



CSIR NEWS

ISSN 0409-7467

VOL 58 NO 23 15 DECEMBER 2008

Team CSIR



R&D at National Physical Laboratory, New Delhi

Primary Standard of Optical Radiation in the form of a Variable Temperature Blackbody

Source based primary standard of spectral radiance in the form of a variable temperature blackbody has been established in the Optical Radiation Standards Section of the National Physical Laboratory (NPL), New Delhi.

This blackbody works in the temperature range of 1800-3200 K with temperature stability of $\pm 0.2K$. Its emissivity is 0.999, and it exhibits radiance uniformity within 0.1%, in the wavelength range 0.2-2.5 μm . The uncertainty in spectral radiance measurement using this blackbody is 0.3-0.5% in the wavelength range 0.2-0.4 μm and 0.1-0.3% in the wavelength range 0.4-2.5 μm , respectively.

This blackbody will be used as a primary standard for establishing the scale for spectral irradiance. The spectral irradiance scale weighted by the spectral sensitivity of human eye provides the means for establishing the SI base unit of optical radiation, the candela. The uncertainty in the measurement of the candela will be reduced to 0.75% at $k=2$ from the present uncertainty of 1.6%.



A view of the set-up for primary standard of optical radiation

Commercial Model of Patented Technology of 50 kN Load Cell Calibrator

The requirement of a functional and vibrant system to disseminate the measurement units traceable to SI units in compliance with ISO 17025 quality management system so as to





Model of 50 KN Load Cell Calibrator

generate confidence among the user industries, is no longer a luxury but an essential ingredient of societal processes. It is worth mentioning that in India, we have thousands of material testing machines (UTM) and weigh bridges, and lakhs of digital balances in use in industry and trade, the numbers of which grow by 10-15% annually. To maintain the national traceability, all these machines are to be calibrated using precision transfer standards, calibrated directly against force standard machine of higher accuracy. The design, development and successful fabrication of the fully automated, user-friendly and energy efficient dead weight force machine up to 50 kN, having range extendable further to 100 kN at NPL has enhanced the capability of standard laboratories under legal metrology (Min Consumer Affairs and Public Distribution, Delhi) to provide the calibration of load cells

used in weighing scales, weigh bridges, etc. to safeguard the consumer interest and safety. The certification of load cell as per OIML using the developed product/technology would go a long way to make the load cell manufacturing industry globally competitive. This patented technology has also been approved technically in the global tender floated by International Center for Automobile Testing, Manesar, Gurgaon.

Establishment of An Automated Josephson Series Array Voltage Standard (JSAVS) at 10 V Level

NPL is the National Metrology Institute (NMI) of India and is responsible for realization, maintenance and dissemination of the SI units in India. In the area of quantum electrical metrology, NPL established JSAVS at 1 volt level in 1997 and 10 volt level in 2007. The JSAVS works on AC Josephson effect which states that if two

superconductors separated by a thin layer of insulator are irradiated with microwave frequency signal, they generate constant voltage steps whose values are given by the following equation:

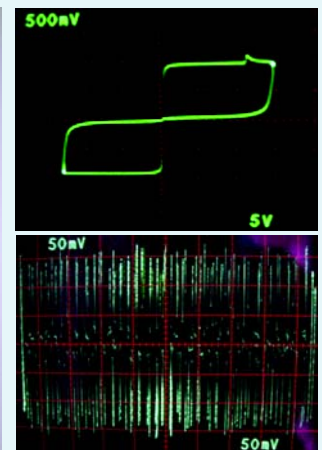
$$V_n = n f / KJ \dots (1)$$

Where n is integer $0, \pm 1, \pm 2, \pm 3, \dots, \pm n$, V_n is the quantized voltage at step no. n and KJ is the Josephson constant whose value depends on the fundamental constants of the nature, i.e. e (electronic charge) and h (Planck's constant). The value of KJ has been internationally agreed as $KJ-90 = 483597.9 \text{ GHz/V}$ since 1 January 1990.

The photograph shows the automatic system along with its characteristics which was integrated, characterized, automated and established at NPL. The uncertainty in measurement of Zener Reference Standards is $\pm 300 \text{ nV}$ at $k=2$ (inclusive of noise of Zener) at 10 V level as per the ISO/IEC 17025:2005. This is the first system in India to measure precisely the 10 volt at par to the international level, and forms the basis for standard of the unit of 'Volt' in India.



Automatic 10 V Josephson Series Array Voltage Standard



Characteristics of array at 76 GHz

It has a very high societal value as it provide traceability to the electrical, electronic and other industries, accredited laboratories, etc. for the global trade.

NPL can now also provide consultancy to other developing NMI's (e.g. SAARC countries) to establish their JVS.

Contribution to Chandrayan Mission

Though NPL is not directly involved in any design and fabrication work of any of the components of 'Chandrayan', but as a part of the International Space Environment Services (ISES), the laboratory has been providing through its Space Weather Regional Warning Centre (RWC-India), the space weather conditions on daily basis, for last fifteen years, Master Control Facility, Hasan, Karnataka and ISTRAC, ISRO, Bangalore. The information such as that pertaining to solar flares, solar winds, radiations, sunspot cycle, etc, is essential for launching and tracking of rockets and satellites.

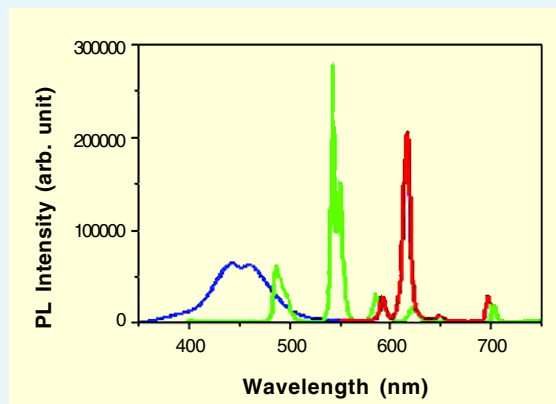
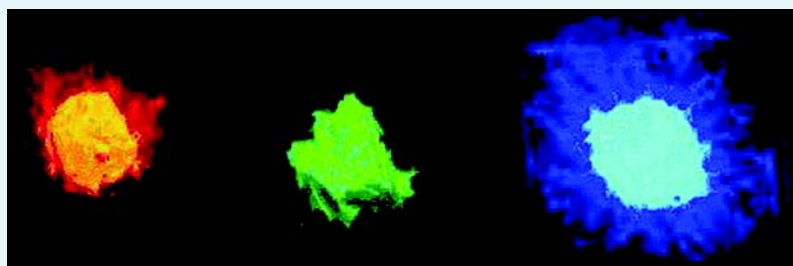
NMITLI Project: Development of Next Generation Plasma Display Panel (PDP) Technology and 50" High Definition (HD) TV Prototype

In this project, PDP phosphors of three primary colours Red, Green and Blue (RGB) were proposed to be developed for application in 50" HDPDP panel at SAMTEL. As degradation of PDP phosphors is a worldwide problem, the objective was to study the baking process of the phosphor and then make the phosphors baking resistant. As overall efficiency depends on the size of phosphor particles, the objective was also to restrict particle size of developed phosphors in the range of 0.5-2 μm .

NPL has zeroed down three phosphors one each for red, green and blue. Synthesis processes by

high temperature solid state reaction were optimized to achieve maximum quantum efficiency. Based on repeated field trials at SAMTEL, two approaches were pursued to arrest degradation of phosphors. In the first approach, the phosphor grains were uniformly coated with a thin layer of silica which is expected to minimize degradation by restricting the oxidation of activator ion (e.g., Eu^{3+} to Eu^{2+} in blue PDP phosphor) and also by passivating the surface states. Silica coating also led to enhancement in luminescence intensity by 30 -35% and decrease in particle size to a near uniform distribution for all the three phosphors.

Silica coated RGB phosphors 20 g each have been delivered to SAMTEL on 22 October 2008 for field trial.



NPL- Developed phosphors

Red YAG: Eu^{3+}
Green YBO₃: Tb^{3+}
Blue BaMgAl₁₀O₁₇: Eu^{2+}

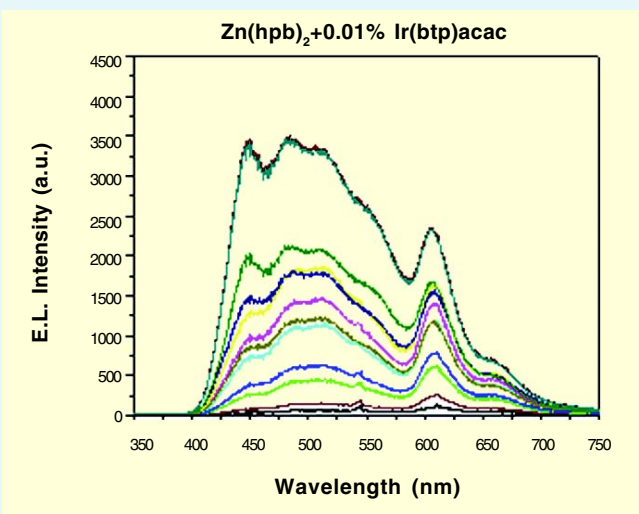
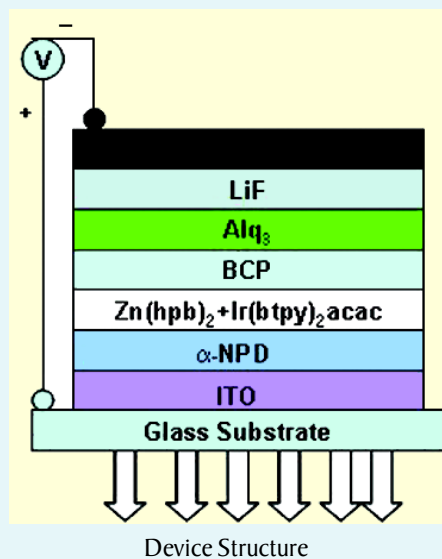
PL Emission Spectra at VUV (172 nm) Excitation



The second approach was slight modification of host matrix of green and blue phosphor. Laboratory simulation of baking process and subsequent luminescence measurement at 250 nm excitation showed drastic improvement in degradation from earlier 30% to 3%. Such green and blue phosphors have been also delivered to SAMTEL for field trial.

Development of White Organic Light Emitting Diode

The high power efficiency of Organic Light Emitting Diodes together with the high quality of white light these LEDs are capable of emitting,



NPL has achieved high quality white light (The maximum current efficiency was 1.23 cd/m² at 9.5 V and maximum power efficiency was 0.44 lm/W at 8.5 V respectively).

The high efficiency of these white light sources is due to the efficient Forster type energy

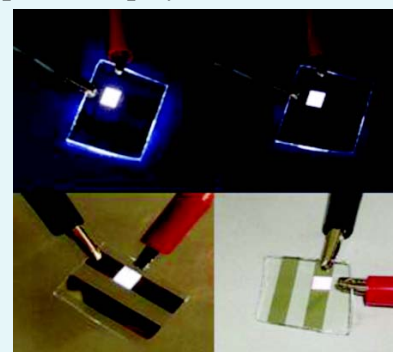
transfer as well as trap assisted carrier recombination on the dye {Rubreen, DCM & Ir(btp)acac} guest molecules.

is making WOLED an ideal source for white light emission in general lighting applications. NPL has developed high quality white light OLEDs by using emitter layers containing a mixture of blue light emitting Zn (HPB)₂ with different red emitting fluorescent and phosphorescent dyes like DCM, Rubreen and Ir(btp)acac.

The device consists of a hole transport layer of N, N diphenyl-N'N'-bis(1-naphthyl)-1,1'-biphenyl-4,4'-diamine, (α-NPD) and emitting layer Zn(HPB)₂ doped with various concentrations of DCM dye. BCP (2,9-dimethyl-4,7-diphenyl-1,10-phenanthroline) was used as hole blocking layer, Alq₃ as electron transport layer and LiF as electron injection layer.

Influence of Ce on Ductility Enhancement and Texture of Mg Alloy using Hot Extrusion

Under this General Motors-sponsored project, it was observed

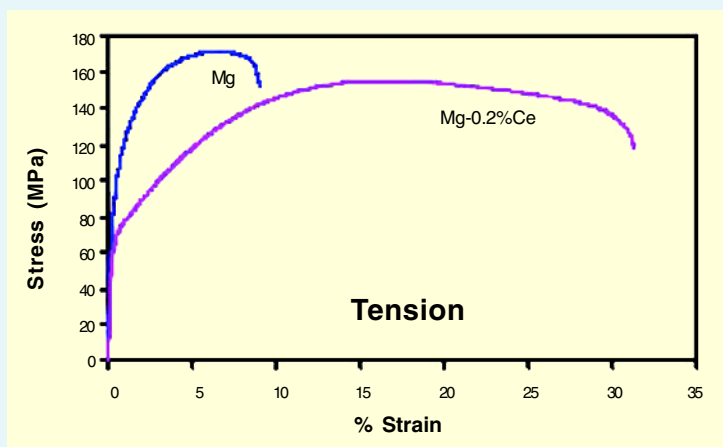


Spectral response of white OLED

Device configuration	Brightness (at 12V)	CIE co-ordinate (at 9V-12V)
Zn(HPB) ₂ +0.01%Rubrene	2400cd/m ²	(0.38-0.36) to (0.31-0.31)
Zn(HPB) ₂ +0.01%DCM	2900cd/m ²	(0.27-0.30) to (0.26-0.31)
Zn(HPB) ₂ +0.01%Ir(btp)acac	3500cd/m ²	(0.29-0.31)to (0.30-0.31)

that slight alloy addition of Cerium (Ce) in Mg followed by hot extrusion results in significant improvement in ductility of Mg-Ce alloy from < 9% (for pure Mg) to >31%, which is considered high by all standards

Enhanced ductility could result in wider applications of Mg alloys replacing the existing Al alloys for automobile applications as this development will make Mg alloy amenable to conventional metal forming processes at room temperatures, improving properties and substantial energy savings.



Stress-Strain curve of Mg-0.2% Ce & Pure Mg

Enhancing ductility of Magnesium through control of Grain orientation

Molybdenum oxide nanoparticles supported on mesoporous silica: A versatile catalyst

The National Chemical Laboratory (NCL), Pune, has developed an environmentally benign process for the manufacture of nitrobenzene using a solid acid catalyst. This innovation was awarded the silver medal of FICCI-

Lokheed Martin Indian Innovation growth program recently. Dr Mohan K. Dongare and his group at NCL worked on this process that represents a green chemistry approach in which benzene is nitrated using dilute nitric acid over

solid acid catalyst in the vapour phase. Nitrobenzene is formed in high yields without use of any sulfuric acid, which is used in the conventional process. Using a solid acid catalyst packed in a tubular reactor, the hazards of handling and storing a large inventory of sulfuric acid is avoided. The capital cost for the plant based on this technology is expected to be lower by 30-40% compared to the conventional processes.

Dr Dongare, a senior scientist at Catalysis and Inorganic Chemistry Division, says, "The development of this novel catalyst originated in 2002 when we were working on another project, namely, the oxidation of benzene to phenol using nitric acid as an oxidant. NCL team prepared and tried various metal oxide catalysts and found that silica supported molybdenum oxide catalyst was very active. This catalyst gave diversity of products at different temperature using nitric acid as an oxidant. Nitration of toluene was also observed at low temperature with high specificity using this catalyst.

"We further worked on the synthesis of this catalyst using various routes to improve the





catalytic activity. Preparation of this catalyst using ethyl silicate-40, a foundry chemical used as binder, as novel silica precursor gave very high surface area (890 m²/g) and high mesoporosity (80 Å). The product was stable up to 600 °C and did not require any surfactant template. This is probably the first report of a high surface area mesoporous silica produced,” informed Dr Dongare.

Transmission electron microscopy of this catalyst showed molybdenum oxide nanoparticles of 1-2 nm formed on mesoporous silica support.

Besides using for benzene nitration, this catalyst has shown very high activity in many other reactions. One such reaction is transesterification of diethyl oxalate with phenol to form diphenyl oxalate giving 100% selectivity for diphenyl oxalate, which is one of the intermediates for preparation of polycarbonate. NCL scientists have also used this catalyst for the synthesis of tinidazole, an important pharmaceutical compound by condensation/oxidation reaction without any use of acetic acid, tungstic acid or ammonium molybdate used in the conventional process.

Patents

- Vapour phase nitration of benzene over solid catalyst, **US Pat 6,791,000 (2004)**.
- Process for the preparation of 4-nitro-O-xylene, **US Pat 6,825,388 (2004)**.
- Process for preparing microporous crystalline titanium silicate, **US, Pat 6,991,678 (2006)**.

Publications

- Transesterification of diethyl oxalate with phenol using MoO₃/SiO₂ catalyst, A.V. Biradar, S.B. Umbarkar, M.K. Dongare, *Applied Catalysis A: General* **285** (2005) 190–195.
- Vapor phase nitration of benzene using mesoporous MoO₃/SiO₂ solid acid catalyst, S. B. Umbarkar, A. V. Biradar, S. M. Mathew, S. B. Shelke, K. M. Malshe, P. T. Patil, S. P. Dagde, S. P. Niphadkar and M. K. Dongare, *Green Chem.*, **8** (2006) 488–493.
- Synthesis of tinidazole by condensation–oxidation sequence using MoO₃/SiO₂ bifunctional catalyst, J.G. Chandorkar, S.B. Umbarkar, C.V. Rode, V.B. Kotwal, M.K. Dongare, *Catalysis Communications* **8** (2007) 1550–1555.

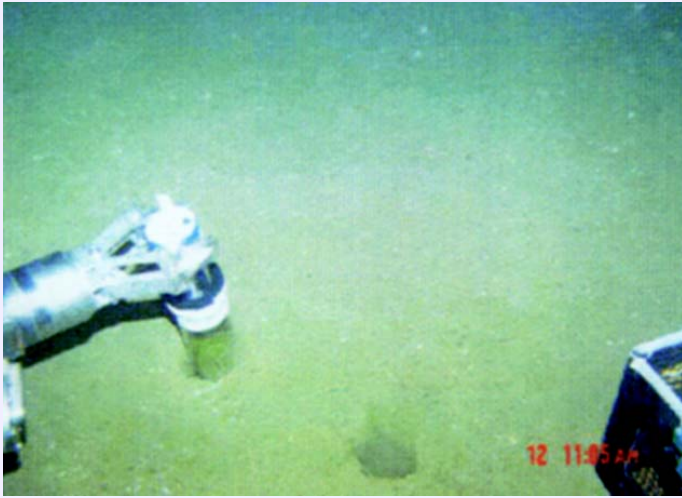
<http://www.ncl-india.org>

First dive in the Arabian Sea using Submersible

Six scientists from the National Institute of Oceanography (NIO), Goa, boarded the Japanese research vessel *RV Yokosuka* with its submersible ‘Shinkai 6500’ for studies at the continental slope off Western India, in the Arabian Sea, between 500 and 2000 m water depth during 29 September - 10 November 2008. Dr V. Purnachandra Rao, Ms Catherine Sumathi, Dr Anil Pratihary, Mr Amit Sarkar and Ms Shahin Badesab dived with the submersible into oxygen minimum depths of the Arabian Sea and made water column and seafloor observations. Dr Z.A. Ansari collected sea bed samples and photos for understanding benthic life and benthic activity at the Sediment-Water Interface (SWI). This is the first scientific cruise of a collaborative programme between CSIR and Japan Agency for Marine-Earth Science and Technology (JAMSTEC), along the margins of Arabian Sea using submersible. The cruise facilitated 26 submersible observations at the oxygen Minimum Zone (OMZ). The quick results indicate oxygen content of water at the SWI to be as low as 0.02 meuM at about 500 m depth. Abundant and diverse life on the seafloor despite the low oxygen content was observed. Several sea bed sediment samples, 15-40 cm long cores have also been collected for further analysis.



A view of the submersible ‘Shinkai 6500’



The study at the continental slope off cities Western India, in the Arabian Sea in progress and the scientists who participated in the cruise facilities

Both faunal and DNA analyses are planned on benthic sample collections.

Besides scientists from NIO and

JAMSTEC, Scripps Institute of Oceanography, USA, University of Edinburgh, University of Aberdeen, National Oceanographic Centre,

Southampton, U.K, University of Tubingen, Germany, were also on board for the cruise.

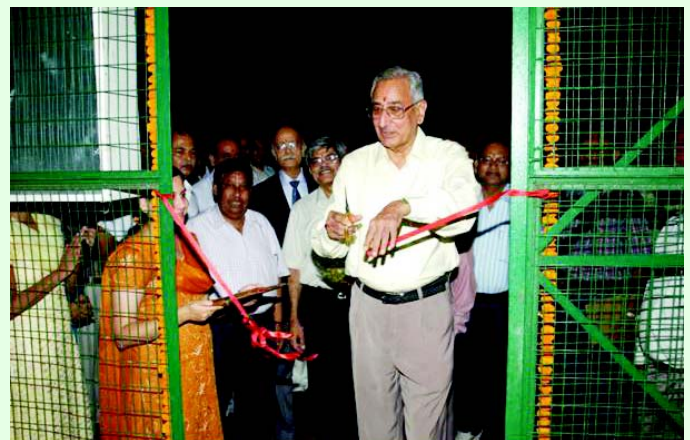
<http://www.nio.org>

Moss House Established at NBRI

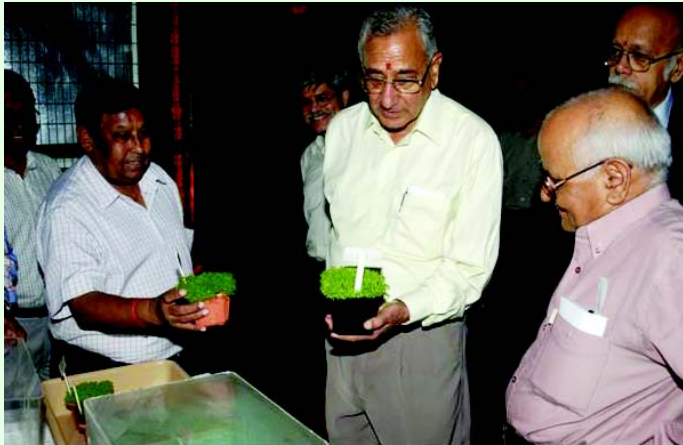
Prof. V.L. Chopra, Member, Planning Commission and Chairman of the Research Council, National Botanical Research Institute (NBRI), Lucknow, inaugurated a Moss House in the

NBRI Botanic Garden on 22 September 2008 in the presence of other Research Council Members of NBRI, Dr Rakesh Tuli, Director, and other senior scientists of the institute. The objective of this Moss

House is to enhance the existing plant diversity in the NBRI Botanic Garden. To make it more educative and purposeful by introducing bryophytic wealth at one place from various parts of the country, to



Prof. V.L. Chopra, Member, Planning Commission, Government of India, inaugurating the Moss House at National Botanical Research Institute



Dr Virendra Nath, Head, Bryology showing *in vitro* raised bryophytes in pots to Prof. V.L.Chopra, Member Planning Commission



Members of Research Council and Dr Rakesh Tuli, Director, NBRI, observing *in vitro* raised bryophytes in pots



A view of Moss House from outside



Inner view of Moss House at the time of water fogging



Population of Bryophytes growing at Moss House



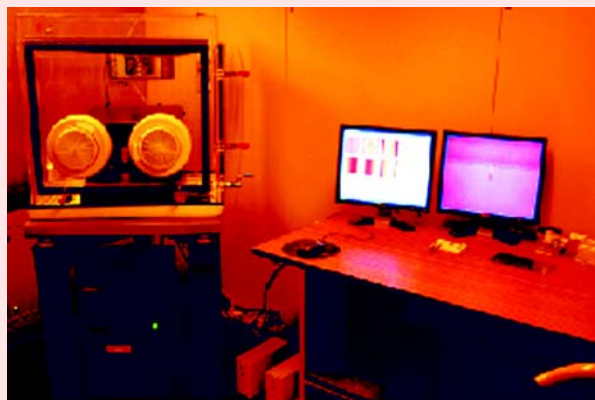
acclimatize them and to raise Rare, Endangered and Threatened (RET) taxa for their conservation.

Bryophytes are highly significant and phylogenetically important group of plants which occupy systematic position between Algae and Pteridophytes among Cryptogams in Plant Kingdom. They grow in specific microhabitats mostly at hills (between 1000 m to 3000 m above sea level) and add fascinating colours to nature by growing over various surfaces. About 14,500 species of bryophytes are known throughout the world, while in India, nearly 850 liverworts, 40 hornworts and 1600 mosses have been recorded so far. Bryophytes constitute an important component of ecosystem by playing vital role in soil conservation and formation of fertile substrata for other plants. Their use as moss grass, moss sticks and bags is common in horticulture. Some of them have commercial value due to their therapeutic and medicinal properties.

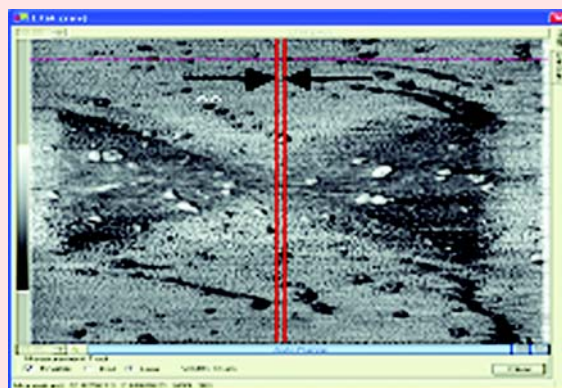
It is the first Moss House in the country which has been developed in local conditions. It will facilitate the availability of living germplasm for exploration of their medicinal and drought tolerance potential, in addition to demonstration of vast varieties of bryophytes for educative purpose and general awareness of public. Bryophytes brought from Uttarakhand, Sonbhadra and Nagaland have been introduced in the house. At present about 14 taxa, viz. liverworts like *Cyathodium cavernarum* Kunze, *Marchantia linearis* Lehm. et Lindb., *Marchantia paleacea* Bertol., *Plagiochasma appendiculatum* Lehm. et Lindb. *Riccia billardieri* Mont. et Nees etc., and mosses like *Fissidens splachnobriodes* Broth., *Fissidens taxifolius* Hedw., *Hyophila comosa* Dix. et P. Vard., *Semibarbula orientalis* (Web.) Wijk. et Marg, and *Vesicularia montagnei* (Bel.) Broth. etc. are growing in the house.

Dip-Pen-Nanolithography Facility for Nanometer Patterning

A Dip-Pen-Nanowriting (DPN) system from M/s Nanoink, USA, has been procured and commissioned at the Central Electronics Engineering Research Institute (CEERI), Pilani, under a sponsored project on nanotechnology from Department of Information Technology. The system is capable of direct writing and aligning nano-dimensional patterns of different molecular inks on compatible substrates. The written patterns are viewed in the same system through AFM imaging in LFM mode. Writing of nano-lines of MHA ink on gold substrate with line-width of ~30 nm has been demonstrated. Processes are being developed to write different nano-dimensional lines and patterns. The system also has capability of nano-oxidation of different materials for generating nano meter thickness insulating barriers. The equipment is being used to develop enabling technology for nano-structures and futuristic nano-electronic devices.



DPN NSCRIPTOR System



Nano-gap Electrode Pattern Written on Gold Substrate using MHA Ink, Measured gap ~80 nm



NPL becomes Member of BIPM's Consultative Committee for Mass and Related Quantities

At its 97th meeting held in October 2008, the International Committee for Weights and Measures (CIPM) has confirmed the membership of National Physical Laboratory, New Delhi, India (NPLI) to the Consultative Committee for Mass and Related Quantities (CCM). This prestigious recognition of NPLI will provide a new thrust to its research and development of the standards and also support for the calibration activities. The new responsibility clearly helps NPLI's justify strength as a major partner in the APMP region and a key player in the global scenario. It is noteworthy to mention that with this achievement, NPLI has joined the elite group of countries such as USA, Germany, France, UK and Japan and this will be beneficial to the Indian Industry in the form of internationally recognized calibration certificates in the global market.

The establishment of CCM originates from the resolution 3 of 25th General Conference of Weights and Measures (CGPM) held in 1975. The CGPM asked the Bureau International des Poids et Mesures (BIPM), Paris and National Laboratories to continue research to improve the precision of the comparisons and verification of national standard of mass.

During the past two decades, the scope of CCM was remarkably expanded from mass to mass related quantities. Eight different Working Groups (WGs) have been created which are:

- Density
- Mass standards
- Force
- High pressure

- Low pressure (below 1 kPa)
- Avogadro constant
- Hardness and
- Fluid flow

Since the first meeting in 1981, CCM has formally met ten times at BIPM.



Sèvres, 23 October 2008

National Physical Laboratory of
India
NPLI
Dr Vikram Kumar
Director
Dr K.S. Krishnan Marg
110 012 New-Delhi
Inde

Copy : Dr Mitsuru Tanaka – President of the CCM
Dr Richard S. Davis – Executive Secretary of the CCM

Dear Sir,

This is to confirm to you that at its 97th meeting held last week, the International Committee for Weights and Measures (CIPM) has confirmed that the National Physical Laboratory of India (NPLI) has been accepted as a Member of the Consultative Committee for Mass and Related Quantities (CCM).

May I thank you for your support of this Committee and of the BIPM.

Yours sincerely,

Andrew J. Wallard
Director of the BIPM

BUREAU
INTERNATIONAL
DES POIDS ET MESURES

ORGANISATION
INTERGOUVERNEMENTALE
DE LA CONVENTION
DU MÈTRE

PAVILLON DE BRETEUIL F - 92312 SÈVRES CEDEX
TEL : + 33 1 45 07 70 70 - FAX : + 33 1 45 34 20 21
<http://www.bipm.org>

The 11th CCM meeting was held on 24 – 25 April 2008 at BIPM, and prior to it, brain storming WG meetings of eight working groups were held from 21- 23 April 2008. The agenda of the CCM meeting consists of usually the recommendations of the Chairpersons of the WGs and discussion on them. The discussion plays a major role in decision making for a particular topic. There is a provision of voting of the full members if the consensus is not arrived. This year, the meeting started with a brief opening ceremony. Prof. M. Tanaka, President, CCM and Director, NIM/AIST, Japan, formally inaugurated the meeting with an appreciation note about the contribution of various WGs. In his address, he stressed the evolution of Mutual Recognition Arrangements (MRA) and the need of degree of equivalence in the key comparison and its importance in the trade.

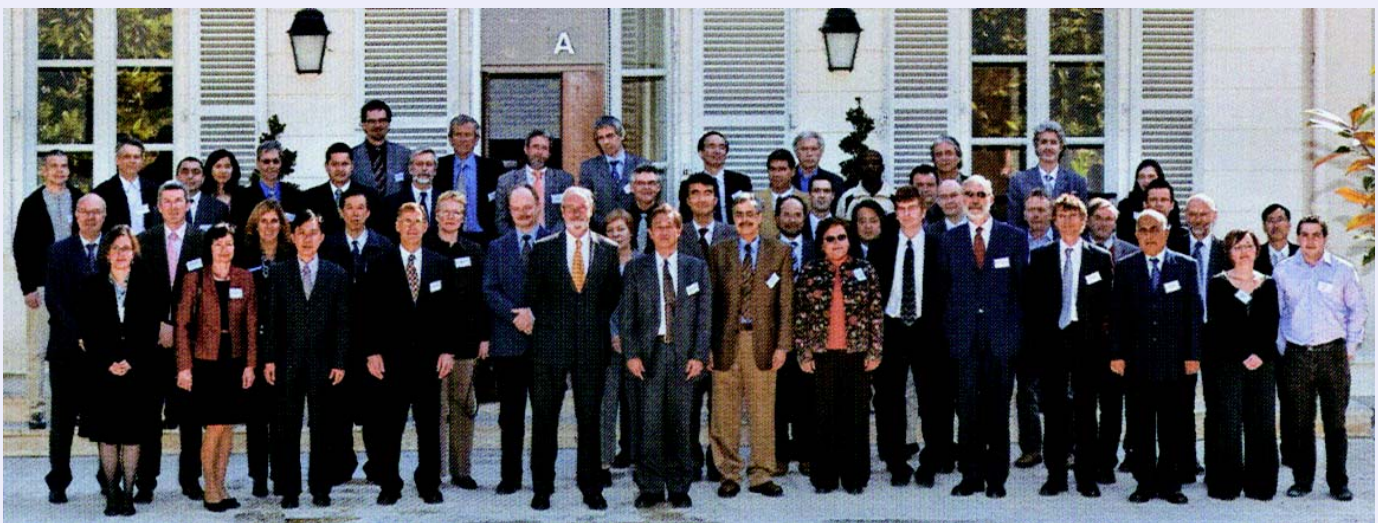
A special presentation was allowed on 24 April, for NPLI. Dr

Tanaka introduced the speaker and mentioned that it is a presentation from NPLI as a potential new member of the CCM. Dr Richard Davis, Secretary, CCM, explained that this presentation was being made because NPLI is interested in changing from observer to full member of the CCM.

The NPLI Scientist Dr A.K. Bandyopadhyay presented the background of metrology in India. The Metric System was adopted in 1957, when India signed the Convention of the Metre and showed data on the stability of their national mass standard, and the hierarchy of mass scale at NPLI. Participation in APMP regional key comparisons was summarised; these included APMP.M.M-K1, K2 and K6. NPLI had also taken part in Key Comparisons CCM.M-K5 and CCM.V-K1. The Force, Hardness and Torque areas were described; the Force area having a 50 kN deadweight machine and a hydraulic amplification machine (1MN). Traceability for the Force,

Torque and Hardness areas was outlined. The Pressure and Vacuum Standards area includes primary orifice flow and series expansion systems. Research has been performed into controlled clearance piston cylinders and into the effect of difference pressure transmission fluid (papers in these fields have been published in *Metrologia*). Participation in pressure area CCM and RMO KCs was outlined along with a number of bi-lateral comparisons. In conclusion, he summarised NPLI's CMCs, which had already been approved, and their participation in KC and listed their publications in this technical area.

After the presentation, CCM approved the NPLI claim of membership and recommended to CIPM. Now, a letter dated 23 October 2008 from Prof Andrew Wallard, Director, BIPM to Prof. Vikram Kumar, Director, NPL, conveys the confirmation of NPLI's membership of the CCM/BIPM.



Participants of the CCM meeting held on 24 – 25 April 2008



Foundation Day Celebrations

CECRI celebrates Foundation Day

The Central Electrochemical Research Institute (CECRI), Karaikudi, celebrated its 61st Foundation Day on 25 July 2008. Prof. D. Balasubramanian, Director (Research), L.V. Prasad Eye Institute, Hyderabad, and former Director of Centre for Cellular and Molecular Biology, Hyderabad, graced the occasion as the Chief Guest and delivered the CECRI Foundation Day lecture on “The History of Genetics – From the Past to Today”.

In his lecture, Prof. Balasubramanian narrated the origin of studies in genetics and its growth during the past. He also highlighted the importance of genetics in the modern scenario, in particular, medical and forensic sciences.

Prof. Balasubramanian quoted verses from ancient Vedic scriptures {*Purushasuktam*} to trace the origin of concepts on Genetics and Inheritance. He narrated Galton's pioneering experiments with the blood samples of 'black and white' rabbits. He briefly touched upon the Lamarckian 'Acquisition of traits and passing them on to the offspring'. He explained elaborately Mendel's observations from the experiments with pea plants. He highlighted the works of W. Johannsen, W. Sulston and Morgan in the field of Genetics. He added that the understanding of DNA from chromosome cells opened an exciting and new era in the field of Genetic Engineering.

He concluded the lecture with some interesting aspects of Reverse Genetics. Here, trait is not the



Prof. D. Balasubramanian delivering the CECRI Foundation Day Lecture

starting point to trace Gene. But after reading gene, it is compared with data bank for correlation. The science of genetics finds immense applications in many areas. Ascertaining legal parenthood, identification of the legitimacy of an infant and remedy for inherited disorders are some areas where genetics has made deep inroads. The lecture ended with a lively discussion session in which Prof. Balasubramanian provided answers with interesting illustrations to the comments and clarifications sought by the scientists.

Earlier, Prof. A.K. Shukla, Director, CECRI, in his welcome address recalled this memorable day, 60 years ago, when Pt Jawaharlal Nehru, the then Prime Minister laid the Foundation Stone in the august presence of Dr S. S. Bhatnagar and Dr R. M. Alagappa Chettiar. He recalled with gratitude the

munificence of Dr Alagappa Chettiar in founding CECRI at Karaikudi. He also highlighted the significant milestones CECRI had passed in its path of progress. Dr V. Yegnaraman, Scientist G and Chairman, organizing committee, delivered the vote of thanks.

In the afternoon, Prof. Balasubramanian visited the Central Instruments Facility. Later, he addressed the students of B. Tech. (Chem. & Electrochem. Engg) programme offered by CECRI. It was an interactive session where students answered the questions from the speaker, who explained many aspects with his vivid illustrations. He planted a sapling at CECRI premises as a mark of his visit.

To mark the occasion of the Diamond Jubilee Year, all the staff members were presented with a memento.



CIMAP DAY 2008

The Central Institute of Medicinal and Aromatic Plants (CIMAP), Lucknow, celebrated its Annual Day on 11 August 2008, with its founder and builder of the institute and former Director Dr Akhtar Husain as the Chief Guest. The function was attended by several dignitaries and scientists including retired staff members, employees, research fellows and the supporting staff of CIMAP. Dr Rakesh Tuli, Director, NBRI and CDRI, delivered the CIMAP Day lecture.

At the outset the Director of CIMAP Dr Paramvir Singh Ahuja highlighted the important structure of the institute. He said that in the face of existing regulatory norms, the institute has suitably obtained accreditation for its internal functioning through ISO 9001: 2001 and NABL certification. For



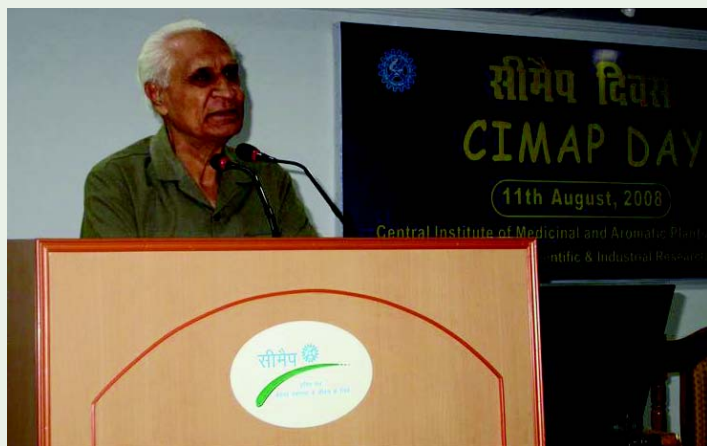
Seen on the dais during the CIMAP Day function, (from left) are: Dr P.S. Ahuja, Director, CIMAP; Dr A. Husain, former Director, CIMAP; and Dr R. Tuli, Director, NBRI

adhering to the requirement of national organic programme and to meet the requirement of EEC market through ECOCERT, the institute has obtained necessary accreditation. Importantly, the institute has gained recognition by the International Centre for Science and High Technology (ICS-UNIDO) as a focal point for research in Medicinal and Aromatic Plants

(MAPs) for South East Asia. Dr Ahuja also highlighted the scientific programmes and recognitions won by the scientists of the institute.

Delivering the CIMAP Day lecture Dr Rakesh Tuli said that as in the case of animals, plants respond in defence against attack by insects and disease causing pathogens. A variety of defence signals are produced in response to the wound inflicted by the attacking organism.

Some of these signals are aromatic & volatile molecules that diffuse into the environment and put the plants in neighbourhood on alert. Describing the defence response of plants attacked by insects and pests, Dr Tuli said that these molecules influence the expression of number of genes, resulting into appearance of a number of peptides, proteins and chemicals that prevent the



Dr Akhtar Husain delivering his message and a view of the audience



enemy from damaging the host or repair the damaged host tissue. Some of these molecules can kill the enemy. Others, very strategically kill the plant cell under attack to cut off the supply of nutrition to the attaching pest, and thus prevent any significant damage to host plant. Such enigmatic ways of plant defence are being studied by scientists at NBRI to discover new approaches for protecting field crops against insects and pests. The molecular and genetic mechanisms by which wounding by pests modulates the chromosomes and genes to alter the expression of genes and pathways are being studied in details. Through biotechnological approaches, it will be possible to develop robust plants that would not require the application of insecticides and pesticides. The well known Bt-cotton is only the first example of crop improvement for resistance to a few herbivorous insects through biotechnological approaches, Dr Tuli added.

The Chief Guest Dr Akhtar Husain in his message called upon the scientists and staff of the institute to work hard and excel in their respective areas of activities and focus on quality research objectives. He told that the worldover, demand of high quality medicinal and aromatic plants is increasing day by day and India can capture this opportunity in a big way based on its present trained manpower, expertise and facilities available in the country.

On this occasion two of CIMAP employees, Shri Kailash Singh, Technical Officer at CIMAP Headquarter, Lucknow and Shri Nisar Ahmed Khan, Staff Car Driver at CIMAP Resource Centre, Bangalore, were awarded 'CIM-One-2008'. Award by the Chief Guest for their sustained efforts and services. The CIMAP Day was also celebrated simultaneously at all the four Resource Centres of CIMAP (Pantnagar, Purara, Bangalore & Hyderabad). Two farm bulletins in Hindi, one each on *Kalmegh* and *Senna* were also released by the Chief Guest.

The senior scientist of the institute, Dr U.C. Lavania introduced the CIMAP Day speaker Dr Tuli, Dr A.H.A. Farooqi introduced the Chief Guest Dr Akhtar Husain and Dr Anand Akhila made a presentation on the glimpses of Dr Husain's contributions at CIMAP. Dr Ashok Kumar Singh proposed the vote of thanks.

Convocation of Indo-Swiss Training Centre at CSIO

"The path from dreams to reality does exist. May you have the vision to find it, the courage to meet onto it and the perseverance to follow it," Prof. Manoj Datta, Director, Punjab Engineering College, Chandigarh, quoted these inspiring lines of Late Ms Kalpna Chawla while addressing the passing out students on the occasion of 43rd Convocation of Indo-Swiss Training Centre of the Central Scientific Instrument Organization (CSIO), Chandigarh, on 1 August 2008. He said that in the new technology oriented world,



Prof. Manoj Datta, Director, Punjab Engineering College, Chandigarh, inaugurating the Convocation by lighting the lamp (top); and Prof. Datta giving away prize to one of the students (below)

special skills are in great demand. He pointed out that India is bestowed with the largest population of young minds in the world and it is a great asset to us. The need is to explore it in a right spirit. He advised the passing out trainees to adopt the spirit of an entrepreneur to sustain in the competitive world.

Earlier, Dr Pawan Kapur, Director, CSIO, highlighted the activities of ISTC and welcomed the Chief Guest. While tracing the history of the success of ISTC, he described it as an institute of excellence for imparting technical skilled training. He advised the students to become worldly wise as now they have entered into a career field, which requires dedicated efforts, up-to-date knowledge, awareness and constant learning from one's mistakes.

Shri R.C. Arora, Principal, ISTC, while presenting the annual report of the Training Centre, informed the gathering that this year all the 82 passing out graduates had already been picked up for employment by various industries of repute and they have been offered starting salary between Rs 15,000-40,000. He informed that the Centre had produced so far over 2800 graduates in various streams.

Later, graduating students were awarded diplomas and advanced diplomas by Dr Kapur, while Chief Guest Prof Datta gave away the prizes and medals to the students, who had excelled in various fields. The programme concluded with the vote of thanks proposed by Shri H. S. Gupta, Scientist, CSIO.

Indo Swiss Training Centre popularly known as ISTC was established in the year 1963 in collaboration with the Swiss Foundation for Technical Assistance, Switzerland.

Prof. George M. Whitesides' Lecture at NCL

New Ideas to Flow from Universities and Research Laboratories

All new products die sooner or later – victims of changing market needs continuous innovation. This is the case for global health and medical products industry and present researchers with opportunities and challenges for new ideas, said Prof. George M. Whitesides a University Professor of Chemistry at Woodward L. & Ann A. Flowers, Harvard University, USA, while delivering a lecture on 'Commercializing New Technology' at the National Chemical Laboratory (NCL), Pune. He used the example of the global health and medical products industry to argue that in the current scenario of short horizons in corporate research, universities and publicly funded research laboratories will play a critical role in exploring absolutely new technology ideas and pursuing long-term research. Scientists and engineers interested in applied science will increasingly have to explore careers in entrepreneurship and build technology start-ups since large corporates will limit themselves to projects delivering results in a short-term. In this context, Prof. Whitesides encouraged scientists and students to learn



Prof. George Whitesides delivering the NCL-TEC lecture

and be familiar with what it takes to commercialize new technology.

Prof. Whitesides highlighted the severe competition in the health industry, increasing commoditization and a dry "new products" pipeline as companies increasingly seek to maximize returns in a shorter time frame. He expressed pessimism that the situation could change in a capitalist economy. In this context, US universities and start-ups play an important role in continuously feeding the economy with new technology ideas and products. Thus, the universities and start-ups contribute critically to the creation of jobs and wealth – an idea that Prof. Whitesides illustrated using an inverted pyramid of the economy with



Mr Elangovan M, President, NCL-TEC,
giving welcome remarks

universities and start-ups feeding the tip.

In his lecture, Prof. Whitesides emphasized the importance of cultivating a deep understanding of the market needs and requirements. Scientists and engineers cannot learn customer needs in the lab. He cited the example of one of his start-up companies where scientists spent months observing surgeons at work to understand the product needs in detail. Whitesides pointed out that in his experience most ideas that are “great science” are often too early to be spun-off into businesses. Creating new ventures requires some certainty in planning and that is only possible when science enters the realm of technology and definite milestones can be defined.

Prof. Whitesides exemplified the business plan and explained the business case in relation to the need of the customers for a product, its solution for having a better product and its benefit over a period of time. He discussed the attributes of a product, its development path, competitive analysis and its costs. Prof. Whitesides talked about the

various sources of money, the corporate partners, government and non-government grants, sale of product and revenue. A business plan typically consisted of the management, its team and important functions like intellectual property, marketing, sales and facilities, etc. Prof. Whitesides said it was important to hire good lawyers to make firm agreement clauses, in order to avoid future disputes leading to litigation and financial loss.

Prof. Whitesides extended his talk to technology innovation in global healthcare and high technology medicine. He spoke about identifying the customer and their needs. He stressed on old and new players in biomedical technologies, where innovation came from universities, by solving societal problems etc. He touched upon topics like the need for research, need and saleability of a product, strategy for risk inevitabilities, risk reduction, etc.

Mr Elangovan M, President, NCL-TEC, welcomed the audience. Mr S. K. Soni, Secretary for Publicity, introduced Prof. Whitesides to the audience. Mr Soni said that Prof. Whitesides and his group has worked in various areas of chemistry and he believes in having an eclectic and generalist approach to a particular problem. Prof. Whitesides and his team have had a profound impact on the field of materials science by drawing on a broad scientific perspective ranging from fundamental chemistry to applied technology. His

efforts in nanostructured materials (at the level of the single molecules), and the techniques he created to produce them, are being applied widely in areas such as biotechnology, electronics, optical networks, circuitry, and computer science. He is well known for his work in the areas of NMR spectroscopy, organometallic chemistry, molecular self-assembly, soft lithography, microfabrication, microfluidics, and nanotechnology. Prof. Whitesides is the author of more than 950 scientific articles and is listed as an inventor on more than 50 patents. He has co-founded over twelve companies with a combined market capitalization of over \$20 billion. These companies include Genzyme, GelTex, Theravance, Surface Logix, Nano-Terra and WMR Biomedical besides others.

Mr Balaji Iyer, member of NCL-TEC, thanked Prof. Whitesides for his lecture and moderated an interactive question-answer session between the students and Prof. Whitesides. His answers provided new insights and provoked the students to think deeper and differently as they enter careers in science and entrepreneurship.

The lecture was organized by the NCL Technology and Entrepreneurship Club (NCL-TEC). The club is driven by NCL research scholars and associates. It aims to provide a common forum for people with a shared interest in technology and translating it into products and services useful to people.

Industry and Sustainable Development

Prof. P. Khanna Memorial Lecture by Dr A.G. Bhole

This year's Prof. P. Khanna Memorial Lecture was delivered by Dr. A.G. Bhole, the eminent Environmental Engineer and Former Professor and Head, Department of Civil Engineering, Visvesvaraya National Institute of Technology at the National Environmental Engineering Research Institute (NEERI), Nagpur, on 14 August 2008.



Dr A.G. Bhole delivering the Prof. P. Khanna Memorial Lecture

This lecture series is organized in memory of Prof. Purushottam Khanna, former Director (1987-1999), NEERI, who passed away on 14 August 2004.

Delivering the lecture on "Industry and Sustainable Development", Dr Bhole mentioned about the contributions of late Prof. P. Khanna in the field of environmental science and engineering, particularly his contributions to industry and sustainable development in the country. He described Prof. Khanna as the pioneer of Environmental Impact and Risk Assessment (EIRA) studies in India. He said that the rapid growth of industry has increased the demand for energy, raw materials, and natural resources, often causing environmental damage owing to resource-extraction processes. In such difficult situation, the industry should adopt a culture to use

recycled material to the most possible extent. He gave details about various aspects related to ISO 14000, which are applicable to industry to ensure sustainable development. He specifically focused on environmental management system, and how effective it should be for sustainable development. He also briefed about environmental auditing and the related environmental investigations being carried out at various industrial outfits, and various benefits of environmental management system in the air pollution control, water management, waste management and community development. Dr Bhole emphasized the need to use renewable energy sources, since these are environment-friendly, favoured option for sustainable development, ensure equitable

distribution of benefits. He also mentioned about wave energy, which is derived from oscillating water columns of sea. He said that it does not require land as in the case of solar or wind energy and the required devices are relatively pollution free. In Indian context, he mentioned that the capacity of wave energy based power plant at Kovalam Beach (Kerala) is

150 kW. Speaking about electricity generation from wastewater, Dr Bhole informed that researchers in USA have shown that bacteria could be used to generate electricity by 'microbial fuel cell' (MFC) technology. It has been proved that some bacteria, typically iron reducing bacteria, do carry the respiratory enzymes that produce protons on the out side of the cell, he added.

Explaining various avenues for water / wastewater recycling through process modifications, Dr Bhole mentioned about various natural systems, i.e. oxidation ponds, constructed wetlands, rapid infiltration systems, etc. Dr Bhole detailed about various technologies being used for air pollution control and solid and hazardous waste management to ensure sustainable development.



Earlier, in his welcome address, Dr Tapan Chakrabarti, Acting Director, NEERI, appreciated the valuable contributions of late Prof. P. Khanna in the field of environmental science and engineering. He particularly spoke about Prof. Khanna's role in making environmental policies and implementing various innovative ideas in public health engineering towards sustainable development. It was Prof. Khanna who introduced molecular biology with computational tools and carried out various societal missions at the institute, added Dr Chakrabarti.

Er. Arindam Ghosh, Scientist and Head, Research & Development Planning Unit (RDPU), introduced the Chief Guest. Dr G. V. Mulmuley, Scientist, RDPU, proposed a vote of thanks

Dr Ranadhir Mukhopadhyay receives Dr J. Coggin Brown Memorial Gold Medal

Dr Ranadhir Mukhopadhyay, Scientist Geological Oceanography Division of National Institute of Oceanography (NIO), Goa, has been awarded 'Dr J. Coggin Brown Memorial Gold Medal for Geological Sciences' for 2007-2008 by Mining, Geological and Metallurgical Institute of India (MGMI), Kolkata. This award was presented to him at MGMI 102nd Annual General Meeting on 27 September 2008.

Dr Mukhopadhyay has over 25 years of research experience in manganese nodule chemistry and morphological changes in local facies in terms of topography and acoustically transparent bottom sediment layers. He was the first to initiate 'InRidge'-- India's Mid-Ocean Ridge research.

Dr Mukhopadhyay has received many honours and awards including the M.S. Krishnan Gold Medal, and C.V. Raman Fellowship. He served as Director of The Mauritius, Oceanography Institute, Mauritius, for a period of two years. He has 36 research publications in various journals of national and international repute.



Dr R.K. Chadha elected Fellow of APAS

Dr R.K. Chadha, Scientist F, National Geophysical Research Institute (NGRI), Hyderabad, has been elected as the Fellow of the Andhra Pradesh Academy of Sciences. Earlier, he was also elected as the Fellow of Indian Geophysical Union in 2007, and also won the National Mineral Award in 2003 in Geophysics. At present he is Secretary General of the Asian Seismological Commission and the President, International Natural Hazard Society. Dr Chadha is Head of the Seismology Group of NGRI and has contributed significantly to the field of earthquake and tsunami research in the country. He has published 49 research papers in refereed international and national journals, edited topical issues of three international journals and one Indian Special Volume of Indian Geophysical Union. He also co-authored 35 technical reports and was granted a US Patent for his work on short-term forecasting of moderate size earthquakes in the Koyna region, India.





Dr Vikram Kumar, Director, NPL, to hold Additional Charge as Director, NISCAIR

Dr Vikram Kumar, Director, National Physical Laboratory (NPL), New Delhi, has been given additional charge of the post of Director, National Institute of Science Communication And Information Resources (NISCAIR), New Delhi, w.e.f. 1 December 2008, consequent upon superannuation of Shri S.K. Rastogi, Acting Director, NISCAIR.



IETE Instrumentation Award to Shri S.K. Mittal

Shri S.K. Mittal, Scientist, Central Scientific Instruments Organisation (CSIO), Chandigarh, has been selected for the prestigious 19th IETE-Hari Ramji Toshniwal Gold Medal for 2007 in recognition of his distinguished contribution and innovative work in the area of research, design and development of advanced instrumentation for Snow and Avalanche and Railways for public safety.

The IETE – Hari Ramji Toshniwal Gold Medal award is given annually to a person for his outstanding innovations for application in industry. The award consists of a medal and a citation.

The contribution of Shri S. K.



Mittal has been recognized at national level. He has made noteworthy contributions to the area of research, design and development of advanced electronic instruments for scientific and industrial applications for public safety. Shri Mittal did his M. Tech in Electronics & Communication Engineering in 1982 from IIT,

Roorkee (earlier University of Roorkee). He has been engaged in design, development and fabrication of scientific instruments and systems for different applications with specific use in Geo Science, Snow and Avalanche Study, Railway Safety and Land Slide Monitoring.

He has published about 35 technical research papers and imparted practical training to approximately 200 undergraduate and 25 post-graduate students of engineering colleges. He has filed patents for two indigenously developed instruments and transferred one know-how to M/S AIMIL, New Delhi.



COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH (HUMAN RESOURCE DEVELOPMENT GROUP)

CSIR COMPLEX, Library Avenue, Pusa, New Delhi 110 012

NOMINATIONS INVITED

Shanti Swarup Bhatnagar Prizes in Science and Technology for 2009

The Council of Scientific and Industrial Research (CSIR) invites nominations for the Shanti Swarup Bhatnagar (SSB) Prizes in science and technology for the year 2009. The SSB Prizes are to be given for research contributions made primarily in India during the past five years. *The age of the nominee for the 2009 SSB Prize should not be more than 45 years as on 31.12.2008.*

The SSB Prizes are awarded for notable and outstanding research, applied or fundamental, in the following disciplines: (1) Biological Sciences, (2) Chemical Sciences, (3) Earth, Atmosphere, Ocean and Planetary Sciences, (4) Engineering Sciences, (5) Mathematical Sciences, (6) Medical Sciences, and (7) Physical Sciences. The SSB Prize carries with it a citation, a cash award of Rs.5,00,000 (Rupees five lakh only) and a plaque for each scientist selected for the Award.

Nominations addressed to **Dr Rajesh Luthra, Head, Human Resource Development Group, CSIR Complex, Library Avenue, Pusa, New Delhi 110012** should be sent as per the *prescribed pro-forma (25 copies)* along with one set of reprints of significant publications of the last 5 years' period on or before **31 March 2009**. The details of the SSB Prize and the prescribed pro-forma for nomination may be obtained from the above address or may also be downloaded from website: <http://csirhrdg.res.in>

CSIR Young Scientist Awards for 2009

The Council of Scientific & Industrial Research (CSIR) invites nominations for the CSIR Young Scientist (YS) Awards for the year 2009. The awards are to be given for research contributions made primarily in India. The nominee should be a regular employee of CSIR system holding a position of a Scientist in Group IV. The age of the nominee should not be more than 35 years as on *26 September 2008*.

The YS Awards are given annually in the following disciplines: (1) Biological Sciences, (2) Chemical Sciences, (3) Earth, Atmosphere, Ocean and Planetary Sciences, (4) Engineering Sciences, and (5) Physical Sciences (including instrumentation). The YS Award carries with it a citation, a cash award of Rs.50,000 (Rupees fifty thousand only), and a plaque for each scientist selected for the Award.

Nominations should be addressed to **Dr Rajesh Luthra, Head, Human Resource Development (HRD) Group, CSIR Complex, Library Avenue, Pusa, New Delhi 110 012**, and sent as per the prescribed pro-forma (20 copies) along with one set of research papers published during the last 5-year period by 31 January 2009. The details of the YS Award and the prescribed proforma for nomination can be obtained from above address or can be downloaded from website: <http://csirhrdg.res.in>

Printed and Published by Deeksha Bist on behalf of National Institute of Science Communication And Information Resources (NISCAIR), (CSIR), Dr K.S. Krishnan Marg, New Delhi -110 012 and printed at NISCAIR Press, Dr K.S. Krishnan Marg, New Delhi -110 012

Editor: Dr B.C.Kashyap; **Associate Editors:** Meenakshi; Vineeta Singhal; **Editorial Assistant:** Neelima Handoo

Design: Pradip Banerjee; Sarla Dutta; **Production:** Kaushal Kishore

Editorial help by Dr Sukanya Datta, Scientist, DG's Technical Cell, CSIR, is greatly acknowledged.

Phone: 25846301; Fax: 25847062; E-mail: bck@niscair.res.in; meenakshi@niscair.res.in; vineeta@niscair.res.in; Website:<http://www.niscair.res.in>

For subscription: The Sales & Distribution Officer, NISCAIR; E-mail: sales@niscair.res.in; Annual Subscription: Rs 300; Single Copy: Rs 15.00

Subscription Complaint No: 25843359