

CSIR NEWS

VOL 56 NO 4 28 FEBRUARY 2006



US Patent assigned for New Lead Molecules for Malaria

THE Council of Scientific and Industrial Research has been assigned a US patent for the discovery of two promising compounds NIO-1 and NIO-2 from mussel for the treatment of malaria. This discovery has been made by Dr Anil Chatterji, Scientist, National Institute of Oceanography (NIO), Goa, along with researchers from the National Centre for Cell Science in Pune and International Centre for Genetic Engineering and Biotechnology in New Delhi.

Malaria is an important tropical parasitic disease. Relatively it kills more people than any other communicable diseases except tuberculosis. In developing countries, especially, in Africa, malaria leads to enormous loss of human lives and serious economic and medical costs. The causative agents in humans are four species of single-celled parasites, borne by mosquitoes. Among these, the parasite, *P. falciparum* accounts for majority of the lethal infections. The emergence of multi-drug resistant strains of parasite is also exacerbating the situation. Malaria is now re-emerging in areas where it was previously under control or eradicated e.g., in the Central Asian Republics of Tajikistan and Azerbaijan, and in Korea.

The New Lead Molecules

The crude extract prepared by the enzyme-acid hydrolyzing process from a marine organism (mussel) showed initially a potent anti-malarial activity, at least when examined for *in vitro* cultures of *Plasmodium falciparum* in human erythrocytes. This led to an effort towards isolating and characterizing the molecular entity(ies) responsible for anti-malarial activity. An activity guided fractionation strategy was followed in present research where a variety of chromatographic steps were employed. These included HPLC using a range of columns (hydrophobic, selective absorption, ion-exchange etc.), preparative thin layer chromatography, selective derivatization and gel filtration chromatography. Selective enrichment of activity was monitored at every step using *P. falciparum* culture for *in vitro* studies.



This effort has resulted in eventually identifying two compounds that independently showed anti-malarial activity. This was followed by structure elucidation of the structure of these two compounds. The elucidated structures were also independently validated and found potent. The compounds have been labelled as NIO-1 and NIO-2.

These two compounds have been found to display biological activity against the malaria parasite (mouse and human tested). Both the compounds exhibit activity against *P. falciparum* for *in vitro* culture assay. Importantly, both compounds act by directly killing parasite, rather than just causing inhibition in their growth. No effect of drug was seen on the host cell in any of the experiments. This confirms that the compounds NIO-1 and NIO-2 are non-toxic. The compound NIO-2 also displayed activity against the chloroquine-resistant strain-W2Mef. The dose response for both 3D7 and W2Mef strains are identical. This strongly suggests that the compound (NIO-2) will be equally effective against field isolates of chloroquine-resistant, *P. falciparum*. NIO-2 acts

on W2Mef strain through killing the target.

Although NIO-1 did not show any activity against the W2Mef strain, at least at the concentrations tested, the possibility that it may act against field isolates of chloroquine-resistant, cannot be ruled out at the moment. But, NIO-1 provides an alternative to existing drugs in the field, and would serve to minimize chances of producing drug resistant variants in the field.

Finally, both compounds, NIO-1 and NIO-2, show anti-malarial activity *in vivo*, at least in the mouse model. Further, blood smears from drug-treated mice also support that these compounds act through killing the parasite *in vivo*. Importantly, the bio-activity of NIO-2 is retained when delivered through the oral route, suggesting this as a drug of high promise. The oral mode of treatment was not examined for NIO-1, but is expected to be completed shortly.

Both the compounds, NIO-1 and NIO-2 present themselves as promising candidate drugs for malaria and may be used in conjunction with conventional drugs. The active compound is relatively cheap to obtain and can readily be prepared in bulk without killing the mussel. The Mumbai-based company Shreya Life Sciences has been licensed to commercialize the drug. The agreement is worth Rs 17.5 million (US \$ 0.4 million).



A view of the green mussel *Perna viridis*

CEERI-IICT develop Potassium Ion-sensitive Field-effect Transistor

THE Central Electronics Engineering Research Institute (CEERI), Pilani, under the MEMS and microsensors project of CSIR network programme CMM 011, has developed potassium-selective ISFET (ion-sensitive field-effect transistor) with the help of Indian Institute of Chemical Technology (IICT), Hyderabad. The ISFET has developed by coating the gate dielectric with ionophoric dibenzo 18-crown-6 (DB18C6) ether layer, which is structurally a cyclic polyether containing hydrogen, carbon and oxygen atoms (Fig.1). Each oxygen atom is confined between two carbon atoms and exhibits a conformation with a hole (accordingly called 'crown'). If metallic elements pass through the centre of the hole, they attach to oxygen atoms forming stable complexes.

The crown compound is termed 'host-guest' chemistry with crown ether acting as the 'host' taking ionic species as its 'guest'. The potassium sensitivity of crown ether ISFET was found to be approximately double of that of the silicon nitride gate ISFET (Table 1).

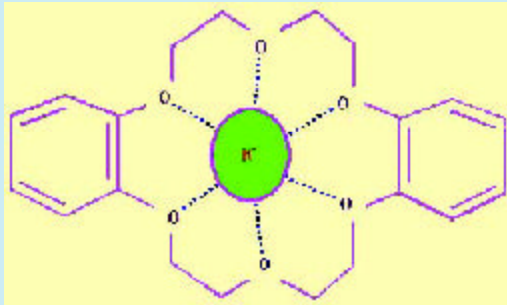


Fig. 1 : Binding of the K⁺ ion within the dibenzo 18-crown-6 ether molecular structure

To apply the crown ether ISFET for K⁺ ion concentration measurements in blood serum, several samples (1 ml) were collected and diluted to 50 ml for immersing the ISFET device and reference electrode. It was found that different output potentials were obtained for samples of different patients according to their potassium ion concentrations. For ISFET calibration, concentration of one sample of the series

was determined by spectroscopic analysis to use it as a standard sample. Then the distribution of potassium ion concentrations in the blood serum samples (Fig. 2) was estimated with reference to the standard sample, from the ISFET sensitivity (7.33 mV per mg/l) by applying the up scaling factor. The normal concentration of potassium in the serum is in the range of 3.5 to 5.0 mEq/l (137 to 196mg/l).

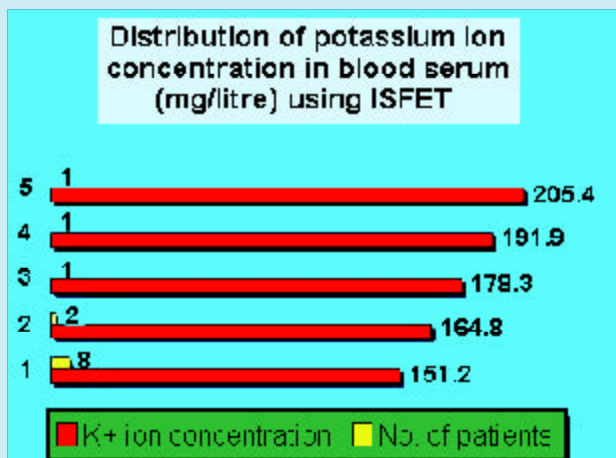


Fig. 2 : Potassium ion distribution chart

Table 1 : Comparison of ISFET sensitivities towards potassium and sodium ions

S No.	Ion studied	Concentration range examined	ISFET without crown ether		ISFET with crown ether	
			Sensitivity of readout circuit without crown ether (mV per mg/l)	Gate potential sensitivity from the Nernst plot	Sensitivity of readout circuit with crown ether (mV per mg/l)	Gate potential sensitivity from the Nernst plot
1.	Potassium	100-400 mg/l	1	36.7	2.3	52.8
		1-10 mg/l	3.4	41.67	7.33	56
2.	Sodium	10-1000 mg/dl	0.342	-	0.348	-

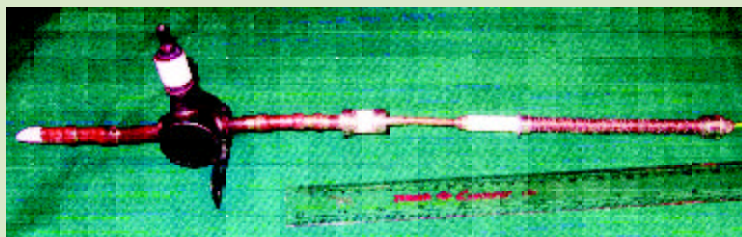
Sub-systems of Micro-TWT for MPM developed by CEERI

THE Central Electronics Engineering Research Institute (CEERI), Pilani, has developed two electron guns of modified design and tested these for Micro-TWT. Both the guns gave desired beam parameters i.e. 170 mA beam current at 4.3 kV beam voltage with the desired beam waist diameter and throw. Beam Stick II was integrated, processed and tested using one of these guns having confined flow beam focusing. Utmost care was taken to maintain the axial alignment within 0.02 mm between the various components and sub-assemblies of the beam stick during its integration. With the use of designed PPM profile, beam transmission of about 99% was achieved.

The collector depressed by 1 kV and the tube was operated for long hours. The duty cycle was increased gradually and the tube maintained the above performance up to 50% duty cycle. Further testing beyond 50% duty cycle is going on at



Diagram of the beam stick II



Beam stick II

the institute. Thus, an important landmark for the successful completion of design and development of electron gun and PPM focusing along with necessary technology was achieved towards the development of broadband micro-TWT for MPM.

Secondary electron emission measurement set-up, using CEERI-made electron gun, was developed for measuring secondary electron emission coefficient of any sample. Secondary electron emission coefficient of Cu sample and a POCO Graphite sample were measured with the help of the experimental set-up.

Industrial Toxicology Research Centre, Lucknow R & D Highlights

THE Industrial Toxicology Research Centre (ITRC), Lucknow, witnessed all-round growth in all its activities, viz. R&D, societal programmes and service to industries during the year 2004-2005.

R & D Highlights

The institute during the period was participating in 13 CSIR network projects. The three new projects initiated were: (i) Comprehensive traditional knowledge digital library; (ii) Physico-mechanical, electrical and electronic standards; and (iii) Industrial waste minimization and clean-up.

The institute held many national and international seminars during the year. Training was imparted to more than 80 postgraduate students. Exchange of newer scientific ideas amongst

researchers was encouraged by holding 108 seminars during the period.

The institute filed one patent and obtained a copyright for Comet Assay Abstract Search Software.

Public-Private Partnership

Specific alliances were forged with Ranbaxy Laboratories, Gurgaon, for screening potential drug molecules; Dabur and INTAS Pharmaceuticals for toxicity evaluation of product/lead molecules.

ITRC signed a Memorandum of Understanding (MoU) with CPCB, Delhi, for a three-year collaborative project entitled Remediation of ground water pollution due to chromium in Noraia Kheda area of Kanpur city, U.P. An MoU was signed between ITRC and Amity, New Delhi, for sharing resources, undertake

consultation/advise for execution of societal and R&D programmes of mutual benefit.

Expertise of ITRC scientists was solicited on several national and international committees and government agencies like BIS, ICMR, ICAR, CPCB, DST, CCRAS and others.

Networked Projects

ITRC has been coordinating the CSIR networked project on 'Toxicogenomics of genetic polymorphism in Indian population to industrial chemicals for the development of biomarkers'. Under this, a proteomics approach for identification of blood protein biomarkers of arsenic exposure was being used for developing a database of protein profile from blood in toxicant-exposed and unexposed population. This will help in delineation of molecular mechanism

of test pollutants. Comparison of 2D-PAGE patterns of serum proteins of unexposed and arsenic exposed human population revealed that there are many proteins which are present differentially in the three sets of samples. Out of these one protein was about 9-12 fold higher in the exposed human serum.

Studies were initiated to identify SNPs in the genes involved in xenobiotic metabolism and toxicity in the Indian population. To investigate the presence of SNPs in the p53 gene in Indian women, genomic DNAs were isolated from peripheral blood samples of healthy control women and those with breast cancer. The exon-4, 5 and 6 of p53 gene were PCR amplified using specific primers. Initial findings suggest that 72 codon polymorphism in exon-4 of p53 gene is associated with the onset of breast cancer in Indian women as also reported in their western counterparts. Additionally, insertions at several locations in the exon 5 of p53 genes have also been found in Indian women suffering from breast cancer. Genetic polymorphism in GSTMI, GSTPI, and GSTTI genes have been demonstrated in studies performed on 24 blood samples.

Based on linguistic and geographical distributions in India, 40 different populations were identified for studying SNPs. DNA samples from each of the contrasting population was processed for identifying SNPs. PCR amplification and sequencing reactions were carried out for cytochrome P450 2D6 (CYP2D6), involved in drug metabolism.

Sequence alignment using DNA STAR software for CYP2D6 gene in the samples of SNP Discovery Panel revealed 7 polymorphic sites. Out of these 7 polymorphisms, 4 were found to be novel.

Selection of animal model for assessment of allergenicity of genetically modified (GM) food showed that a combination of single sensitization through i.p. route and elicitation through the oral route evolved an acceptable animal model for evaluation of allergenic potential of GM food in terms of serum IgE antibody, IL-4 and II-5 cytokines. Affinity purified polyclonal antibody against Cry1Ac was developed through Protein A Chromatography. The primary antibody along with secondary anti-rabbit IgG linked to horseradish peroxidase has been included in a prototype ELISA kit. The resultant ELISA kit is able to detect Cry1Ac protein both from recombinant bacteria and from transgenic cotton (Mon-162). The detection limit of the test ELISA kit is 1ng of the protein.

An advanced facility for the safety evaluation of genetically modified/engineered drugs was inaugurated by Dr R.A. Mashelkar, DGSIR at Gheru campus. A PCR based method was developed for the detection of GM foods, by amplification of the 'incorporated genes' viz. 35S promotor of cauliflower mosaic virus, Nos terminator and modified epsps gene. Amplification of genes for lectin and starch synthase were used as house-keeping genes for soy and maize respectively. Validation of PCR based Assays/Kits for detection of food borne pathogens was done. For

Salmonella, a product size of 236 bp and for *Shigella*, a product size of 844 bp was found to be present in spiked samples only.

Under the network project, 'Newer scientific herbal preparations for global positioning' medicinal plant extracts were evaluated for their antioxidant potential using 5 semiautomated microassay screens. The study showed 7 out of 18 selected extracts with radical scavenging capacity to be strong antioxidants. These coded extracts were selected for inclusion in herbal formulations. Medicinal plant raw material samples were analysed for presence of heavy metals, Pb, Cd, Cr, Ni, As and Hg as well as pesticide residues of endosulfan, isoforms of HCH, DDT and its metabolites before preparation of extract. *In vitro* receptor radio-ligand binding assay showed one extract out of 12 to have 65% inhibition of benzodiazepine receptor binding indicating anti-anxiety potential which also showed strong antioxidant capacity.

Prophylactic/therapeutic potential of herbal antioxidants using oxidatively stressed primary rat hepatocyte was explored. Standardized extract of *Glycyrrhiza glabra* (root) was found to induce cell proliferation in unstressed hepatocytes at higher doses. Low doses of *G. glabra* extract did not accord protection against t-BHP induced oxidative stress whereas cell survival at higher doses was comparable to unstressed cells. In a separate study Diallyl sulfide (DAS), a major volatile compound in garlic known to have anticarcinogenic activity in various

rodent tumor models was found to provide protection against oxidative damage induced by carcinogen. The antioxidant potential of DAS was investigated against 7,12-dimethyl benz(a)anthracene (DMBA), induced oxidative stress with reference to lipid peroxidation and antioxidant enzymes catalase, superoxide dismutase, glutathione reductase and glutathione-S-transferase in the liver, kidney and prostrate tissues of Swiss albino mice.

A unique database has been developed for presence of 6 heavy metals i.e. Pb, Cd, Ni, Cr, As, Hg and residual organochlorine pesticides α -HCH, β -HCH, γ -HCH, δ -HCH, endosulphan; opDDT, ppDDT and its metabolites DDD and DDE. The Qamp (Quality Assurance of Medicinal Plants) database has more than 28000 data entries as a result of extensive analysis and represents a baseline for contaminant levels in herbal raw material collected from different ecological zones of India.

In vitro screening of psychoactive potential of traditional preparations of herbal, microbial, fungal, Ayurvedic, Unani and Siddha origin using receptor-ligand binding assay for dopamine (DA-D2), cholinergic (muscarinic), benzodiazepine and serotonin (5-HT-2A) receptors was performed. Over 2500 samples/preparations have been screened using radioligand binding. Out of these 276 extracts were found active. Samples showing high D2 receptor affinity were recommended for *in vivo* screening on mouse model of Parkinson's disease. Two preparations were

found to be active on muscarinic binding and exhibited anti-dementia activity in animal model. Another bioactivity being evaluated under the project is antioxidant potential of coded samples. Out of 312 extracts subjected to secondary screening using microassays for SOD mimetic activity and LPO inhibitory potential, 45 samples were found to have demonstrable antioxidant capacity and were recommended for detailed study under the drug development programme.

Literature search on active constituents, toxicological parameters and antidote potential of 200 medicinal plants has been carried out using primary and secondary sources. Information on the toxic potential of the plant as such and its active constituents too is being compiled. In order to digitalize this information, entry of the compiled data is being carried out in the software provided by NISCAIR under the network project, 'Comprehensive traditional knowledge digital library.'

Proinflammatory and anti-inflammatory cytokine balance and associated changes in pulmonary bronchoalveolar lavage fluid (BALF) of unleaded gasoline exhaust (GE) exposed mice was studied. A shift in pro- and anti-inflammatory cytokine balance and elevation of the pulmonary marker enzymes indicated toxic insult due to gasoline exhaust. Mice ciliated epithelial cells were isolated and the base line ciliary beat frequency (CBF) observed which ranged from 6-7 Hz. When cells were cultured *in vitro* in presence of TNF- α , increase in

the CBF was observed. Asthmatic mice had 13.9% of motile cells against 26% motile cells in normal mouse trachea.

Animal Models and animal substitute technologies were standardized, validated and used for toxicity assessment in a network programme. Induction studies with 3-methylcholanthrene (MC), demonstrated a dose and time dependent increase in the activity of 7-ethoxyresorufin-o-deethylase (EROD) in the cultured brain and neuronal and glial cells. Neuronal cells, in general, exhibited higher activity of CYP 1A1/1A2 dependent EROD than the glial cells. RT-PCR studies demonstrated a significant constitutive mRNA expression of CYP1A in neuronal cells when compared to the glial cells. However, when treated with MC, the induction in mRNA was more pronounced in glial cells than the neuronal cells, although, the overall expression was found to be greater in neuronal cells.

An *in vitro* system for neurotoxicity evaluation of environmental chemicals and drugs, using specific receptor binding assays has been standardized in PC-12 cell, a rat pheochromocytoma cell line and the effect of rotenone and manganese on dopamine receptor (DA-D2) was assessed.

A method to assess the genotoxicity in multiple mouse organs was established and validated using ethyl methanesulfonate and then used for assessment of system genotoxicity of cypermethrin. The genotoxicity was in the order; brain > spleen > kidney > bone marrow > liver >

lymphocytes. These studies have shown the systemic genotoxicity of cypermethrin and also shown that comet assay is a more powerful technique when compared to the environmental cytogenetics assays.

Drosophila melanogaster earlier validated as an alternate animal model for *in vivo* genotoxicity assessment was used to assess the genotoxic potential of leachates from tannery and pigment industry. Chemicals in the leachate of tannery industry were more genotoxic as compared to that of pigment industry. Reproductive toxicity studies revealed that testis and vas deferens in male and ovary and oviduct in the female exposed organisms elicited Hsp70 expression indicating chemical induced toxicity.

An *ex vivo* model of immunotoxicity was validated in mouse thymocytes with Cd by measuring the mitochondrial membrane potential, glutathione levels and apoptosis by flow cytometry.

Allium sativum was validated as an alternate to animal model for genotoxicity assessment. The magnitude of genotoxicity was observed to be more in *Allium sativum* than *Allium cepa*. The groundwater sources in the Gangetic alluvium aquifer region (Unnao) was classified as moderately hard, normal chloride and sulfate type after analyzing 119 samples comprising of ground water, surface water and soil. Analysis of alluvial watershed data with multivariate modeling techniques suggest that groundwater aquifer in the study region is under anthropogenic influence.

Application of molecular technique, Polymerase Chain Reaction (PCR) for monitoring pathogenic bacteria in water were explored. PCR oligomers were designed to target virulence genes: *stx1* (Shiga like toxin type I), *stx2* (Shiga like toxin type II), *hlyA* (Enterohemolysin), *chuA* (heam iron transport system), and *eae* (attaching and effacing protein, intimin) present in diarrheagenic *Escherichia coli* belonging to enterohemorrhagic group.

In the network programme 'industrial waste minimization and cleanup' study conducted for *in-situ* remediation of contaminated soil revealed that amending the non-humus soil with humus soil and hydroxyapatite can immobilize metals. Under the programme 'Biological decolorization of anaerobically treated distillery effluents by wetland plant treatment system', the rhizosphere bacterial population dynamics of Phragmites species facilitated bioremediation.

To repair, calibrate maintain and carry out testing of electronic and allied instruments of ITRC and other private, government, academic institutions facilities were provided under the network project 'Physico-mechanical and electrical & electronic standards'.

R&D related to National Common Minimum Programme

In a study it was observed that sanguinarine, an active benzophenanthridine alkaloid of argemone oil, intercalates DNA molecule, the *in vivo* clastogenic and DNA damaging potential of

argemone oil was studied which indicated that even single exposure of argemone oil at low doses produces genotoxic effects in mice.

A simple method has been developed for the extraction, separation, and determination of synthetic colors in ice cream samples. Edible oils were analyzed for the presence of ten light and heavy polycyclic aromatic hydrocarbon (PAH) residues using liquid-liquid extraction, cleanup on a silica gel column, and resolution and determination by HPLC using a fluorescence detector.

Science & Environmental Awareness

Creation of Scientific Waste Instruments and Materials (SWIM) park at Cheru campus has been a unique exercise. The park is one of its kind in the world where obsolete instruments and waste material generated in laboratories is put to use by school children through creation of innovative models. Some such models on display are robots, wind mills, fighter plane, missile, computer, radar, microbes, DNA helix etc.

A CSIR scheme 'Faculty training and motivation and adoption of schools and colleges by CSIR Labs' was initiated during the year. A Creativity Camp was organized in which 130 children and 12 teachers from 6 schools participated to design models from condemned and obsolete scientific gadgets and instruments in the SWIM Park. To popularize science among the younger generation a variety of programmes on environmental awareness were

conducted by ITRC for school children.

Rural health camps to create awareness among the rural populations were conducted in Chinhat and Itaunja to assess pulmonary health status. In addition, health survey of pesticide sprayers was conducted in Malihabad, a mango growers belt.

Honours and Awards

Prof. Y. K. Gupta, Director, ITRC, was elected Fellow of Indian Academy of Neurosciences, 2004. He has also been awarded the AEB Honours Award 2004 by the Academy of Environmental Biologist and Gujral Bhargava Oration by King George's Medical University-2004.

Dr R.K. Upreti, was elected Fellow of Academy of Environmental Biology and Dr Alok Dhawan was elected Fellow of the Society of Toxicology (India), 2004.

A paper entitled Modulation of P-glycoprotein mediated multi drug resistance in K562 leukemic cells by indol-3-carbinol by Dr Yogeshwar Shukla was featured on the cover page of *Toxicology and Applied Pharmacology*, **202**(3), 237-43, 2005.

Dr P. Kakkar was elected as the executive council member of Society for Free Radical Research India, a constituent of SFRR-International for a second two-year term (Jan, 2005).

Dr V. P. Sharma was appointed as Associate Editor for the *Journal of Ecophysiology and Occupational Health* (w.e.f. 1 October, 2004). Dr Kewal Lal awarded Best poster presentation award (2nd Prize) in: National Symposium on 'Safety Assessment of Cosmetics', 18-19 November, 2004.

New Projects taken-up by the CEERI

THE New Projects taken-up by the Central Electronics Engineering Research Institute, (CEERI), Pilani, in the recent past include:

Phase II Special Manpower Development for VLSI Design and Related Software

The Project named Phase II: special manpower development for VLSI design and related software, sponsored by Department of IT, Government of India, with a sanctioned Amount of Rs 49.98 crore (total for all the institutions) for a duration of five years has been taken up.

The brief description of the project is given below:

This multi-institutional project is being implemented at the following institutes:

- (a) Resource Centres (RCs) : IIT-Bombay, IIT-Delhi, IIT-Kanpur, IIT-Kharagpur, IIT-Madras, IISc-Bangalore, CEERI-Pilani
- (b) Participating Institutes (PIs) : IIT-Roorkee, IIT-Guwahati, BESU-Howrah, Jadavpur University, BHU:IT-Varanasi, TIET-Patiala, SGSITS-Indore, PSGCT-Coimbatore, NITs at Silchar, Rourkela, Durgapur, Jamshedpur, Allahabad, Srinagar, Hamirpur, Jalandar, Kurukshetra, Jaipur, Bhopal, Surat, Nagpur, Calicut, Surathkal, Trichy, Warangal

CEERI also has the responsibility of coordinating and making the centralised procurement of hardware and software items for about Rs 16.75 crore to set up VLSI design laboratories at the above institutes.

The other major activity under this project would be the PIs' faculty training programmes at the RCs on a regular basis.

Technology for Quantum Structures and their Applications in Futuristic Silicon-based Nanoelectronic Devices

The Project on technology for quantum structures and their applications in futuristic silicon-based nanoelectronic devices has been sponsored by Department of IT, Government of India for a sanctioned amount of Rs 3.77 crore for the duration of three years.

Brief Description

In this project, technology will be developed for fabricating nano-structures and single electron devices. A new facility for patterning nano-dimensional features will be set up. This technique is based on direct writing using AFM system. A significant feature of the project is to develop nanotechnology on the lines of conventional planar silicon technology, so that the quantum dot devices can be

fabricated in a reproducible manner. The technology development will combine optical lithography and recently discovered Dip-Pen Nanolithography (DPN) techniques to generate nano-dimensional device structures. A process will be developed to synthesize semiconductor quantum dots, which are the heart of single electron devices. Various processes will be integrated to demonstrate the fabrication of single electron transistor. Further, very low-level, current-voltage, capacitance-voltage measurement and nano-processing facilities will be set up.

6MW Peak, 24KW Average Power S-band Klystron

The project 6MW Peak, 24KW average power S-band Klystron has been sponsored by the Government of India with a sanctioned amount of Rs 3.33 crore for the duration of five years.

Brief Description

Klystron is an electron tube capable of amplifying electromagnetic signals in microwave frequency range. High power klystrons find wide application as RF sources for linear accelerators used for a variety of scientific, medical and industrial applications. The tube to be developed under this project will be used a RF source for an industrial linear accelerator under development at Bhabha Atomic Research Centre (BARC), Mumbai. The tube will be developed up to a successful laboratory prototype stage and two working tubes will be supplied to BARC.

Silicon Carbide (SiC) Schottky Diode Detector

The project entitled silicon carbide (SiC) Schottky diode detector has been sponsored by Government of India with a sanctioned amount of Rs 38.38 lakh for a duration of 18 months.

Brief Description

Silicon carbide is a wide band gap material providing superior material properties than conventional semiconductors such as silicon and GaAs for emerging electronic applications. Schottky diode fabrication technology shall be developed for high-energy particle detection purposes for which silicon carbide ensures stability under harsh conditions. A few diodes shall be fabricated up to the level of packaging and shall be tested under realistic conditions for feasibility.

On-line Mango Sorting System using Soft X-ray Imaging

The project entitled on-line mango sorting system using soft X-ray imaging has been sponsored by Department of Science and Technology, Government of India, in collaboration with Industry with a sanctioned amount of Rs 22.71 lakh for a duration of fifteen months.

Brief Description

The main objective of this project is to develop a soft X-ray imaging based technology for sorting export variety mangoes based on internal disorders by using a suitable conveyor arrangement.

Study of High Dielectric Gate Materials for Scaled MOS Devices

The project on study of high dielectric gate materials for scaled

MOS devices has been sponsored by Department of Science and Technology, Government of India with a sanctioned amount of Rs 16.56 lakh for a duration of two years

Brief Description

SiO₂ films have been the preferred material for more than four decades for MOSFET devices. Further scaling of the 65 nm technology would require this thickness to be of the order of 2 nm. There are several problems associated with such a thin SiO₂ gate dielectric. A high-k dielectric material is needed to sustain continued scaling of MOS devices. Among various high-k materials HfO₂ is the most promising one that could replace SiO₂ as gate dielectric.

In this project, it is proposed to study the deposition and characteristic properties of high-k HfO₂ thin films and to fabricate MO₂SCAP to evaluate the performance characteristics for an equivalent oxide thickness of SiO₂

Mango Sorter

The project entitled mango sorter has been sponsored by National Horticulture Board, Gurgaon (Haryana), with a sanctioned amount of Rs 10.00 lakh for a duration of 18 months.

Brief Description

To develop machine vision and image analysis methodologies for fast sorting and grading of mangoes as per the required grading standards. The classification of the mangoes is done based on the color, size, shape, weight and external defects. Main emphasis will be given to varieties of mangoes having large export potential.

Fourth ISSS International Conference on Smart Materials, Structures and Systems

THE Institute for Smart Structures and Systems (ISSS), National Aerospace Laboratories (NAL), Bangalore, and Indian Institute of Science (IISc), Bangalore, organized the Fourth ISSS International Conference on Smart Materials, Structures and Systems at the Indian Institute of Science, Bangalore. The conference was preceded by two workshops: (i) Micro-electro-mechanical systems (MEMS): Technology, Devices and Applications, and (ii) Bio-micro-electro-mechanical systems (BioMEMS) & Neuroelectronics. The faculty for the former consisted of Dr P. Nagasayanu of Bharat Electronics Ltd, Bangalore and Shri Manoj Mathur of Semiconductor Complex, Ltd, Chandigarh.

The faculty for the Bio-MEMS workshop comprised Prof. Vijay Varadan, University of Arkansas, and Dr Sang Choi, NASA, Langley. There were about 100 participants for both the workshops. Prof. C. N. R. Rao, Linus Pauling Research Professor, Jawaharlal Nehru Centre for Advanced Scientific Research, was the Chief Guest. Dr V. K. Aatre, Conference Chair, and former Scientific Adviser to Defense Minister, welcomed the gathering. On behalf of the Indian Institute of Science, Prof. H. P. Khincha, Chairman, Electrical

Sciences Division, welcomed the gathering.

An introduction to the conference was given by Prof. Vijay Varadan of the University of Arkansas, USA. Dr A. R. Upadhya, Director, NAL, introduced the Chief Guest. Prof. C. N. R. Rao in his inaugural address, delivered a talk which was a mix of science and science policy. He spoke of materials being smart essentially because they are in transition, and related his experience with materials undergoing transition. He expressed regret that material science research was not getting enough importance in the country, and in general science was not being paid enough attention. The inaugural address was followed by the release of the conference proceedings by Prof. S. Mohan, President ISSS, and Chief Executive, Society for Innovation and Development, IISc.

The programme ended with the Vote of Thanks by Dr G. M. Kamath, one of the Conference Secretaries. After the programme, Prof. Khincha inaugurated the exhibition that was organized as part of this conference.

The conference comprised plenary sessions, invited talks, oral presentations, and poster presentations. There were 10 plenary talks by distinguished speakers from five different countries.

The talks covered topics ranging from the national programme on smart materials in India, smart structures & systems, MEMS for bio-medical applications, nanomaterials for engineering and life sciences, and smart electronics for space applications. There were five parallel technical sessions. One session focused on micro-electro-mechanical systems (MEMS). Another session focused on the material aspects of smart and MEMS technologies. The remaining three sessions covered smart structures, smart systems, development of actuators and sensors, and applications of smart technologies including health monitoring, vibration control, and flow control. In total, there were 35 invited talks, 95 oral presentations and 19 poster presentations.

The exhibition stalls provided a forum for interaction between vendors and conference participants. Eighteen companies had put up their stalls. In addition, an industry session was organized to allow for companies and industries working in the area of smart structures and systems to present their products and services. This session had six presentations.

The general feeling among the participants at the end of the conference was that of satisfaction and fulfilment.

First Karnataka Science Congress at NAL

THE First Karnataka Science Congress (KSC) opened at the National Aeronautical Laboratories (NAL), Bangalore, recently on the birthday of Sir M. Visvesvaraya. Over 250 delegates participated and 100 research papers on different subjects like biotechnology, aerospace science, medicine and information technology were presented over 21 sessions.

Dr A.R.Upadhyya, Director, NAL and Chairman, First KSC welcomed the gathering. He mentioned NAL's three-decade long tradition of encouraging activities related to science in Kannada, and the overwhelming success of the popular science magazine *Kanaada*, brought out by NAL's Kannada Samskrithika Sangha, and released on Rajyotsava day. He went on to explain how the purpose of the Congress was to propagate science in the regional language and take it to the common man.

Shri Basavaraja Horatti, Hon'ble Minister for Science and Technology, Small Savings and Rural Development and Panchayat Raj, Government of Karnataka, inaugurated the seminar and declared that the organization of the Congress was a memorable day for Kannada and science.

Prof. M.S.Thimmappa, Vice Chancellor, Bangalore University, released the souvenir and delivered the presidential address. "By organising this seminar you are doing the work which was supposed

to be done by the University," he remarked. He further added that by participating in this seminar, his burden of guilt had lessened. Prof. Thimmappa pointed out that the rural population needs science and technology for clean drinking water, sanitation, education against smoking and consumption of alcohol, family planning and protection from sexually transmitted diseases. He also said that science and spirituality must go hand in hand.

Prof. K. I. Vasu, President, Vijnana Bharati, announced the Sir M.Visvesvaraya Vijnana Puraskara for Prof C.N.R. Rao, FRS; Prof R.Narasimha, FRS; Prof U.R.Rao, President, Karnataka Science Academy; Dr V. K. Aatre, Prof. S. K. Ramachandra Rao and Dr N. R. Narayana Murthy.

Prof V. K. Aatre delivered the keynote address. He said that science is the father of technology and explained how science and technology were the two edges of the same sword. He also recalled India's tradition of high standard science and inventions (decimal system, algebra, distillation process in chemistry and metallurgy) that we have lost during the 300 years of colonization. Fortunately, scientists like J. C. Bose, C. V. Raman, S. Ramanujam and Sir M. Visvesvaraya rejuvenated science and technology, he added.

Shri M. S. Ramachandra, Head, PMED, NAL, proposed the Vote of Thanks.

Workshop for Students to celebrate International Year of Physics-2005

THIRTY-FOUR bright senior school students and teachers from State of Punjab and the Union Territory Chandigarh, recently attended a one-day brainstorming workshop organized by the Central Scientific Instruments Organisation (CSIO), Chandigarh, as a part of its celebration of International Year of Physics-2005. The aim of the workshop was to offer an opportunity to the students with a strong motivation towards science in general and physics and instrumentation in particular, an opportunity to interact with researchers, scientists/faculty members of CSIO, Panjab University, Punjab State Council for Science and Technology, and National Technical Teachers Institute, Chandigarh, and learn about the conceptual foundation of applied physics through lectures and models.

Broadly, the workshop covered: X-ray spectroscopy and applied physics, agri-electronics and environmental

pollution monitoring instruments, fibre optics, and analytical, defence, test reliability and calibration instruments.

Addressing the inaugural session, Dr Pawan Kapur, Director, CSIO, highlighted the importance of physics-based science and technology, and the objective of the workshop. Dr Neelam Gulati Sharma, co-ordinator of this workshop and faculty members pointed out that though the course would mostly cover the topics already known to them, it would help them have a better understanding of the process and also how the scientific theories had evolved.

The students were also taken round the analytical environmental monitoring instruments division, agri-electronics and holography lab to acquaint them with real life research conditions.

An interactive session was organized during the valedictory function to assess the status of scientific awareness among the students and teachers and impact of the workshop.

Dr N.S. Tewana, Executive Director, PSCST, gave away the certificates to the participants and Dr Neelam Gulati Sharma proposed a Vote of Thanks.

Dissemination Workshop on Agro-biodiversity Conservation for Sustainable Livelihood of Hill Communities in Uttarakhand

A two-day dissemination workshop entitled 'Agro-biodiversity conservation for sustainable livelihood of Hill Communities in Uttarakhand' was recently organized in Ukhimath block, Rudrapur district, Uttarakhand by the National Institute of Science, Technology and Development Studies (NISTADS), New Delhi, in collaboration with Queen's University, Kingston, Canada and Appropriate Technology, India (AT-India), an NGO in Ukhimath. The workshop was a part of NISTADS collaborative research project entitled 'Policy Development to Support Biodiversity within Agricultural Systems of Hilly Regions of Uttarakhand' with Queen's University, Kingston, Canada.

Canadian International Development Agency (CIDA) through Shastri Indo-Canadian Institute (SICI), New Delhi, provided the funding support for this project. NISTADS-CSIR provided all support, which was essential for execution of this project. A total of 100 delegates attended the workshop, including 53 women farmers. Prof. S.P. Singh, Vice Chancellor, Garhwal University, Srinagar (Uttarakhand) delivered the inaugural address and several other important officials from Uttarakhand Government and Scientists, participated in the workshop. The proceedings were conducted in Hindi and at times these were translated into local language Garhwali also for a clear understanding of the participants.



Participants of NISTADS (CSIR)-SHARP workshop Ukhimath (Uttarakhand)

Some of the recommendations that emerged from the workshop include: (i) The agriculture products from Uttaranchal should develop a brand of echo-mark for value addition of various processed foodstuffs to withstand competition in national and international markets. (ii) The exploitation of organic potential through composting and vermi-composting of agricultural land in the state is essential to improve and increase farm productivity and for better sustainable organic farming. (iii) Diversified farming related to high potential traditional crops may be useful to generate more economy that will also meet the increased demand of traditional grains for the production of various value added foodstuffs/recipes for commercial view point. (iv) The foodstuffs/recipes prepared from different traditional food grains need to be incorporated with tourism/eco-tourism. (v) Since per capita land holding and annual income is very low in Uttaranchal, the conservation of traditional agro biodiversity may not be effective up to desired limits as such unless it is encouraged, compensated and promoted.

For more details contact: Dr Mohammad Rais: rais@nistads.res.in

NISTADS-SHARP
Project Leader and Workshop
Convener

IIP organizes Workshop under CSIR Scheme for Faculty Training and Motivation

THE Indian Institute of Petroleum (IIP), Dehra Dun, organized a two-day workshop under CSIR Scheme for Faculty Training and Motivation. The basic objective of this scheme is to take up training and motivation programme by all the CSIR laboratories for selected science teachers to upgrade their knowledge base in new and emerging areas of science and to provide opportunities for interaction and exchange of ideas with the scientific community.

Keeping in mind that participants are to be given an exposure to the advancement taking place in all the scientific fields, the faculty for the lecture was drawn not only from IIP but also from the local scientific institutes. Course was organized for five working days. Two science teachers from each of the 40 Government schools were invited for the participation in the workshop. Out of that 18 reported for the training programme.

Two sessions were held on each day. In the first session, three lectures on various topics were held. Ample time was provided for discussion on each topic so that the participants can freely interact with the speaker to clear their doubts. The second session was basically for the interaction of the participating teachers with scientists of the

institute by making laboratory visits, visits to Pilot Plant, and interactive sessions through various workshops.

By conducting very simple experiments, it was brought out by Dr A. Datta, IIP, that if the scientific principles behind various phenomena are explained to the students it will remove the tendency of mugging up among the students. Shri V. S. Saini, IIP, explained the fundamentals of science through very simple experiments using the material available in homes especially in kitchens. Participants were encouraged to perform these experiments themselves. Dr Pradeep Srivastava, Scientist, CDRI, Lucknow, combined science with cartoons and conducted an interactive session on Bio-diversity.

Dr Dinesh Chamola, Hindi Officer, IIP, stressed that the findings of the research must bring benefits to the common man and must reach common masses. He said that Hindi as well as local languages may become effective tools in propagation of science among common masses.

Dr M. O. Garg, Director, IIP, inaugurated the programme. Shri S. K. Maheshwari, Additional Secretary Education, Uttaranchal who had consented to be Chief Guest could not be present due to some other engagements. Dr A.

Datta, Chairman Scheme Implementation Committee welcomed the participants. He explained the objectives of this programme. Dr M. O. Garg talked on the important role of the teacher in moulding the young minds and to encourage them so as to bring out their talents. Shri V. S. Saini, Coordinator, introduced all the participants and finally proposed Vote of Thanks.

Shri S. K. Maheshwari, Additional Secretary (Education), Director Education, Government of Uttaranchal was the Chief Guest at the valedictory function. In this address Shri Maheshwari said that science is very important for the progress of the nation. He advised the participating teachers to deliver this message to the students, right from an early age. He congratulated IIP and CSIR for showing their serious concern about the fact that the brilliant students are turning away from science as the other careers are more lucrative for them. He appreciated the efforts of IIP and hoped that the knowledge gained by the teachers would be further communicated to thousands of students. He put forward suggestion that a paper be made on the importance of science education and circulated to various schools.

A questionnaire was designed to get the feedback of the participants. Everybody appreciated the efforts made by CSIR by giving them an opportunity to visit the laboratory and to interact with the scientists. While majority of the participants agreed that the course would be useful in improving their teaching skills, some suggested that there should be less lectures but more lab visits and interactive sessions.

The Chief Guest awarded the certificates to all the participants during valedictory function.

Mongolian Delegation visits NISCAIR (TKDL)



Shri V.K. Gupta, Director, NISCAIR explaining the TKDL project to Ms Odgerel Erdembileg of the Intellectual Property Office of Mongolia and Mr Gankhuyag Damdinsuren, Programme Officer, TKDL Task Force, during their visit to NISCAIR

MR Chinbat Namjil, Director General, Intellectual Property Office, the implementing agency of the Government of Mongolia appreciated the legal and technological framework of the Indian Traditional Knowledge Digital Library (TKDL) and found that these could be highly effective and valuable in Mongolian context also. The Mongolian delegation visited National Institute of Science Communication And Information Resources (NISCAIR), New Delhi, with the aim of understanding the technical implementation and mechanism, as well as exploring the possibilities and modalities for collaboration for establishing TKDL for the protection of Mongolia's Traditional Knowledge. Ms Odgerel Erdembileg of the Intellectual Property Office of Mongolia and Mr Gankhuyag Damdinsuren, Programme Officer, TKDL Task Force, both from Ulaanbaatar visited NISCAIR.

The Mongolian delegation came on a four-day visit. Keeping in view the aim and objectives of the visit, a detailed programme comprising presentations and discussion sessions was prepared at NISCAIR.

The outcome of the presentations and discussions particularly on the protection of Traditional Knowledge and on the creation of TKDL with reference to Mongolia led to the emergence of the following points.

- Protection of TK could be by defensive as well as positive protection, and for defensive protection a non-disclosure agreement is necessary before providing the database to international patent offices. It was also felt that without the non-disclosure agreement, the knowledge could again be easily misappropriated as the knowledge is being made available in multiple international languages.
- It was unanimously felt that the quantum of work and the further requirements for initiation of the project need to be worked at first instance for creation of TKDL for Mongolia so that the cost of the project, time line, major milestones could be assessed.
- The delegates felt that TKDL was required for Mongolia which could be developed for the codified traditional knowledge of Mongolia. It was desired that the Indian delegation comprising Shri V.K. Gupta, Director, NISCAIR, and other experts may visit Mongolia and get acquainted with the technical facilities available in Mongolia for creation of TKDL. The role of NISCAIR regarding technological assistance, cooperation

and mechanism of funding for the project, may also be discussed during the visit. For financial support, options for international funding may be looked into, for example, from agencies such as UNDP, World Bank, Global Environment & Technology Foundation, National Development Cooperation Programme, IDRC (International Development Research Centre), etc.

- It was suggested that it could be checked with Department of Science & Technology, India, if there is any bilateral agreement for technical cooperation between Government of Mongolia and Government of India. If it exists, further collaboration through that agreement could be done, otherwise, a request to Department of Science & Technology, India, could be made through Department of Science & Technology, Mongolia with a reference of the TKDL project at NISCAIR.
- It was felt that WIPO should also be brought on board, to facilitate the project initiation and implementation, and there could be no better place than NISCAIR in terms of contribution towards the technical aspect of the project.

Honours & Awards

Dr Sukumar Devotta, awarded Golden Jubilee Visiting Fellowship

DR Sukumar Devotta, Director, NEERI has been awarded Golden Jubilee Visiting fellowship for the year 2005-2006 by the University Institute of Chemical Technology (UIC), Mumbai, to interact with the faculty and students of the UIC.

Dr Asha A. Juwarkar bags Pitambar Pant National Environmental Fellowship Award

DR Asha A. Juwarkar, Deputy Director, Environmental Biotechnology Division, bagged the prestigious Pitambar Pant National Environmental Fellowship Award for 2003, of the Ministry of Environment and Forests (MoEF), Government of India. The award is in recognition of her contribution to the field of the Environmental Biotechnology and for undertaking research on 'Phytoremediation and Bioutilization of Industrial Wastes'.

Honours & Awards

NEERI-GVAK Research Paper bags First Prize in Biotech Cancer

A research paper jointly submitted by the National Environmental Engineering Research Institute (NEERI), Nagpur and Go-Vigyan Anusandhan Kendra, on the effectiveness of Gomutra in cancer treatment bagged first prize in Biotech Cancer, an event organized by Hisslap College of Biotechnology. The paper discusses in detail how 'Gomutra' (cow-urine) acts as a catalyst in triggering destruction of the cancerous cells through 'Apoptosis'. A patent application has been filed for international patent for the treatment method.

Shri Aravindhan receives ISCA Young Scientist Award-2006 for Environmental Sciences

SHRI Aravindhan, SRF at the Central Leather Research Institute (CLRI), Chennai, has been awarded the Indian Science Congress Association Young Scientist Award 2006 for his outstanding contributions to the area of Environmental Sciences, at the 93rd Indian Science Congress held at Hyderabad. His Excellency Dr A.P.J. Abdul Kalam, President of India, gave away the award. Shri Aravindhan, M.Tech in Leather Technology, is presently working towards his Ph.D, which deals with removal of dyes and chromium from tannery wastewater using low cost absorbents. This award has been presented to him for his excellent work on successful removal of dyes from wastewater using a novel zeolite based catalyst. The award carries a citation and a cash prize of Rs 25,000. He is actively pursuing research on pollution reduction emanating from leather sector. Shri Aravindhan is a recipient of Ganesan Endowment Gold Medal (Anna University) and B. M. Das Memorial Gold Medal (Indian Leather Technologists' Association) for securing 1st Rank in M. Tech. He has 10 papers in international journals of repute and has presented many papers in conferences.

Dr (Smt.) Kaiser Jamil elected President of TWOWS

DR (Smt.) Kaiser Jamil, Emeritus Scientist and Head, Genetics Department, Bhagavan Mahavir Medical Research Centre, Hyderabad, has been elected as President of Third World Organization for Women in Science, Italy. She has also been given the additional responsibility of Heading the Research Division of Indo-American Cancer Hospital and Research Centre. A recipient of many awards, Dr Jamil was formerly an active scientist at the Indian Institute of Chemical Technology (IICT), Hyderabad.

Printed and Published by V.K. Gupta on behalf of National Institute of Science Communication and Information Resources (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; Ashwani Kr. Brahma

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. 200 Single Copy: Rs. 10.00

Subscription Complaint No 25843359

RN 4512/57