

CSIR NEWS

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Team CSIR



CGCRI Ceramic Membrane Technology based iron removal plants in the North-Eastern States

THE north-eastern states of India are a large storehouse of replenishing fresh water. But the people of the hill region often lack access to safe and adequate amount of drinking water. Mainly iron and, sometimes, arsenic and fluorine are the elements which mar the quality of water in this region.

The Central Glass & Ceramic Research Institute (CGCRI), Kolkata's technology for water treatment for the removal of arsenic and suspended particles is being widely used successfully in various parts of West Bengal where the problems owing to arsenic is rampant. The process based on ceramic membrane technology is also suitable for the removal of iron from water. In view of this, Department of Science & Technology (DST), Government of India, has sponsored a project to CGCRI to install two iron removal plants in each of the eight states in the north-eastern part of India. One plant each has been installed in Assam (Guwahati), and Tripura (Udaipur). Two plants have been installed in Nagaland (Dimapur — one in Walford Colony and the other in Chakhesang Colony). The two plants in Nagaland were inaugurated recently.

A view of the iron removal water treatment plant installed in Walford Colony, Dimapur, Nagaland ▶





The State Government of Nagaland has long wanted to ensure supply of good quality potable water to its population in view of the poorer quality of the groundwater available in this state.

The problem is mainly owing to higher iron content in the water. The installation of two iron removal plants under the DST sponsored project will be of great help in this regard. The Nagaland Science & Technology Council has been associated with CGCRI for the installation. Recently at the Walford colony of Dimapur, a function was organized for the inauguration of two iron removal plants. Shri Imkong M. Imchen, Honourable Minister of Science & Technology, Nagaland, graced the occasion. Dr H.S. Maiti, Director, CGCRI, Kolkata, was the Guest of Honour.

Shri Imchen in his inaugural address expressed his gratitude to CGCRI for bringing such an advanced technology in the State of Nagaland with a quotation 'Health for One, Health for All'. Setting up of the two iron removal plants was a positive move towards ensuring quality products for better health and economy for the people of the state, he added. He also informed that the Nagaland Science & Technology Council was contemplating to make provisions to supply potable water to all citizens of the state.

In his keynote address, Dr Maiti highlighted the features of the technology which is capable of supplying potable drinking water as per the quality standard stipulated by the World Health Organization and the Bureau of Indian Standards. He explained how the principle of separation worked, stressing on the efficiency of the membrane based separation technique for solid-liquid separation in cross flow mode. In many respects, the technique is superior to the other techniques which are available for such applications.

Dr S.C. Deorani, Principal Secretary, Science & Technology Department and Dr Zaveri Hiese, Member Secretary, Nagaland Science & Technology Council, were also present during the inaugural ceremony.

R&D at CEERI

Vacuum-sealed Absolute Pressure Sensor

THE Central Electronics Engineering Research Institute (CEERI), Pilani, has recently developed a vacuum-sealed cavity micro-sensor based on polysilicon piezoresistive MEMS technology for absolute pressure applications. The technology integrates surface and micromachining techniques, making best use of the two technologies in respect of compatibility with microelectronics. Two batches were processed with sealed cavities and polysilicon resistors on the diaphragm in half wheatstone bridge configuration. The chip size of the sensor is 1 mm × 1 mm and the diaphragm size is 0.1 mm × 0.1 mm.

New Project taken up by CEERI

CEERI has recently taken up a project on Wave-guides and Prototype Photo Masks Fabrication. The project has been sponsored by IRDE with a sanctioned amount of Rs 9.95 lakh for a duration of 18 months. A brief description of the project is given below.

The Photonics Group at Instruments Research and Development Establishment (IRDE), Dehra Dun, is working on the DRDO-sponsored project on integrated optics where substrates such as lithium niobate and BK-7 glass are used for the fabrication of optical wave-guide and devices. IRDE approached the Opto-Electronic Devices Group at CEERI, which already has the required expertise and infrastructure, to undertake this work as a collaborative R&D programme. Under this project, the Opto-electronics Devices Group will fabricate the optical wave-guides and devices for IRDE.



Technology developed/licenced, Sponsored/Consultancy Projects taken up and Technical Services rendered by CECRI

THE technology developed/licenced, sponsored/consultancy projects taken up and technical services rendered, in the recent past by the Central Electrochemical Research Institute (CECRI), Karaikudi, include:

Technology developed

- Electroplating of cadmium on margining steel using acid cadmium electrolyte

Technology licensed

- Zinc methyl silicate primer – M/s Krishna Conchem Products Ltd, Mumbai – [Lumpsum Premium Rs 50,000; Recurring Royalty: 2.5%; Nature of License: Non-exclusive; Period of Licence: 5 years]
- Modified UV & light stable epoxy system – M/s Krishna Conchem Products Ltd, Mumbai [LP: Rs 50,000; RR: 2.5%; NL:NE; PL: 5 years]
- Self passivating primer — M/s Krishna Conchem Products Ltd, Mumbai, [LP: Rs 1,00,000; RR: 2.5%; NL: NE; PL: 5 Years]
- Production of diamond powder incorporated nickel matrix composite coating on steel disc for gem final polishing – M/s Control System & Service Engineers, Jaipur [LP: Rs 88,160; RR: 2.5%; NL: NE; PL: 5 years]
- Low-cost anticorrosive coating for marine and industrial structures – M/s Ultra

Chemicals, Karaikudi [LP: Rs 66,120; RR: 2.5%; NL: NE; PL: 5 years]

- Lead acid battery for normal temperature operation – Sri Pechi Batteries, R.P. Pudur, Namakkal Dt. [LP: Rs 50,000 (+ 15,000 as demo charges); RR: 1% on ex-factory sale; PL:14 years; NL: NE]
- Cement polymer composite coating system for corrosion protection of reinforcing and prestressing steels (Renewal of licence) – M/s Narendra Coating India Pvt. Ltd, Mumbai [LP: Rs 11,20,000; RR: 2.5%; PL: 7 years; NL: NE]

Sponsored Projects

- Development of corrosion inhibitors for carbon steel in decontamination process – DAE, BARC, Mumbai (Rs 17,56,400)
- Modeling of non-linear reaction – diffusion process at modified electrodes – DST, New Delhi (Rs 6,42,000)
- Development of electroless nickel plating on margining steel for LCA slat tracks and LCA Navy arrester hook component – Aeronautical Development

Agency, Bangalore (Rs 9,00,000)

- Evaluation of 12V/65AH VRLA batteries as per JIS 8702-1:1998 – Orchid Electronics, New Delhi (Rs 71,079)
- Polymer light emitting device (LED) synthesis of molecularly designed polymers, design and development of LED – DST, New Delhi (Rs 22,59,750)
- Development of DC magnetron sputtered tin coating with brush plated Ni interlayer on steel for multiple applications – DST, New Delhi (Rs 7,56,000)
- Evaluation of HBL NIFE VRLA cells as per/RS-S-93/96A specification for the following cell: 2V 80Ah – HBL Nife Power Systems Ltd, Chennai (Rs 43,088)
- Protective coating to prestressing steel for use in concrete structures – Krishna Conchem Products Pvt Ltd, Mumbai (Rs 4,95,900)
- Evolution of engineering materials for marine conditions with special reference to corrosion and biotouling – DAE, BRNS, Mumbai (Rs 11,83,300)
- Selective electrocatalysis for mixed reactants direct methanol fuel cell – DST, New Delhi (Rs 17,22,000)



- Direct conversion of solar radiation into electricity through dye-sensitized solar cells – Department of Science & Technology, New Delhi (Rs 10,32,000)
 - Design and development of arsenic monitor – Department of Science & Technology, New Delhi (Rs 13,65,000)
 - Corrosion failure analysis of hydrogen cooler – Nuclear Power Corporation of India Ltd, Karnataka (Rs 3,50,000)
 - Evaluation of “Hi Power” low maintenance batteries for Southern Batteries as per IRS S88/2004 for 2 types of batteries – Southern Batteries Pvt Ltd, Bommasandra (Rs 4,84,888)
 - Corrosion and force monitoring of prestressing strands in Kaiga Atomic Power Project Units 3 & 4 – Nuclear Power Corporation of India Ltd, Mumbai (Rs 75,88,000)
 - Feasibility study of brush electropolishing of 316 LN stainless steel – IGCAR, Kalpakam (Rs 1,24,775)
 - Solar light for Self Help Group of Women – Aranmanaipatti Panchayat, Attangudi (Rs 55,100)
 - Evaluation of Exide batteries of the following types for 3 hour capacity followed by short circuit and internal resistance test as per IEC 60896-21 and 22 (EPST & MS) types and IEC 60896-11 (YAP types) – one 12 V battery in each type – Exide Industries Ltd, Mumbai (Rs 2,08,036)
- ### Consultancy Projects
- To advice on the preparation of electroplated diamond tools – Control system & Service Engineers, Jaipur (Rs 37,800)
 - To study the condition of the existing coatings on the conveyor structure – TNEB, Chennai (Rs 23,660)
 - To synthesize cobalt TMPP and study the electrocatalytic reduction of alkyl halides in solution phase by cyclic voltammetry – High Energy Batteries India Ltd, Mathura (Rs 43, 928)
 - Corrosion investigation of reinforced concrete structures – Hindustan Newsprint Ltd, Newsprint Nagar, Kottayam Dist. (Rs 2,65,570)
 - Cathodic protection for CPCL Dockline – Indian Oil Corp. Ltd, Chennai (Rs 5,20,089)
 - Preparation and characterization of semi-conducting thin film – Karunya Institute of Technology and Sciences, Coimbatore (Rs 19,836)
- ### Technical Services
- Microscopic analysis of Exide cured plates – Exide Industries Pvt. Ltd, Chicurakanpalli (Rs 13,224)
 - Testing of anticorrosive treated rods supplied by the firm – Prasad & Co., Pondicherry (Rs 13,224)
 - Evaluation of Bindal and Bindal 12V, 40Ah tubular battery and 12V, 75Ah tubular battery as per IS 13369:1992 – Bindal & Bindal Batteries Pvt Limited, New Delhi (Rs 52,896)
 - Treating of anticorrosive treated reinforcement rods supplied by National Highways, Subdivision III, P.W.D., Pondicherry – P.K. Mookanambalam & Co., Madurai (Rs 27,400)
 - Analyais of sewage water collected from sewage treatment plant – Trichirapalli City Corporation, Trichy (Rs 11,020)
 - Testing of anticorrosive treated rods as per ASTM standards supplied by AEE, TWAD Board, Urban Sub Division, Chennai – Asst Exe Engineer, Chennai (Rs 13,300)
 - Testing of anticorrosive treated reinforcement rods – P.K. Mookanambalam & Co., Madurai (Rs 28,000)
 - To conduct thermal runaway, sensitivity test – Amara Raja Batteries Ltd, Tirupati (Rs 16,530)
 - Evaluation of CPCC samples from pro construction of major bridges No.307, 329 and 452 between Karaikudi and Manamadurai as per CECRI code of practice – Southern Railway, Manamadurai (Rs 27,625)
 - Testing of Eagle-Pitcher lithium-thionyl chloride (3.5V/750 Ah), batteries–NELCO Ltd, Mumbai (Rs 26,989)
 - Testing of organo phosphonate – NLC, Neyveli (Rs 38,570)
 - Evaluation of 6V/230 Ah battery for life (at elevated temperature) as per MIL specification – Orchid Electronics, New Delhi (Rs 17,632)
 - Thermal and corrosion resistant paint–VSSC, Thiruvananthapuram (Rs 73,195)



Development of A Novel Scale Space Approach in Nonparametric Statistical Smoothing

Shanti Swarup Bhatnagar Prize-winner
Dr Probal Chaudhuri's work

DR Probal Chaudhuri of the Indian Statistical Institute, Kolkata, has been awarded, along with Dr Kapil Hari Paranjape of the Institute of Mathematical Sciences Chennai, the Shanti Swarup Bhatnagar Prize in Mathematical Sciences for the year 2005 for the research contributions he has made to diverse areas of theoretical and applied statistics. His work ranges from statistical smoothing in non-parametric estimation and a multi-scale approach in statistical pattern recognition to the exploratory analysis of large DNA sequences. [CSIR News, 55 (2006) 342]

Dr Probal Chaudhuri and his collaborators have developed a novel scale space approach in nonparametric statistical smoothing. This approach uses a family of statistical smoothers to make statistical inference about a function parameter. This leads to new techniques for identifying statistically significant geometric features in an unknown curve or surface based on noisy observations. Mathematical theory underlying this methodology has some deep connections with totally positive kernels and heat diffusion equations. The work was published partly in *Journal of The American Statistical Association* in 1999 and partly in *The Annals of Statistics* in 2000. Within a very short period, this scale space



technique for nonparametric function estimation has become very popular among scientists in different disciplines, and has been widely used in natural and engineering sciences as evident from the citation records in recent literature. The visual device called SiZer Map introduced in these papers are now widely recognized as a fundamental and extremely useful discovery in the area of statistical smoothing.

A major impact of the work was in developing new tools for statistical pattern recognition and image analysis. In a recent paper published in *IEEE Transactions on ImageProcessing* in 2004, Probal Chaudhuri and his collaborators presented a new edge detection algorithm for digital images based on a statistical principle of thresholding that was developed using the scale space type statistical inference tools applicable to kernel smoothers. An impressive feature of this new edge detector is that it produces excellent edge maps for a variety of complex

images with a very stable choice of input parameters. It is now known that for a wide range benchmark images, unlike many popular edge detectors including the famous Canny's edge detector whose performance may dramatically deteriorate due to small perturbations in the input parameters and for which a good choice of input parameters may vary a lot from one image to another, the new edge detector works satisfactorily with a common choice of input parameters. Further, the visual quality of the edge maps obtained using this new edge detector from a large number of benchmark images are generally comparable to the best possible output obtained using those edge detectors.

Together with his students and colleagues, Probal Chaudhuri developed some multiscale versions for kernel and nearest neighbour classifiers. These multiscale classifiers are again based on scale space principles of statistical smoothing. The work has been published recently in *IEEE Transactions on Pattern Analysis and Machine Intelligence* in 2005 and *Technometrics* in 2006. These papers demonstrate the superior performance of multiscale classifiers over single scale classifiers when applied to a large number of benchmark data sets. An appealing



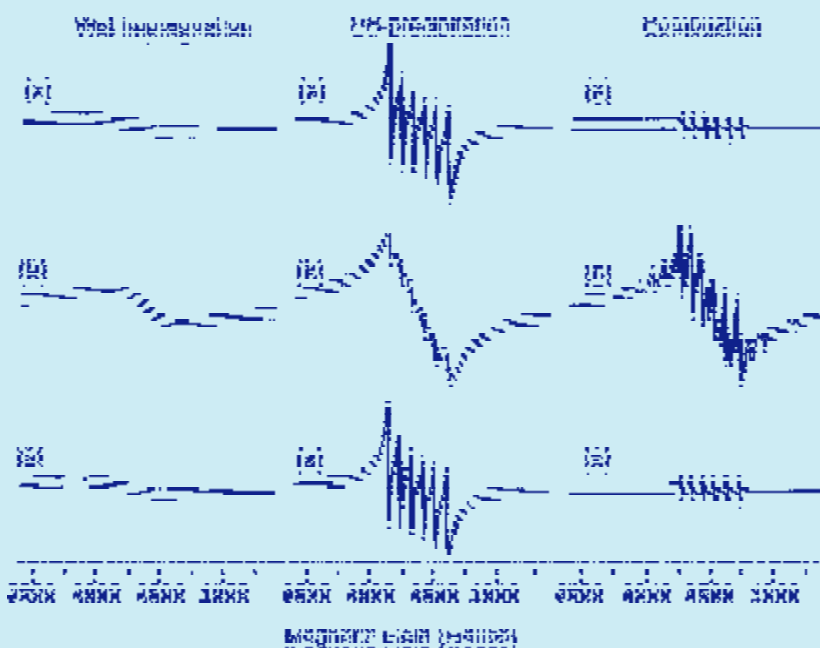
feature of these multiscale classifiers is a novel visual representation of the classification results from the family of classifiers indexed by the bandwidth parameters in the case of kernel discriminant analysis and by the neighbourhood parameters in the case of nearest neighbour classifiers. Besides, there is a clearly formulated scheme for aggregation of the classification results from a family of classifiers.

Probal Chaudhuri was born in 1963 in Kolkata. He received his primary education from Paikpara Raja Manindra Memorial Primary School and his secondary and higher secondary education from Hare School in Kolkata. He obtained B.Stat (Hons.) and M.Stat degrees from Indian Statistical Institute in the years 1983 and 1985, respectively. Subsequently he moved to the United States and received his Ph.D. degree in statistics from University of California at Berkeley. Before returning to India, he worked as a faculty member at the University of Wisconsin, Madison. He returned to India and joined the faculty of Theoretical Statistics and Mathematics Unit of Indian Statistical Institute, Kolkata, in December 1990, and since then he has been working there. He was elected a fellow of Indian Academy of Sciences, Bangalore in 2003 and a fellow of the Institute of Mathematical Statistics (USA) in 2005. He was awarded B. M. Birla Science Prize in Mathematics by B. M. Birla Science Center, Hyderabad for the year 2001, and the National Award in Statistics in Honour of C. R. Rao by the Ministry of Statistics & Program Implementation, Government of India for the year 2005.

Nature of Manganese Species in $\text{Ce}_{1-x}\text{Mn}_x\text{O}_2$ -%o Solid Solutions Synthesized by the Solution Combustion Route

A series of manganese-cerium oxide composites with Mn concentrations in the range of 1-20 mol % in ceria was prepared by the solution combustion technique using urea as fuel. The nature, type, and oxidation state of Mn species in ceria were investigated by X-ray diffraction (XRD), diffuse reflectance UV-visible spectroscopy, electron paramagnetic resonance (EPR), X-ray photoelectron spectroscopy, and temperature-programmed reduction techniques. The study carried out by B. Murugan and A.

V. Ramaswamy Department of Chemistry, University of Pune, Pune; D. Srinivas, C. S. Gopinath, and V. Ramaswamy of Catalysis Division, National Chemical Laboratory, Pune, reveals that the method of preparation significantly influences the type of manganese species in ceria. Wet-impregnation, coprecipitation, and solid-state synthesis techniques lead to clustered MnO_x -like species in the ceria matrix, while the present method of preparation (solution combustion route) yields a highly dispersed form of Mn species. In



EPR spectra of the $\text{Ce}_{0.95}\text{Mn}_{0.05}\text{O}_2$ solid solution prepared by various methods showing the reversible redox behaviour of the Mn species in ceria (a) fresh sample evacuated at 773 K; (b) reduced at 773 K and reoxidized at 573 K. The sample is reduced at 773 K in the flow of hydrogen, and oxidation is done at 573 K in the flow of air and recorded at 298 K

the reported series of samples, Mn is present mainly in +2 and +3 oxidation states and there is no evidence for the presence of Mn⁴⁺ species. Powder X-ray diffraction studies at variable temperatures (298-1323 K) indicate the formation of Ce_{1-x}Mn_xO_{2- δ} solid solutions. No separate MnOx-type phase was detected even at 1323 K. EPR studies reveal that the isolated Mn²⁺ and Mn³⁺ species are present in at least three different structural locations: species A, Mn ions in ceria-lattice defect sites; species B, Mn ions in framework Ce⁴⁺ locations; and species C, Mn ions in interstitial locations and at the surface of ceria. The Mn³⁺ ions in ceria exhibit a facile reduction and reoxidation behaviour when exposed to dry hydrogen and subsequently to air at elevated temperatures. A highly dispersed state of Mn³⁺ and Mn²⁺ in ceria, facile redox behaviour, and a synergistic Mn-ceria interaction are some of the unique properties of this material prepared by the solution combustion procedure. The work has been published in *Chemistry of Materials*, 17 (2006) Iss16 3983-3993.

Emergence of India as a Hub for Pharma R&D and Manufacturing

— Dr R.A. Mashelkar, FRS,
Director General, CSIR

“INDIA will emerge as a hub for pharma R&D and manufacturing,” says Dr R.A. Mashelkar FRS, Director General, CSIR, in an interview with Manas R. Bastia, published in the column ‘Leaders Speak’ of the February-March issue of *Modern Pharma-ceuticals*. Expressing his happiness over the way Indian pharma sector has been responding to the challenges of the new product patent regime, Dr Mashelkar in this interview discusses the key strengths and tremendous opportunities and also spells out his vision for the Indian pharma industry:



“The Indian pharma sector has responded very well to the challenges of new product patent regime,” says Dr Mashelkar. “Major pharma companies have already shifted their focus from imitative to innovative research, including new drug discovery. Ranbaxy, Dr Reddy’s Laboratories, Wockhardt, Nicholas Piramal, Cipla, Lupin, etc, have created state-of-the art R&D facilities so as to take on the global challenges.”

“The Indian pharmaceutical companies have several advantages that include: abundance of trained manpower (especially in chemistry and process engineering), cost-competitive clinical research, low-cost manufactur-

ing and large markets for modern and lifestyle drugs. They also have the advantage of availing government support for niche R&D in the area of new drug development. The pharma industry can cash upon our rich biodiversity, large pool of S&T manpower, state-of-the-art R&D infrastructure, cost-effective clinical trials for various diseases, large drug-naïve patient population, low operational costs, US FDA standard manufacturing facilities and globally aligned IP laws.”

“In Europe and the US, a number of drugs will be going off patent during 2005-2009. This offers a huge opportunity to Indian companies in the domain of generic drugs.”

“Further, Indian companies have tremendous potential of becoming manufacturing partners globally as they provide the best cost advantage. The MNCs and TNCs are rethinking of ways in which new ideas could be generated and brought to the market in product form. Also, they are under immense pressure to cut costs for product-based R&D and thereafter product manufacturing. They are thus increasingly exploring India for contract research (CR) and contract manufacturing (CM). Many alliances that gained entry into India either for CR or CM are operating successfully. The



focus of such alliances has not only been domestic market but international markets as well. Success of some of these alliances has led to setting up of specialized research centres by the MNCs. I see this trend to grow further. India will emerge as a hub for pharma R&D and manufacturing,” opines Dr Mashelkar.

“The future belongs to bio-pharmaceuticals. Presently, the Indian biotech industry contributes modestly to global markets. The size of the industry is just \$ 1 billion. But it is growing at around 35-40 per cent over the past three years. It shall become another success story for us. The National Biotechnology Development Strategy would play an enabling role. We need venture capital funding to propel entrepreneurship in this segment of industry. We need to replicate successes like that of Biocon.”

“We already have these (venture capital) funds – but the problem is that ‘venture’ capital has to assume the role of ‘adventure’ capital!! We need to be more daring rather than having the mindset of a conventional banker.”

“On the regulatory front, the Mashelkar Committee (2005) has drawn up a new procedural framework for biopharmaceuticals, which has streamlined the process for the first time in the country. But it needs to be implemented fast. I feel India can take global leadership in vaccines and recombinant products. We already have some success stories. We must build on these. I will like to see the next generation biopharmaceuticals with improved therapeutic characteristics on one

hand and reduced costs on the other. The focus should be on debilitating and life-threatening diseases.”

Explaining the various efforts to pool the resources through private-public partnerships, Dr Mashelkar says, “Various schemes have been launched to foster collaboration among various players of National Innovation System (NIS). These include: Programme Aimed at Technological Self Reliance (PATSR-DSIR); Home Grown Technology (HGT-TIFAC); Drugs & Pharmaceuticals Research Programme (DPRP-DST); Technology Development Board (TDB-DST); New Millennium Indian Technology Leadership Initiative (NMITLI-CSIR); and Small Business Innovation Research Initiative (SBIRI-DBT).”

“DPRP is primarily focused on synergizing the strengths of publicly funded R&D institutions and the Indian pharmaceuticals industry so as to enhance the nation’s self-reliance in drugs and pharmaceuticals especially in areas critical to national health requirements.”

“NMITLI was launched with an objective to secure a leadership position for India in niche areas, based on technology through Team India effort in PPP mode. The scheme has been operationalised and by now there are 41 massively networked projects in diverse S&T areas including drugs and pharmaceuticals. NMITLI has been a tremendous success and various novel products could be launched through the well-focused project efforts. In the domain of drugs and pharmaceuticals, the discovery of a new drug molecule for tuberculosis

for the first time in the last 40 years, and development of a unique herbal formulation for psoriasis through NMITLI could be achieved in a short period of two years. We need to put in place more schemes like NMITLI to help our industry develop world-class products.”

Regarding the R&D expenditure, Dr Mashelkar says, “India’s annual S&T budget is \$6 billion. This is less than that of Pfizer’s annual R&D budget! Yet we have so many achievements to our credit. That is because a dollar goes very far in India. I am not worried by the size, but by how we lay our baits, how we leverage our strengths and how cleverly we exploit the public-private partnerships.”

Regarding the measures that India needs to take to strengthen the regulatory framework with respect to drug approval and patents, Dr Mashelkar explains, “Government of India had constituted an Expert Committee under my chairmanship to undertake a comprehensive examination of drug regulatory issues including the problem of spurious drugs. The Committee examined in detail the existing drug regulatory scenario in the country as well as the prevailing systems in a number of other countries and performed a gap analysis vis-à-vis the envisioned situation. The Committee recommended revamping of the existing drug regulatory structure and practices to achieve a world-class system.”

“Restructuring of CDA and modification of the Drugs & Cosmetics Act were also suggested. To ensure safety of Indian study subjects in clinical research, sharing of

responsibility by all the stakeholders, viz. investigators, sponsors, was recommended. Creation of a single window clearance mechanism for approval of various applications concerning drug research and approval, including research materials, etc, within CDA was sought.”

“Also, rationalization of policies and procedures presently applicable in the country for animal experiments was recommended to avoid undue delay. Effort was thus to further improve the drug regulatory environment in the country and fully align the guidelines and setups with the global scenario. Again, this report needs to be implemented quickly.”

Finally, spelling his vision, Dr Mashelkar says, “I envision an Indian pharma industry, which will show three qualities: innovation, compassion and passion. It should do innovation of the highest order, not embark on beaten paths but traverse untrodden paths. I will like it to have compassion – especially compassion for the poor – by creating therapeutics for the poor that are available, affordable and accessible. I will like them to have a passion – to be the best in the world – in terms of quality of their products, the highest ethical standards and providing value for money to the Indian and global customers.”

Japanese Delegation visits NISCAIR



Mr Hirokazu Nakano, Deputy Director, Japanese Patent Office (extreme left); Shri V. K. Gupta, Director NISCAIR; Mr Hiroshi Kato, Associate Professor, National Graduate Institute for Policy Studies, Tokyo; and Mr Hitoshi Amano, Director, Intellectual Property Department, Japan External Trade Organization (extreme right) in discussion on Traditional Knowledge Digital Library and Intellectual Property

A three-member Japanese delegation comprising Associate Professor, Hiroshi Kato, National Graduate Institute for Policy Studies, Tokyo; Mr Hirokazu Nakano, Deputy Director, Japanese Patent Office, Tokyo; and Mr Hitoshi Amano, Director, Intellectual Property Department, Japan External Trade Organization, Bangkok, visited the National Institute of Science Communication and Information Resources (NISCAIR), New Delhi, on 6 March 2006 to discuss regarding Traditional Knowledge Digital Library and Intellectual Property. The delegation expressed the keenness of Japanese Patent Office to have access to the TKDL database for the purpose of Search and Examination. A formal request for accessing the TKDL database would be submitted shortly by JPO.

SEEDA, UK, Delegation visits SERC

A delegation from the South East England Development Agency (SEEDA), UK, comprising their Science, Technology, Entrepreneurship Management Team and Academia from the Universities in the South of England, visited the Structural Engineering Research Centre (SERC), Chennai, in the recent past with the aim to work out a strategy to collaborate with India.

Indo-Belarus Seminar on Bitumen Emulsions and Cold Mix Technologies

A seminar on 'Bitumen emulsions and cold mix technologies for maintenance of roads' was organized at the Central Road Research Institute (CRRI), New Delhi, in the recent past. The Institute of General and Inorganic Chemistry (National Academy of Sciences of Belarus) (IGIC-NAS), Republic of Belarus, and CRRI-CSIR are currently working on various aspects of highway engineering materials such as bitumen emulsions, cold mixes, microsurfacing, modified bitumens and high performance stone matrix asphalt. The seminar was sponsored by Department of Science and Technology and IGIC-NAS. As a part of the seminar, a half-day workshop on 'High Performance Bituminous Materials' was also held at CRRI.

The IGIC-NAS is playing a leading role in development of high quality bitumen emulsions for construction and maintenance of



During the Indo-Belarus Seminar on Bitumen Emulsions and Cold Mix Technologies, seated on dais (from left) are: Dr V.K. Sood, Scientist G; Dr P.K. Nanda, Director, CRRI; Shri S.K. Varshney, International Collaboration, DST; Prof. V.S. Ramamurthy, Secretary, DST; Dr R. A. Mashelkar, Director-General, CSIR, Mr H.E. Olegphtenok, Ambassador, Republic of Belarus to India; Prof. N.P. Krutsko, Director, IGIC-NAS, Belarus; Dr T.S. Reddy, Area Advisor, TTP and Dr P.K. Jain, Scientist F

roads in Republic of Belarus. An agreement of intent was executed in March 2003 between CRRI and IGIC-NAS to undertake joint collaborative research projects. The scope of agreement included development of (i) high quality bitumen emulsions, (ii) modified bitumen emulsions, (iii) stone matrix asphalt, (iv) ready to use cold mix materials for road maintenance and (v) specifications

for high performance cold mixes. A six member delegation under the leadership of Prof. N.P. Krutsko, Director, IGIC-NAS, visited India recently.

Dr R. A. Mashelkar, Director-General, CSIR, inaugurated the seminar and it was presided over by Prof. V.S. Ramamurthy, Secretary, Department of Science and Technology. While appreciating the efforts of CRRI and IGIC-NAS in organizing this international event, Dr Mashelkar emphasized the need for a Center of Excellence at CRRI, where scientists from IGIC-NAS may stay for a longer period and work jointly with scientists of CRRI and other laboratories closely for development and adoption of environment-friendly cold mix



A view of audience during the Indo-Belarus Seminar

technologies. During the inaugural session, Mr H.E. Olegphptenok, Ambassador, Republic of Belarus, also addressed the participants.

The seminar was attended by about 250 delegates from India and different countries like France, Singapore, Germany, Denmark and Spain. There were two technical sessions on themes of 'Bitumen emulsions' and 'Cold mix technologies' chaired by eminent scientists and professionals like Prof. C.E.J. Justo, Prof. Emeritus, Indian Institute of Science, Bangalore, and Shri R. Subramaniam, Engineer-in-Chief, Delhi, PWD. Issues of emulsion technology, aggregate-emulsion mixture chemistry and applications for road maintenance were discussed. The session on panel discussion was chaired by Shri S.C. Sharma, former DGRD, MoS & RTH and Additional Secretary. In the panel discussion, role of industry in development of better emulsion technology was discussed. The valedictory address was given by Prof. C.G. Swaminathan, former Director, CRRI.

Prof. V.S. Raju, Chairman, Research Council, CRRI and former Director, IIT Delhi, inaugurated the workshop. The technical session was chaired by Dr M.P. Dhir, former Director, CRRI. During the workshop, presentations were made by Dr P.K. Jain, Scientist, CRRI; Dr U.C. Gupta, Scientist, IIP; Shri C. Kamraj, TO, CRRI; Dr L. Auseyenko, and Mr Stefan Schultc, IGIC-NAS of Belarus. Earlier, Dr P. K. Nanda, Director, CRRI, welcomed the participants and delegation from Belarus. About 150 delegates from academic and research institutions, consultants, planners and user agencies attended the workshop. Shri R.S. Sharma, Secretary-General, Indian Roads Congress, presented a summary of the session proceeding in the concluding session.

Fifteen industries from India and abroad participated in the technical exhibition organized on this occasion. Key participants were from AKZO-Nobel, France and ENH Engineering, Denmark.

Workshop on Road Safety Audit



Dr P. K. Nanda, Director, CRRI, delivering the inaugural address. Seated (from left) are: Dr T. S. Reddy, Head, TESD, CRRI, Prof. B. P. Chandrasekhar, Director (Technical), NRRDA; Shri D. P. Gupta, former Director-General, Road Development, MRTH; Mr David Williamson and Mr Maurice Burley, VICROADS International, Australia.

A workshop on Road Safety Audit was organized at the Central Road Research Institute (CRRI), New Delhi, in the recent past. The workshop was moderated by Shri D. P. Gupta, former Director-General (Road Development), Ministry of Shipping, Road Transport and Highways. Dr P. K. Nanda, Director, CRRI, gave welcome address and spoke on the genesis of Road Safety Audit activities being pursued at the institute. In an effort to minimize the growth of accidents on Indian roads, Road Safety Audit (RSA) is being pursued in a big way on the existing as well as for the proposed new roads. As a part of this effort National Highways Authority of India (NHAI) has commenced road safety audit project of National Highways Development Projects (NHDP) covering a length of around 3000 km. Since the road safety audit is an important aspect of highway traffic operations and management it was considered necessary to share the knowledge relating to Road Safety Audit process and prospects through discussions of case studies. Discussions were held on basic concepts and process of conducting road safety audit with the help of case studies relating to National Highway-8 and Mumbai-Pune



Expressway. Mr David Williamson and Mr Maurice Burley, VICROADS International, Australia, Prof. B. P. Chandrasekhar, Director (Technical), National Rural Road Development Agency (NRRDA) and Dr T.S. Reddy, Head, Traffic Engineering & Safety Division (TESD), CRRI, made presentations which included description of Road Safety Audit process and finer aspects of safety auditing and results of the Road Safety Audit conducted on Jaipur-Kishangarh Expressway, Mumbai-Pune Expressway and the Road Safety Audit issues of rural roads in India. Forty scientists and practicing engineers from Ministry of Shipping, Road Transport and Highways and Central Public Works Department participated in the workshop. Dr T. S. Reddy, Head, TESP, proposed Vote of Thanks.

Workshop on ENVIS Bioinformatics — Vector Control



Dr U.S.N Murty, Coordinator, ENVIS Centre, addressing the invitees and District Malaria Officers Dr J.S. Yadav, Director, IICT, is seated (second from left)

THE Indian Institute of Chemical Technology (IICT), Hyderabad, organized a two-day workshop on 'ENVIS bioinformatics - vector control' in the recent past, jointly with the Directorate of Medical and Health Services, Government of Andhra Pradesh for the District Malaria Officers of the Directorate of Health and Medical Services. The main aim of the workshop was to impart the knowledge of information technology in controlling the dreaded vector borne diseases and for information dissemination to act efficiently in controlling the mortality and morbidity.

Welcoming the gathering of District Malaria Officers and other health officials (28 officers) drawn from various districts of Andhra Pradesh, Dr J. S. Yadav, Director, IICT, gave a brief overview of IICT and its achievements in bioinformatics vector control. Dr Yadav also spoke about the societal work being

done by the Biology Division under the leadership of Dr U.S.N. Murty, Head Biology, in the area of vector borne diseases. He said that the research would be fruitful only when it reaches the common man. He also stressed that Information Technology can play a very vital role and hoped that the assembled medical officers would get benefited by this two-day workshop.

Speaking on the occasion, Dr U.S.N. Murty, ENVIS Coordinator, spoke about the concept of ENVIS and the role it plays in control of vector borne disease and information dissemination system. The IICT-ENVIS, which started as a Node, has now been upgraded as a 'ENVIS Centre'. Dr Murty spoke how important the workshop was as it would help the district health officers retrieve the information quickly and take necessary steps to control the outbreak.

Dr Murty also told that the ENVIS Centre is catering to the needs of the



researchers working in the area of vector control and also explained about the application of data mining tools for prioritization of endemic zones for the vector diseases like malaria, Japanese encephalitis and filariasis.

In his special address Dr Prabhakar Reddy, Additional Director, DM&HS, spoke about the importance of the two-day workshop and how helpful it would be for the District Malaria Officers in controlling the vector borne diseases.

The Chief Guest Dr Somasekhar Reddy, Director, DM & HS, Government of A.P., deliberated the importance of such workshops for the medical officers and stressed that these would go a long way in controlling the vector borne diseases and thanked IICT for initiating such programmes, which have great importance for a better society. He also spoke about the outbreak of chicken gunya virus, which was reported recently.

The participants were given lecture cum demonstration on the usage of various software on vector borne diseases, developed at IICT under the 'ENVIS' programme. The participants had hands-on session in the state-of-the-art 'ENVIS' Lab of Biology Division, IICT, Hyderabad. The participants were given study material, user manual and the compact disc which contain various vector borne diseases databases and complete information about the ENVIS website.

The programme concluded with the vote of thanks proposed by Dr M. Mahboob, Technical Officer Biology Division, IICT.

NBRI celebrates Annual Day

THE National Botanical Research Institute (NBRI), Lucknow, recently celebrated its 51st Annual Day. Noted environmentalist and Director of Centre for Science and Environment Dr Sunita Narain was the Chief Guest on this occasion. Dr Nityanand, former Director, Central Drug Research Institute, Lucknow, delivered the presidential address.

In her lecture entitled 'Between Wants and Wastes: Environmental Challenges in India', Dr Sunita Narain said that in this country many believe that pollution was the sign of development but the important question that should be answered was how sustainable was our progress. Lucknow should be freed from vehicular pollution, which is gripping the city day by day, she said. "It is wrong to compare ourselves with developed countries like USA, as we are ill equipped both in infrastructure and financial resources to take environmental issues, especially in developing equipment to monitor pollution and strategies to mitigate it," she said. Finally, she said that solutions for these problems lied in the mindset of people and not on developing infrastructure and evolving methodologies. If people start thinking differently then these can be solved, she said. She called upon the scientists and the masses to work in tandem for countering the pollution. She lauded the efforts in reviving traditional wisdom and developing environment-friendly

products for the sake of mankind.

Dr Nityanand in his presidential address threw light on the origin of life. He said that various phases of life are interrelated to each other and there always remains equilibrium both in the living and non-living segments. He further said that it has been proved by various experiments that there are similarities in some gene clusters of most complicated and most simple living organisms. He was concerned that environmental problems are on rise owing to enhanced imbalances between living and non-living beings.

Earlier, Dr Pushpangadan, the then Director, NBRI, welcomed Dr Sunita Narain, Dr Nityanand, distinguished guests and other dignitaries and presented the progress report of the institute, highlighting the work carried out during 2004-2005. He revealed that this year the institute has come out with a number of natural products. The know-how of the *Bacillus* based microbial technology has been transferred to M/s Biotech. International Ltd, New Delhi. Another microbial technology, i.e. *Trichoderma* based microbial technology has been transferred to M/s Gujarat Agri Processing Co. Ltd, Vadodara, Gujarat. The Nutra-Diab technology developed earlier by the institute has been transferred to another client M/s National Energy Consultant, Gurgaon. The institute forged ahead with development and transfer of natural product based technologies,



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giving utmost attention to IPR. The scientists of NBRI published a total of 155 research papers in various national and international journals.

The Plant Biodiversity & Conservatories Biology continued its impressive work on both basic and applied projects related to taxonomic revision, biodiversity assessment, ethnobotany, conservation biology, molecular taxonomy, seed biology and palynology studies, Dr Pushpangadan informed. Floristic surveys and plant diversity assessment were carried out in various regions of the country. Genetic diversity in lesser known (under-utilized) wild edible plant resources of Gangetic Plain was assessed for their *ex-situ* conservation. The identification of lichens collected during 22nd Indian Antarctic Expedition from Schirmacher Oasis and neighbouring Nunataks was completed, which revealed the occurrence of 35 species of lichens belonging to 20 genera and 11 families. Out of the total 35 species, 13 are endemic to Antarctica, 10 are bipolar while 11 species are cosmopolitan in distribution.

Describing the work of phytochemistry group, he said that the technology of Herbal Gulals for the preparation of dry colour powders using natural dyes and natural ingredients developed by this group had been transferred for three natural colours namely Lac, Indigo and Turmeric dyes to D. M. Herbal, a division of D. Manoharlal (Shellac) Pvt. Ltd, Sakti, Chattisgarh.

Summarizing the progress report of Biomass Biology group, Dr Pushpangadan said that the Biomass Biology Group have done

studies on eco-friendly and sustainable model for bioremediation of contaminated water bodies. A mission programme on *Jatropha curcas* has been initiated. The group has developed a drought-resistant variety. Besides, protocols for raising seedlings in winter months have been developed so that nurseries can be raised throughout the year. Surveys were undertaken in different degraded land sites for soil characteristics, plant biodiversity and microbial screening. The biosorption of the chromium, frequently found in polluted tannery wastes, by *Pseudomonas* and *Bacillus* spp. was studied. Out of hundred twenty morphological distinct chromate-resistant strains screened for their tolerance limit to Cr and other toxic metals, four strains were found to show maximum tolerance and bioaccumulation potential.

Narrating the achievements of NBRI in the area of Molecular Biology & Genetic Engineering, Dr Pushpangadan told that considerable progress was made both in basic and cutting edge areas of plant molecular biology and genetic engineering for applying the developed techniques and knowledge of molecular genetics to address the questions in basic and applied areas of plant sciences.

The plant molecular biology research group carried out studies on transgenic plants for insect pest resistance and viral diseases resistance with encouraging results. State Seed Corporations and other agribiotech industries have been approaching CSIR/NBRI to enter into suitable agreements for further development and utilization of the

Bt-cotton technology developed at NBRI. Transgenic δ -endotoxin cry1EC expressing stable lines of cotton Coker 312 were selected and backcrossed for the development of agronomically useful cultivars. A selected high expressing line was backcrossed with an agronomically elite cotton cultivar Khandwa-2, he informed.

Commenting on the efforts of plant microbiology scientists, he said 'Rabies' was a dreaded disease, fatal in 100% cases if no treatment is administered. A plant-based vaccine will lead to the development of a safer and economically competitive technology than the currently used technologies based on animal systems. The efforts towards development of plant-based vaccine continued using rabies as a representative system. A synthetic gene coding for the surface protein (G-protein) of rabies virus was strategically designed to achieve high level expression in transgenic plants. Suitable laboratory protocol to prepare G-protein enriched fraction was developed. Recombinant DNA technology programme was carried out in fruits, vegetable and flowers to develop transgenic varieties, which show desired post harvest behaviour and have higher shelf and vase life. The crops selected are banana, tomato, rose and gladiolus. Several genes from rose were identified, which are specific to abscission of petals under natural and ethylene regulated conditions. Tomato plants were engineered for the production of isoflavones from tomato fruits, a therapeutically active secondary metabolite. The reported health benefits include re-



lief in menopausal symptoms, reduction in osteoporosis, improvement in blood cholesterol levels and lower risk of certain hormone related cancers and coronary heart diseases. An ultra-sensitive system was developed, for the first time in the world, to detect phytoplasma inducing Witches' broom disease of *Withania somnifera*, Sandal spike disease and little leaf of periwinkle in India.

In the field of Genetics, Plant Breeding and Agriculture good progress was made towards the development of high opium morphine, yielding hybrids of *Papaver somniferum*. Germplasm line BR 226 was found to be maximum opium yielder (298 mg/plant) followed by BR 228 (270 mg/plant) and BR 239 (216 mg/plant). For the first time *Peronospora farinosa* f. sp. *chenopodii* causing downy mildew disease on *Chenopodium quinoa* has been reported from India. A talc based formulation of two effective strains of *Trichoderma harzianum* (NBRI IV and IX) and a consortium thereof has been developed for application in sunflower and mustard.

A new hybrid of *Hippeastrum*, namely 'Agni' has been developed. Two new plant species namely *Chlorophytum bichetii* (Karrer) Backer, a native to Gabon, tropical West Africa and *Lepidozamia peroffskyana* Regel, endemic to Eastern Australia have been introduced in the institute's garden. A garden of lesser known edible fruit trees was developed with a view to educating visitors, especially school children, regarding centre of origin,

distribution and sites of large-scale cultivation of these plants.

Some new enzymes with unique properties were also produced which are involved in scavenging activities. These enzymes can find applications in a number of products of use to mankind. A number of such products have been developed. The process of *in vitro* cloning of mature trees of *Azadirachta indica* (neem) and improving by inducing *ex vitro* rooting in isolated shoots, obtained from cultures of proliferating shoots was simplified successfully.

A range of safe herbal hair dyes with shining ebony black to brown and pinkish red has been developed. The hair dye is non-irritant, non-itching, non-toxic, non-allergenic, antifungal and non-sticky to skin, Dr Pushpangadan informed. The dye enhances, the texture and luster of hair. Moreover, the dye has powerful antioxidant activity and therefore, it is hoped that it may even be a hair tonic. An Indian Botanic Gardens Network Website – <http://www.ibgn.org> was established and NBRI has been declared as the National Node of GBIF.

At the end, Dr Rakesh Tuli, the then Scientist-G, proposed the vote of thanks.

Dr Divi Haranath, and Shri Shiv Kumar Jaiswal, awarded DST's BOYSCAST Fellowship 2005-2006

Two scientists of National Physical Laboratory (NPL), New Delhi, have been awarded the Department of Science and Technology (DST)'s, BOYSCAST Fellowship 2005-2006.

Dr Divi Haranath, of the Electronic Materials Division has been selected under Physical Sciences category with sub-area of nano-phase Materials, and Shri Shiv Kumar Jaiswal, of the Josephson Voltage Standard and DC Standards Division, has been selected for Engineering Sciences category with sub-area of electrical metrology/nanometrology.

BOYSCAST is the abbreviated form of better opportunities for young scientists in chosen areas of science and technology. It provides opportunities to the young Indian scientists/technologists who hold regular positions in recognized science & technology institutes in India, for visiting international institutions to enable them to interact with scientists/technologists abroad, get exposure to latest techniques, participate and contribute to the latest developments in specially chosen areas of science & technology.

Dr Divi Haranath is working with Luminescent Materials and Devices Group of NPL and is involved in the core activities of the group as well as development of various industrially important nanophosphors and their devices. He will be visiting Nanocrystals Technology (NCT), New York, USA, for one



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year for advanced research and training in the field of III-V compound nanophosphors useful for the conversion of blue light from GaN LEDs into efficient white light.

Nanotechnology involves the control and manipulation of atoms and molecules, which exhibit modified physical properties as a Quantum Confined Atoms (QCA). Advanced training is essential to work at this infinitesimally small order of magnitude and realize practical device fabrication as speculated by Richard Feynman many years ago. NCT, USA is the world's first 'atomic' nanotechnology based laboratory. The expertise acquired at NCT, USA in the proposed area of work will help understand and develop novel nanophosphors that have both scientific and commercial importance. And NPL's primary goal is to develop devices based upon QCA for various applications that essentially involve lighting. In order to have efficient lamps, NPL is planning to develop novel nanophosphors that will generate efficient white light under UV excitation. The nanophosphors in size range 2 to 5 nm, when properly incorporated in a clear polymer provide efficient, transparent and high-index nano-composite materials which can easily down-convert UV-light emitting diodes to white solid state lamps. The



engineering of an atom (ion) in the nano-regime will allow NPL to significantly change the paradigm of designing new phosphors and lenses for all lamps. The control of refractive index with use of QCA based nanophosphors is also expected to impact all optical, transparent materials where high refractive index is desirable, such as optometry, specialty glass etc.

Shri Shiv Kumar Jaiswal, is involved in establishment, maintenance, updating, dissemination and R&D activities of Standards of DC voltage, DC current and DC resistance. He will be visiting National Institute of Standards & Technology, USA (i.e. National Measurement Institute of USA) for one year for advanced research and training in the field of voltage maintenance and dissemination using NIST Josephson voltage standard systems (including voltage transfer, array comparisons and uncertainty evaluation), improvement in uncertainty for

Josephson array to array direct comparison and upgradation of Programmable Josephson Voltage Standards.

The expertise acquired at NIST, USA in the proposed area of work will help NPL to automate its Josephson

Voltage Standard and reduce uncertainty in measurement and provide better and comparable results. The expertise in array-to-array comparison and voltage dissemination will help NPL to have international intercomparison in JSAVS and establish degree of equivalence. This will also enable the laboratory to design, integrate and establish Programmable Josephson Voltage Standard, which will help in disseminating the unit of volt in India in simple and straightforward way. Thus the Indian R&D laboratories, calibration laboratories and industry will be benefited by better calibration facilities. Since the reduction in uncertainty in measurement and automation requires skills in low-level measurement (nano-metrology), Shri Jaiswal's learning will be also utilized to establish facilities for low voltage (nV), low current (pA) and electric charge measurement & calibration.

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