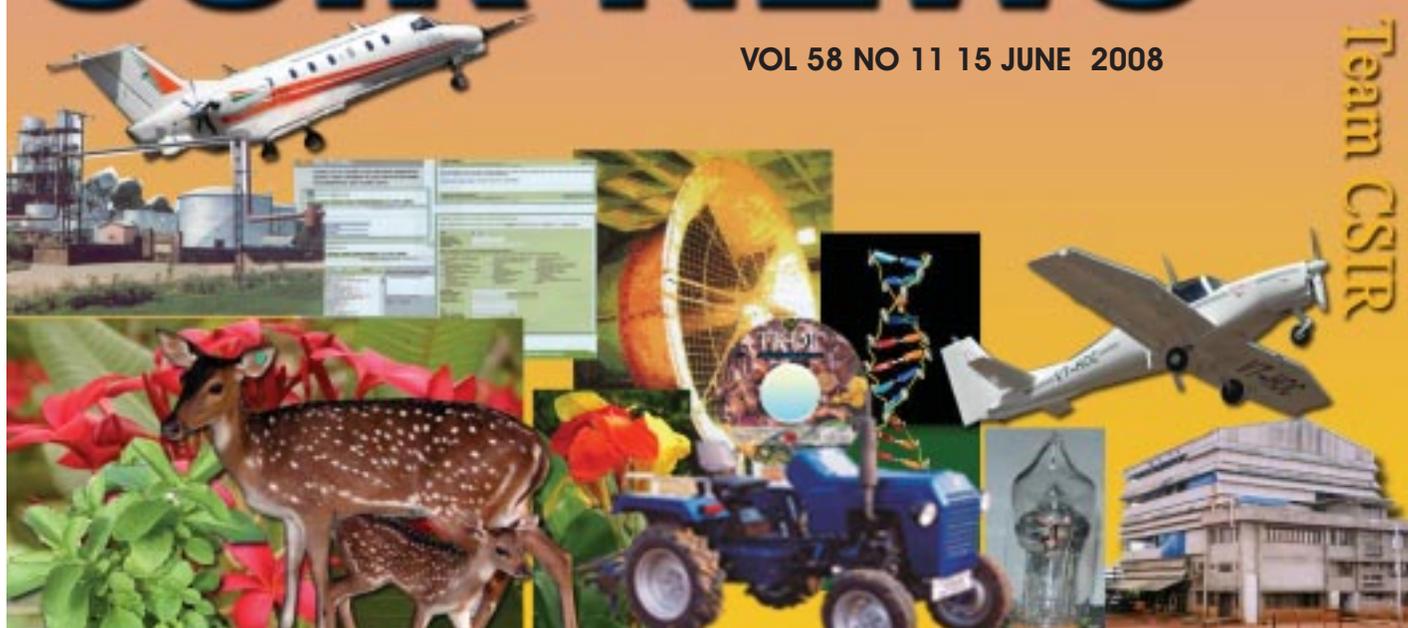


CSIR NEWS

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Team CSIR



CIMFR: Stabilization of rocky/difficult hilly terrains

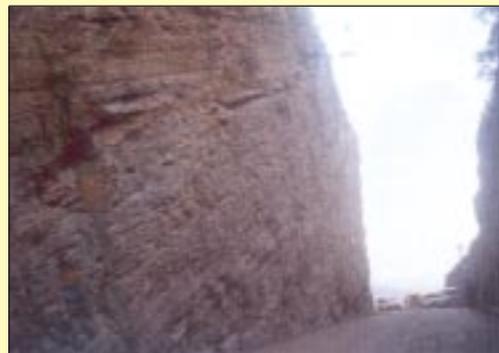
The Blasting Department of Central Institute of Mining and Fuel Research (CIMFR), Dhanbad, in a significant one-year contract worth Rs 55 lakh, for stabilizing the rocky slopes along one of the railway tracks between Maharashtra and Karnataka for the Konkan Railway Corporation Limited of the Indian Railways without damaging the tracks and hampering the daily train schedules. Unique controlled blasting techniques were applied to the sites at Chinchavali, Barewadi, Sheravali (North and South), Ambivali, Wave, Sherpe and Harwada for successful flattening of rock slopes.

Another significant contribution was to the World Bank-funded project of Rs 108 crore of the state of Mizoram for construction of 160 km long road in difficult hilly terrain connecting Aizawl-Thenzawl-Lunglei, wherein CIMFR scientists provided technical guidance and constant supervision to build a 1.5 km stretch through the hilly and treacherous terrain of Midumkham which had claimed several lives during earlier attempts. A special technique with bamboo spacers was used for the first time during controlled blasting to make stable and undamaged rock slope without damaging close-by high-tension cables and residential structures. A similar kind of work was also completed in Durtlang-Leitan (through cutting) in Aizawl Gate.

In addition to the above contributions of national importance and mass-benefit, the output of S&T projects carried out by the Blasting Department has been used by the Directorate General of Mines Safety (DGMS) and several other regulatory agencies to frame up safety standards in the form of Technical Circulars.



Flattening of rock slopes at Sheravali (South) site of Konkan Railway, after controlled blasting



Smooth wall formation after controlled blasting in Durtlang-Leitan (through cutting) in Aizawl Gate



DGGE profiling of bacterial community from Arabian Sea

Advances in genomic analysis are providing new technologies that may be useful for characterizing uncultivated prokaryotes. Large DNA fragments can be recovered from mixed microbial populations using modern genomic techniques. Analysis of these large fragments can yield information on gene organization, structure and content of uncultivated bacteria. To study spatial and temporal variation of microbial communities, multiple sample analysis is essential. Approaches based on cloning and sequencing of the PCR amplified 16S rRNA gene fragments are too labour intensive, costly and time consuming, especially for analysis of large microbial diversity. More appropriate techniques in such cases are the molecular fingerprinting techniques such as denaturing gradient gel electrophoresis (DGGE). DGGE is able to detect differences in the melting behaviour of small DNA fragments (200-700 bp) that differ by as little as a single base substitution. By DGGE, the DNA fragments of the same length but with different sequences can be separated. Further, DGGE is useful to separate polymerase chain reaction (PCR)-generated DNA fragments.

Using this technique, scientists at National Institute of Oceanography (NIO) Goa, analyzed the bacterial community structure from six locations in the Arabian Sea. Fig 1 depicts the possible number of different bacterial species and station-wise changes. Fig 2 depicts the vertical profile of bacterial

community in four samples from surface to 1900 m at on location. These analyses suggest both horizontal and depth-wise differences in bacterial community. As each band corresponds to a single bacterial species, as many as 21 bacterial species would be present in the water sample collected at 13°54.26'N; 74°18.97'E. Similarly, at 14°00.29'N; 73°29.94'E; 14°00.24'N; 73°13.97'E; 14°00.25'N; 73°08.11'E and, 14°00.30'N; 72°57.22'E the possible number of bacterial species are 17, 15, 24 and 22 respectively. Many of the bands were common to all the five water samples, indicating presence of same bacterial species. Similarly from Fig 2, it can be made out that as many

as 28 bacterial species are present in the surface sample. At 250, 1000 and 1900 m the possible number of bacterial species are 23, 21 and 22 respectively. If one had to follow conventional (biochemical) identification method, it would have taken very long time to obtain such information. Also, the conventional method would not be useful if many of the 'species' we could count using DGGE technique were non-cultivable.

The work was carried out by Dr N. Ramaiah and Sanjay Kumar Singh. The students Aditi Thakur and Deepthi Rao from VIT, Vellore, also participated in the experiment as a part of their dissertation\work.

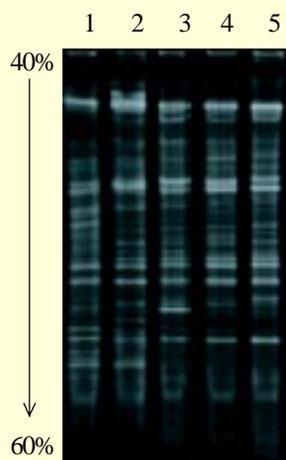


Fig 1: DGGE profiles of the bacterial community associated with the 16S rDNA polymerase chain reaction (PCR) products of the 5 surface water samples. Gel gradient ranging from 40 to 60% denaturant. Lanes 1 to 5 corresponds to the DGGE profiles of the ribosomal DNA fragments from 13°54.26'N; 74°18.97'E; 14°00.29'N; 73°29.94'E; 14°00.24'N; 73°13.97'E; 14°00.25'N; 73°08.11'E and, 14°00.30'N; 72°57.22'E water samples respectively.

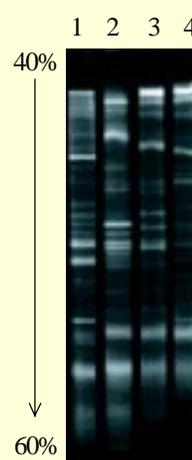


Fig 2: DGGE profiles of the Bacterial community associated with the 16S rRNA gene polymerase chain reaction (PCR) products of the 4 depth wise water samples collected at 14°00.09'N and 71°13.21'E. Gel gradient ranging from 40 to 60% denaturant. Lanes 1 to 4 corresponds to the DGGE profiles of the ribosomal DNA fragments from surface, 250 m, 1000 m and 1900 m water samples respectively

National Environmental Engineering Research Institute (NEERI), NAGPUR

R&D Highlights

This national institute is committed to excellence in R&D in environmental science and engineering and providing related services to government, industry and society, with dedication to protect the environment.

During 2006-07 the institute entered into several agreements with various agencies/organizations in the country, in its field of expertise, and also pursued R&D programmes with/for international agencies/organizations like Alcoa (USA) for defluoridation, World Bank (DPWH, Philippines) for training on EIA, USEPA for air quality, water surveillance, etc, UNICEF for water safety plan and defluoridation, and WHO for water surveillance. The institute transferred the know-how on 'Field Kit for Arsenic Detection in Water' to LTEK System, Nagpur, during the year.

During the year, it filed six patent applications in India and four patent applications abroad. Four patents, three national and one international, were granted. During 2006, NEERI published 79 research papers including 62 in peer reviewed SCI journals with a cumulative impact factor of 87.68. NEERI brought out a series of documents/books/manuals covering various

fields of environmental science and engineering. These are *Urban Air Pollution in India — Status and Future Challenges* (INSA), *Handbook on Indian Environmental Standards* (NEERI), *Greywater Reuse in Rural Schools*, *Environmental Biotechnology* (APH Publishing Corporation), *R&D Frontiers in Water and Wastewater Management* (NEERI), and *Environmental Science and Engineering* (NEERI-Bharathiar University).

The institute has strengthened its financial base through external earnings to an extent of 45% of the total budget. It earned Rs 17.22 crore, whereas the CSIR grant for the year was 19.33 crore. There has been consistent improvement in the institute's ECF in recent years — from Rs 9.17 crore in 2004-05, Rs 11.08 crore in 2005-06 to Rs 17.22 crore in 2006-07 —i.e. about 53%

growth over the previous financial year.

Working towards fulfilling its commitment to the national and societal missions, it has made significant contributions to its various thrust areas of R&D.

R&D Highlights

Environmental Monitoring

In the area of environmental monitoring, the institute has been operating a nationwide air quality monitoring network. Sponsored by the Central Pollution Control Board (CPCB), this programme, is important to maintain and update the database on Indian air quality. This enables the assessment of long-term air quality trends for health related critical air pollutants. This also forms the basis for air pollution management plans. The institute is carrying out ambient air quality monitoring and emission source apportionment studies for Delhi and will soon be launching such studies for Mumbai as well. Stack emission characterization studies, monitoring of gaseous pollutants including VOCs, in indoor and outdoor air, and environmental audit studies have also been carried out for various industries and locations.



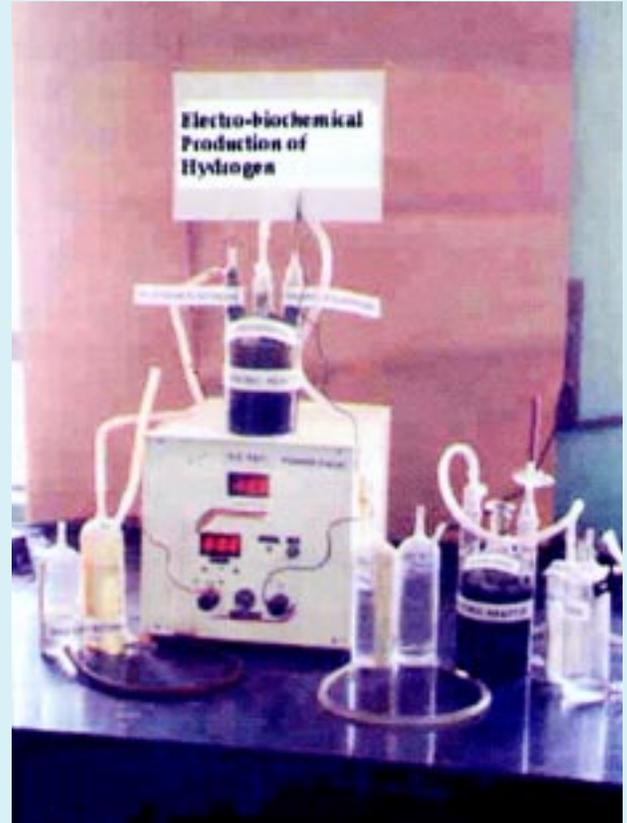
Air quality monitoring-reference site



R & D Highlights



Pilot scale trials for remediation of soil



An experimental set-up for electro-biochemical production of hydrogen



Bench scale biofilter system for treatment of waste gas containing dimethylsulphide (DMS)



PHB polymer

In collaboration with USEPA the institute has brought out a laboratory guidance manual for water testing laboratories. This manual describes the essential laboratory techniques for physico-chemical and biological parameters to ensure drinking water quality. The manual also delineates various aspects of organizational structure of laboratories, roles and responsibilities, staff management and training.

The institute has been involved in monitoring of pesticide residues at national level. The primary objective of this project is to evaluate the status of pesticide residues in vegetables, water, meat and marine products covering the entire nation. The pesticide residue data generated would be instrumental in justifying India's presence in World Trade Organisation (WTO) and in CODEX in foreign trade.

Environmental Biotechnology

Environmental biotechnology has emerged as a useful tool for environment management and remediation. The R&D programmes at NEERI in this field pertain to development of biotechnological methods for treatment of nitrogenous wastewater using anaerobic ammonia oxidation process, remediation of degraded ecosystem owing to metals through biotechnological approaches, biotechnological applications of novel hybrid zeolitic material for *in-situ* remediation of contaminated soil, phytoremediation and bioutilization of industrial wastes,

biodegradable plastic production from wastewater using activated sludge, anaerobic production of hydrogen by diverting electron flow from methane to hydrogen generation, biological deodorization of industrial emissions containing sulphurous odorants generated from pulp and paper industries, production of nicotinic acid from 3-cyanopyridine, biological deodorization of waste gases containing chlorobenzene, assessment and remediation of hazardous waste contaminated areas in and around M/s Tamil Nadu Chromates and Chemicals Ltd, Ranipet, microbial sequestration of carbon dioxide and bioprospecting for phytochemicals and natural products from indigenous plants adopting green processes.

Environmental Genomics

NEERI has significantly contributed to the field of environmental genomics. It has evolved the use of genomic tools to address to the environmental pollution problems. The microbial and functional diversities of effluent treatment plants have been analyzed to improve the efficiency of treatment of wastewater generated in various industries. The hitherto unknown microbial population of activated biomass has been assessed and bacteria identified by sequencing the 16S rDNA, and sequences deposited in the public database of Gen Bank. The institute houses a library of more than a thousand bacteria with the catabolic capacity for varied target pollutants. A battery of PCR primers has been developed that

can assess the catabolic potential of any niche. Mathematical and statistical tools have been used to address specific problems, e.g. biodegradation of mixed waste stream for pesticides, or designing signature specific probes for bacteria. A detailed study has been undertaken at M/s Jeedimetalta Ltd, Hyderabad, to identify various genera of bacteria available in its activated sludge units with a view to improving assimilatory capacity of the effluent treatment plant. The other activities carried out include degradation of 4-nitroaniline by lab isolate, degradation of basic yellow-2 dye by *Kebsiella* sp. and detection of *Pseudomonas* by Real Time PCR.

Hazardous Waste Management

In the field of solid and hazardous waste management, NEERI has pioneered significant R&D activities for various industries. A process is being developed at bench scale for biomethanation of municipal solid waste with two-phase approach to generate bio-energy from the municipal solid waste. Concerted efforts are being made to develop appropriate technologies for treatment and recycling of industrial wastes and sludges. Studies related to assessment, remediation and management of hazardous wastes have been undertaken for various industries. One of the most critical areas was the remediation of mercury contaminated site in Tamil Nadu. The related activities carried out by the institute during the year were: decontamination of machineries and materials, and remediation of mercury



contaminated area at M/s Hindustan Lever Limited, Kodaikanal; designing of secured landfill facility for M/s Jayshree Chemicals Limited, Ganjam, Orissa; feasibility study on disposal of discarded container of hazardous chemicals through induction furnace and management of hazardous wastes generated at NICOMET Industries Limited, Goa.

Environmental Systems Design, Modeling and Optimization

The institute's thrust in the field of environmental systems design, modeling and optimization has been mainly on the development of cost-effective and resource recovery based technologies suitable to socio-economic conditions prevailing in the country. Such technologies include: development of Ventury Scrubber (VS); Turbulent Bed Contactor (TBC); and Airlift Loop Reactor (ALR) for controlling NO_x emissions from nitric acid plants; innovative process for treatment of toxic air emissions from small/medium scale industries; development of GIS-based modeling tool for assessment of non-point source pollution in a watershed; development of air pollution model for interfacing with multi-scale meteorological modeling platform; groundwater modeling around Kovaya Limestone Mine, Gujarat Cement Works; Amreli District, Gujarat; development of techniques, exploration, assessment and management of groundwater in hard rock areas, studies on wastewater management for textile sector at

Tirpur, and tannery and textile sectors at Erode, Tamil Nadu; studies on effectiveness of polyaluminium chloride for water treatment; studies on treatment of coke oven and by-products recovery plant effluents for removal of ammonical nitrogen and cyanide and feasibility studies on removal of phenol and associated COD from wastewater generated from sebacic acid manufacturing.

NEERI, in collaboration with UNICEF, has provided the design for construction of greywater recycle plants in some schools in water scarce areas of Dhar and Jhabua districts of Madhya Pradesh. The use of these recycle/reuse plants has resulted in saving of freshwater resources in these schools. The institute has also carried out the activities to assess quality of effluent discharged from TPS, Ukai and water quality of *Ghoda Nallah* and the river *Tapi*. The institute provided basic engineering package for proposed CETP to be setup at Bikaner, Rajasthan and developed a tariff structure for CETP, proposed to be set up at Tarapur, Thane.

Environmental Materials

The R&D activities in the area of environmental materials include development of novel functionalized materials for CO₂ capture, development of nano structured zeolitic materials for artificial photosynthesis vis-à-vis control of green house gases (alternative route for non-renewable energy sources), development of catalytic materials for diesel exhaust emission control, development of advanced materials for environmental applications,

development of catalytic materials for selective catalytic reduction of NO_x by hydrocarbons for the control of NO_x from stationary sources, target oriented zeolite analogues for monitoring and control strategies for organo toxins, molecular imprinting for detection and monitoring of phenolics and development of novel photocatalytic materials for water splitting reaction.

Environmental Impact Assessment

During the year, NEERI was called upon by several organizations and industries to carry out Environmental Impact Assessment (EIA) studies to identify and evaluate the impacts of various proposed activities and delineate Environmental Management Plans (EMPs). The Environmental Risk Assessment (ERA) studies assist in identification and evaluation of potential hazards in industries enabling suggestion of remedial measures to reduce or eliminate such hazards. During the year, the institute carried out EIA studies for developmental projects in the following sectors of industries: hydrocarbon, power, port and harbour, chemicals and fertilizers, and mining. The institute also provided significant contributions to these industries by carrying out Environmental Risk Assessment (ERA) studies for proposed/existing projects. Also carried out were the Environmental Audit (EA) studies for various industries so that their manufacturing activities and products do not adversely affect the environmental quality and energy resources are used efficiently. An

agreement was signed with Kalpasar Department for initiating the EIA and SIA studies. Under the agreement NEERI was to assess the potential environmental and social impacts likely to occur due to the Kalpasar project on the existing and proposed port activities in the vicinity of Gulf of Khambat. This was being done in collaboration with NIO-Goa, CSMCRI-Bhavnagar and Tata Institute of Social Sciences, Mumbai.

The activities related to CSIR Network projects during the period pertained to industrial waste minimization and clean up, pollution monitoring mitigation systems and devices, exploration and exploitation of microbial wealth of India for novel compounds and biotransformation processes, phytoremediation and bioutilization of industrial wastes, bioremediation of heavy metal contaminated soil using rhamnolipid biosurfactants, enzymatic bioreactor for treatment of industrial wastewater and biotransformation to valuable chemicals, photocatalytic treatment

of wastewater for colour removal and biodegradability induction. Sequential Batch Reactor (SBR) technology for nutrient removal, biological nitrification–denitrification and phosphorus removal through fixed film/attached growth systems for tannery wastewaters and colour removal from tannery wastewater through heterogeneous photocatalysis.

The institute is endeavoring to investigate high rate transpiration system (HRTS) with a view to providing an alternative technology for disposal of effluents from tanneries so that the effluents should not contaminate the groundwater. The studies are being also carried out for CETPs located at Ranipet and Ambur for assessment of various CETP components including optimization of operational parameters, and development of guidelines for efficient

operation and maintenance of various components of these CETPs.

NEERI Zonal Laboratories

The Zonal laboratories located at Delhi, Mumbai, Kolkata, Chennai and Hyderabad also contributed to make significant contributions during the year. Delhi Zonal Laboratory (DZL) is actively involved in National Ambient Air Quality Monitoring Programme (NAAQM), particularly in Delhi and nearby areas, and in the source apportionment studies in Delhi and few other projects.



The launching of heavy duty diesel vehicle retrofitment project



Instrumental facilities at Delhi Zonal Laboratory



Mumbai Zonal Laboratory (MuZL), besides developing phytoid technology for treatment of wastewater, which has been granted European and Australian patents, made significant contributions to the following projects: heavy duty diesel vehicle retrofit project in Pune; study of Volatile Organic Compounds (VOCs) in SIPCOT Industrial Complex, Cuddalore; water quality assessment of beaches, seafronts and coastal water of west coast; toxicity and biodegradability studies, synthetic oil based mud study on air quality trends and health impacts in Mumbai and air quality assessment, emission inventory and source apportionment studies of Mumbai. Kolkata Zonal Laboratory (KolZL) carried out following activities during the year: water quality assessment of Serampore water treatment plants and underground reservoirs and quality assurance at consumer end; inventory of evaporative emissions of hydrocarbons from various sources in Delhi, Mumbai, Chennai and Kolkata; monitoring and inventory of emissions of Volatile Organic Compounds (VOCs) in urban areas; inventory of VOC emissions in Thane Belapur Industrial area of Mumbai; indoor air quality monitoring for VOCs and ozone at the premises of Tatatele Services; estimation of waste load to the river Hugli from Kalyani to Diamond Harbour; ambient air quality monitoring in Kolkata and EIRA studies for proposed 1200 MW power project in Jharkhand. The contributions of the Chennai Zonal Laboratory (ChZL) include: environmental quality assessment of the Gem Stone Beach Resorts and Theme Park Site at Mattukadu; assessment of dust emissions from stone crushing industry in Trisoolam area, Tamil Nadu; designing of sewage treatment plant for Calicut Airport, Kerala; basic designing of sewage treatment plants for Tsunami affected areas in seven districts of Tamil Nadu; leachability and engineering properties study for the solid waste encapsulated concrete blocks made by ITC Ltd, Thiruvottiyur, Chennai and hydrochemical study of ground water in Pondicherry and Karaikal regions, and various EIRA projects for industries. The Hyderabad Zonal Laboratory (HZL) contributed to the following areas: water treatment, sewage treatment, industrial wastewater treatment, water technology mission, environment impact assessment, off-site emergency preparedness plan and disaster management plan, and waste minimization and cleaner technology options.

IICT signs MoU with RMIT University, Australia



Seen during the signing of IICT-RMIT MoU:
Dr J.S. Yadav, Director, IICT and Prof. Neil Furlong,
Pro Vice-Chancellor, RMIT

Indian Institute of Chemical Technology (IICT), Hyderabad, has entered into an agreement with RMIT University, Australia, to collaborate in the first instance through joint Ph.D. student programme and also to establish a joint laboratory for applied research projects. RMIT and IICT will aim at launching new projects this year in the area of wastewater treatment, green chemistry and climate change impact, renewable energy, etc. The students working on this research exchange programme will have the opportunity to work in both the countries for their Ph.D. programme and will form part of the international team.

The MoU was signed by Dr J.S. Yadav, Director, IICT and Prof. Neil Furlong, RMIT's Pro Vice-Chancellor, on 18 April 2008 at Melbourne. The agreement has come into force with main partnering scientists Dr M. Lakshmi Kantham, Head, I&PC, IICT-Hyderabad and Prof. Suresh Bhargava of RMIT University, Australia.



Synaptic Signaling and Olfactory Coding: Computational and Experimental Approaches

Dr Upinder S. Bhalla's
Shanti Swarup Bhatnagar Prize-winning work

Dr Upinder S. Bhalla, National Centre for Biological Sciences, Tata Institute of Fundamental Research, Bangalore, is a winner of the Shanti Swarup Bhatnagar Prize in Biological Sciences for the year 2007 [CSIR News, 57 (2007), 331].

Dr Bhalla's lab is interested in analyzing signal flow in the brain. Its major contributions have been in the area of computational neuroscience and systems biology. Computational neuroscience analyzes the basis for neuronal information processing. Systems biology analyzes the basis for cellular function and responses to stimuli. Dr Bhalla's group combine both these themes for an integrated analysis of brain function. Their work ranges from single-molecule biochemistry to subcellular function, cellular biophysics, neuronal networks, information processing in sensory systems, and finally to animal behaviour.

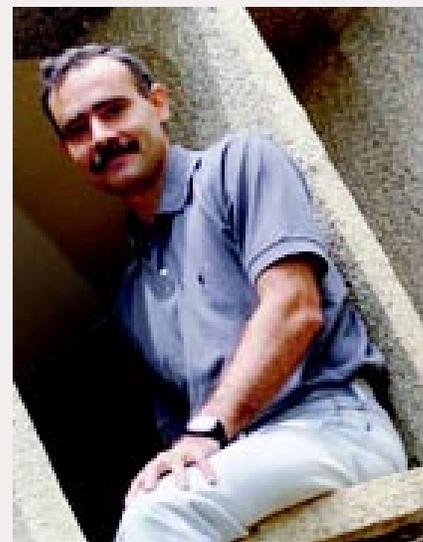
Biochemical basis of memory

Memory involves lifelong changes in neuronal function. When one neuron is activated, it passes information to the next neuron by means of a complex series of electrical and biochemical events at the synapse. In response to appropriate conditions, the effectiveness of this information transfer may change. This process of synaptic change is believed to

underlie memory.

There are at least three fundamental problems with any form of cellular storage of information. First, the lifetime of cellular molecules is brief: typically minutes to days. Thus changes in state or number of molecules will rapidly decay, leading to loss of memory. Second, cellular molecules move through diffusion and directed transport processes. This may remove them from the site of information storage. Third, many events happen in such small volumes that there are very few molecules available to store information. This leads to biochemical fluctuations that can lose information.

Dr Bhalla has analyzed these problems in a series of studies that began in the late 1990s when he was a post-doctoral fellow in the lab of Ravi Iyengar at Mount Sinai. In the work initiated there and continued in India through collaboration, Dr Bhalla and coworkers showed that biochemical feedback could give rise to the phenomenon of bistability. In a series of collaborative papers they predicted the properties of such a switch, analyzed its robustness, and finally provided combined theoretical and experimental evidence for its existence in a model cell type (Bhalla and Iyengar, *Science* 1999; Bhalla and Iyengar, *Chaos* 2001; Bhalla, Ram and



Iyengar, *Science* 2002).

In independent work in his laboratory in India, Dr Bhalla has analyzed how these complex biochemical networks may give rise to additional emergent properties, particularly the selectivity for specific input patterns in time (Bhalla, *J. Comput. Neurosci.* 2002; Bhalla, *Biophys.J.* 2002). They have recently provided experimental support for these predictions (Ajay and Bhalla, *Eur. J. Neurosci.* 2004; Ajay and Bhalla, *HFSP Journal* 2007).

They have also analyzed another kind of switch, the one which relies on cellular movement of molecules rather than simple biochemistry, to maintain cellular information (Hayer and Bhalla, *PLoS Comput. Biol.* 2005). This study explicitly considers each of



the three forms of potential information loss. They have shown that information can be retained for periods of over a year despite biochemical noise and molecular turnover.

Modelling Tools

The research being pursued by Dr Bhalla and coworkers is strongly dependent on modelling and simulation tools, and they have been deeply involved in developing these tools (Bhalla, *Book of Genesis*, 1998; Bhalla, *Meth. Enzymol.* 2002). They are now about to release the successor simulator to GENESIS, named MOOSE. All these tools are publicly available for free download and with full source code, and have an international user base both for teaching and for research (<http://www.genesis-sim.org/GENESIS/>). They have released new techniques for signalling simulations (Vasudeva and Bhalla, *Bioinformatics* 2004) as well as databases and tools for managing model data (Bhalla, *Bioinformatics* 2002; Weng, Bhalla and Iyengar, *Science* 1999; Bhalla and Iyengar, *Novartis Found. Symp.* 2001; Bhalla, *Progr. Biophys. Mol. Biol.* 2003; Vayttaden, Ajay and Bhalla, 2004; Harsha Rani, Vayttaden and Bhalla, *J. Biochem.* 2005; Sivakumaran *et al*, *Bioinformatics* 2002; Bhalla, *Neurocomputing* 2003; Le Novere *et al*, *Nature Biotech*, 2005). They have also developed an online model exploration system for helping users explore biochemical models ranging from simple reactions to complex bistable system (Vayttaden and Bhalla, *Science STKE* 2004).

Olfactory Research

In order to examine systems neuroscience at the level of sensory processing, Dr Bhalla's lab has undertaken studies on how rats perceive odorants. In a recent study they showed

how the hippocampus, traditionally viewed as a memory, spatial, and integrative area, exhibits direct responses to olfactory stimuli (Deshmukh and Bhalla, *J. Neurosci* 2003). They have analyzed olfactory responses from the receptors and the two primary olfactory regions of the brain. They have recordings from each of these areas that suggests that odour identity is encoded primarily through respiration phase tuning of responses (Deshmukh, Clement, Rajan, and Bhalla, in preparation).

They have recently analyzed the representation of odorant mixtures in the olfactory bulb, and have shown that olfactory responses change smoothly as the composition of the mixture is varied (Khan, Thattai, and Bhalla, *Neuron* 2008). They have previously shown through a combination of behavioural studies and electrophysiology that rats can perform rapid odour direction through the use of stereo processing, and that this may occur within 50 msec of the stimulus (Rajan, Clement, and Bhalla, *Science* 2006).

Upinder S. Bhalla was born in 1963 and studied at IIT, Kanpur in 1982 before shifting to Cambridge University. He obtained his BA from Cambridge University in 1986, and his Ph.D. from the California Institute of Technology in 1993. He worked with Ravi Iyengar at the Mount Sinai School of Medicine in New York from 1993 to 1996, and then joined NCBS, Bangalore as faculty. Dr Bhalla is recipient of the DAE/SRC Outstanding Research Investigator Award in 2005, Millenium Medal of the Indian Science Congress 2000, and Wellcome Trust Senior Research Fellowship in 1999. He has published 28 research papers and 16 review articles and book chapters. He has three Indian patents.

Dr Ewa Bjorling, Minister for Trade, Sweden, visits NAL

Led by Dr Ewa Bjorling, Minister for Trade, a high-level Swedish delegation visited the National Aerospace Laboratories (NAL), Bangalore, on 2 April 2008. Dr A. R. Upadhyya, Director, NAL welcomed the delegation and gave a presentation on NAL activities. Dr Ewa Bjorling mentioned that it was her first visit to India. The purpose of the visit was to strengthen the relations between the two countries and promote small and medium scale industries.

Mr Jan Olof Widerstrom appreciated the Director's presentation and mentioned that there may be a possibility of collaboration in the areas of Wind Energy Programmes, Composites, Carbon Fibers, Aerodynamics and Civilian Aircraft Programmes.

Mr Erik Jean Christian A Belfrage expressed interest in RTA programme since Sweden had earlier done some work for a similar transport aircraft.

Workshop on Superhydrophobic Surfaces for Aerospace Application

A workshop on superhydrophobic surfaces was organized by SED at KTMD Seminar Hall, National Aerospace Laboratories (NAL), Bangalore, on 9 April 2008. This was the first theme workshop organized in connection with the technologies for NAL's envisaged RTA-70 programme. The objective was to discuss the recent trends in superhydrophobic surfaces and the technological challenges of applying these surfaces to aircraft.

Dr K.S. Rajam, Head, SED, welcomed the chief guest Dr A. R. Upadhy, Director, NAL; the Chairman Dr Kota Harinarayana, Raja Ramanna Fellow, STTD, invited speakers from various organizations and participants. Inaugurating the workshop, Dr Upadhy, mentioned about the inspiring nature pointing at the technologies that can be developed. He talked about the lotus effect wherein the leaf remains always clean due to the unique microstructure of its leaves along with nanostructure giving rise to a phenomenon called superhydrophobicity. He mentioned about the various approaches for preparing superhydrophobic surfaces. Dr Upadhy noted that the purpose of the workshop was to pool the knowledge and expertise available in the country and come out with the right kind of material, method of application, etc. and to network for creating superhydrophobic surfaces for aerospace application.

Dr Kota Harinarayana gave an insight into the envisaged RTA-70 programme with special emphasis on the need for superhydrophobic surfaces to combat the icing problem. He also explained how using anti-icing coatings and reducing drag could increase the fuel efficiency.

Dr Rajam gave a brief introduction to superhydrophobic surfaces for aerospace applications. Dr Bharathi Bai J Basu presented the exciting preliminary results at NAL using sol-gel and polymer routes. Prof. Venkateswara Rao from Shivaji University, Kolhapur, presented their work on superhydrophobic aerogels, their applications and coatings. Prof. M. S. Bobji from IISc, Bangalore, asked some interesting questions and explained the marvelous and splendid nature of the most abundant compound on earth - water. He explained the Wenzel and Cassie -Baxter models to explain the superhydrophobicity and also the famous Young's equation. Dr Goutam De of CGCRI, Kolkata, presented their work on development of sol-gel based coatings on ophthalmic lenses and textiles. The effectiveness of the development of these coatings has crossed the laboratory and resulted in technology transfer. Dr Subasri Raghavan from ARCI, Hyderabad, gave an overview of the infrastructure available at the sol-gel technology demonstration centre and also on the hydrophobic coatings developed at ARCI for clinical and house-hold items. She also said that their facility is open for up-scaling the sol-gel process. Shri Nirav Jamnapara, the youngest speaker, presented their accidental discovery of superhydrophobicity using plasma assisted process.

In the technical discussion session technological challenges and specifications of superhydrophobic coatings were addressed to and discussed. Some issues related to abrasion resistance were also discussed. The workshop gave an overall bird's eye view on the work carried out at different organizations pooling the resources in the area.

Indo-German Workshop on Electromagnetic Induction

The National Geophysical Research Institute (NGRI), Hyderabad, organized an Indo-German workshop on 'Electromagnetic Induction Studies for Complex Geological Problems' at Lonavala near Mumbai. It was inaugurated by Shri I.L. Budhiraja, President of Reliance Industries Limited (E&P), Navi Mumbai.

Electromagnetic induction method is gaining importance in recent years in the fields of oil geothermal and mineral exploration. Millions of dollars are being spent by the oil industry for offshore electromagnetic surveys engaging the consultancy and data acquisition services by the multinational companies. It is of great topical importance that the methodology needs to be given a quantum jump to meet the demands in the above sectors in the Indian



context.

The workshop was co-ordinated by Dr T. Harinarayana from India and Dr Heinrich Brasse from Frie University, Berlin. The meeting was presided over by Dr V.P. Dimri, Director of NGRI and participated by Prof. Archana Bhattacharya, Director, IIG, Mumbai. It was attended by more than 80 participants – ten from Germany and 70 from India — representing 26 different institutions from India and Germany.

The five-day workshop held during 14-18 March 2008 culminated with the planning of major research projects covering NS corridor in India Himalayan terrain and EW corridor in Ganga basin under Indo-German joint collaboration with funding by DFG, Germany and



Seated on the dais (from left): Dr T. Harinarayana, Scientist, NGRI and Indian co-ordinator; Dr V.P. Dimri, Director, NGRI, Shri I.L. Budhiraja, President, Reliance Industries Limited (E&P); Dr Heinrich Brasse, the German co-ordinator; Prof (Ms) A. Bhattacharya, Director, Indian Institute of Geomagnetism, Navi Mumbai

DST, India. World renowned professors from Germany have also agreed to guide the young Indian

researches and to send German students to India under sandwich programmes.

Professor J.B. Joshi delivers National Science Day Lecture at NCL

Prof. J. B. Joshi, Director, Institute of Chemical Technology (ICT, formerly known as UDCT/ UICT), Mumbai, delivered a lecture on 'UIC: Core Values and Core Purpose' on the occasion of National Science Day at the National Chemical Laboratory (NCL), Pune, on 28 February 2008.

Prof. Joshi began with a brief on the formative years of UICT. Talking about the credentials of UICT technologies, Prof. Joshi cited the example of a technology for laser dye molecule. He said that this technology had been denied.



Prof. J. B. Joshi delivering the National Science Day Lecture at NCL

The cost of the molecule was rupees three crore per kilogram. UICT's Ph.D. students successfully contributed to the total requirements of the country which was about three kilograms. Citing the successes in the non-formal sector, he said that during the mid 1940-50s soaps and oleochemicals were manufactured from edible oils. UDCT developed alternative processes from non-edible oil which was later successfully commercialized resulting in an increased availability of edible oils. This initiative generated jobs for over

five lakh people in the non-formal sector. UICT has contributed to the increased profitability of manufacturing plants, such as soda ash, nitric acid, petrochemicals, refinery operations, fertilizers, etc. in the past five years resulting in the industry's benefit of almost Rs 10,000 crores. The contributions of ICT to catalytic hydrogenation technology led to a gain of over Rs 500 crore to the industry. In the late 1980s most of the hydrogenation was being carried out by iron/acid process which resulted in high environmental pollution. Hydrogenation capacity was increased to about 50,000 tpa from 20,000 tpa, out of which 80% was using catalytic hydrogenation process. Today, more than 75 reactors designed by ICT are in operation for hydrogenation processes.

Prof. Joshi said that presently ICT was engaged in areas such as process intensification, synthesis of new molecules, drug delivery systems and chromatographic separations. He also touched upon strategies adapted by ICT for generating extra budgetary funds.

Prof. Joshi said that any technology that is based on imported knowledge is not likely to be economical. The participation of US Chemical Industry was 30% in the world market and is on the decline. Presenting comparative data on percentage contribution in terms of cited publications in chemical engineering from around the world, he said that 65% of the publications came from outside the US. In terms of publications, the contribution from Canada, Japan and European

Union also show a declining trend.

Prof. Joshi talked about UICT's recent initiative in applying knowledge of engineering and chemical technology to problems associated with energy needs of the nation. He stated that the land area requirement for present energy requirement of the country is 60 million hectares for producing energy crops. This will increase to 180 million hectares to reach the present level of energy consumption in China and 1680 million hectares if we have to reach the energy consumption level of USA. Against this the total arable land available in India is only 300 million hectares. Clearly, India cannot solely depend on energy crops for meeting its growing energy needs. In this context Prof. Joshi touched upon the cooperative R&D agreement entered between ICT and Department of Atomic Energy in the area of nuclear energy. ICT has also entered into an agreement with DBT to setup Energy Bioscience Programme to look into ethanol production from cellulosic biomass. Apart from working on technology improvements and developments, the objective of these programmes is to train future generation of engineers at the doctoral level focussed on problems of strategic interest to the nation.

Dr Sivaram welcomed Prof. Joshi and narrated his contributions and his association with NCL.

Science Day at NCL was celebrated by displaying posters on topics of interest, by research scholars and project assistants. There were more than 100 posters

on display on 26-27 February followed by the Science Day Lecture. Maneckji & Shirinbai Neterwala Foundation NCL RF Award Lecture was delivered by Dr A. Sudalai, Scientist, Chemical Engineering & Process Development Division, and Dr Absar Ahamd, Scientist, Biochemical Sciences Division. Dr R. A. Mashelkar Endowment Fund NCL RF Award Lecture was delivered by Dr Ashok Giri, Scientist, Biochemical Sciences Division. The awards were announced by Dr Sourav Pal, Chairman, Students Academic Committee and Head, Physical and Materials Chemistry Division. Prof. Joshi distributed the awards — Keerthi Sangoram Endowment Awards for 'Best Research Scholars' for the year 2007 to five students, Nanai Natu Award for 'Best Publication' in Organic Chemistry with the highest impact factor for the Scientists to Dr (Mrs) V. A. Kumar, Scientist, Organic Chemistry Division for her paper on 'A versatile method for the preparation of conjugates of peptides with DNA / PNA / analog by employing chemo-selective click reaction in water' and Dr Rajappa Award for 'Best Publication' in organic chemistry with the highest impact factor for the research scholars to Shri `Khirud Gogoi for 'Synthesis & RNA binding selectivity of oligonucleotides modified with five-atom thioacetamido nucleic acid backbone structures'. Finally, Dr Pal proposed the vote of thanks.



CSIR Medical Officers Meet

A two-day meet of CSIR Medical Officers was organized by the National Aerospace Laboratories (NAL), Bangalore, on 18–19 April 2008. Nineteen Medical Officers from 14 different CSIR Labs (NAL, NEERI, IMMT, IIP, CECRI, NIO, NCL, NEIST, CFTRI, CIMFR, CIMAP, NGRI, CCMB, ICT) attended the meet and discussed various issues pertaining to their Health Centres in particular and health care issues of CSIR in general.

The meet began with a demo presentation on “Arogya software” by Dr D. Amaranarayan, Medical Officer, NAL. This software has already been successfully implemented in CSIR labs like NAL and IIP-Dehra Dun. Many other CSIR labs are in the process of implementing this software in their respective Health Centres. Later, Dr V. K. Agarwal, Medical Officer, CIMAP-Lucknow made a brief demo presentation on “Swastham” a health software developed by him for use of Health Centre, CIMAP.

The meet was formally inaugurated by Dr V. Prakash, Director, CFTRI – Mysore. In his address Dr Prakash made an elaborate Power Point presentation on various aspects of nutrition and its impact on health. He supported the idea of holding CSIR Medical Officers meet on a regular basis, which will provide a common forum for healthy interaction among them. Dr K. S. Nanjunda Swamy, CMO, NAL, in his introductory remarks briefly outlined the purpose of this meet. A talk on “Telemedicine in Current Scenario” by Dr Kananka Rao, CMO, ISRO, was organized after the inaugural ceremony.

The various issues were discussed and it was proposed that a comprehensive report be submitted to the Directors of respective labs suggesting measures to upgrade the existing facilities at Health Centres to enable the Medical Officers provide effective and quality health care services to the CSIR staff, pensioners and their dependents.

IICB celebrates Foundation Day

The Indian Institute of Chemical Biology (IICB), Kolkata, celebrated its 52nd Foundation Day on 2 April 2008. Prof. Amitabha Ghosh, Honorary Distinguished Professor, Bengal Engineering and Science University, Howrah and Ex-Director, IIT, Kharagpur, graced the occasion as Guest-in-Chief. Prof. Tej Pal Singh, Distinguished Biotechnologist, Department of Biophysics, All India Institute of Medical Sciences (AIIMS), New Delhi, delivered the 21st Dr J.C. Ray Memorial Lecture. Prof. Siddhartha Roy, Director, IICB, presided over the function.

Prof. Roy in his welcome address discussed the growth of the institute over the years and how it continued flagship researches in basic biological sciences and common health diseases in spite of several difficulties. He said that the scenario has changed a lot now and the young generations have to take the challenge to excel even our predecessors who made outstanding contributions in extraordinarily difficult situations.

Prof. Ghosh in his inaugural address described Science as an interdisciplinary subject. He expressed his belief that third Industrial Revolution is going to happen in next 20-30 years. The central theme of this revolution will be based upon synthesis of Life Science and Engineering Science together to develop human civilization. He said that engineering miniatures will mimic biological systems and biological science will have tremendous impact on this new age. In this context, he informed that CSIR, a frontrunner in science, will start a new area of research, Synthetic Biology, soon. He also mentioned about the large number of quality publications of IICB.

Prof. T.P. Singh delivered the Dr J.C. Ray Memorial Lecture on ‘High Throughput Protein Structure Determination and Rational Structure-based Drug Design’. The lecture was very informative and interesting.

Dr Arindam Banerjee, Scientist, IICB, delivered a popular science lecture in Bengali on Nanotechnology. The employees of IICB who had completed thirty-five years of service in IICB / CSIR were honoured with mementoes. Six scientists who had received national recognition, during 2007-08, for their achievements/contribution were also honoured with mementoes. The function was graced by invited guests, distinguished scientists, present employees, ex-colleagues and the students.



MERADO celebrates CMERI Golden Jubilee

The Mechanical Engineering Research and Development Organization (MERADO), Ludhiana, an extension centre of Central Mechanical Engineering Research Institute (CMERI), Durgapur, celebrated Golden Jubilee of CMERI on 26 February 2008.

Shri S. Salman Mojiz, Scientist and Head, Business Development Group, MERADO, introduced the chief guest, Dr (Col.) H.S. Singha, Director, Guru Nanak Institute of Management and Technology, developed for the Ludhiana, and highlighted the major achievements of CMERI and the MERADO. He said the technologies developed for the three tractors ('Swaraj', 'Sonalika' and 'Krishi Shakti') are prominent among the various contributions to the nation. Other significant contributions include the development of a series of oil expellers by MERADO for pungent mustard oil and release of technology to 17 leading manufacturers of oil in the country. As many as 150 expellers had been commissioned in different states under various promotion schemes, which are running successfully. MERADO has also developed a range of products e.g., leather and garment sewing machines, friction welding machine, radial drilling machine, brick moulding machine and rough terrain forklift, etc. 'Light Weight Power Tiller', 'Filter Press' and recently designed and developed 'Black Box' were also mentioned. The technology of 'Black Box' has been recently released by



Dr (Col.) H.S. Singha, Director, GNIMT delivering lecture and receiving memento from Shri S. Salman Mojiz, Scientist and Head, BDG

the sponsor, C-DAC, Mohali.

India being an agriculture based and net energy deficient country, exploration of alternative fuel options such as bio-fuels is an imperative need. The present and future thrust area of MERADO would be bio-fuels, Shri Salman said. MERADO has already taken initiative in this direction and designed and developed 'Semi-continuous type bio-diesel plant of 600 litres/day capacity' for rural sector and 'Bio-gas plant for producing bio-gas through bi-methanation of de-oiled *Jatropha* cake'. Both technologies are ready for release. Shri Salman stressed on the imperative need to synergize and have closer interaction among R&D, industry and academic institutes to face the challenges imposed by globalization and liberalization.

Dr (Col.) Singha, the Chief Guest, appreciated the achievements made

by CMERI and MERADO. Deliberating on 'Effective R & D Management' at length, Dr Singha said that to achieve the best results, it is the duty of every employee to put his best efforts in any R&D organization irrespective of his/her official status. He stressed the need to facilitate scientists by the supporting staff, so that the scientists may get sufficient time for their projects. He called upon the scientists and other staff members to be proud of their organization which has made significant contributions to the nation.

Dr Singha gave several useful tips for R&D management through simple examples of day to day life. He got his points across and motivated the staff to use their full potential to achieve success in their chosen areas.

Shri S.K. Banerjee, Technical Officer, NDT section, proposed a vote of thanks



Seventh CSIR Diamond Jubilee Invention Award for School Children (CDJIA-2008)

Council of Scientific & Industrial Research (CSIR) is the premier Industrial R&D Organisation in India. On the occasion of its Diamond Jubilee in 2002, CSIR initiated Invention Awards for school children to create awareness, interest and motivation for Intellectual Property amongst children.

On the occasion of the World Intellectual Property Day, which is celebrated through out the world on 26 April CSIR invites applications for the 'Seventh CSIR Diamond Jubilee Invention Award(CDJIA) for School Children-2008'. The first prize winner would also become eligible for WIPO's Young Inventor's Award carrying a medal and a certificate.

Applicant must provide the details of the invention submitted for the award in not more than 5000 words in English/Hindi including an abstract (in not more than 100 words), authenticated (by giving seal and date) and sent through the Principal/ Head of the School where the student is enrolled and personal details on a separate page as follows: Name, date of birth, school and residential address, class, telephone no. (residence/school), e-mail address.

In case of proposals already selected for state, national, international or equivalent awards, only the subject matter covering the

improvements need to be submitted for consideration of CDJIA-2008. Published inventions would be considered as per the provisions of the Patent Act.

The applications for the award not exceeding 5000 words in English/Hindi with requisite drawings will be considered. The write-up must describe the subject matter in a problem - solution mode and highlighting the novel and non-obviousness feature of the invention and its advantages.

Any Indian student enrolled in an Indian school below the age of 18 years as on 31st July 2008 can apply. The invention submitted should be one that is globally novel, non-obvious and utilitarian. It could be a new concept or idea or a solution to an existing problem or completely a new method/ process/ device/ utility. It is not essential/necessary that the invention should have been worked, only the concept of the invention should have been proved through a model, a prototype or experimental data. Details of any assistance/ guidance provided by teachers/parents/friends or others must be appropriately mentioned and acknowledged.

Typed applications to be sent by Registered Post/Courier to: Head, Intellectual Property Management Division, CSIR, NISCAIR Building, 14 Satsang Vihar Marg, Special Institutional Area, New Delhi - 110

067 with the envelope marked on top left hand corner 'CDJIA-2008'. You may also send application through addressed to head.ipmd@niscair.res.in. However, a hard copy should also follow through post with Principal's authentication.

Applications received on or before **30th September 2008** will be considered for the Award.

Prizes : There are in all 60 prizes. Besides a certificate, the cash awards are:

First Prize (1 No.)	Rs. 50,000/-
Second Prize (2 Nos.)	Rs. 25,000/- each
Third Prize (3 Nos.)	Rs. 15,000/- each
Fourth Prize (4 Nos.)	Rs. 10,000/- each
Fifth Prize (50 nos.)	Rs. 5,000/- each

The awardees will be selected by a high level Awards Selection Committee. If required, the short listed candidates may be called for interview at Delhi or at any other appropriate place. The decision of the Awards Selection Committee / CSIR will be final and binding on the applicants and no enquiries/ correspondence in this regard will be entertained. The Awards will be announced on 1 January 2009, at New Delhi and would be communicated to the Awardees only. For more information, please visit our site at www.csir.res.in