



LaCONES delivers Spotted Deer --- First in India

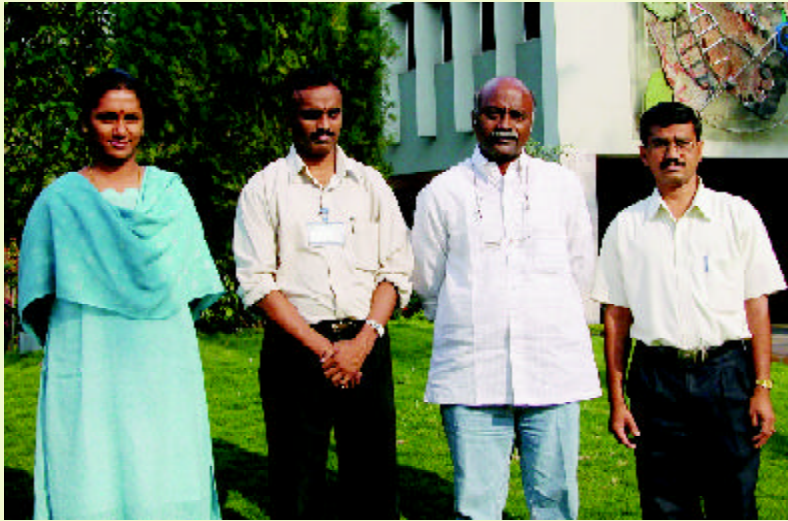
Scientists at the Centre for Cellular and Molecular Biology (CCMB), Hyderabad, had sufficient reason to be delighted when an artificially inseminated female deer delivered a live fawn on 14 March 2006, after eight months of pregnancy. This was the first successful artificial non-surgical intra-vaginal insemination in the spotted deer in India, which led to the birth of a fawn. With this, India has joined Australia and United State of America, the only other two countries to achieve this remarkable feat using the same procedure. This accomplishment is the outcome of concerted efforts of the CCMB scientists Drs G. Umapathy, S.D. Sontakke and Anuradha Reddy under the leadership of Dr S. Shivaji, as a part of the long-term Project of the Laboratory for the Conservation of Endangered Species (LaCONES). LaCONES, a national facility, is being set up in seven acres of land, 25 km from CCMB, called as CCMB Annex-1. Dr Lalji Singh, Director and Dr S. Shivaji Deputy Director, CCMB, are the two Principal Investigators of this project.

Exploitation of forests and loss of habitats owing to human intervention have threatened the very survival of various endangered species, including deer such as the Manipur brow-antlered deer, Swamp deer, Kashmir musk deer and Mouse deer in the wild and their populations have become isolated and fragmented. Such fragmented populations are prone to loss of genetic variability and susceptible to demographic and environmental factors that may prove to be very detrimental.





Therefore there is an urgent need to augment efforts to preserve habitats and simultaneously develop methods to boost their numbers. In this context, CCMB has undertaken studies to standardize techniques for assisted reproduction at the Nehru Zoological Park, Hyderabad, using the



A team of scientists responsible for delivering the spotted deer

spotted deer as a model for the other critically endangered deer of India. The present accomplishment is the result of such studies under a project of LaCONES.

LaCONES is sponsored by the Central Zoo Authority (CZA), Ministry of Environment and Forests (MOEF), Government of India; Department of Biotechnology (DBT) and Council of Scientific and Industrial Research (CSIR), Ministry of Science and Technology, Government of India and Department of Biotechnology and Forest Department, Government of Andhra Pradesh. The primary objective of LaCONES is to conserve endangered animals of India by using modern techniques of DNA finger printing, genetic polymorphism analysis and assisted reproductive techniques such as artificial insemination, *in vitro* fertilization, cryo-banking of DNA, cells and tissues and eventually somatic cell cloning. As of date, somatic cell cloning has been successfully employed for cloning of a few animals such as sheep, mouse,

goat, pig, rabbit, cat, dog and donkey and two critically endangered animals namely the Mouflon sheep and the bison elsewhere in the world.

Semen collection and preservation along with artificial insemination can significantly contribute to the maintenance of genetic diversity and conservation of endangered animals. However, the technique of artificial insemination (AI), although routinely practiced in domestic animals, has not been commonly applied to wild animals.

In ungulates, behavioral cues are not reliable indicators of estrus detection and, therefore, there is a need to synchronize estrus in the ungulates using hormones. In the present efforts, CCMB scientists synchronized estrus in spotted deer by using an intra-muscular injection of estradiol valerate with norgestomet and an ear implant containing norgestomet. The estrus-synchronized animals were then inseminated intra-vaginally using a cattle artificial insemination device

containing freshly collected semen from an adult male.

A total of three females were inseminated following estrus synchronization. Thereafter, the scientists waited patiently for the results. After four and a half months, one of the animals had conceived when examined by

ultrasonography and the conception was confirmed after another one and a half months. The scientists were delighted when their continuous monitoring revealed that the conceived animal delivered a live fawn, after 8 months of pregnancy.

Surgical intra-uterine insemination, an invasive procedure, has also led to the birth of young ones of the cheetah, leopard, puma, wild cat and the deer in other countries. But, non-surgical intra-vaginal insemination, which is a non-invasive procedure, is preferred by wildlife biologists. This success could form the basis for future attempts to increase the numbers of other endangered deer species and other animals in our country.

Dr Lalji Singh, Director, CCMB, called a press conference on 28 March 2006 and named the new-born fawn as Spotty. Shri K. S. Rao, Principal Chief Conservator of Forests, Wildlife, Andhra Pradesh and Shri A. V. Joseph, Additional Chief Conservator of Forests, were also present on this occasion.



Open-Frame Networks in Coordinated Polymers through Hydrogen Bonds

NATURAL materials like zeolites, with porous structures, are being widely used e.g. in separation and purification, and as catalyst. Inspired by these natural marvelous assemblies, several synthetic materials were developed to gain control over the dimensions of the pores and topology of the architecture. Thus, a new frontier research area, Supramolecular Chemistry, has emerged, which deals with the design and synthesis of porous assemblies, either organic or metal-organic, that can be utilized in various applications like gas storage, host-guest studies, etc. Among these, metal-organic frameworks have gained significant attention due to their stability, porosity, simple preparation methods and potential applications. Their frameworks are crystalline materials formed by binding the metal clusters or metal ions using organic linkers. In most of the cases, these frameworks are formed and stabilized by strong metal-ligand dative bonds. In the field of organic crystal engineering, the hydrogen bonds play a significant role in the creation of targeted assemblies. But studies towards the utilization of these bonds in the coordination

assemblies were not well explored. Thus, taking into account the ability to form coordinate bonds through the carboxyl group (-COOH) and hydrogen bonds by the nitro (-NO₂) and methyl (-CH₃) groups, Dr Pedireddi and his group at the National Chemical Laboratory (NCL), Pune, chose 3,5-dinitro-4-methylbenzoic acid to study the influence of both the types of bonds on the resultant assemblies. This work of S. Varughese; V. R. Pedireddi, appeared as the cover page article on the prestigious international journal *Chemical Communications*, 2005, 1824-1826 published by the Royal Society of Chemistry.

Single crystals in the form of golden yellow needles, obtained from the hydrothermal methods (synthesis at elevated temperature and pressure), revealed the formation of a porous assembly (Figure 1) stabilized by C-H...O hydrogen bonds, as characterized by single crystal X-ray diffraction. The channels thus formed were occupied by six water molecules, held to the host network through O-H...O hydrogen bonds (Figure 2a). The thermal studies and powder X-ray diffraction analysis revealed that this

assembly is stable up to 300°C even after losing the guest water molecules. Further, the reactions with some aza-donor ligands like 4,4'-bipyridyl, 1,2-bis(4-pyridyl) ethane and 1,2-bis(4-pyridyl)ethene, also yielded host guest assemblies, with the aza-donor compounds acting as the guest species (Figure 2).

A fascinating feature of these assemblies is their possible evaluation in the application of catalysis and separation processes, as they undergo guest-exchange reaction, with high flexibility of exchange between water and aza-donor compounds. Thus, the study reveals the utility of hydrogen bonds in the preparation of porous coordination assemblies, which are stable enough to undergo guest exchange reactions.

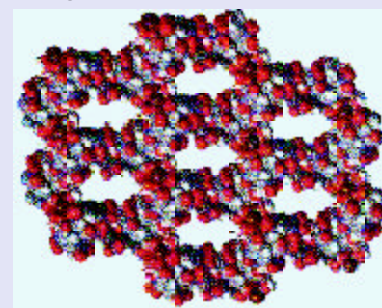


Figure 1. The porous assembly stabilized by hydrogen bonds

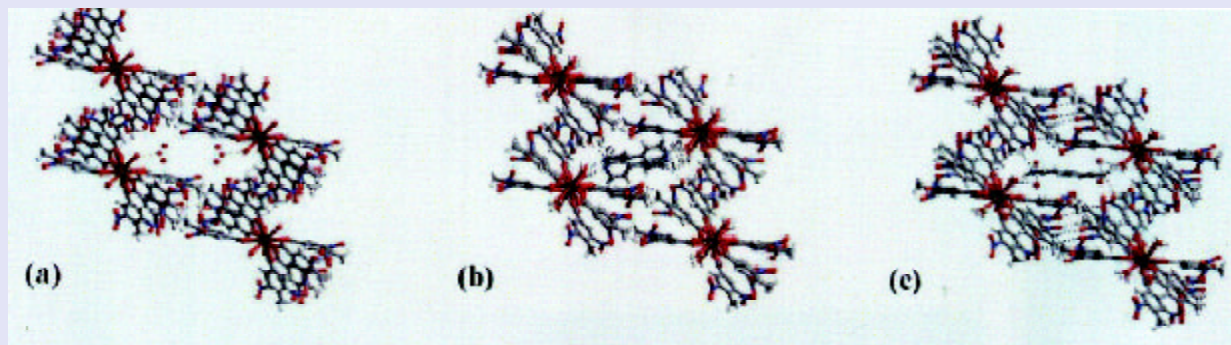


Figure 2. The metal-organic frameworks showing the channels occupied by water, 4,4'-bipyridine and 1,2-bis-(4-pyridyl)ethene, respectively



Structural Engineering Research Centre, Chennai

R & D Highlights

THE Structural Engineering Research Centre (SERC), Chennai, undertook six new sponsored research projects during 2004-05, apart from the three continuing sponsored projects. Also, the center is participating in a project under the prestigious New Millennium Indian Technology Leadership Initiative (NMITLI) scheme, on the Development of a 500 kW, low cost Horizontal Axis Wind Turbine, with the National Aerospace Laboratories, Bangalore and Sangeetha Group of Companies, as collaborating partners. In addition, it carried out a number of consultancy assignments for the industry/user agencies who had approached SERC to solve their current/urgent problems in structural engineering related to the areas of proven expertise of the laboratory.

A few of the major activities are highlighted here:

Static and cyclic tests were conducted as a part of studies on Vibration Control of Buildings and Structures under Seismic Excitation. A one-third scale model of a three-storeyed reinforced concrete structural frame, having a soft first storey without infilling brick walls at the ground storey level and brick infills in the second and third floors, was fitted with base isolators made of natural rubber and evaluated for different type of seismic acceleration inputs. A testing fixture assembly for testing laminated rubber bearings under axial load,

simulating the effect of dead load and shear deformation representing the dynamic effect due to seismic loads, has been fabricated. Tubing frequency response is an important requirement in any pressure measurement study on a model of a building using wind tunnel testing.

A new pressure calibrator consisting of an air chamber, rubber diaphragm, a spindle and a frequency generator has been designed and fabricated in-house in the present study. A detailed wind tunnel investigation was carried out on six steel chimney models of equal diameters, arranged in a tandem configuration.

Wind tunnel investigations were conducted to investigate the group effects of surrounding buildings/structures on an aeroelastic cooling tower model (1:300 scale). Correlation of wind pressures on a cooling tower was analyzed in both time- and frequency-domains, using pressure measurement data acquired in wind tunnel. Detailed strain and vibration measurements on a guyed mast at a wind farm site at Kethanur have been carried out in the prevailing wind conditions during the operation of a two bladed wind turbine.

Computational Fluid Dynamics (CFD) study was carried out to understand the flow patterns around a typical launch vehicle model subjected to wind loading. Continuing the investigations on application of fibre optic sensors for health monitoring of civil

engineering structures, experimental studies were carried out to assess the performance of fibre optic sensor under fatigue load. For example, studies were carried out on a notched steel specimen instrumented with EFPI fiber optic sensor under fatigue loading.

A sponsored project was taken up on 'Health Monitoring of a Fly Over Bridge in Visakhapatnam Port Trust'. Towards augmentation of R&D facilities in the area of fatigue and fracture, a steel reaction frame of 2000 kN dynamic capacity was fabricated for conducting fatigue and fracture tests on large and heavily loaded structural components. An instrument was developed for the measurement of crack depths in metallic components using skin effect principle and ACPD technique. The instrument has been designed using a micro controller to facilitate automatic signal range detection, offset adjustment processing of the signal and display of the output in engineering units.

An analytical study on the structural response of cold formed panel has been completed. A new beam element formulation based on finite Green's strain has been developed to enable easy implementation of material nonlinearly in steel frames.

A user-friendly interactive computer program was developed to determine the ultimate moment and shear carrying capacity of beam members by the proposed Limit State Method in revised IS: 800 for



a given shape and its corresponding sizes. The program can also be used to design a member for a given factored moment and shear. Analytical studies were continued on fracture behaviour of metallic structural components considering corrosion.

Several algorithms have been developed and implemented for desired structural performance employing parallel processing techniques. An Independent Modal Space Control (IMSC) algorithm has been developed and integrated with finite element code of frame dynamic analysis. Keeping in view the lack of precision and non-linearity present in the structural properties of civil-engineering structures, a Fuzzy Based Control Algorithm (FBCA), has been developed, which automatically takes care of the deficiencies in dynamic modeling of structures.

A methodology has been proposed for determining the expected damage to corrosion affected RC framed structures subjected to earthquakes over the service life of the structure. Efforts were made to evaluate the probabilistic vulnerability function of masonry buildings for in-plane and out-of-plane failure under seismic loading, which will be useful for performance-based design of masonry buildings.

Investigations were taken up to characterize the nonlinear response of beam-column joints with SFRC.

Under the project on Standardization and Typification of Composite Bridge Decks, a computer program using the Courban's method of load analysis has been developed, for selection of

plate sizes as per the available rolled steel section in the Indian steel industry. A sophisticated algorithm has been developed for (modeling) seismic damage process using the Discrete Wavelet Analysis.

Work on the development of an expert system for condition assessment of bridges was continued, with emphasis on artificial neural networks (ANN) and genetic algorithms (GA) for detection and localization of damage, especially in bridges.

A formulation has been developed for condition rating of bridges using analytical hierarchical approach and fuzzy logic and implemented in a computer program. Formulation for condition rating of bridges using fuzzy weighted average (FWA) was also developed and implemented in a computer program.

A critical review of application of wavelet theory in civil/structural engineering was taken up, specifically for the development of parallel computing methodologies for damage detection of large structures, using the Wavelet Theory. Work was taken up on risk consistent design and risk management of structural systems and assemblages, and development of structural system identification methodologies using parallel processing techniques. Work was initiated on imported samples of sintered fly ash aggregates (SFAs). Studies were continued on monitoring of early age stiffening and strength characteristics of cementitious mixtures, transit times were measured employing ultrasonic techniques.

A research project on Seismic Evaluation and Retrofit of Multi-storeyed RC Buildings, jointly undertaken with IIT, Madras, under the sponsorship of the Department of Science and Technology, Government of India, has been completed.

Publications, Reports Lectures, Training Programmes

A total of 155 research papers were published, during the year, in various Journals/conference proceedings. SERC edited and published the proceedings of ICACS2005, co-edited the proceedings of an Indo-US workshop, in collaboration with experts from the USA. Eighty technical reports were prepared, pertaining to the work carried out in various in-house/contract research projects. Sixty-seven lectures were delivered in the in-house colloquia meetings. Eighty-three lectures/invited talks were delivered at various forums/programmes outside. Scientists and technical officers of SERC attended 55 technical programmes/conferences/seminars/workshops/training programmes across the country and one programme abroad.

An international delegation of 25 Information professionals from 15 countries, visited SERC as participants of a training programme on database management systems [DBMS] organized by the NISIET, Hyderabad. The Centre also organized a course on 'Training and Motivation of Teachers and Faculty in Engineering Colleges'.



Indo-Canadian Workshop on Clinical Validation of Herbal Medicines and Functional Foods organized at NBRI

A three-day Indo-Canadian workshop on 'Clinical Validation of Herbal Medicines & Functional Foods' with a specific theme: Diabetes, Obesity and Cardiovascular Diseases was jointly organized by the National Botanical Research Institute (NBRI), Lucknow; Risk Factor Modification Center, St. Michael's Hospital, University of Toronto and International Research Society for Complementary and Alternative Medicine, Canada, at NBRI. The broad objective of this workshop was to provide an opportunity and platform to the scientists from the participating institutions to interact on perceptions of Indian and North American medicinal herbs and functional foods and examine issues related to generation of clinical data on the plant-based health products in the area of diabetes, diabetic complications and cardiovascular diseases.

At the inaugural function, Dr Pradeep K.S. Visen, Secretary of this Indo-Canadian workshop and Scientist at Risk Factor Modification Centre, St. Michael's Hospital, narrated the history of University of Toronto, aims and objectives of the workshop and possible areas of S&T collaboration between the two countries. He mentioned that the natural health product research has never been so

fascinating and challenging as it is in the present time across the world over. He highlighted the global incidences of diabetes and related disorders and the current trend of their management through Complementary and Alternative Medicines (CAM).

Dr Rakesh Tuli, Director, NBRI and Chairperson (India) of the workshop, in his welcome address spoke on the global importance of Indian medicinal and aromatic plants in health care system including diabetes, obesity, cardiovascular diseases, cancer, hypertension, inflammation, chronic infections and respiratory diseases. He said that the demand of natural health products, antioxidants, nutraceuticals, functional foods and alternative medicines was likely to increase many fold in the international market in near future. He further enlightened about the expertise and facilities available and R&D activities and future vision of NBRI. He reiterated on good-



Dr Nitya Anand, former Director, Central Drug Research Institute, Lucknow, delivering his presidential address at Indo-Canadian workshop. Seen on the right is Dr Rakesh Tuli, Director, NBRI

manufacturing practices (GMPs) and scientific validation of the products for proper development of natural health products as per the Indian System of Medicines. In view of differences in human response to health products, he emphasized upon the immense possibility of joint research and collaboration in this field.

Prof. Vladimir Vuksan, Associate Director, Risk Factor Modification Centre, St. Michael's Hospital, and Chairperson and Organizer of the workshop, in his keynote address highlighted the vast research facilities available at St. Michael's Hospital, its achievements and inventions. He said that Risk Factor Modification Centre (RFMC) was an integral part of Diabetes

Comprehensive Program (DCCP) of St. Michael's Hospital, a unique North American program with substantial clinical, academic and research strength. Mentioning the availability of a wide range of medicinal and aromatic plants in India and the strength of NBRI, Lucknow for the development of herbal medicines, Dr Vuksan emphasized the need of joint Indo-Canadian research work on clinical validation of Indian herbal medicines to make them acceptable at international platform.

Dr Nitya Anand, former Director, Central Drug Research Institute, Lucknow, in his presidential address said that this Indo-Canadian workshop was dedicated to Clinical Validation of Herbal Medicines and Functional Foods — areas that are of special relevance and importance. He dwelt in detail upon the long history of the use of herbal medicines in India, traditional systems of medicine (TSMs) in India, such as of Ayurveda. He said that the use of medicinal plants was well documented in the *Materia Medica*. Canada is one of the few western countries with special provisions and laws for the use of herbal drugs. Dr Nitya Anand emphasized the importance of creating an interface between the traditional and modern systems of medicines. The time is just ripe for Ayurveda to be brought into this perspective of Systems Biology, which will provide an experimental basis to the 'holistic' concept of Ayurveda towards a modernized scientific perspective,

he added.

Guest of Honour Shri Sameer Ahmed, Trade Commissioner (S&T), Canada High Commissioner (India Office), in his address highlighted the latest agreement between India and Canada in the fields of health science, nanoscience, information technology, biotechnology, natural health products, agriculture, environment, and disaster management. He reiterated that such type of joint workshop and scientific collaborations will further strengthen the relation of both the countries and assured full support from Canadian High Commission. He was appreciative of the efforts of Prof. Vuksan, Dr Tuli and Dr Visen in bringing together the Indian and Canadian groups to examine the potential of joint collaborative research for scientific validation of Indian herbal medicines for its world-wide acceptance.

Dr Carmen Tamayo, Director (R&D), Flora Inc, USA, in her address mentioned the importance of Indian herbs and medicinal plants and possible areas of linkages between the two countries in clinical research and scientific validation of natural health products in particular in the development of Complex Herbal Products.

Dr Harpal Buttar, Senior Scientist, Therapeutic Products Directorate, Health Canada, Ottawa, Canada, in his special remarks explained the rules and regulations related to natural health products research, their export and acceptance in Canada. He stressed on the importance of strict quality

control in terms of analysis of heavy metals, pesticides and herbicides.

Mr Anatoly Oleksiyenko; International Liaison Officer, International Research and Development Programme, University of Toronto, Canada, in his special remarks said that the international collaboration with NBRI, on the development of plant medicines for diabetes, hypertension, diabetic complications and related cardiovascular diseases, would be an excellent example of linkages between the two countries.

Prof. D.R. Singh, State Ayurvedic College, Lucknow, talked about the facilities and methodologies related to clinical trials available at his Centre and expressed his willingness to collaborate in the above matter in this joint venture. At the end of inaugural session, Dr Dhan Prakash, Coordinator of the workshop and Scientist-F, NBRI, proposed the vote of thanks.

The inaugural session was followed by special lectures by distinguished scientists of India and Canada. Dr Rakesh Tuli in his highly illuminating lecture on 'Plants as a source of therapeutic proteins' explained that the production of pharmaceutical and industrial recombinant proteins is carried out traditionally in bacterial, yeast or animal cell lines. Dr Pierre S. Haddad, Département de Pharmacologie, Université de Montréal, Canada, while speaking on 'Anti-diabetic properties of the lowbush blueberry *Vaccinium*



angustifolium Ait. assessed by *in vitro* bioassays', elucidated that *V. angustifolium* contained active principles that exert insulinotropic, insulinomimetic, glithazone-like and cytoprotective effects, and support the efficacy of the lowbush blueberry as a complementary treatment against diabetes.

Prof Vladimir Vuksan, Risk Factor Modification Centre, St. Michael's Hospital, Canada, delivered his lecture on 'Clinical methodologies for diabetes and cardiovascular diseases'. Dr Dhan Prakash, Nutraceutical Chemistry of NBRI, presented his lecture entitled, 'A herbal formulation for diabetes and associated disorders'.

Dr Cyril Kendall, Department of Nutritional Sciences, University of Toronto, Canada, explained the clinical methods and techniques in the assessment of functional foods and diets in reducing cardiovascular diseases risk. Dr Branka Barl, Edmonton, Alberta, Canada, gave a review of most scientifically documented botanical ingredients used presently in the diabetes and obesity in north America. Delivering her talk on 'Clinical trial development of complex herbal products', Dr Carmen Tamayo, Director (R&D), Flora Inc, USA, mentioned the importance of existing clinical

research methods providing basic tools for the evaluation of natural health products and herbal medicines in particular.

Dr A.K.S. Rawat, Scientist, Ethnopharmacology and Pharmacognosy Laboratory, NBRI, spoke on 'Quality control, standardization and development of scientifically validated herbal /drugs formulations', while Dr C.V. Rao, Scientist, Ethnopharmacology and Pharmacognosy Laboratory, NBRI, described the efficacy and toxicity study of selected herbal drugs/formulations in experimental animals.

After the detailed deliberations, experts from both the countries recognized some areas such as *In-vitro* and *in-vivo* screening (pre-clinical study) for bioactive molecules; Clinical trials to validate known plant based drugs; Clinical methodologies and scientific validation; Traditional/herbal medicines; Quality control and standardization; Medicinal chemistry of herbs; Nutraceuticals and functional foods; Plants as a source of therapeutic proteins; Scientific and regulatory affairs; and Food-NHP drug interactions of common interest that may benefit future possible collaborations between RFMC, St. Michael's Hospital, and NBRI.

Workshop on Dynamic Behaviour of Materials at High Strain Rates (DYMAT INDIA 2005)

THE Central Glass and Ceramics Research Institute (CGCRI), Kolkata, organized a one-day workshop on Dynamic Behaviour of Materials at High Strain Rates. Dynamic behaviour at high strain rates is an important area of materials research in view of various applications. One such application is in armament where deformation and fracture behaviour under high strain rates is an important design criterion.

The workshop provided a forum for discussion of present status and the future direction of the R&D activities on the subject. The internationally renowned experts, Prof. G. Ravichandran, John E. Goode, jr. Professor of Aeronautics and Mechanical Engineering, California Institute of Technology, USA and Prof. G. Subhash, Department of Mechanical Engineering, Michigan Technological University, USA, were among the invited speakers.

The Chief Guest on the occasion was Shri Sudipta Ghosh, DGOF and Member, Ordnance Factory Board. He explained the importance of armour materials research and complimented CGCRI for organizing the workshop. He was happy to note the activities in CGCRI on armour materials research. Dr K.K. Phani, Scientist G, CGCRI, delivered the welcome speech.

The workshop covered several aspects of high strain rate behaviour of metals, ceramics, polymers and composites. The



Shri Sudipta Ghosh, Member, OFB, delivering his inaugural speech.
Seen with him are Dr K.K.Phani and Dr S. K. Biswas, Programme Convenor

topics of interest included constitutive relations, flow and fracture of materials at high strain rates, wave propagation, and numerical simulation at high strain rates and the experimental methods at high strain rates to characterize dynamic behavior of materials. The workshop was attended by 50 delegates from the various CSIR, DAE and DRDO laboratories; IITs; engineering colleges; ordnance factories and the Ordnance Factory Board. Most of the faculty comprised invited speakers. There were a few contributory presentations also.

In his keynote address entitled 'Dynamic Behaviour of Ceramic Materials at High Strain Rates' Prof. G. Ravichandran stressed the importance of establishing reliable methods for evaluating the high strain rate properties of ceramics and ceramic composites subjected to dynamic loading. He explained from experimental results that

failure mode changed from fragmentation by axial splitting without confinement to localized faulting under confinement of aluminum nitride ceramics. Prof. G. Subhash in his special lecture entitled 'Dynamic Behaviour of Materials under High Strain Rates' elucidated the behaviour of different materials such as structural foams, ceramics, metallic glasses and refractory metals under high strain rates. He described the development of a dynamic indentation hardness tester, a novel experimental set up designed for obtaining the constitutive behaviour of dense ceramics and metals.

It was illuminating to note the level of progress from the presentations of various researchers in the areas of modeling and experimentation in the understanding various aspects of materials behaviour under high strain rates. Even a range of computer codes has been generated

in the country, including 2D and 3D lagrangian hydrodynamic codes and a 3D smooth particle hydrodynamics code for modeling impact and penetration phenomena. It was highlighted in one of the presentations that the properties of materials change from brittle to ductile phase after dynamic loading at high strain rates.

Dr K. K. Phani chaired the valedictory session. The delegates praised the efforts of CGCRI in organizing the workshop, a similar kind of which is held triennially in Europe. The importance of collaboration for further insight into the behaviour of the materials at high strain rate loading was also emphasized. Dr S. K. Biswas, Convener of the workshop, proposed a vote of thanks.



Prof. G. Ravichandran, John E. Goode, jr.
Professor of Aeronautics and Mechanical Engineering, California Institute of Technology, USA, delivering his keynote address



NPL-NABL Training Programme on Vacuum and Pressure Standards

THE National Physical Laboratory (NPL), New Delhi, and National Accreditation Board for Testing and Calibration Laboratories (NABL), New Delhi, jointly organized a two-day training programme on Vacuum and Pressure Standards at NPL. The training programme focused on the various aspects of vacuum and pressure standards. It had lectures on the subject by NPL experts and practical demonstrations through four uniquely designed experiments. Dr A.K. Bandyopadhyay, Head, Vacuum and Pressure Standards and Shri S. K. Chakladar, Head, Human Resource Management Group (HRMG), NPL, and Shri S. Mohan, NABL, New Delhi, coordinated the programme which was attended by 43 participants from various industries, R&D laboratories and other institutions.

Dr R.P. Singhal, Head, Physico-

Mechanical Standards, inaugurated the programme. He stressed the need for this kind of training programmes and mentioned about NPL-NABL Memorandum of Understanding (MoU). Under this MoU, NPL has already organized training courses on Mass, Dimension, Force, Temperature, etc. and several PT programmes.

Dr Bandyopadhyay talked about the objectives of the present programme and also narrated a brief history of Vacuum and Pressure Standards Group at NPL. This group, he said, had flourished under the generous financial UNDP assistance in early 1980. A unique facility was established not only for the vacuum and pressure measurements but also for an active participation in key comparisons both under CIPM and APMP. Infact, in one of the APMP activities, NPL is the pilot

laboratory and coordinator. Shri Chakladar summarized the HRM activities of NPL.

The NPL experts delivered lectures which broadly covered: (1) International trace ability in pressure and vacuum standards, (2) Calibration facility near atmospheric pressure by UIM, (3) Calibration facility in high vacuum range by static expansion method, (4) Calibration facility for pneumatic transducers, dial gauges and blood pressure instruments, (5) Calibration facility in hydraulic primary and secondary pressure standards, (6) Calibration facility in pneumatic primary and secondary pressure standards and finally, (7) Recently concluded NABL-NPL PT programmes in pressure measurement. The second half of the day was devoted to practical demonstrations and training. Four experiments on Calibration of



Participants of NPL-NABL training programme on vacuum and pressure standards



different gauges near atmospheric pressure region, Calibration of different gauges under high vacuum, Calibration of different gauges in hydraulic pressure region, and Calibration of different gauges in pneumatic pressure region, were specially designed for the practical demonstration to the participants. Participants took keen interest in both the lectures and experimental demonstrations.

At the end of two-days, an interactive session was organized to get feedback from the participants. Dr Vikram Kumar, Director, NPL, chaired the session and distributed certificates to the participants. He mentioned that uniformity of assessment by NABL technical assessors is possible only when the technical assessors undergo this kind of training. He also made a note about the importance of this kind of programme in view of the present globalization of economy under WTO and assured the participants that this kind of training cum awareness programmes will be organized more frequently to provide first hand experience in the field of vacuum and pressure standards in future.

Training Programme on Analysis of Pesticides and Other Organics (SELA-2)

A five-day training programme on Analysis of Pesticides and Other Organics (SELA-2) sponsored by Central Pollution Control Board (CPCB), Delhi, was organized at the Industrial Toxicology Research Centre (ITRC), Lucknow. Chemists and analysts from State Pollution Control Boards (West Bengal, Tamil Nadu, Himachal Pradesh, Bihar, and Punjab), CPCB Central Ground Water Board, universities and scientific institutions, participated in the programme.

The training programme began with a welcome address by the Course Chairman, Dr Jai Raj Behari, Scientist F and Head, Analytical Chemistry, ITRC, who emphasized the need for correct analysis to combat the present day environmental pollution and health problems. The analysis of chemical pollutants/toxicants is very crucial when some decision making is

based on analytical results.

Dr R. B. Raizada, Scientist F and Head, Pesticide Toxicology Division, ITRC, gave the genesis of the programme and spoke on the importance of pesticide analysis in different matrices, including water, air, food, soil and the way pesticides and other organic chemicals like polycyclic aromatic hydrocarbons (PAH's) directly or indirectly affect human health. He also mentioned about setting up the permissible limits of these chemicals.

The forenoon session was restricted to lectures while the afternoon session was totally devoted to practicals/demonstrations.

The course was designed in five modules, which included analytical laboratory management, national status of organic pollutants, chromatographic systems, quality



Participants being shown experimental demonstration of polyaromatic hydrocarbons in water sample

assurance, compilation and reporting of data.

The valedictory function was chaired by Dr C. M. Gupta, Director, CDRI, Lucknow, Dr M. Q. Ansari, Senior Scientist, CPCB, New Delhi was the guest of honour. Dr Jai Raj Behari welcomed the guests and presented the brief report of the event. Dr Ansari laid emphasis on the necessity of such courses in the present environmental scenario and informed the role of CPCB in training the manpower all over the country. Dr C. M. Gupta in his presidential address expressed his views on quality of analysis in relation to chemical pollutants especially pesticides which somehow find their way into the food chain. He also emphasized the need of precise and accurate analysis of heavy metals, as they are also organic contaminants in environment.

Dr L. P. Srivastava, Scientist EII, Pesticide Toxicology Division, ITRC, and Organizing Secretary of the programme while proposing the vote of thanks, expressed his happiness over the success of the programme, which was mainly due to active interest of the participants and the cooperation of the ITRC team.

Shri Kapil Sibal visits CGCRI



Shri Kapil Sibal, the Hon'ble Minister for Science and Technology and Ocean Development, Government of India, and Vice President CSIR at the Specialty Glass Plant of CGCRI

SHRI Kapil Sibal, the Hon'ble Minister for Science and Technology and Ocean Development, Government of India, and Vice President, CSIR, visited the Central Glass and Ceramic Research Institute (CGCRI), Kolkata recently. On this occasion, he inaugurated the Specialty Optical Fibre Laboratory, and the Acharya Prafulla Chandra Roy Seminar Hall. The Hon'ble minister also visited some of the important laboratories and facilities of the institute, and its permanent exhibition stalls. He addressed the staff members of the institute, and had a discussion with the senior scientists of the institute. He also released the latest issue of the 'Darpan' – the house magazine of CGCRI published regularly in Hindi.

In the Optical Fibre Laboratory, the Hon'ble Minister was shown the various types of specialized optical fibres that CGCRI is making for communication and strategic sectors.

In the Glass Division, he was shown the various type of glasses in different sizes developed for the strategic sectors. He was also shown the facilities for the production of laser glass and ultra low expansion glass. During the visit to the exhibition stalls, Shri Sibal showed great interest in knowing the various achievements of CGCRI made over the years and its present programmes.

The Hon'ble Minister enthralled the staff members by his address and shared with them some of his visions for the Science and Technology scenario in the country. He emphasized the importance of symbiosis of academia and CSIR. He lauded CGCRI for its achievements in frontier and societal areas. Earlier, Dr H.S. Maiti, Director, CGCRI, welcomed the Minister, and informed him that in the last decade or so, there had been significant improvements in CGCRI in every sphere – be it R&D output, technology transfer, work culture or external cash flow.

Prof. P. Rama Rao delivers the Fourth Atma Ram Memorial Lecture at CGCRI

PROF. P. Rama Rao, presently an ISRO Dr Brahm Prakash Distinguished Professor at International Advanced Research Centre for Powder Metallurgy and New Materials (ARCI), Hyderabad, delivered the Fourth Atma Ram Memorial Lecture at the Central Glass and Ceramic Research Institute (CGCRI), Kolkata, on 'The Unexplored Materials World'. Prof. Rao had an illustrious professional career as a Professor in Banaras Hindu University, Director of Defense Metallurgical Research Lab, Hyderabad, Secretary of the Department of Science and Technology, Government of India, Chairman of Atomic Energy Regulatory Board, Vice Chancellor of Hyderabad University and the Chairman of the Board of Research in Nuclear Science.

Prof P. Rama Rao while delivering the Atma Ram Memorial Lecture which is given every year by an invited and eminent materials scientist or an engineer, in memory of Dr Atma Ram who was the founder Director of CGCRI and later became Director General of CSIR, dealt with two major issues. In the first part of his lecture on 'The Unexplored Materials World', he discussed the extremities in materials composition, chemical state, materials processing, service conditions. In the second part, he discussed the new approaches in systems approach to materials design. Under extremities in

materials composition he chose the examples of nickel super alloys, oxide super-conductors, multi-phase biomimetics, multi-interface or functionally graded materials. Under the extremities in chemical state, he chose the examples of nano-materials and high entropy alloys. Under the extremities in materials processing he chose the examples of extremes in temperature and pressures. Under the extremities in service conditions, the examples chosen were larger strains and strain rates. Whatever may be the parametric boundaries within which a materials scientist has to work, he needs to consider the following aspects: phase stability and equilibria, temperature-pressure environment for materials processing, diffusion rate processes, strain rate-temperature conditions for materials evaluation. Unexplored areas exist in all these aspects. For example, there are about 22 millions of known chemical substances. Out of this, only 0.4 million substances have been analyzed for their crystal structures! If we consider the elements in the periodic table and their binary, ternary and the quaternary combinations, we find that only for the binary combinations we have about 80-90% of the required phase diagrams. For the ternary combinations, we have perhaps 5-10% of the total possibilities. But for quaternary combinations, the available number is less than 1% of the possible ones. The situation regarding



Prof. P. Rama Rao delivering the Fourth Atma Ram Memorial Lecture at CGCRI

combinations of larger number of elements is virtually a virgin field. There is every possibility that we would find materials with unusual properties if we carry out systematic investigations on the phase diagrams and phase stabilities involving multiple elements (multinary systems). An example is the recent observations of room temperature giant magneto-caloric effects in $Gd_5Si_2Ge_2$ which has great potential in the application as a permanent magnet and refrigeration systems. Another example is the recent discoveries of materials with ultra low elasticity and ultra high strength maintaining such properties over a large temperature range. The explanation for this behaviour is a deformation mechanism which does not depend on dislocation and its dynamics. The strain is accommodated in an hierarchical fashion. Deformations



unrelated to dislocations are also seen in the case of nano-materials where vacancy clusters and stacking fault tetrahedra have been found to accommodate the strain arising out of deformation. Developments of materials based on multi component combinations require the availability of multinary phase diagrams, which can be understood in hyper dimensions. While super-hard materials can be designed by the use of multinary component systems, it can also be made under high pressure, such as in coatings with super lattice structures. For these, we need to know more about the thermo-chemical data under extreme conditions of pressure and temperature, for which the available data are inadequate. Data are again inadequate regarding diffusion processes in multi-component systems, glassy structures and nano-materials. In the last case, the diffusion processes will be unusual and they are still largely un-explored. What emerges in all these considerations is that we are rich in fundamental knowledge. But there are mounting gaps in the face of new multi-component, multi-phase materials and those resulting from extreme regimes. If these challenges are to be addressed, there should be multi-institutional endeavours in basic materials research.

In the second part of the lecture, Prof Rao dwelt on the integrated computational materials design taking help of design principles relevant at various structural dimensions. While explaining the possibilities, he made a point of caution that the dream design could be hampered by an inadequate data



Dr H.S. Maiti, Director, CGCRI, explaining Prof. P. Rama Rao regarding the various special glass blocks made by CGCRI

base. This again brought forth the need of multi-institutional efforts. The speaker also threw light on the status of research in ultrahigh strength, high fracture toughness low alloy steel and revealed optimum compositions of a multi-component structural steel for ultrahigh strength and ultrahigh fracture toughness.

Earlier, Dr H.S. Maiti, Director, CGCRI, made a presentation on 'CGCRI's Achievements in last one year and the Challenges ahead'. He narrated briefly the report of the Performance Appraisal Board of CSIR which had made admission that CGCRI had been turned around with a noticeable upward trend and had re-established its brand equity. Among the salient features, Dr Maiti reported that for the first time in the history of CGCRI a product called Erbium Doped Fibre Amplifier (EDFA) designed and developed in a public-private mode of collaboration had been formally launched by Network System and Technology, a Cochin based Indian multinational company. These amplifiers are the

key components for cable TV network and telecommunication system. He further reported that a number of private entrepreneurs had accepted the community models of arsenic and iron removal plants developed by the Ceramic Membrane Section of the institute and also highlighted the transfer of technology on anti-scratch coatings over plastic ophthalmic lenses to a private industry. Dr Maiti also narrated the commencement of manufacture of value added bone china products at Ceramic Centre for Rural Development (CCRD), Panchmura, Bankura, with the support of TIFAC as a part of the rural development programme of the institute. The inauguration of special glass facilities designed and fabricated by the institute for manufacture of high density RSW glass by Dr Anil Kakodkar, Chairman, Atomic Energy Commission and Ultra-low thermal expansion glass by Dr V.K.Saraswat, Director, Research Centre Imarat, Hyderabad, during the year were also focused by the Director.

CGCRI participates in 3rd Shilpa Baniya Mela-2006

THE Central Glass and Ceramic Research Institute (CGCRI), Kolkata, participated in the 3rd Shilpa Baniya Mela-2006 at Baruipur, West Bengal, organised by the Cottage and Small Scale Industries Association, South 24 Paraganas, West Bengal, in cooperation with the Bengal National Chamber of Commerce & Industry, Zila Parishad (South 24 Paraganas) and Baruipur Shilpa Bandhu (South 24 Paraganas) recently. The objectives of the SBM-2006 were to highlight simultaneously the host of attractive products of cottage industries of the huge area of South 24 Paraganas run by utterly depressed people suffering with abject poverty and various societal and financial supports/services/opportunities rendered by renowned organizations of the country to help small and cottage rural industries to flourish meaningfully.

The *Mela* was inaugurated by the Chief Minister of West Bengal Shri Buddhadeb Bhattacharya in presence of various M.Ps and Ministers of South 24 Paraganas and the Chairman, Baruipur Shilpa Bandhu. In his speech, the Chief Minister requested the local unemployed youths to set up industries in a number of other sectors like Information Technology, Bio-technology, Ceramics, Fisheries, Coloured Fish Culture, Horticulture, Embroidery in addition to locally popular agro industries. This will help them in



Visitors entering the CGCRI pavilion in the 3rd Shilpa Baniya Mela-2006 at Baruipur

enhancing their earnings.

On this occasion, interactive meets were organised each day in different areas. Second day's seminar was chaired by Shri Shameek Lahiri, MP and Deputy Chairman, District Planning Board, 24 Paraganas (S). Dr H. S. Maiti, Director, CGCRI, Kolkata, made an attractive multimedia presentation on the possibilities of setting up ceramic industry in the rural areas. He opined that clay, one of the major components in manufacturing ceramic products, available in this area is of very good quality and from this clay high quality glazed tiles/glazed terracotta bodies/glazed stoneware bodies etc. can be

manufactured and the CGCRI has already demonstrated this in their laboratory in collaboration with M/s. Krishna Glass & Silicate Works, Kolkata. Dr H. S. Maiti also told the entrepreneurs present that the institute has developed ceramic membrane based arsenic removal plant which can be successfully installed in the area of South 24 Paraganas by the local NGOs etc. to generate self-employment opportunities since the ground water available in this area is contaminated with arsenic.

This institute made an attractive introductory presentation of its R&D activities in the *Mela* relating to the rural industrial development with posters in local language (Bengali) in popular form and samples of products manufactured in the Ceramic Centre of Rural Development, Bankura, with the technologies developed at the institute primarily covering the area of traditional ceramics. Several posters and samples relating to the hi-tech R&D achievements of the institute covering Health Care, Information Technology etc. were also displayed.

The arsenic removal plant developed with the Membrane Technology of the institute displayed in the *Mela* was one of the items of main interests to the large number of viewers and participants.

Introductory leaflets on various R&D achievements of the institute in Bengali were distributed to the common viewers and participants there.



Shri Mohammed Khalil gets National Award for Science Communication

SHRI Mohammed Khalil, former editor of *Science ki Duniya* and retired Scientist F of National Institute of Science Communication and Information Resources (NISCAIR), New Delhi, has been awarded the national Award for outstanding efforts in science popularization among children. Shri Khalil has made pioneering contributions through his books, biographies of great Scientists, editorials and science columns in Popular Science magazines, articles in newspapers, and radio talks especially in Urdu.

The award was given to Shri Khalil, by Shri Kiran Karnik, President NASSCOM at a function organized on the eve of National Science Day in New Delhi. The award carries one lakh, a memento and a citation.



Shri Mohammed Khalil receiving the National Award for Science Communication by Shri Kiran Karnik, President NASSCOM. Seen (from left) are Prof. V.S. Ramamurthy, Secretary, Department of Science & Technology, Government of India; Dr V.R. Gowarikar, Chairman, Rajiv Gandhi Science & Technology Commission, Maharashtra; Shri Kiran Karnik, President, NASSCOM and Shri Mohammed Khalil, scientist, NISCAIR

Dr Rakesh Tuli awarded Honorary-fellowship and Life-membership

DR Rakesh Tuli, Director, National Botanical Research Institute, Lucknow, has been awarded Honorary-fellowship and Life-membership by International Research Society for Complementary and Alternative Medicine, Risk Factor Modification Center, St. Michael's Hospital, University of Toronto, Canada, for his outstanding contribution to the area of Molecular Biology and for the promotion of the Natural Health Products at global level.

Dr Rakesh Tuli, Director, NBRI, being honoured with Honorary-Fellowship and Life-membership of International Research Society for Complementary and Alternative Medicine and Risk Factor Modification Center, St. Michael's Hospital, University of Toronto, Canada



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