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Team CSIR

28th General Assembly of International Union of Radio Science First Time in India

THE National Physical Laboratory (NPL), New Delhi, organized the 28th General Assembly of International Union of Radio Science (URSI). National Organization Committee under chairmanship of Dr A.P. Mitra and Local Organizing Committee with Dr Vikram Kumar, Director, NPL as Chairman, and Dr P. Banerjee of NPL as Convenor, were responsible for the organization of this general assembly.





Seen during the 28th General Assembly of International Union of Radio Science (URSI) (from left) are: Prof. Govind Swarup, Co Chairman, NOC, URSI, GA; Prof. Paul Lagasse, Secretary General, URSI; Dr R.A. Mashelkar, Director General, CSIR; Shri Kapil Sibal, Minister of S&T and Ocean Development; Dr A.P.J. Abdul Kalam, President of India; Prof Kristian Schlegel, President, URSI; Dr A.P. Mitra, Chairman NOC; Dr Vikram Kumar, Director, NPL; and Dr P. Banerjee, Convenor, URSI

So far all General Assemblies (i.e. since 1922) were held mostly in developed countries except once in 1975 in Peru. It was held in Asia only in Japan and Israel. The General Assembly of URSI was, held for the first time in India.

The International Union of Radio Science (URSI) is one of the international Scientific Unions, which adhere to the International Council for Science (ICSU). The objective of URSI is to simulate and to co-ordinate, an international basis, studies, research, application, scientific exchanges and communication in the field of radio science.

The members of the union are committees formed by Academies of science or equivalent, which adhere to the union like

Indian National Science Academy (INSA), in India. There are 44 member countries, including India in URSI.

There are ten scientific commission like (Com. A, B, C, D, E, F, G, H, J & K) each dealing with a particular aspect of radio science which is reviewed from time to time. General Assemblies of URSI are held at interval of three years. The main objective of the Assembly is to review current trends in research, present new discoveries and make plans for future research work or for specific projects, especially where it seems desirable to arrange for cooperation on an international scale.

Most of technical sessions, board and council meetings etc. were held at Vigyan Bhawan

Complex of New Delhi. However, opening ceremony was held at Siri Fort Auditorium, New Delhi, in which the General Assembly was formally inaugurated by Dr A.P.J. Abdul Kalam, President of India.

Dr A.P. Mitra in his welcome address dedicated this General Assembly to Sir J.C. Bose, pioneer in Radio Science. Shri Kapil Sibal, Vice President CSIR and Minister of Science & Technology and Ocean Development and Dr R.A. Mashelkar, Director General, CSIR and President INSA also graced the occasion of the opening ceremony.

Shri Kapil Sibal said that the General Assembly has been a forefront of the creation of knowledge in Radio Science for benefit of humanity. Holding the

Dr R. A. Mashelkar receives TWAS Medal Lecture Award

Dr R. A. Mashelkar, Director General, CSIR, received the prestigious TWAS Medal Lecture Award instituted by the Academy of Sciences for the Developing World at the hands of His Excellency, the President of the Arab Republic of Egypt Mr Hosni Mubarak, on 30th November 2005 in Alexandria, Egypt.



The other award medal lecture winners were Nobel Laureate Prof. Ahmed Zewail of USA and Prof. Del Pino Veintimillia of Equador.

Dr Mashelkar received this award for his pioneering

basic research in polymer science. He delivered a scientific lecture entitled 'On putting life into gels' on 2nd December 2005 at the annual gathering of the Fellows of TWAS. He described the breakthroughs on switching

biomimetic hydrogels, metal ion initiated healing and macroscopic self organization in gels that his research group in polymer science and engineering made during 2000-2005 in National Chemical Laboratory, Pune.

General Assembly of URSI in India is timely and appropriate as India is playing a role of global commitment in remote sensing in line with the objective of URSI. He appreciated the role of Indian Scientists in radio science through the efforts of Sir J.C. Bose in 1895, Prof. S.K. Mitra, Megnath Saha, Vikram Sarabhai, Dr A.P. Mitra and Prof. Govind Swarup and so on.

President of India in his inaugural speech emphasized the need of the study of electromagnetic phenomena for the prediction of earthquakes. He mentioned the importance of the role of HAM and communication networking during Post earthquake recovery & during Tsunami. He proposed the following seven missions for radio scientists:

1. Radio communication and networking for common man;

2. Radio communication in education;
3. Need to study the relation between earthquakes and electro magnetic waves activity;
4. India is in process of setting up three scientific centres. URSI can evolve curriculum for study and research in electro-magnetic spectrum for use;

5. Solution to provide high BW through wireless in mobile environment;
6. Need for optimum and bandwidth efficient communication; and
7. Solar power satellite.

In closing remarks, Dr Mashelkar referred to the glorious past of Indian Radio Scientists and expressed his confidence for their great future. He mentioned about great contribution of Dr A.P. Mitra and Prof. Swarup who were present on dais. He emphasized the message given by President of India prior to his talk.

After inauguration, five scientists received the URSI awards. Balthasar Van der Pol Gold Medal was awarded to Dr Ismo V.I. Lindell (Finland), John Howard Dellinger Gold Medal to Dr J. Bach Andersen (Denmark), Booker Gold medal to Dr Y.Rahmat-Samii (USA), Issac Koga Gold Medal to Dr S.Hagness (USA) and Appleton Prize was awarded to Dr Didier Massonnet (France).

A total of about 1200 participants attended the assembly. Eight hundred scientists from 50 countries including experts from all developed countries took part in this

general assembly. A total of 1590 papers were presented, distributed over ten technical sessions. Eight hundred and ten papers were presented orally and the rest were presented through posters. Around 400 Indian Scientists could attend the General Assembly of URSI, many of them for the first time. From NPL as many as 80 papers were presented. CDs of the proceedings of URSIGA 2005 were brought out (with ISBN No. 81-7764-928-0) and

sensing, ionospheric studies, radio astronomy earthquake precursors and other aspects of radio science. Two workshops prior to the start of the General Assembly were arranged at Vigyan Bhawan. One was on 'J.C. Bose and to-day' under chairmanship of Dr A.P. Mitra and Prof. M. Siddiqi. The aim of this workshop was to review the contribution of Sir J.C. Bose in Radio Science and its impact on present day status of Inter-national

Recognition of Indian Scientists

As usual, in URSI General Assembly, vice chairs, – one for each of ten commissions, have been elected by international voting of 44 member countries. After a long gap of roughly two decades, Indian scientists - Dr P. Banerjee of NPL and Prof. S. Ananthkrishnan of NCRA, Pune, have been elected vice chairs of commission A (i.e. for electromagnetic metrology) and of Commission J (i.e. for Radio Astronomy) respectively. These vice chairs will automatically be elevated to chairs after three years at the next 29th General Assembly at Chicago, USA. Dr A.P. Mitra, Prof. Govind Swarup, Prof. V. Radhakrishnan and Dr B.M. Reddy were other Indian Scientists who had earlier been involved formally with official activities of the URSI. Dr A.P. Mitra is only Indian scientist who had been the president of URSI during 1984-87 and he is currently the Honorary President of URSI. Dr M.K. Goel of NPL has also been chosen to be the Scientific Programme Coordinator for 29th URSI General Assembly.

Radio Science. Second parallel workshop was on "Rural Radio Communications for Developing Countries". It was convened by Prof. A. Jhunjhunwala of IIT, Chennai and Dr Sandro M. Radicella of ICTP, Italy. This workshop was partially funded by ICTP to encourage participation from developing countries. Both the workshops were very timely and very interactive.

distributed to all participants during the general assembly.

This general assembly emphasized on the topics like Solar Power Satellites, mobile communications, diagnostic, curative and ill effects of electromagnetic waves on human biology in addition to remote

The technical exhibition was one of the important aspects of the General Assembly. The work of Sir J.C. Bose as designed and prepared by Bose Institute, Kolkata, was the main attraction of the exhibition.

The technical sessions included few tutorial lectures on

emerging topics for each commission by the respective eminent experts. In addition, there were two public lectures – one delivered by Dr A.P.J. Abdul Kalam, President of India, on 'Electronic connectivity of billion people' and second was delivered by Prof. V. Radhakrishnan, former Director of Raman Research Institute, Bangalore, on '100 years of Radio Science in India'.

One hundred and forty four young scientists from different parts of world (including 30 from India) were awarded Young Scientists Award. These young scientists were felicitated by President of India himself at the Rashtrapati Bhawan. Shri Kapil Sibal also hosted a party in honour of these young scientists at Park Hotel. Each young scientist was given a certificate and a tie/scarf with URSI logo printed on it.

Taking advantage of the presence of many NRI radio scientists attending the General Assembly, an 'India-NRI Radio Scientists Meet' was organized at NPL under the chairmanship of Dr A.P. Mitra to explore the possible collaborations and interactions between Indian Scientists and NRI's in some specific emerging areas. The NRI were very enthusiastic and felt it to be a good beginning to strengthen these interactions. It was suggested that a directory of Indian-NRI radio scientists with relevant information which would soon be available on 'ursiga2005.org' website, might be important to give a momentum to this move as a first step.

The general assembly was generously funded by Council of Scientific & Industrial Research, Department of Science & Technology and Defence Research and Development Organization. The financial assistance from Indian Space Research Organization, Department of Ocean Development was of great help. Sponsorships from Academy of Technology, Hoogly and from M/S KVARZ, Moscow, Russia and Indian National Science Academy were very useful.

NCL signs MoU with GIST, South Korea



Prof. J. S. Lee, Department of Materials Science & Engineering, GIST and Dr S. Sivaram, Director, NCL, exchanging the MoU documents. Also seen are: Dr D. Baskaran, Scientist, Polymer Science & Engineering Division, NCL and Prof. Shashadhar Samal, GIST

THE National Chemical Laboratory (NCL), Pune, has recently signed an MoU with Gwangju Institute of Science and Technology (GIST), Republic of Korea. The MoU is valid for a period of five years.

GIST, founded in 1993, is a research oriented graduate school that focuses on the essential fields of applied science and engineering. It offers Master and Doctorate degrees in integrative sciences, such as, information & communications, materials science & engineering, mechatronics, environmental science & engineering and life sciences.

The objective of the MoU is to strengthen the scientific and technical cooperation between NCL and GIST. The scope of the cooperation involves to exchange academic staff, graduate students, researchers, and pertinent publications between the two institutions.

The proposed area of cooperation will include functional organic materials, photonic polymers and hybrid materials.

NCL signs MoU with NTPC

THE National Chemical Laboratory (NCL), Pune, signed a Memorandum of Understanding (MoU) with National Thermal Power Corporation Ltd (NTPC) recently. NCL has expertise in the area of chemical engineering, catalysis, membrane science, polymer science & engineering and computational fluid dynamics.



Dr S. Sivaram and Dr R.R. Sonde exchanging the MoU documents

NTPC is a leading public sector enterprise involved in the area of power generation and distribution with expertise in areas such as setting up of thermal power stations, operations and maintenance of power stations and distribution of power. NTPC through this MoU intends to conduct research, carry out experiments and build software base leading to development of technologies in areas such as i) development of SO_3 reactor and associated components for SO_3 -FGC, ii) development of artificial intelligence based modeling & optimization system for SGTG cycle, iii) CFD modeling of coal fired boiler, and iv) CO_2 separation using membrane contactors based on ionic liquids.

The NTPC team comprising Shri Bhanu Prakash, Shri Shaswattam, Shri Chandok and Shri Pankaj Gupta was lead by Dr R. R. Sonde, Executive Director, Energy Technologies. The NCL team comprised of Dr S. Sivaram, Director, Dr B. D. Kulkarni, Head, Chemical Engineering & Process Development Division, Dr V. V. Ranade, Dr Sanjeev

Tambe, Shri Prashant Barve, besides Shri Venugopal, Head, Business Development Division. Speaking on the occasion, Dr Sivaram said, "Though NCL has a distinguished record of working with many multinational and national companies, it was our long desire to work with some of India's leading public sector companies and NTPC is one of them."

Dr Sivaram further added that energy technology has been identified at NCL as one of the strategic areas of research of great interest to the country. NCL is building a core group of scientists and projects in this area where its strengths in materials, catalysis, polymer science and chemical engineering will be leveraged to develop innovative solutions for nations energy needs. NCL is, therefore, pleased to establish this relationship with one of the leading energy companies of India. Dr Sonde, in his remarks hoped that this collaboration will benefit from NCL's expertise. "We are proud to be associated with a laboratory like NCL," he added further.

NIO signs MoU with Pacham Aquaculture Farms Limited

THE National Institute of Oceanography (NIO), Goa, has signed a Memorandum of Understanding with Pacham Aquaculture Farms Limited (PANCHAM), Mumbai on 11 November 2005 for development of technologies and products for sustainable coastal aquaculture and their health management. This MoU will enable PANCHAM to identify issues affecting sustainability in coastal aquaculture and NIO with its vast experience in aquatic resource assessment and environmental management will provide scientific, technical and aquatic health solutions to the sustainable coastal aquaculture and disease management.

PANCHAM is one of the largest aquaculture farming joint sector company under the

government of Maharashtra. The present MoU would provide an opportunity for NIO to work with stake-holders in this area.

Dr Satish R. Shetye, Director, NIO, signed the agreement on behalf of the institute and its parental body Council of Scientific and Industrial Research (CSIR), New Delhi. Shri Ajit Sinha Patil, Chief Technical Officer, PANCHAM, Mumbai, signed on behalf of the company. Both NIO and PANCHAM will collaborate in the areas of research programme, seminars/workshops, skill enhancement training programmes, exchange of samples, and know-how from both ends.



Dr Satish R. Shetye, Director, NIO, and Shri Ajit Sinha Patil, Chief Technical Officer, PANCHAM, Mumbai, after exchanging the MoU documents

IHBT releases Cultivars of Medicinal Crops

THE Institute of Himalayan Bioresource Technology (IHBT), Palampur, has developed one composite cultivar of *Valeriana jatamansi* 'Himbala' suitable for cultivation in western Himalaya at locations situated above 1300 m altitude and one cultivar of *Hedychium spicatum* 'Himkachari' suitable for locations situated around and above 1300 m altitude.

Valeriana jatamansi, commonly known as Muskbala and Indian valerian, is a medicinal herb distributed in temperate Himalayas between 1500-3500 m



Valeriana jatamansi

altitude in Himachal Pradesh, Uttar Pradesh, Jammu & Kashmir and north east hill states. Roots of *V. jatamansi* are in demand by pharmaceutical industry for its essential oil and valepotriates. It is used as tranquilizer and stimulant. It is also used in epilepsy. Its cultivar Himbala is propagated by seeds.

The seeds are sown in March-April. The seedlings take about 4-5 months to be hardened. The suitable time for planting Himbala is July to September. The crop requires about 45 t/ha of farm-yard manure. It prefers well-drained soil conditions.

Water requirement is critical at nursery stage and after transplanting in main field. The crop is harvested after two years of growth in field. The average yield of dry roots of Himbala is 1 t/ha at 2 years after planting. Roots contain about 4% valepotriates (dry matter basis) and 0.4% essential oil in fresh roots.

Hedychium spicatum, commonly known as Kapur-Kachari and Spiked ginger lily, is distributed in sub-tropical Himalaya in the state of Assam, Arunachal Pradesh, Himachal Pradesh and Uttaranchal at an altitude of 1000-2500 m. Its



Hedychium spicatum

rhizome is used for treatment of asthma and internal injury. Powder of rhizome is used as an antiseptic agent and as poultice for various aches and pains. The paste of rhizome is given orally to the cattle and domestic animals in case of stomach disorder.

The cultivar Himkachari is propagated by rhizomes. The suitable time for planting Himkachari is December and January. The crop requires about 30 t/ha of organic manure. The crop is harvested after two years of growth in field. The average yield of fresh rhizomes is 12 t/ha at two years after planting. Rhizomes contain 0.75% essential oil on dry weight basis.

National Environmental Engineering Research Institute R & D Highlights: 2004-2005

THE National Environmental Engineering Research Institute (NEERI), Nagpur, dedicates itself to the service of humankind by providing innovative and effective solutions to various environmental and natural resource problems through an effective R&D programme in Environmental Science & Technology. A noteworthy achievement during the year is that NEERI acquired ISO 9001:2000 certification in January 2005.

According to the Annual Report of NEERI for 2004-2005, the Institute, in line with the vision, mission and policy of CSIR, delineated thrust areas for R&D comprising Environmental Monitoring; Environmental Biotechnology and Genomics; Hazardous Waste Management; Environmental Systems, Design Modeling and Optimization; Environmental Impact and Risk Assessment; and Environmental Policy Analysis, and conducted a large number of studies during 2004-2005.

Performance Indicators Patents

A total of 15 patents disclosures were made and two national patents were filed.

MoU/Agreements and Technology Transfers

Three memorandum of understanding signed with IOC, Mathura; Delhi Jal Board (DJB), Delhi; and Hindustan Lever Research Centre (HLRC) were renewed during the period while two MoUs between NEERI and All India Institute of Local Self Government, 2005 and CPCB, New Delhi were also signed during the period.

Agreement for Performance of Work (APW) was signed between NEERI and WHO, India, New Delhi for Development of a Directory of Drinking Water Quality Laboratories in the country – Phase I and Phase II; and for conducting workshop on water quality standards in India. NEERI also signed agreements with IOCL; Nagarjuna Fertilizers Co. Ltd, and Maharashtra State Pollution Control Board (MPCB).

On the technology transfer scenario, the institute transferred the technology for stabilization, solidification and containment of heavy metal bearing hazardous wastes to M/s Zuari Industries Ltd (ZIL), Goa, for treatment and disposal of arsenic and chromium bearing

wastes. The technology developed for bioremediation of silt affected agricultural land have been successfully transferred to field at Bicholim, Goa.

Human Resource Development-

The institute continued its efforts towards human resource development in the area of environmental sciences. Ten Ph.Ds were awarded to NEERI scientists and scholars. Institute organized 10 training programmes/conferences/workshops.

Publications – NEERI scientists published 80 research papers in national and international journals, of which 35 were in SCI journals with a cumulative impact factor of 35.55. NEERI scientists have contributed chapters in four books. In addition 42 research papers have been presented in international conferences while 18 papers were presented in national conferences. Twenty five scientists delivered lectures on different forums.

Honours & Awards – The institute received acclaims for its demonstrated unparalleled scientific excellence. Dr S. Devotta, Director, received ICICI Technology Award of the year 2004. He was also elected Fellow of Maharashtra Academy of Sciences, Institution of Engineers and Indian Institute of Chemical Engineers. Dr D.M. Dharmadhikari elected Fellow of Maharashtra Academy of Sciences. Dr P. Newa became the Vice-Chairman of Nagpur Regional Centre of Institute of Public Health Engineers (India) Kolkata; Dr

Animesh Kumar recognized as Ph.D. Supervisor by Nagpur University in environmental science. Dr C.V. Chalapati Rao was elected Member, Board of Courses and Studies by the Centre of Mining Environment, Indian School of Mines, Dhanbad. Dr V.P. Deshpande was not only honoured with the Award of Fellowship of the Academy of Environmental Biology (AEB), Lucknow, but also elected Member, Board of Studies in Civil Engineering under Faculty of Engineering & Technology by Pune University, Pune, and Amravati University, Amravati. Dr Sunil Kumar was nominated as a referee in the Journal of Environmental Studies, UK. Dr Nitin Labhsetwar has been bestowed with Best Research Paper Award by CSMCRI, Bhavnagar, while Pitambar Pant National Environment Fellowship Award for the year 2003 was given to Dr (Smt.) Asha A. Jawarkar by Ministry of Environment and Forests, Government of India.

Highlights of the R&D activities

Environmental Monitoring

In the area of air environment, under National Ambient Air Quality Monitoring (NAAQM) programme, NEERI maintained and updated the national database on air quality of ten major Indian urban cities for the last two decades. The trend analysis shows that although there was an overall decreasing trend in concentration of PM levels, it

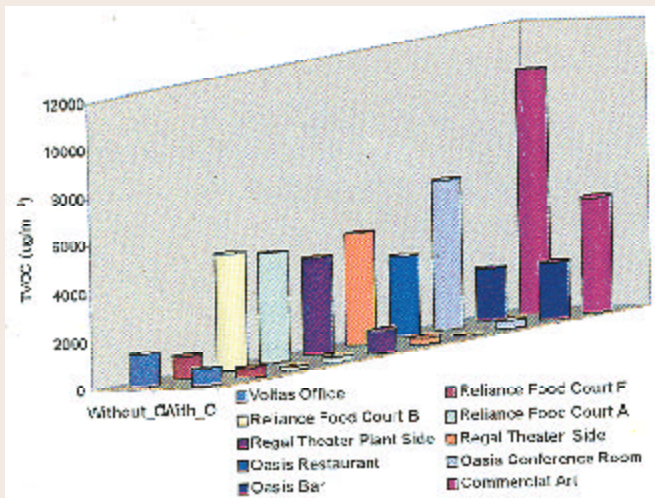
exceeded CPCB standards in all cities, most of the time throughout the year. The PM fraction in SPM varies between 30 and 60 percent and coastal cities recorded the highest values.

The institute developed an inventory of evaporative emissions of hydrocarbons (methane and VOCs) from various sources in Delhi, Kolkata, Mumbai and Chennai based on secondary data, to assess the portion of evaporative emissions of total ambient hydrocarbons and to design suitable control measures. Similar studies are in progress at Thane-Belapur Industrial area. Assessment studies on releases of fugitive benzene, VOCs and total hydrocarbons from stack monitoring at IOCL Refinery, Deigboi were completed.

As a part of the evaluation of performance of engineered ozone system at Voltas, VOCs and ozone levels in the indoor air was monitored. It was found that controlled ozonization removes total VOCs to levels specified by OSHA, EPA, and NHMRC (Australia) and the residual level of ozone was found to be between 6 to 8 ppb, which is well below the maximum TLV level of 50 ppb, specified by EPA.

In a study on air quality trends and health impacts in Mumbai, the impacts and possible implications of the Air Act, 1981, together with the interventions based on air quality and health information were analysed using the BENMAP simulation model.

With a view to assess the contribution of vehicular emissions to total air emissions, ambient air quality monitoring and emission



TVOC levels with and without ozonization at different locations

source apportionment studies for Delhi are in progress. This project is being carried out, as per the recommendation of Mashelkar Committee on Auto Fuel Policy, sponsored by all major oil companies and is coordinated by IOC R&D, Faridabad. Ten representative sampling stations have been selected in Delhi. Six locations are road/kerbside and the remaining four residential, industrial, reference (with minimal activity) and sensitive areas. The pollutants monitored include basic criteria pollutants along with additional parameters viz PM, benzene, alkynes, 1-3 butadiene, aldehydes and methane & non-methane hydrocarbons. Similar studies will be undertaken for Mumbai and Chennai soon.

Air quality modelling using Artificial Neural Networks (ANN) is in progress to obtain alerts on air quality levels exceeding prescribed limits or standards. Based on ambient air quality survey, an air quality management plan was

suggested to the Visakha-patnam Bowl Area. In the area of water environment studies on development of technologies involving rain water harvesting and environmental protection of the streams for safe drinking water supply and

sanitation for sustainable water resource management in Himalayan villages are in progress for the Rajiv Gandhi Drinking Water Mission. Quality assurance (QA) and quality control (QC) data have been established for analyzing the trace quantities of most commonly encountered pesticides, including, organo-chlorine and organo-phosphorous group of pesticides, lindane, endosulfan I, endosulphan II, p.p'-DDT, p.p'-DDE, p.p'-DDD, chlorpyrifos, methylparathion and malathion.

Under a study on surveillance of drinking water quality, water quality assessment of 134 water samples from 5 slums of Chennai, together with epidemiological data were analyzed for the identification of the viral and pathogenic protozoans.

For a study on environmental contamination due to polychlorinated dioxins (TCDDs), 55 samples collected from pulp and paper mill, plastic industry, chloro-organics, incinerators, brick kilns, crematoria were analysed. Residue of 2,3,7,8-TCDD was found in effluents of paper mill, chlor-organic industries, and fly ash of hospital waste incinerators. The concentration was the highest (0.27 ngl) in fly ash sample, compared to 0.12 ngl found in the effluents from paper mill and chlor-organic industries.

Based on PCR and gene probe studies for concentration and detection of human enteric viruses in marine environment and seafood, a few samples of seafood, water and sediments from Ennore estuary, Pulicat lake and Kovalam creek in Tamil Nadu were analysed for the presence of viruses, viz. Polio, Rota, HEV, and HAV.

In the area of land environment and ecology, an extensive assessment of the status of brick kiln industry in Assam, Maharashtra, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh and



Sludge sample collection from paper mill

West Bengal for soil and nutrient losses due to brick making was made for MOEF; the status of fly ash utilization in this industry was also studied.

Other studies ongoing in this area include ecotechnological and limnological studies for rejuvenation of Futala Lake in Nagpur and impact assessment of silt disposal on water quality and aquatic life of Sutlej and Beas rivers.

Environmental Biotechnology

R&D studies on environmental biotechnology have led to the development of a microbial consortium to degrade persistent synthetic chlorinated cyclodiene and endosulfan. The degradation studies are in progress.

A microbial study employing *Bacillus pantothenicus* to sequester CO₂ at 1% and 5% levels identified an enzyme, zinc containing carbonic anhydrase (CA), which is inhibited by diamox. An increase in CA activity led to an increase in alkalinity, resulting in the conversion of CO₂ to bicarbonate/carbonate.

A three stage chemo-biochemical process for the treatment of industrial emissions containing sulphur dioxide and oxides of nitrogen was developed. This includes a caustic scrubber for the removal of SO₂, an up-flow anaerobic packed-bed bioreactor seeded with mixed cultures of *Desulfotomaculum acetooxidans* and

Desulfovibrio desulfuricans, and a NO scrubber. Lab scale studies so far achieved reduction efficiency of 87% and 99% for sulphate and NO respectively.

Under a DBT funded project, a pilot plant with a capacity of 100 Nm³/hr was designed, fabricated and commissioned at M/s Jubilant Organosys Limited, Bharatiyagram, U.P. for the demonstration of deodorization of industrial emissions containing pyridine.

Studies are in progress using a biofilter for deodorization of waste gases containing monochlorobenzene and 1,2-dichlorobenzene.

A simple and reproducible culture protocol was developed for the induction of somatic embryogenesis from callus cultures of sandalwood (*Santalum album*). A protocol is ready for large-scale production and multiplication of bamboo (*Dendrocalamus strictus*) for application in rapid re-forestation and green belt development programmes.

An ecotype of brake fern, *Pteris vittata*, having ability to hyperaccumulate arsenic was studied under in vitro culture medium. It

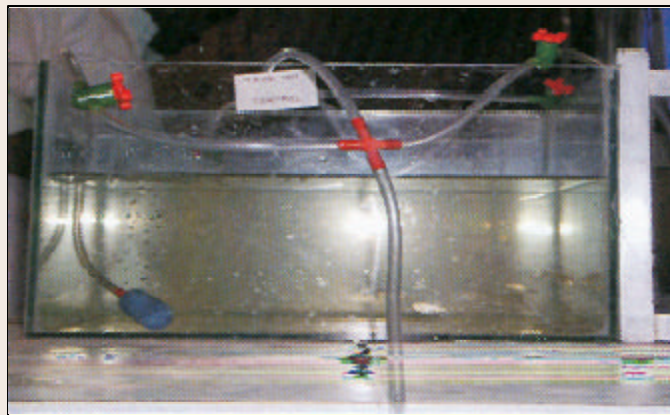
was observed that after 10 weeks of growth, the above ground plant biomass accumulated 1908-4700 mg of As per kg of dry biomass in soil having arsenic concentrations between 100 and 1000 mg As per kg of soil.

Bioassay based toxicity studies were carried out to determine LC₅₀ of marine and estuarine species, such as, *Mugil persia*, *Tilapia mossambica* and the mud skipper *Boleophthalmus boddarti* sp. from oil based mud samples.

Based on extensive field studies on self-preservation capacity of River Bhagirathi, upstream of Tehri dam, the uniqueness of river Bhagirathi/Ganga could be attributed to the presence of predator coliphages in the river sediment, radioactivity of the sediment and release of bactericidal copper and chromium under static (benthic) conditions. Further, it was concluded that Tehri dam is not likely to affect the quality or self-preservation property of river Bhagirathi/Ganga.

Using flow cytometer, anti-genotoxic properties of extracts of natural products, such as, Tulsi, Ajowain and redistilled cow urine (RDCu) were tested on Jurkat (caner cell line) cell cultures. Similar studies for testing anti-carcinogenicity are under progress.

Under the CSIR Network programme on Toxicogenomics and Polymorphisms of Indian population exposed to industrial chemicals, a



Marine fish toxicology

study on manganese mine workers and PAH exposures in diesel garage workers revealed a four fold decrease in protein expression in the manganese exposed individuals and five fold increase in protein expression in the PAH exposed population.

Environmental Genomics

R&D studies on environmental genomics have led to the development of a culture bank of 1050 bacteria from isolates, which have been collected from various effluent treatment plants. The culture collection also includes a few bacteria, which are cultivable and still unidentified based on 16S rDNA sequence data. Of the total bacterial culture collection, 650 cultures were identified using partial 16S rDNA sequence data; the sequence data have been deposited in NCBLI, NLM, GenData Bank.

Total diversity was assessed using 16S rDNA clones derived from metagenome extracted from a selected niche. The bacterial population selected from such samples was discriminated for novel isolates via RAPD analysis. Total 16S rDNA libraries were subjected to Amplified Ribosomal DNA Restriction Analysis, where the clones were distinguished from each other using restriction digestion profile. Regular expressions for forty different microorganisms, present in effluent treatment plants, were generated to design genus specific probes for their rapid identification. In collaboration with NIO, Kochi Zonal Centre, novel bacteria with diverse catabolic capacity were

collected and isolated from brackish waters.

Software for BLAST was developed to generate random sequences, BLAST many sequences, find regular expressions and curate FASTA file in a single stride.

Environmental Materials

In the area of environmental materials biotechnological applications of novel hybrid zeolitic materials for in-situ remediation of heavy metal and oxy-anions contaminated soil through sequestration are attempted to conserve the ecosystem and biodiversity in the vicinity of thermal power plants and metallurgical industries.

Studies on environmental materials include immobilization of heavy metals on zeolites by ion-exchange, entrapment within the zeolite complex structure, regeneration of perovskite based catalytic materials for diesel particulate filter (DPF), development of functionalized zeolitic and mesoporous materials as molecular imprinting and biomimicking agents for applications in monitoring and control technologies, carbon dioxide capture and its valorization for the production of methanol to reduce anthropogenic carbon dioxide from



Bench scale unit for treatment of wastewater containing high organics

industries, and the development of catalytic materials for selective reduction of Nox by hydrocarbons for the control of Nox from stationary sources are in progress.

In the area of wastewater treatment, an integrated green chemistry based treatment system is being developed for high organic containing wastewaters from food and fruit processing units, dairy and dairy-based product units, sugar and integrated distillery Units. The study involves plant based natural coagulants, aerobic and anaerobic treatment, recovery of organic acids using green solvents and green processes, and value addition to the recovered organics.

A biotechnological process has been developed for the treatment of wastewater generated from textile and desiccated coconut industries. It has been found to be possible to achieve an overall removal of COD and BOD at 95.6% and 97.35%, respectively in a combined anaerobic-aerobic system.

Extensive field investigations and assessment of the



Aerial view of pilot plant for bio-deodorization of industrial emission containing pyridine at M/s Jubilant Organosys Limited, Bharatiyagram, Jyotiba Fule Nagar, Uttar Pradesh

advanced treatment processes, employed in eleven textile industries in Hyderabad, enabled recycle and reuse of waste water with zero liquid effluent discharge.

Based on extensive lab scale treatability studies, two treatment options were recommended for the treatment of combined waste water generated from pyridine and 3-cyanopyridine plants at Jubilant Organosys Limited, Gajraula.

Based on laboratory studies using photocatalysis, formaldehyde from paint industry wastewater was converted to methanol with a reduction of formaldehyde to 80% in 4 hours of exposure.

technical services provided include designing of sullage/sewage treatment plant at Rashtrapati Bhavan, New Delhi, upgrade of effluent treatment facilities for Terephthalic Acid Plant at Haldia, study of the best use of water through recycle and reuse in an existing STP at National Stock Exchange Limited, Mumbai, and improving the quality of treated effluent from Jeedimetla CETP with recourse to short and long term measures.

The institute evaluated existing waste treatment systems of 157 small-scale industries located within 1 km from surface water bodies in various districts in Tamil Nadu.

A cost effective Phytoremediation Technology, a constructed wetland model was developed for industrial wastewater treatment. In the pilot scale system, the treatment efficiencies for BOD, COD, TSS, N, P and FC were in the ranges 80 - 90%, 70 - 85%, 75 - 95%, 60 - 80%, 50-70% and 90 - 99%, respectively.

Various

Environmental System Design and Modelling

In the area of environmental system design and modelling, an innovative process for the treatment of toxic emissions, using a flue gas treatability (FGT) system, was designed and constructed at the institute for small-medium scale industrial emissions; an appropriate waste management system was developed for handmade paper industries.

A GIS based modelling tool was developed for site and structure selection for artificial groundwater recharge. All information layers were integrated through GIS analysis and the criteria for groundwater prospective recharge zones mapping were computed based on geology, geomorphology, soils, slope, water table and groundwater quality of the watershed, through weighted index overlay analysis (WIOA).

For the development of high efficiency biogas plant, extensive laboratory studies were carried out for modification of design and feedstock amendment.

Solid Waste Management

In the area of municipal solid and hazardous waste management, the status of municipal SWM in metro cities state capitals, Class-I cities and Class-II towns was assessed, for CPCB, and a national database on selected 59 cities has been established. Based on the studies carried out in 42 cities so far, the waste generation rate has been

estimated to be in the range 0.12 to 0.60 kg/capita/day.

In a study on bimethanation of MSW with two phase approach, the input COD load to the methane reactor was varied between 10-18 g/l to obtain 75-85 per cent COD reduction with the biogas yield between 4-10 l/kg of volatile solids. The biogas comprises 45-50 per cent methane and 50-55 per cent carbon dioxide.

A methodology developed for monitoring landfill gas emissions from a landfill at Nagpur was validated at another landfill site at Amaravati.

A study on bioprocessing of municipal solid wastes by composting was undertaken to develop the design criteria and identify the process variables under Indian conditions. NEERI, in a pioneering endeavour, immobilized arsenic bearing hazardous waste at the Zuari Industries Ltd, Goa. ZIL was storing 50 metric tonnes of solid and 250 m³ of liquid wastes containing around nine per cent of arsenic since 1975. The stabilised and solidified hazardous waste was contained in a specially designed landfill.

A reinforced concrete cement containment tank (15 m x 15 m x 3 m), lined with high-density polyethylene (HDPE) liner was designed and constructed for containment of stabilized/solidified arsenic waste and the spent catalyst.

In a project under Pitambar Pant National Fellowship of MoEF, remediation strategies for POP contaminated soil/sediment/water

using microbial and chemical systems are being developed.

Other studies include a leachability study for the solid waste of Chemfab Alkalis Limited (CAL), Kalapet, Pondicherry and EIA studies for proposed hazardous waste disposal facility at the SIPCOT Industrial Estate, Gummidipoondi.

Environmental Impact and Risk Assessment

In the area of environmental impact and risk assessment, the institute completed the prestigious assignment of EIA and techno-economic feasibility of Sethusamudram Ship Channel Project. The project envisages a 300 m width, 12 m deep (10.7 m draught) ship navigation channel across Adam's Bridge and Palk Strait connecting Gulf of Mannar with Palk Bay and Bay of Bengal, saving about 254 to 425 nautical miles within Indian Territorial Waters. An alignment, more than 20 km away from the National Marine Park in the Gulf of Mannar and the wild life sanctuary in coastal area of Palk Strait, to minimise the impacts on the biological resources around the islands, has been proposed. In the proposed navigation channel, about 38 million m³ dredge spoil would be generated in Adam's Bridge area. The disposal of dredged spoil containing silt and sand will be used to reclaim land, subject to CRZ approval. The balance spoil will be discharged subsurface so that impacts on primary productivity will be minimized. Forty four million m³

dredged spoil from Palk Bay area will be disposed in the Bay of Bengal at a depth of more than 25 m.

The institute also completed environmental impact assessment studies for the power sector involving Oil & Gas Development in Transition Zone of CB/OS-2 Block at Hazira, Gujarat; proposed 1040 MW expansion of gas-based thermal power station at Uran; proposed 7480 MW natural gas based combined cycle power plant at Dehra Dun, Uttaranchal; proposed additional 3 & 4 Units in the nuclear power project at Kudankulam, T.N.; and Parbati hydroelectric power project (Stage III), Kullu, H.P.

Other significant environmental impact assessment studies completed during this year include capacity enhancement to 15 MMTPA Panipat Refinery Complex and Indalin Unit; HPCL Clean Fuels Project in Visakha Refinery, Visakhapatnam; mining operations in Bellary-Hospet Region, Kamataka; and impact of pesticides use under public health programme on environment and health.

Several environmental impact assessment studies were initiated for hydrocarbon exploration activities in offshore areas of eastern and western coasts of India, seismic survey in offshore area for identification of hydrocarbon reserves using several standard seismic techniques, and exploratory drilling in offshore areas.

Environment audit studies were also undertaken for Gujarat Electricity Board (GEB), Gandhinagar and various other industries in the State of Gujarat.

Shri Nikhilesh Jha, IAS, takes over as Joint Secretary DSIR and CSIR

SHRI Nikhilesh Jha, IAS, has taken over as Joint Secretary (JS), Department of Scientific & Industrial Research (DSIR), and Council of Scientific & Industrial Research (CSIR), w.e.f. 12 December 2005 (A.N.). Prior to his present assignment Shri Jha has held the following significant positions:



Institute of Public Administration, New Delhi (2000); Ms in Management from the Sloan School of Management, MIT, USA (1991), (World Bank Graduate Scholarship) and M.Phil. in Chemistry from University of Delhi (1981), (Junior Research Fellowship of CSIR).

Shri Jha has following publications to his credit:

Commissioner to Government of Manipur, Department of Rural Development & Panchayati Raj and State Council of Educational Research & Training (2004-2005); Co-ordinator, Centre for Public Policy & Governance (2001-2003); Deputy Secretary & Director in the Department of Administrative Reforms & Public Grievances, Ministry of Personnel, Public Grievance & Pensions (1995-2001).

As a member of the Indian Administrative Service allocated to the Manipur-Tripura Cadre, he was assigned different responsibilities in the State Government. Some of the important assignments held by him include the post of Secretary (Tourism), Government of Manipur, Secretary to Governor of Manipur, Secretary to Chief Minister, Manipur, District Magistrate, Senapati, and Director of Industries, Government of Manipur (1984-1995).

Shri Jha did his M.Phil. in Public Administration from Indian

- A March towards Effective and Responsive *Administration, Management in Government* (Vol. XXX, No. 2, July-Sept., 1998).
- Initiative of Government of India on Regulatory Reforms, *The Indian Journal of Public Administration* (Vol. XLV, No.2, April-June, 1999).
- Global Eco. System: Challenges for International Agreements/Laws, *Management in Government* (Vol. XXXII, No. 2, July-Sept., 2000)
- Need for a Viable Population Policy in India, *Management in Government* (Vol. XXXII, No.4, Jan.-Mar., 2001)
- Centrally Sponsored Schemes: What should we do to make them more effective? *Management in Government* (Vol. XXXIII, No. 3, Oct.-Dec., 2001).
- Rightsizing the Government: The Indian Experience, *Management in Government* (Vol. XXXIV, No. 1, April-June, 2002).

Dr Solimabi Wahidullah honoured with MAAS award

THE Muslim Association for the Advancement of Science (MAAS), has recognized the scientific work of Dr Solimabi and conferred on her the title, 'Muslim Woman Scientist' for the year 2003. Dr Solimabi, a senior scientist at the National Institute of Oceanography, Goa, since 1974, has been pursuing research on 'Chemistry of marine natural products specially the bioactive substances'. She has 62 research papers and 4 patents to her credit and has been acting as a recognized guide for Ph.D. students of the Goa University. An alumna of the Lyceum, Panaji during the pre-liberation times, she obtained her M.Sc. and Ph.D. degrees in Organic Chemistry from the University of Bombay. As a part of her professional activities she has visited and collaborated with research organizations in Italy & USA.

NOMINATIONS INVITED

Shanti Swarup Bhatnagar Prizes in Science and Technology for 2006

THE Council of Scientific and Industrial Research (CSIR) invites nominations for the Shanti Swarup Bhatnagar (SSB) Prizes in Science and Technology for the year 2006. 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 2006 SSB Prize should not be more than 45 years as on 31.12.2005.

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 plaque and a cash award of Rs 2,00,000 (Rupees two lakh only) for each scientist selected for the Award.

Nominations should be sent to Dr Rajesh Luthra, Head, Human Resource Development Group, CSIR Complex, Library Avenue, Pusa, New Delhi 110012 as per the prescribed pro-forma (25 copies) and one set of reprints of significant publications of the last 5 years' period on or before 31 March 2006. The details of the SSB Prize and the prescribed pro-forma for nomination can be obtained from the above address or can be downloaded from the website: <http://csirhrdg.res.in>

CSIR Young Scientist Awards for 2006

The Council of Scientific & Industrial Research (CSIR) invites nominations for the CSIR Young Scientist (YS) Awards for the year 2006. 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 post of Scientist in Group IV. The age of the nominee should not be more than 35 years as on 26 September 2005. Those who joined CSIR Laboratory after 26 September 2005 are not eligible.

The Young Scientist 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 Young Scientist Award carries with a citation, a plaque and a cash award of Rs 50,000 (Rupees fifty thousand only) for each scientist selected for the Award.

Nominations should be sent to Dr Rajesh Luthra, Head Human Resource Development (HRD) Group, CSIR Complex, Library Avenue, Pusa, New Delhi 110 012, 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 2006. The details of the Young Scientist Award and the prescribed pro-forma for nomination can be obtained from the above address or can be downloaded from our website: <http://csirhrdg.res.in>

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