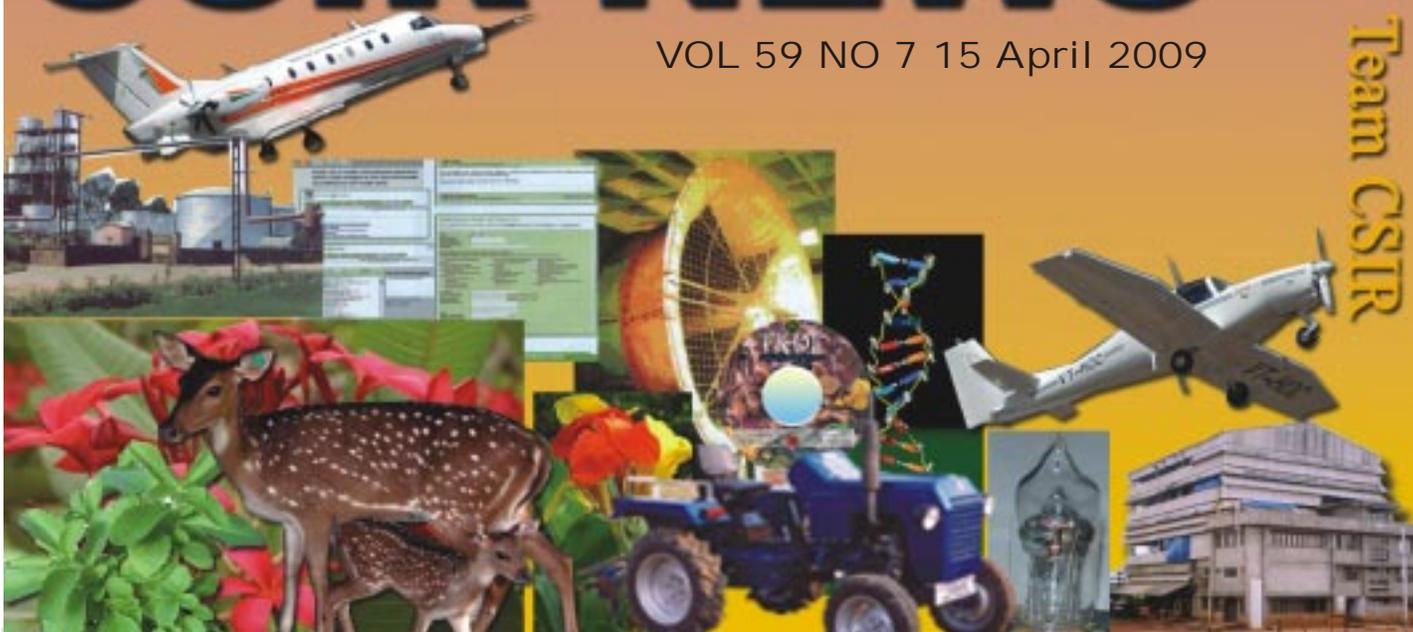


# CSIR NEWS

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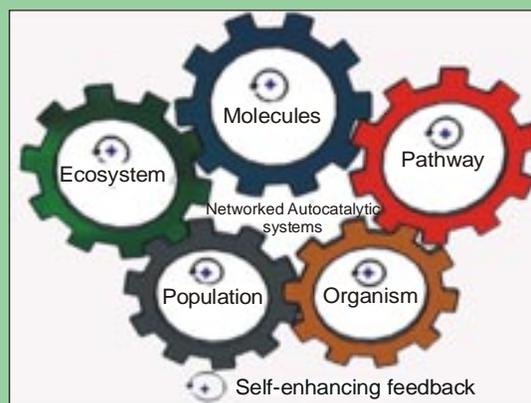


## Autocatalysis in Biological Systems

**C**hemical engineers study chemical plant operations by studying individual 'unit operations' such as separations (distillation, adsorption etc), heat and mass transfer, and reaction kinetics. The plant is analyzed as a whole as a particular combination of such unit operations linked according to the process flow diagram.

There exists an analogy between chemical plant operations and biological systems. Biological systems are complex networks that contain multiple interconnected reaction pathways with non linear feedback control loops, heat and mass transfer, mechanochemical coupling, and electrochemical regulation. Scientists from National Chemical Laboratory (NCL), Pune, have outlined a way to analyze biosystems through identification and analysis of their constituent unit processes. This is analogous to the study of a chemical plant through an analysis of its constituent unit operations. Characterizing the effect of a particular unit process will help to identify its contribution to a system comprised of multiple interacting unit processes.

Dr B.D. Kulkarni and Dr C.J. Gadgil from NCL's Chemical Engineering and Process



**Perspective  
Autocatalysis in Biological Systems**

Development Division have shown how component unit processes in biology can be identified through the example of autocatalysis. An autocatalytic reaction occurs when a product catalyzes a reaction and aids in its own creation. The idea for this work originated from the research summary that appeared as *Scirus Topic* page and was further developed by them.



The subsequent perspective article described such processes in biological systems which are present at all scales from the single molecule to ecosystems and discussed modeling frameworks that are required for understanding them. The article also identifies directions for further research such as the stochastic and deterministic study of coupled autocatalytic loops at various length and time scales, and modeling of interlinked unit processes.

This approach is potentially a better means for analyzing the fascinating dynamics exhibited by biological systems, a critical step in understanding existing normal and disease states (systems biology), as well as in the *de novo* synthesis of biological networks (synthetic biology). A better understanding will also open up the possibility of using these principles in designing robust chemical and biochemical processing operations.

This work has appeared as a cover page perspective article in March 2009 issue of *AICHE Journal*.

### For further reading:

Autocatalysis in Biological Systems, C.J. Gadgil and B.D. Kukarni, *AICHE Journal*, 2009, 55(3), 556-562.

[http://www.scitopics.com/Autocatalysis\\_a\\_way\\_of\\_life.html](http://www.scitopics.com/Autocatalysis_a_way_of_life.html)

Autocatalysis: A unit process of biological systems, *Chemical Engineering Progress*, March 2009.

[www.ncl-india.org](http://www.ncl-india.org)

## New Projects undertaken and Technology Transferred by CLRI

The Central Leather Research Institute (CLRI), Chennai, has undertaken the following consultancy projects during the quarter ending 31 December 2008:

- Implementing CAACO based system for purification of waste water at TNPL (Dr G. Sekaran) for M/s Tamil Nadu News Print and Papers Limited, Chennai
- Risk analysis studies for putting up a chlorinated polyethelene plant (Mr G. Swaminathan) for M/s Aria Chemicals Private Limited, Cuddalore
- Development of a computer aided pattern cutting programme for leather footwear (Mr Gautham Gopalakrishna) for M/s Phoenix International Limited, Chennai

### Technology Transferred

Licensing agreement has been signed in connection with transferring know-how on “Modified Chemo Autotrophic Activated Carbon Oxidation (CAACO) process for purification of waste water” to M/s Tamil Nadu News Print and Papers Limited, Chennai, Indian Patent application no. 788 DEL 2000, (Project leader: Dr G. Sekaran)

## Patent Filed by CLRI

The Central Leather Research Institute (CLRI), Chennai, has filed a patent application relating to the invention on “A Novel Viscoelastic Polyurethane and a Process for the Preparation Thereof” [23 October 2008, Indian Patent Application No. 2413Del2008].

## Aerodynamic Characterization of RLV-TD

The Trisonic Wind Tunnel Facility (TWTF) of the National Aerospace Laboratories (NAL), Bangalore, is being used extensively to characterize the aerodynamics of Reusable Launch Vehicle Technology Demonstrator (RLV-TD) configuration during various phases of flights as well as to generate very important data, viz. FADS calibration coefficients, hinge moments, unsteady aerodynamics, flow visualization and dynamic derivatives of RLV-TD HEX-1 mission. The mission is planned in the middle of this year. The descent phase aerodynamic characterization (TDV alone) has been completed and the huge data generated of immense use for the design and simulations. The aerodynamic community has lauded the voluminous data, which run into 1196 tables, for the first time as practiced in aircraft industry.

To meet RLV-HEX-1 mission target of May-June 2009, the complete aerodynamic characteri-

zation during ascent phase as well as FADS calibration data were essential by November, 2008. At the instance of ISRO, the test programme was undertaken on priority by the NTAF team. Also, during the course of the tests, the test data were made available in real time to the Project and design teams that facilitated making a first cut assessment of the result and to carry forward the remaining programme.

The total number of blowdowns was more than 450 and the whole test programme went smooth. The NTAF team came forward to meet the crises, like power problems and put extra effort to ensure timely completion of the programme.

Dr K. Sivan, Project Director, RLV-TD, VSSC, has appreciated the NTAF team for putting their best efforts to complete the RLV-TD ascent phase aerodynamic characterization and FADS calibration test for providing the data within the targeted schedules.

Dr K. Sivan has also mentioned that he is looking forward to the continued support and cooperation from NAL for the further test programmes.



## MoU between CSIR/CMMACS and G. B. Pant Institute of Himalayan Environment and Development, Almora

An MoU was signed between CSIR/CMMACS and G. B. Pant Institute of Himalayan Environment and Development (GBPIHED), Almora, Uttarakhand, on 24 February 2009 to create an institutional framework for an effective synergy in a resource-sharing environment.

GBPIHED, engaged in research in environment, climate and development of the Himalayan region, has emerged as a focal agency to advance scientific knowledge, evolve integrated management strategies, demonstrate their efficacy for conservation of natural resources and to ensure environmentally sound development in the entire Indian Himalayan Region. CSIR/CMMACS and GBPIHED have had sustained interaction in the areas of monsoon forecasting, rainfall observation, etc. The MoU has been signed with the purpose of providing broad-based collaboration between CSIR/CMMACS and GBPIHED, which will be mutually supportive and beneficial for the science and technology programme of the country.



### Isotope Fingerprinting of Waters of India (IWIN)

It has been estimated that by the year 2050, the demand of water will almost triple to ~1,450 cubic kilometre per year. Whichever way the demand is met, there will be large scale modification of the natural hydrological cycle in the country not just due to engineered structures and controlled stream flows but also by changing the residence time of water in aquifers and by increasing water vapour content of the atmosphere over India, significantly during non monsoon months.

A national programme of research on investigating the spatial and temporal fingerprinting of water sources of India using stable isotopes is proposed for detailed study of components of the local and regional hydrological cycles, their seasonal evolution, interactions between the various components and controls exercised by

geographic factors and climatic forcing.

This programme is considered vital for predicting the consequences of the impending engineered modification of the hydrological cycle of the country necessitated by increase in population and the need to rapidly develop and exploit the water resources of the country on a massive scale.

The strategy is to monitor spatial and temporal variations of isotopic composition of water in all its phases and major water sources, namely (i) atmospheric vapour, (ii) precipitation, (iii) surface flows in streams and lakes, (iv) ground water, (v) Arabian Sea and (vi) Bay of Bengal, and improving hydrological flow models through combination of isotope data with conventional data of flux across hydrological reservoirs at local/

regional/national levels.

Although, the present proposal is for a five-year period, it has a 10 years perspective during which several new programmes of local and regional characters will also be undertaken.

The National Institute of Oceanography (NIO), Goa, is one of the several national institutions actively involved in this national programme and as a part of it, a Vaisala Radio Sonde facility has been established and made operational at the POD terrace of NIO to monitor the surface and upper atmosphere parameters such as rain water, atmospheric moisture, air temperature, humidity, wind speed and direction. Director, NIO, has inaugurated the facility on 20 February 2009 and witnessed the upper atmosphere sounding activities.



Dr S.R. Shetye, Director, NIO, inaugurating the Vaisala Radio Sonde facility (left) and witnessing the upper atmosphere sounding activities (right)

## Conference on Trends and Challenges in Structural Engineering and Construction Technologies

The Central Building Research Institute (CBRI), Roorkee, organized a Conference on Trends and Challenges in Structural Engineering and Construction Technologies during 11-12 February 2009 at Roorkee. The objective of the conference was to bring together the scientists, researchers, field engineers, design engineers and planners, working in the field of infrastructure development and building science and technology. The conference provided a platform for R&D organizations, academia and industrial agencies to present their latest achievements and to further explore the possibility of deriving synergies.

The conference was inaugurated by Prof. Prem Krishna, former Professor, IIT-Roorkee and Founder President of Indian Society of Bridge Engineering.

Dr M.O. Garg, Director, CBRI, presided over the inaugural function. Dr T.K. Datta, Professor, IIT, Delhi, graced the occasion as Guest of Honour. Shri S.G. Dave, Scientist 'G' introduced the Chief Guest to the audience. Dr A.K. Pandey, Scientist, CBRI and Organizing Secretary of the conference, welcomed the distinguished gathering and also apprised the theme of the conference. Dr Rajesh Deoliya,



A dais view of the Conference on Trends and Challenges in Structural Engineering and Construction Technologies

Scientist, proposed the vote of thanks.

Prof. Prem Krishna in his inaugural address, pointed out that South-east Asia, wherein India lies, is severely affected by mainly three kinds of natural hazards, namely wind storms, earthquakes and floods. From the point of view of Structural Engineering and Construction Technology (the theme of the conference), the first two have a different bearing on the problem of disaster mitigation than the latter. In fact, it is interesting to see the 'commonalities and contradictions' in ensuring the safe design of structures for wind and seismic loads, whereas floods present a different nature of problem.

Earthquake engineering has been pursued quite vigorously over the last few decades in India, but surprisingly, wind engineering has

taken the 'back seat', despite the increasing challenge of safety against wind for the developing infrastructure. Although India is as yet quite some distance behind the developed world in building tall and slender structures, which are wind sensitive to a great extent, the country is very much at the take off stage. Besides, a number of structures of innovative geometrical form are coming up. These present a

challenging wind engineering problem.

Although the issue of safety under wind loads is important to structures in various sectors – housing industry, communication, transportation, energy – involving buildings, towers, bridges, chimneys and cooling towers, buildings present the major proportion of these.

Dr M.O. Garg, in his presidential address, hailed the achievements of CBRI in structural engineering and construction technologies. He apprised that structural engineers play a key role in planning and designing national infrastructure and habitat.

Developments in structural mechanics in last few decades have made it possible to analyze and design complex geometrical shapes with more confidence and use optimization tools for evolving cost-



effective solution. With increasing population and tremendous increase in cost of land, there is further challenge for optimal utilization of space and designing tall structures which may be subjected to extremely large wind, earthquake, impact and explosive forces. Construction technologies, especially pertaining to prefabricated components for buildings, bridges and flyovers, are the need of the day for faster construction. Civil engineering profession is going through a vital transformation phase now that there is a demand for specialists for planning and execution of different parts of the project.

Structural engineering is being diversified into wind engineering, earthquake engineering, material engineering and bridge engineering. CBRI contributes significantly in applied and basic research in various areas of Building Science and Technology to provide S&T back-up to the problems related to Shelter Planning, Building Materials, Structure, Foundation and Disaster Mitigation. The conference is aiming to review the information related with analytical techniques, materials, design tools, construction technologies and various ongoing research programmes in the structural engineering. He also apprised the recently launched initiative, the 'CSIR-800'.

Prof. T.K. Datta, in his keynote lecture presented a methodology for semi-active control of building frames using semi-active hydraulic damper (SHD) and fuzzy rule base. He described the SHDs installed in

combination with steel bracings and the methodology developed in the MATLAB environment. He gave an illustrative example of a five storeyed steel frame, selected from the literature. The control of the responses of the frame under EI-centro earthquake record is obtained for a specified set of the frame, steel bracings and the SHD properties. Different distributions of the semi-active control force along the height of the frame are tried in order to arrive at the best distribution for obtaining the maximum control of a response quantity of interest. An extensive parametric study has been conducted to investigate the effectiveness of the control scheme under the variation of the important parameters. The results of the study show that an efficient semiactive control strategy can be developed using fuzzy rule base. Further, optimum combinations of parameters for maximum control are different for different response quantities of interest.

Prof. D.K. Paul, IIT-Roorkee, delivered a keynote address on Seismic Base Isolation of Multistorey Buildings: An Overview. One of the most widely implemented and accepted seismic protection system on base isolation, 'Seismic base isolation' is a technique that mitigates the effects of an earthquake by essentially isolating the structure and its contents from potentially dangerous ground motion, especially in the frequency range where the building is most affected. In recent years, base isolation has become an increasingly applied structural design technique

for buildings and bridges, especially the structures that must remain fully functional during a major earthquake, e.g. hospitals, fire stations and emergency command centres. Many type of structures have been built using this approach and many others are in design phase or in construction. Prof. Paul also explained base isolation importance, applicability, design technique and testing method.

Dr A.K. Pandey, Organizing Secretary, in his paper 'Curvature Ductility of Reinforced Concrete Beams at High Strain Rates', explained an iterative approach for computation of curvature ductility factor for doubly reinforced concrete sections, which takes into account strain rate sensitive properties of concrete and steel. The available curvature ductility reinforced concrete rectangular sections with a range of tension and compression steel ratios has been derived at a strain rate varying from  $3.3 \times 10^{-5}$  to  $1.0 \times 10^1/s$  encountered during static and earthquake loading. The parametric studies have indicated that curvature ductility factor decreases at higher strain rates. The percentage decrease is more for a richer mix concrete with the similar reinforcement. The various codal provisions for providing required ductility in moment resisting frames has been discussed.

Prof. V.K. Verma, Civil Engg. Department, G.B. Pant University of Agriculture and Technology, Pant Nagar, explained the effect of elevated temperature on high strength concrete. Dr Rajesh Deoliya, Scientist, CBRI, explained the challenges in Life Prediction of

RCC Structures. Dr Achal Mittal presented the paper on Shear Strength and Flexural Behaviour of Reinforced Hollow Concrete Block Masonry.

The 54 contributory papers were presented in six technical sessions. An exhibition was also organized to display technologies and products in the area of interest to the conference.

Dr Gopal Ranjan, DG, CoER, was the Chief Guest, at the valedictory function. Shri M.P. Singh, Scientist 'G', briefed and thanked all the speakers and delegates for their active participation, the sponsors for their support, and the organizing committee and others involved on their committed and enthusiastic efforts.

## National Conference on Recent Advances in Surface Engineering (RASE-09)

**H**eld at the National Aerospace Laboratories (NAL), Bangalore, during 26-27 February 2009, the National Conference on Recent Advances in Surface Engineering (RASE-09) offered a platform to the scientists, faculty members, researchers and students from leading R&D organizations and academic institutions of the country to present their latest achievements and to discuss the innovations and challenges in the field.

Dr K.S. Rajam, Head, SED, in her welcome address spoke about the scope of surface engineering and of the conference, and also introduced the chief guest Dr P.R. Vasudeva Rao, Group Director, Chemistry, Metallurgy and Materials, IGCAR, Kalpakkam, to the audience. Dr Vasudeva Rao inaugurated the conference and released the souvenir brought out on the occasion.

In his inaugural address, Dr Rao said that surface engineering is a critical technology for every industrial and manufacturing sector. He emphasized the importance of surface engineering to overcome many problems encountered by several components in the severe environments of high radiation and heat in the atomic energy reactors and plants.

Dr A.R. Upadhyaya, Director NAL, presided over the function and delivered the presidential address. Dr Upadhyaya talked about surface engineering technologies and said that these technologies are vital to the success of almost every industrial and commercial product from aero-engines to aeroplanes, from electronic gadgets to surgical implants and from razor blades to automobiles.

Dr Bharathi Bai J. Basu introduced the

keynote speaker, Dr H. S. Maiti, Director, CGCRI, Kolkata, to the audience. Dr Maiti delivered the keynote lecture entitled "Advances in nano-structured films and coatings". He talked about the recent advances in the frontiers of nanotechnology and its industrial applications. He said that nanostructured coatings could be prepared by several techniques including sol-gel technique. He showed some of the important contributions made by the scientists of CGCRI, in the area of nanostructured coatings with optical properties and hydrophobic properties.

Dr Harish Barshilia proposed the vote of thanks. An exhibition was organized to display industrial products in the theme area. The exhibition was inaugurated by Dr S.R. Rajagopalan, Adviser, SED.

The conference had about 150 participants from various R&D organizations and academia including IITs, IISc, ISRO, BARC, IGCAR, ARCI, DMRL, NITs, RRI, CSIR Labs, etc. It had 11 invited talks, 47 contributory lectures and 17 poster presentations. The technical talks were divided into 10 sessions covering important issues in the field of surface engineering.

The conference ended with a concluding session chaired by Dr S.R. Rajagopalan. Panel of experts drawn from different R&D institutions and academia expressed their views about the conference. Other participants also shared their experiences about the conference and suggestions during the concluding session. All the participants felt that the conference was well organized and was unique in several aspects especially the technical presentations. Best poster paper awards were also presented to the students.



### Seminar on 'Prospects of Kangra Tea'

Registering of Kangra Tea as one of the geographical indicators has attracted several stakeholders of the flavoury tea industry in Himachal. In view of this, Tea Board of India in association with the Institute of Himalayan Bioresource Technology (IHBT),

Palampur, organized a one-day seminar on 'Prospects of Kangra Tea' on 31 January 2009 in IHBT Auditorium. Shri Jairam Ramesh, the then Minister of State for Commerce & Industry and Power was the Guest of Honour. Prof. Prem Kumar Dhumal, Chief Minister, Himachal Pradesh, was the Chief Guest. Former Chief Minister of the State Shri Shanta Kumar also graced the occasion. Other dignitaries included MLAs Shri Ravindra Ravi, Shri Atma Ram and Shri Praveen Sharma.

Addressing the audience, Shri Ramesh suggested that the flavoury tea industry in Himachal Pradesh should switch over to production and promotion of Kangra Orthodox Green Tea. He assured that in June 2009 Ministry of Commerce and Industry will organize a conference



A dais view of seminar on 'Prospects of Kangra Tea'

of bulk tea buyers from Amritsar, Gujarat and Assam along with the tea producers of the State. He also suggested that the planters in Himachal should form Self Help Group as it has proved successful in South India for small tea growers like those in Himachal.

The Chief Minister Shri Dhumal assured Shri Ramesh that as per his suggestion, the State government is open to joining hands with the Tea Board India to share the responsibilities of protection of the GI standard to the Kangra Tea. The Chief Minister exhorted tea planters to overcome the mentality of dependence on subsidy culture and concentrate all efforts and available resources to revive the Kangra Tea.

Ms Roshani Sen, IAS, Deputy Chairman, Tea Board of India, highlighted the 'Importance of GI

for Tea' while Shri R.D. Nazeem, IAS, Executive Director, Tea Board of India, shared key points of the 'Functioning of Small Tea Growers in South India.' Dr P.S. Ahuja, Director, IHBT, deliberated on 'Status and Prospects of Kangra Tea'. Renowned economist Prof. S.S. Johl opined that the

tea planters in Kangra should form clusters of registered tea growers for promoting organic tea culture. He mentioned that commercial viability of Kangra Tea should be given more importance than its economic feasibility.

Shri Krishan Gopal, Sungal Tea Estate and Ex-President, Kangra Valley Small Tea Planters' Association, highlighted the problems of Kangra Tea industry, e.g. increasing cost of energy, transport and labour wages and lack of financial and structural supports for exposure visits of Kangra tea growers to other tea growing areas, for human resource development.

A documentary on 'Journey of Kangra Tea' was screened at the seminar. Also an exhibition was organized on R&D activities in tea science and tea products from Himachal Pradesh.

## National Seminar on Fly Ash Products at IMMT

The Institute of Minerals and Materials Technology (IMMT), Bhubaneswar, and Centre for Fly Ash Research & Management (C-FARM), New Delhi, jointly organized a one-day National Seminar on 'Technology to Manufacture High Fly Ash Content Bricks/Blocks & Measures for Quality Assurance' on 3 March 2009 at IMMT.

The seminar was inaugurated by Dr Vimal Kumar, Scientist-G and Head, Fly Ash Unit, DST, Government of India; Shri Sourabh Garg, IAS, Secretary, Department of Industry, Government of Orissa; Shri Ashok Meena, IAS, MD-IPICOL, Orissa; Dr B.K. Mishra,

Member Secretary, Orissa State Pollution Control Board; and Shri K.N. Agrawal, Former DG-CPWD and Director, C-FARM. Dr R.K. Paramguru, Scientist-in-Charge, IMMT, welcomed the guests and delegates. Dr Srikant Sharma, Scientist, IMMT, conducted the inaugural function and proposed the vote of thanks.

Over 90 delegates attended the seminar, of which 24 persons were from outside the state of Orissa. The delegates were from various sectors and represented State Governments, State and Central Public Sector Enterprises, Fly Ash Brick Manufacturers and Suppliers, Equipment Manufacturers and

Suppliers; Scientists and Policy Makers.

The seminar had two technical sessions in which four papers were presented on the aspects of technology and quality control measures in the production of fly ash bricks and blocks. Dr B.D. Nayak, Scientist, IMMT, presented a paper on 'Clay-fly ash bricks with fly ash content up to 80%' and showcased IMMT's technology profile. He also demonstrated IMMT's patented process for fly ash brick manufacturing. In the concluding session several recommendations were made for effective utilization of fly ash generated in the country.



Address by Shri Ashok Meena, MD, IPICOL



Presidential Address by Shri Sourabh Garg, Secretary Industry



Keynote Address by Dr Vimal Kumar, Head, Fly Ash Unit, DST



Demonstration of IMMT's fly ash products



Demo of fly ash brick prepared using IMMT technology



### Joint Indo-German Workshop on Microreaction Technology

A workshop on 'Microreaction Technology' was held at the National Chemical Laboratory (NCL), Pune, jointly with German institutes during 4-5 March 2009. Researchers from German research institutes (Institut für Mikrotechnik Mainz GmbH, IMM), academia (Technical Univ. of Dortmund, Technical University Ilmenau, Institute of Micro and Nanotechnologies) and industries (Bayer Technical Services and Mikrogas GmbH) and the Indian academia (IIT-Kanpur, IIT-Madras, IIT-Kharagpur) participated in the workshop. The workshop focused on exploring the various facets of microreaction technology for different applications. It was attended by more than 110 participants, of which about 50 were from industries like Ranbaxy, Reliance, Tata Chemicals, Sandoz, Lupin, L&T, etc., about 25 students from different IITs and about 40 from academia and Government funded research labs, including NCL. The workshop was partially funded by the German Research Foundation (DFG), New Delhi and Department of Science and Technology (DST), New Delhi.

The workshop was held as a part of NCL's Diamond Jubilee celebrations that aimed to bring together as many practitioners of science from industry, academia and Government to NCL for scientific discussions and interactions.

Dr Amol Kulkarni, NCL scientist and coordinator of the workshop, spoke about the main

objectives of the workshop. He said that a new tool of microreaction technology has emerged in last few years for expediting R&D for process development and process intensification. Microreactors are miniaturized assemblies which allow continuous production of chemicals by providing significantly higher transport rates. It has received wide acceptance from the research labs and chemicals industry in the western world and Japan. The Indian chemical, pharmaceutical and allied industry needs to proactively take lead in understanding the new technology and deriving the associated benefits. NCL with proven strengths in organic synthesis, process development, reaction engineering and flow modeling has established a significant research programme on microreaction technology. He highlighted the importance and applications of microreaction technology and how they can be used for commercial production. Their relevance to industry and the demand of the technology for future was also emphasized.

Dr S. Sivaram, Director, NCL, in his inaugural address acknowledged assistance of the German Research Foundation (DFG), New Delhi, and welcomed the speakers and participants to the workshop. Dr Sivaram said that the microreactor technology workshop would help in understanding its applications in industry and R&D. It will lead to sharing of knowledge amongst the scientists and thereby widen use of the technology in

defined applications. Substitution of established technology is never easy. Therefore uniquely relevant applications of this technology have to be demonstrated. The goal of NCL is to build capacity and capability for R&D in this area and partner with industry on diverse applications. Dr Sivaram hoped that the workshop would infuse more confidence amongst industry and further interest them towards exploring the technology for defined applications. Simultaneously, the academic scientists will be prompted to identify gaps in this area of technology and work towards filling these gaps through focussed scientific research. He said that the workshop was a beginning to deepen the S&T relationship between India and Germany and would benefit science and industry in the years to come.

Prof. V. Hessel, Director, IMM and Workshop Chairman from Germany side, initiated the first session with his presentation on "Sustainability through green processing: Novel process windows intensify micro processing and applications in catalysis". In his talk he covered the aspects relevant to current developments in milli and micro process technologies at Eindhoven University of Technology (TU/e) and IMM. He spoke on how these technologies contributed to green and sustainable processes in chemical industry. Prof. Hessel briefed the audience on the applications of micro reaction technology to the field of heterogeneous catalysis, particularly



for fuel processing to generate hydrogen for fuel cells.

The workshop covered topics in micro process engineering highlighting modelling of fundamentals for microfluidics and further tailoring of fluidic principles, catalyst development and coating, integration of reaction and separation into combined systems or plants, energy generation, etc. A poster session for students and industrial participants was also organized. The workshop also had a panel discussion on 'Industrial relevance of microreactors'.

Prof. Volker Hessel, in the concluding session observed that the workshop was fruitful and beneficial to the participants as well as the speakers. Discussion on topics like continuous flow synthesis of fine chemicals, nano particles, pharmaceutical drug molecules, etc. were quite informative. The panel discussion on 'Industrial relevance of microreactors' was one of the most effective sessions, he opined.

Dr B. D. Kulkarni, Deputy Director, NCL and the workshop chairman from Indian side, in his concluding remarks said that one needed to move from conventional reactors to new reactors. Miniaturization is the most important keyword that needs to be looked at. One has heard of micromixing, microtechniques, mini pilot plants but soon microreactors will be the future. He gave an example of a room with proper length, breadth and height and compared it with its space and volume and said that the volume of this room was defined by its area likewise as you decrease the size of the room and increase its space the degree of freedom increases. Similarly, microreactor technology works by reducing its size and increasing its hyperspace, while increasing the hyperspace the size reduces. This is exactly the concept that can be generally thought of for a microreactor. Therefore the number of different kinds of applications and benefits from a microreactor increases. He concluded by mentioning the benefits and applications of microreactors. Dr Amol Kulkarni thanked the speakers, participants and organizing team.

The workshop had 13 invited lectures, and about 20 poster presentations. The best poster awards were distributed by Prof. Hessel and Dr B.D. Kulkarni. First prize was given to Mr Chaitanya Karale, NCL, for his poster on 'Flow and heat transfer in mini channels'. Second prize went to Ms Manasi Kasture and Mr D. V. Ravi Kumar, both from NCL and third prize to Mr Ameya Diwan, IIT-Bombay and Mr Vikram Sheshadri, IIT-Madras. The workshop proved immensely effective. The participants in their feedback clearly expressed their resolve to explore the technology for further applications in their respective areas.

## CSIR's 'Leadership Development Programme'

**N**. Shantha Kumar of the National Aerospace Laboratories (NAL), Bangalore, who attended the CSIR's Leadership Development Programme held during November 2008-January 2009, reports:

Recently Mr R. K. Rao, COSP, Dr Soumendu Jana, Propulsion and Dr Raveendranath Nair, ALD and I from NAL, participated in CSIR leadership development programme (LDP).

The LDP was organized in four modules. The first module consisted pre-work assignments which were to be carried out at our work place before attending the programme. The second module was a 12 day residential programme held at Human Resource Development Centre (HRDC), Gaziabad from 23 November to 5 December 2008. The third module consisted of assignments (on learning) that were carried out at our work place before attending the fourth module. Fourth module 'Accreditation and Graduation' was again held at HRDC, from 27 to 31 January 2009.

The main emphasis of the whole programme was to:

1. Develop a thorough understanding of what high performance means in every function and role of CSIR
2. Review the implications of rapidly changing environment of India in general and CSIR in particular and how leaders in CSIR can respond
3. Develop and revitalize senior level leadership competences for extraordinary achievements



4. Create core leaders in CSIR who can make meaningful contribution to improve CSIR's performance, relevance and impact (PRI).

There were series of tests and assignments during the entire programme focusing on our personal mastery in identifying and correcting flawed mental models, interpersonal skills, capacity to reveal what we are truly thinking during a really tough discussion, capacity to persevere under pressure. In addition there were 48h continuous teamwork simulations which were designed to give us opportunity to practice and experiment with leadership ideas and behaviours. Some outdoor teamwork simulations were designed to test our teamwork corroboration and physical fitness. As part of the assignments we were asked to look into issues which improve CSIR's PRI, make a detailed study and present before Director General, CSIR. On the final day we had presentation and interaction with DG. During our discussion it was evident that DG insisted on promoting CSIR brand. He was of the opinion that in every forum we should promote CSIR brand (like CSIR-NAL in publication, in presentations, in our visiting card, letter head, etc.). DG also made brief presentation on new policy of recruitment and restructuring of senior level positions in CSIR.

To sum up, the programme has given us the needed boost to carry out the work with zeal. Advise to all younger colleagues not to miss the opportunity if they are selected to undergo this training programme. But be prepared to go through some sleepless nights.

## EMBO World Lecture Course on Recent Developments in Macromolecular Crystallography at NCL

The National Chemical Laboratory (NCL), Pune, hosted the EMBO World Lecture Course on Recent Developments in Macromolecular Crystallography during 9-14 November 2008. The purpose of this EMBO Lecture Course was to promote the field of macromolecular crystallography at Indian universities and encourage young students of biology, biochemistry, chemistry, physics and computer science to enter the field. This course consisted of various lectures describing recent methodological developments in the field of crystallization to diffraction data collection, structure determination and function prediction based on structure as well as contributions from recent achievements in biology using X-ray diffraction techniques. About 80 students, with at least two-third coming from Indian universities, besides 20 faculties from India and abroad attended the course.

Twenty-one invited lectures were delivered by distinguished crystallographers and experts in the field of crystallography and structural biology, dealing with a variety of research problems and new developments. In addition, 10 out of more than 100 registered participants were given opportunity to present their own research as oral presentation. Another 22 student participants presented their research as posters. Apart from these presentations, scientists from different structural biology related commercial organizations such as equipment manufacturers, consumable suppliers and software developers also presented their scientific research in the lecture course. Representatives of a few organizations arranged demonstrations in their respective exhibition stalls for the benefit of participants.

The lecture course started with the inaugural lecture by CSIR Director General, Prof. Samir K. Brahmachari. In his address Prof. Brahmachari stressed the importance of the participation of structural biologists in the Open Source Drug Discovery Project, a CSIR-led global consortium targeted at diseases such as tuberculosis and malaria that affect poor populations of the developing countries. He explained the methodology of participation and how due credit would be awarded for significant contributions. He emphasized that this effort should be distinguished from that of the patent-driven drug research by pharmaceutical companies, which is equally important. Prof. M. Vijayan, President of the Indian National Science Academy (INSA) and Emeritus Professor, Indian Institute of Science (IISc), Bangalore, delivered the keynote address. Prof. Vijayan presented an enlightening view of the development of macromolecular crystallography with special emphasis on the research efforts in macromolecular crystallography in Indian laboratories and how crystallography has become an important

component of biological research in the country. Vidya Gupta welcomed the participants, C. G. Suresh presented an overview of course structure and Manfred Weiss talked about the genesis of the course. Inaugural session concluded with vote of thanks by Sanjay Nene.

The course consisted of fifteen scientific sessions and two evening talks. In the first day's sessions the lecturers addressed to the various new developments in protein crystallization and diffraction data collection. Jochen Mueller-Dieckmann from European Molecular Biology Laboratory, Germany, dealt with new

developments in crystallization and Zbigniew Dauter of Argonne National Laboratory, USA, on data collection strategies, whereas, Paul Tucker and Manfred Weiss from EMBL, highlighted the application of synchrotron to enhance the capabilities of structural research. Jagannath from Bhabha Atomic Research Center, Mumbai, talked about the design and efforts to build the Indian synchrotron source.

The lectures of the second day focused on the developments of techniques for phasing the protein reflections presented by Bi-Cheng Wang of University of Georgia, USA and crystal structure refinement by

Eleanor Dodson of University of York, UK. Among the presentations on the applications of crystallography in biology, M. Vijayan talked about lectin structures, Dinakar Salunke of National Institute of Immunology, New Delhi, on structural immunology and Shekar Mande of Centre for DNA Fingerprinting and Diagnostics, Hyderabad, on structural research going on in mycobacterium tuberculosis proteins.

On the third day, Joel Sussman of Weizmann Institute of Science, Israel, introduced the concept of Proteopedia, a collaborative



Manfred Weiss briefing on genesis behind the course



Prof. S. K. Brahmachari delivering Inaugural Address on Open Source Drug Discovery



Dr C. G. Suresh introducing the course structure



Prof. M. Vijayan delivering Keynote Lecture on Macromolecular Crystallography, historical background and the Indian effort



website, for creating descriptions of macromolecules linked to their 3D structure with the participation of scientific community. This important effort is expected to narrow the rift between the 3D structure and function of biomolecules. Edward Baker of University of Auckland, New Zealand, talked about the structural biology of bacterial pilin protein and Jiban Dattagupta of Saha Institute of Nuclear Physics, Kolkata, on the recent research in structure-activity studies of proteases and their protein inhibitors in the context of his own research.

The fourth day's proceedings comprised mainly the talks on the use of Protein Data Bank to infer functional information and bringing automation into structure determination of proteins. Gerard Kleywegt of Uppsala University, Sweden, dealt with the various methods of assessing the quality and correctness of structures in PDB. Pinak Chakrabarti of Bose Institute, Kolkata, showed how systematic analysis of selected protein structures

could provide information on protein interfaces and interaction. This analysis is shown to help distinguish between interactions in quaternary structure of proteins from packing interactions in crystals. Santhosh Panjekar of EMBL, Germany, presented the automated crystal structure determination software developed by him. The many features of the package were demonstrated with the help of examples. M.R.N. Murthy of the Indian Institute of Science, Bangalore, presented an overview of the structural research in virus crystallography and his own recent investigations in this field.

The main theme of the concluding day's lectures was the prediction of function from structure. Srinivasan of the IISc, Bangalore, described how comparison of several structural and other properties can help in the prediction of unknown function of proteins with known structures in PDB.

Two evening lectures were also delivered to bring in general awareness and interest in

crystallographic research among university students and scientists. Guy Dodson of University of York, UK, who had worked in the laboratory of the Nobel Laureate Dorothy Hodgkin described Dorothy's research in structure analysis of penicillin antibiotics and insulin hormone. Edward Baker presented how the interesting world around us can be understood through crystallographic tools and showed the beauty of crystals and their inherent symmetry.

Participants got enough opportunities to interact with the faculty and also to see the displayed posters and discuss research problems and find solutions for experimental difficulties. During the valedictory function, awards sponsored by commercial exhibitors were presented for the best posters and the best oral presentations. Joel Sussman presented copies of the text books authored by him and mementos to selected participants who showed active participation in the discussions during various sessions.

## Prof. Samir K. Brahmachari delivers Prof. G.N. Ramachandran Endowment Memorial Lecture

**P**rof. Samir K. Brahmachari, Director General, CSIR, delivered the First Professor G.N. Ramachandran Memorial Lecture on 'Deciphering Biological Function from Genome Variation' at the Central Leather Research Institute (CLRI), Chennai, on 18 October 2008. This prestigious lecture has been instituted by the Indian Peptide Society in association with the University of Madras.

The theme of the lecture was the occurrence of genetic variability as a result of changes in proteins/peptides in their time of expression, activity, quantity, presence at a particular point of time and location. It has been emphasized that this variability makes each individual different. While in some cases it is beneficial, in others it may cause diseases. Dr Brahmachari explained that comparative genomics may

provide answers to many questions in Nature as to why a particular organism is different from others. When the non-coding regions of the DNA was considered as junk, it was proposed by the speaker's group in India that this junk DNA may actually have a role in gene regulation as well as serve an evolutionary function, which has been proved later on. It has been concluded that miRNA mediated

regulation includes multi-level regulation of target genes at transcriptional and post-transcriptional levels and that source gene regulation is mediated by its own intronic miRNA ensuring homeostasis. The presentation also

deliberated on another study where computational biology has been used and has yielded conclusive information with respect to schizophrenia and bipolar disorder. A comparison of the human system to an eco-friendly bioreactor has also been drawn.

The lecture not only focused on various important issues relating to genomic study, but also provided important leads for future works.

Prof. Brahmachari paid glowing tributes to Prof. G.N. Ramachandran during the course of the lecture.

## Prof. Samir K. Brahmachari addresses CBRI Staff

Visiting the Central Building Research Institute (CBRI), Roorkee, on 27 December 2008, Prof. Samir K. Brahmachari, Director General, CSIR, addressed the CBRI staff, on the 'Quality of leadership and importance of CBRI.' He said that CBRI scientists have potential but a good leadership is required to tap the potential. He reminded that the institute's role is to ensure how the country can grow and develop a low-cost housing model for the poor segment of the country. Prof. Brahmachari also spoke about the mentors and leadership that he had when he started his career as a CSIR Research Fellow at Indian Institute of Science, Bangalore, in mid-70s.

In 1995, he was a part of human genome project formulation funded (\$ 3 billion) by United States. Today the human genome sequence is an open source document, he added. Prof. Brahmachari further said that when the human genome sequence was over, as a Director of Institute of Genomics and Integrative Biology (erstwhile CBT), he launched Indian Genome Variation Project to bring India into the world genomic map and he succeeded in his endeavour. He mentioned that he has created 'G.N. Ramachandran Knowledge Fund' of Rs 1.2 crore with his



Prof. Samir K. Brahmachari, Director General CSIR, addressing the CBRI staff

personal money at the Institute of Genomics and Integrative Biology (IGIB), New Delhi, for providing fellowships to carry out studies on genomics and integrative biology. Prof. Brahmachari stated that as the world is advancing very fast, CSIR will also have to change its gears in the right direction. He urged the scientists to concentrate on their missions. He lamented that people still do not know what CSIR has done for the country.

Prof. Brahmachari said that CSIR is adapting to changing needs. He pointed out that CSIR stands for Council of Scientific and Industrial Research with Corporate Social Indian Responsibility. Prof.

Brahmachari assured that CSIR would render high science which will empower the farmers in future. Briefing about the new initiatives, he said that affordable health, sustainable energy, potable water and waste to energy are the prime issues on which CSIR will concentrate more by launching the CSIR - 800 programme for betterment of the people in the country. He also apprised about soleckshaw - The Flagship programme of the recently launched initiative of CSIR, CSIR - 800 - Sustainable effort to utilize the fruits of cutting-edge science to improve the quality of life of 800 million Indians, who are at the bottom of



the “Pyramid of quality of life”. He informed that India needs to spend Rs 1000 crore to convert 8 million traditional rickshaws into petrol-driven vehicle. Each soleckshaw is thus capable of saving carbon-dioxide emission to the tune of Rs 4,000/- per annum and total saving countrywide approximating Rs 200 crore.

During discussions under the leadership of Dr M.O. Garg, Director, CBRI, five projects from CBRI under CSIR-800 programmes, i.e. Low Cost Prefabricating Housing – Dr A.K. Pandey, Energy Efficient Building Design – Shri Ashok Kumar, New Materials for Buildings – Dr S.R. Karade, Earthquake Disaster Mitigation of Buildings and Nuclear Reactor – Dr Navjeev Saxena, Fire Resistant Materials and Techniques – Shri Suvir Singh, were identified.

Prof. Brahmachari also had a meeting with Heads of various Divisions, Achiever’s Groups and Young Scientists of the institute.

## Prof. B.K. Mishra receives National Mineral Award

**P**rof. Barada Kanta Mishra, Director of the Institute of Minerals and Materials Technology (IMMT), Bhubaneswar, received the prestigious National Mineral Award at a special function held at Vigyan Bhavan, New Delhi on 13 February 2009. The award was presented to him by Hon’ble Union Minister of Mines, Shri Sis Ram Ola.

Prof. Mishra has developed a unique software-based numerical approach to study stratification of particles, which allows computer-aided visualization of large system of fine particles undergoing separation. His research work on application of the discrete element method is a pioneering contribution in increasing the productivity of minerals and powder technology industry, for which he has been receiving international reorganization. Recently, he has been elected a Fellow of the Indian National



Prof. B.K. Mishra, Director IMMT, receiving the National Mineral Award

Academy of Engineers. Prof. Mishra and his colleagues at IMMT offer high standard R&D and trouble shooting solutions, especially to minerals industries. Under his stewardship the institute, will very soon offer a new PG diploma programme in Materials and Minerals engineering. The institute’s endeavour in this direction has already received overwhelming response from the industry, especially when the latter is facing acute shortage of skilled personnel to maintain their competitive edge in international business.