or histology alone cannot predict the course of disease, especially in breast cancer and lymphoma. Aggressive types of tumor will need a more aggressive treatment, whereas indolent type of tumor will need a more conservative approach.

Prof. Ravi Kant opined that now a days, doctors can tailor the treatment of some cancers like breast cancer, thyroid cancer, head & neck cancer, stomach cancer, pancreatic cancer, colorectal cancer, soft tissue sarcoma, etc. using detailed molecular knowledge. It is presumed that the molecules in the DNA are signaling pathway and can inform us what will happen to the cell in the future. The knowledge of molecular abnormalities can help us in prevention, vaccines, diagnosis, treatment and prediction of prognosis, he added. According to him, the knowledge of molecular pathways and the knife of the surgeon are entwined.

On this occasion, a technology 'NBRMAP-DB, a safe hypoglycaemic herbal formulation', was also transferred to M/s Aimil Pharmaceuticals, New Delhi. This novel formulation for the management of diabetes was jointly developed by CSIR-NBRI and CSIR-CIMAP, Lucknow.



Inauguration of the event

Prof. Ravi Kant, a renowned surgeon and Vice Chancellor, King George's Medical University, Lucknow, was the Chief Guest of the function and delivered the National Technology Day Lecture. In his lecture entitled, *Human Genome Study and its Impact on Surgical Practice* said that it was essential for the surgeon to be familiar with new advances in molecular and genetic



NBRMAP-DB, a safe hypoglycaemic herbal formulation was transferred to M/s Aimil Pharmaceuticals



It was a unique congregation of farmers from different states of the country, representatives of leading industries, manufacturers and buyers of medicinal and aromatic plants and scientists at CSIR-CIMAP on the occasion of the annual mega event “Kisan Mela” on 31 January 2014.

About 3000 farmers visited CSIR-CIMAP on the occasion of the day-long Kisan Mela. The farmers were apprised of the improved agro-technologies and plant varieties of various economically important medicinal and aromatic plants and exposed to various recent developments through interaction, field demonstrations and published literature.

A large numbers of farmers procured planting material of improved variety of Mentha and other medicinal and aromatic plants and women learnt the technique of making incense sticks using floral bioresource and production of rose water on a cottage scale.

The beneficiaries of CSIR-CIMAP technologies also displayed their products. Besides CSIR-CIMAP, CSIR-NBRI, Biotech Park, Sharp Menthol, Jindal Drugs, IPCA Lab, Spices Board, STHIL, Motor & General Sales, Mentha Growers Association, etc. put up their stalls to showcase the products, technologies and services for the benefit of the participants.

CSIR-CIMAP scientists comprising Dr. V.K.S. Tomar, Dr. Alok Kalra, Dr. H.P. Singh, Dr. Sanjay Kumar, Dr. Saudan Singh, Dr. H.



Dr. C.S. Nautiyal delivering the welcome address

S. Chauhan and others gave lectures and answered the questions asked by the participants. The scientists informed that several medicinal and aromatic plants can also be grown in different kinds of wastelands and degraded soils. A farmer can earn an additional income of Rs 40000 to Rs 60000 per hectare per year under normal conditions by adopting suitable crop rotation, they added.

The representatives of leading menthol industries M/s Jindal Drugs and M/s Sharp Menthol and producer of anti-malarial drug M/s IPCA Lab, Ratlam also addressed the farmers on the occasion. The beneficiary farmers of a Department of Biotechnology (DBT) sponsored project were also provided with Trichoderma Kit for increasing the yield of mint oil.



Release of herbal product 'Relaxomap' oil



Release of a training manual for tribals of Dudhwa

The inaugural session of the Kisan Mela was chaired by the Guests of Honour Dr. Har Saran Das, Principal Secretary, Science & Technology Department, Uttar Pradesh and Shri Rajan Shukla, Principal Secretary, Coordination and Project Coordinator of UPDASP, Uttar Pradesh. Both Dr. Das and Shri Shukla praised the efforts of CSIR-CIMAP in organizing the farmers' fair every year and hoped that farmers will be able to earn more profit after adopting the technologies developed by CSIR-CIMAP.

Dr. Das stressed upon the need for conservation of energy and optimal use of the available resources for more productivity. Dr. Shukla called for close collaboration between, farmers, extension scientists and administration for effective technology dissemination in rural areas.

Welcoming the guests and the participants of the Kisan Mela, Dr. C.S.

Nautiyal, Director, CSIR-CIMAP and CSIR-NBRI said that CIMAP is continuously focusing on new research areas which could extend direct benefit to the farmers and industries. Dr. Nautiyal further assured that this institute would continue to provide its technical guidance and improved technologies in the area of medicinal and aromatic plants for the development of rural India.

The guests and Director CSIR-CIMAP also released Kisan Mela souvenir 'Aus Gyanya' and a training booklet brought out under a DST-sponsored project for the tribal people of Dudhwa National Park who also attend the Kisan Mela.

A newly developed herbal product 'Relaxomap' was also released by the guests on this occasion. This is an aromatherapy based herbal formulation developed by CSIR-CIMAP in the form of oil and is



Participants looking at medicinal plants



Guests going round the stall of women artisans



Demonstration of early mint planting technology



Participants looking at the Khus Digger

intended to provide soothing relief from pain, resulting from daily tiredness and fatigue.

The Early Mint Technology, a new method of transplanting, was demonstrated to the farmers by Dr. Saudan Singh and his team. By application of this technology the cropping period, water requirement and problem of weeds can be reduced by 15-20% with 15-20% increase in the productivity. Similarly, the modern distillation unit developed by CSIR-CIMAP provides more safety at work and reduces time and fuel about 20-30% and increases recovery of oil about 15-20%.



Felicitations of Dr. Das and Shri Shukla

Honours & Awards

IGU Krishnan Gold Medal 2013 to CSIR-NGRI Scientist

Dr. Senthil Kumar, Senior scientist, CSIR-National Geophysical Research Institute, Hyderabad was awarded the *IGU Krishnan Gold Medal 2013* for his significant contributions to the emerging field of planetary geology.

His most notable contributions include: recognition of continental scale shear zones on the Venus similar to the continental shear zones on Earth, geological mapping of the southern hemisphere of Venus to be published by the USGS, reconnaissance of a long deep canyon on Mars (Valles Marineris) as possible future exploration sites, impact cratering processes on the Moon and Earth based on insightful observations of structural uplift of crater rims, structural control of crater shape and geometry, central mounds characteristic of secondary craters from the 90 km wide Copernicus crater with bearing on lunar chronology based on crater counts, and architecture of gullies and landslides on the interior walls of lunar craters.

His work of impact-induced deformation of basaltic rocks in the Lonar crater, central



Prof. V.P. Dimri, (left) President, IGU and former Director, CSIR-NGRI presenting the Krishnan Gold Medal to Dr. P. Senthil Kumar

India and sedimentary rocks in the world famous Meteor crater in western USA have been very revealing. He has already received two prestigious awards for young scientists by the Indian National Science Academy and the Indian Academy of Sciences.

CSIR-NIO Scientist receives First Anni Talwani Memorial Prize

Dr. Kolluru Sree Krishna, Chief Scientist, CSIR-National Institute of Oceanography (NIO) has received the first *Anni Talwani Memorial Prize* for the year 2013.

This award is instituted by the Indian Geophysical Union (IGU). Under this award nominations were invited from meritorious scientists who have contributed significantly to the field of Earth System Science. The Indian Geophysical Union is dedicated to serve the society, in general and Geoscientific community in particular, by bringing all the Earth system scientists on a common platform to address, assess and suggest solutions for various challenges faced by the society/industry.

Dr. Krishna joined the National Institute



of Oceanography in 1984, since then he has continued his research in understanding the plate break-up process of the central Indian Ocean, rift-initiation process between the Eastern Continental Margin of India (ECMI) and East Antarctica, and ridge-hot spot interactions during the formation of the volcanic

ridges.

Dr. Krishna has over 60 research papers to his credit published in various journals of repute in geology and geophysics. His research in the field of Marine Geophysics, particularly in understanding the structure and tectonics of the Indian Ocean has brought out several new findings, superseding several earlier concepts.

Prime Minister's Fellowship Awarded to CSIR-CFTRI Research Scholar

Research Scholar Miss Padma Ishwarya S. of the CSIR-Central Food Technological Research Institute (CSIR-CFTRI), Mysore has been bestowed with the coveted Prime Minister's Fellowship. Miss Padma is pursuing her PhD under the guidance of Dr. C. Anandharamakrishnan, Principal Scientist, Food Engineering Department, CFTRI.

CSIR-CFTRI is working on computational modeling of food processing operations for nearly a decade. Dr. C. Anandharamakrishnan, Principal Scientist, CSIR-CFTRI will be leading the project collaborating with a team of scientists from

industry partner General Mills (India) Private Ltd., Mumbai on this relevant doctoral research programme of Ms. Padma Ishwarya.

The industry sponsor of this fellowship, General Mills, is one of the leading multinational food companies in India, having market presence with brands like Pillsbury, Nature Valley and Häagen-Dazs. The aim of this collaborative research work is to computationally model the baking process to determine the effect of change in ingredients on final product quality. This novel approach is expected to generate newer insights and help reduce costlier experimental trials.

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