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Progress, Promise and Prospects

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C O N T E N T S

Connect to Decode (C2D)



High Level Delegation from Oman visits CSIR



Foundation Day Lecture



Aerofest 2010



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CSIR Takes a Lead The Tick-Tock of TeleClock

Dr P. Cheena Chawla

The weary battery of your clock may halt the tick-tock temporarily but the fact remains that time never stops. As you place a new battery, the tick-tock is once again restored but you have to adjust the clock to the exact time. Now for adjusting your clock, you set the time according to clocks that are in function. But what is the surety that the time displayed by those clocks is accurate? This challenge of non-synchronicity of the clocks in use is most evident when you miss your train or flight by a few minutes or find your bank closed for the day, which may sometimes cost you quite heavily.

Well, you could just dial 174 and know the exact time of the day — the Indian Standard Time (IST) — precise to the second! Maintained by the Time and Frequency Standards Laboratory at the National Physical Laboratory (NPL), CSIR, the IST is followed by the Doordarshan and the All India Radio (AIR) for the announcement of accurate time, which most of us listen to for adjusting time in our hand watches and wall clocks. Another increasingly popular means of obtaining the time is through Global Positioning System (GPS) receivers.

Now comes the question of disseminating the IST across the nation. The most common method is to transmit the time signal via satellites or from a broadcast station. The classic example is the transmission of the Standard Time and Frequency Signal (STFS) via INSAT

by the NPL, CSIR. INSAT satellite based standard time and frequency broadcast service offers IST correct up to ± 10 microsecond on a continuous basis. However, there is still a considerable variance in the display of time by other customer service providers like the Indian Railways, Airlines, Banks and so on. For example, the times displayed by clocks on different platforms of a railway station are often quite different. This strongly necessitates the need for synchronizing the clocks for display in public places to one source clock. In the fast paced life of today, synchronization of time has surely assumed importance.

In a landmark achievement, CSIR has fulfilled the requirement of one and all for easy access of IST data for updating the local clocks. The wonder product is a 'Teleclock', which has been developed by a team of scientists led by Dr. P. Banerjee, Head of the Time and Frequency Section at NPL, CSIR, New Delhi. Dr. Banerjee conceived the idea of developing a Teleclock sometime in 1994-95. Today this innovative Teleclock Service is the first of its kind in India, which is a digital time data service, facilitated through the telephone network. Simply put, the Teleclock has a unique in-built system, which auto-dials the telephone number of the Teleclock Service at the user-defined time. It has its own

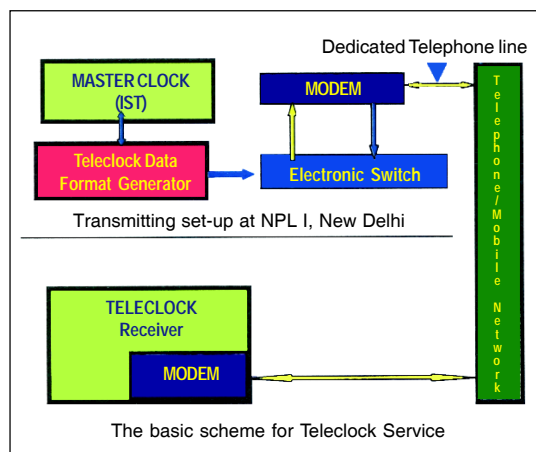


Mobile Teleclock

clock and a modem that facilitates the connection to the local telephone line.

NPL maintains the IST with the help of a bank of caesium atomic clocks, which are so accurate that it is only one second that they can lose or gain in a span of 30,000 years! “The primary standard of time the world over is Cesium atomic clock. Cesium is preferred because of its long-term, high order stability”, says Dr Banerjee. “These atomic clocks are synchronized with the worldwide system of clocks that support the Coordinated Universal Time, through GPS network,” he further adds.

As the NPL numbers are dialed by the Teleclock, the internal clock gets synchronized with the help of received



Atomic Clocks

All clocks basically keep track of the passage of time by counting the 'ticks' or oscillations of a 'resonator'. The oscillation in an ordinary clock is between the balance wheel and the hairspring, while the oscillation in an atomic clock is between the nucleus of an atom and the surrounding electrons. Similarly, in a pendulum clock the resonator is a pendulum, which swings back and forth.

The gears in the clock keep track of time by counting the resonations of the pendulum, which are usually at a frequency of one swing per second. A digital clock uses either the oscillations on the power line or the oscillations of a quartz crystal as the resonator, and counts them using digital counters. Needless to say, the accuracy of the clock is dependent on the accuracy of the resonator at the specified frequency.

Atomic clocks are the most accurate keepers of time. They are, however, not radioactive as they do not rely on atomic decay. They use the resonance frequencies of atoms as its resonator. Cesium-133 oscillates at 9,192,631,770 cycles per second. The oscillation frequencies within the atom are determined by the mass and the gravity and electrostatic 'spring' between the positive charge on the nucleus and the electron cloud surrounding it. Atoms of different elements have their characteristic oscillation frequencies.

The accuracy of an atomic clock

is completely different from the accuracy of a quartz clock. In a quartz clock, the quartz crystal is manufactured so that its oscillating frequency is close to some standard frequency, but every crystal may be slightly different, and temperature could change its frequency. Whereas a cesium atom always resonates at the same known frequency, which makes an atomic clock so precise.

There are different types of atomic clocks, which only differ with regard to the element used and the means of detecting the changes in the energy level. The various types of atomic clocks are: *Cesium atomic clocks* that employ a beam of cesium atoms; *Hydrogen atomic clocks* that use hydrogen atoms at the required energy level and *Rubidium atomic clocks* that use rubidium gas. The most accurate atomic clocks use the cesium atom (Cesium 133).

The genesis for developing an atomic clock took root in 1945, which was based on the technique called atomic beam magnetic resonance developed by Isidor Rabi, a physics Professor at the Columbia University. In 1949, the National Bureau of Standards (now the National Institute of Standards and Technology, NIST) announced the world's first atomic clock using the ammonia molecule. Later in

1952 it came up with the first atomic clock using cesium atoms as the source of vibrations. The National Physical Laboratory in England built the first cesium-beam clock in 1955 that was used as a calibration source.

The keeper of Indian Standard Time (IST), NPL, CSIR, New Delhi, has five such atomic clocks. A cesium atomic clock typically has a life span of less than a decade. They are electronic boxes with digital displays, stacked together in a sanitized chamber at an appropriate temperature and humidity. Atomic clocks make GPS navigation possible, and help synchronizing the Internet.



Bank of Cesium atomic clocks at NPL, New Delhi



Physics Package of Rb Atomic Clock Developed at NPL

In a milestone achievement, a Physics Package of Rb atomic clock has been successfully developed at National Physical Laboratory, New Delhi, under the Space Application Centre—National Physical Laboratory (SAC-NPL) MoU for joint collaborative project on the development of Rb Atomic clock for Indian Regional Navigation System (IRNS). As per NPL's specifications, the Rb isotopic cells and bulbs for the Physics Package were developed by Ruknar, Russia.

Dr G. M. Saxena, Leader of the project recently signed the memorandum for developing Rb bulbs and cells of high quality, which can stand vibration, shock, radiation and other stringent tests, making them worthy of use in high pressure and vacuum conditions. India may produce Rb atomic clocks in near future for various strategic applications. The technology of Physics Package of Rb atomic clock is confined to a few countries.

time data through the telephone line. After the time updation, the Teleclock automatically gets disengaged. An additional feature provided in the Teleclock Service is to set the Real Time Clock (RTC) of a computer. All that is required is that the computer should be connected to a telephone line through a standard modem. For this, the NPL scientists have developed the necessary software for the computer's RTC. This cost-effective way of disseminating universal standard time for all users in the country was launched in February 2000. Dr P. Banerjee has to his credit a US Patent (No. 6091804, dated July 18, 2000) entitled, '*Device Useful as Master/Slave Clock for Transmitting Standard Time Over a Telephone Network and a Telephone Network Incorporating the Device for Transmitting and Receiving Standard Time.*'

The Teleclock service through the landline network is, however, accessible to users having a landline telephone, which becomes a limiting factor for some key applications like police patrolling vans, remote locations where telephone lines are not available, and personal vehicles. The NPL scientists have met this challenge by adding a new

dimension to time dissemination by developing an improved version of the Teleclock.

In a significant advancement, Dr P. Banerjee's team has developed the Mobile Teleclock receiver that receives data through wireless mobile telephone network. The receiver has the provision of dialing the telephone number of the line dedicated for this service manually by pressing a switch or automatically at a pre programmed time. The Mobile Teleclock receiver was formally launched by Prof. Samir K. Brahmachari, Director General CSIR on 28 July 2009. This improved Teleclock receiver is an inexpensive and advanced solution to access Standard Time of any country without any separate landline telephone connection.

The basic requirement of the Teleclock receiver for mobile network is that it should have GSM SIM card with 'Data Communication Mode Enabled'. For this innovation, patents have been granted in India as well as in the United States Patent and Trademarks Office, besides five European countries namely, Germany, France, U.K., Italy and Sweden. A patent No.1390DEL2009 on, '*Improved Teleclock Receiver Utilizing Mobile*



Teleclock Transmitter



Launching of Mobile Teleclock by Prof. Samir K. Brahmachari, DG, CSIR, Dr. P. Banerjee (on Left)

Telephone Network' by P. Banerjee, P. P. Thorat and A. K. Suri was filed in 2009 in India, Japan, Korea and Europe.

NPL has also transferred this technology to M/s Excel Technologies, based in Noida, on a non-exclusive basis. The other manufacturers to whom this



technology has been transferred include M/s Bihar Communications Pvt. Ltd. in Patna and M/s Electronics Equipment Company based in Kolkata. The Mobile Teleclock is currently in use in the Parliament House, airports, railway platforms, Delhi police control rooms, besides the CSIR laboratories and some private organizations. But why this highly useful, scientifically developed product still not popular with the Indian masses? To this Dr Banerjee says, “Manufacturers in our country are not so aggressive. As there is low profit per

unit, bulk orders are few”. “The need is to give a more decorative look to the otherwise boxy appearance of the Mobile Teleclock receiver, so that people are interested to buy it. As the demand increases, manufacturers will have to produce more units and this will reduce the cost per unit”, Dr Banerjee explains. This service can be implemented in any country with very low investment. So far this service is operational in Saudi Arabia and Nepal, while the process of commissioning it in other SAARC countries is earnestly on.



Dr. Vikram Kumar (*on right*), the then Director, NPL, transferring the Mobile Teleclock Technology

Photo courtesy: Dr P. Banerjee, Time and Frequency Section, NPL, New Delhi

Connect to Decode (C2D) Open Source Drug Discovery (OSDD) — A Reality

For the first time, a comprehensive mapping of the *Mycobacterium tuberculosis* (MTb) genome has been compiled, verified and made publicly available, thanks to the ‘Connect to Decode (C2D)’ Project under the OSDD Initiative of CSIR-led Team India Consortium with a global partnership. The results of C2D Project on re-annotating the biological and genetic information relating to MTb genome were released at a conference held in New Delhi on 9-11 April 2010.

The C2D’s findings may contain critical data to unlock previously undiscovered details of tuberculosis (TB), resulting in development opportunities for urgently needed new TB drugs in India and other developing countries.

According to the World Health

Organization (WHO) 1.7 million people die annually from TB and in some areas of the world, one in four people with TB become ill with a form of the disease that can no longer be treated with standard drugs regimens.

India is among the list of countries which bears a major share of this burden. Combating TB has become even more complicated in recent years due to the deadly relationship of TB with HIV and also because of the emergence of drug-resistant varieties. Despite this public health emergency, TB research funding remains alarmingly inadequate, particularly for research into new drugs.

In addition, conventional market-based patent incentives are ineffective in addressing public health needs in developing countries with only 1% of newly developed drugs targeting

neglected diseases. With children and people living with HIV in India and other developing countries bearing the greatest burden of the disease, as well as the emergence and spread of TB that is resistant to treatment by the standard anti-TB drugs, there is an urgent global, but unanswered need for new drugs.

New strategies for combating TB, new points of attack and new ways of drug and vaccine discovery are, therefore, essential. In particular, it is important to approach the problem with a systems, perspective of the pathogen and the disease, rather than the commonly adopted reductionist view of studying proteins individually, one at a time.

“We need to have a balanced view between health as a right and health as a business. It is because there has been



Connect to Decode (C2D) Glimpses of the Conference



imbalance in this view, that diseases like TB with high mortality but low profitability are neglected by the current system of pharmaceutical research,” said Dr. Samir K. Brahmachari, Director General, CSIR. “As virtually no new TB drugs have been developed since the 1960s, OSDD’s model in particular holds great promise for the scientific community by stimulating the development of better drugs and diagnostics for patients.”

“For us the irony is that with the availability of drugs for HIV, we are living with HIV but dying of TB,” Loon Gange of the Delhi Network of Positive People, a support group of people living with HIV/AIDS, said. “TB research has yet to see any great progress as we struggle to pull ourselves out of a system that places profits before people’s lives. India’s OSDD project

holds immense hope for my community.”

About a decade ago, the genome sequence of MTb was deciphered, triggering intense research on the pathogen. Along with it came the first annotation, providing the first “parts list” of the microbe. A re-annotation carried out subsequently identified more parts, completing the list of proteins, coded by the genome.

To get a systems’ view of the microbe, however, it was pertinent to move on from the “parts list” towards how these parts are “assembled” in the cell. To do this, the description of each part needed to be as complete as possible. A wealth of experimentally derived data on various proteins of MTb was known but often buried deep and needed to be extracted. Besides, there are a number of informatics and knowledge-driven tools that are helpful

in enriching the annotations.

The C2D project has attempted exactly this from four different angles. The first, called TBGO, has obtained associations for each gene with functional ontologies, thus getting first clues of the functions of the various proteins. Second, each protein is studied at high resolution by modeling their three dimensional structures, through which, higher order clues about their functional roles are obtained.

Third, proteins which interact with various sugars or carbohydrates in the cell are deciphered; these are believed to be important for the signaling events in the cell, somewhat akin to the switches. Fourth, the assembly of the parts has been sought out by identifying those parts that talk to each other directly and those parts that talk to others through mediators, such as metabolites.



Integrating data from all the angles, or network of the parts list is reconstructed, in which functional modules (or biochemical pathways) are also identified. The network helps in understanding how metabolism takes place in the bacterial cells, how it compares with human and other bacteria and helps in answering questions about what strategies should be adopted to kill the bacteria, eventually useful for new drug discovery. A fifth theme that has been pursued in this project is to identify proteins that contain antigenic parts in them that could trigger immune responses in the host and thus ultimately help in rational vaccine design.

Under the C2D project, researchers and students pooled their time and skills using online tools to provide insights into

4000 genes of the deadly pathogen. The researchers also mapped the genes as they related to functional interactions and pathways. Their work is held in a shared database, which OSDD would share through a globally accessible database to any research institutions involved in TB research through its open portal (www.osdd.net).

C2D demonstrates the power of people to connect through the internet, particularly young people, and accomplish complex research tasks. It is also a distinct move from a hierarchical based model of doing science towards one of equal collaboration. The project has been implemented in a novel way, with high cost and time efficiencies. A large set of student volunteers in the country have been inducted into the program. In a record time of about four

months, they have been trained and monitored online, guided step-by-step towards this goal by the respective Principal Investigators, who championed the cause. Stringent quality control measures were put in place to verify and where required, correct the annotations made by students in various places.

Launched in September 2008 by CSIR, OSDD is the first project of its kind by any government. It is a US \$ 35 million (Rs 146 crores) collaborative research effort that focuses primarily on TB. With a global community of nearly 3000 members from 74 countries, OSDD brings together scientists, doctors, students, policy experts, software professionals and others to work on TB research.

The Sethu Project

In a significant development, the National Institute of Oceanography (NIO), Goa, has been nominated by the Ministry of Shipping, Government of India, for carrying out the Environmental Impact Assessment (EIA) for a new alignment of the Sethusamudram Channel between the southern tip of India and the northern tip of Sri Lanka. The Expert Committee established by the Supreme Court to advise on the alignment, recommended NIO for this task. The NIO has tied up with two other institutions to carry out the EIA. The National Environmental Engineering Research Institute (NEERI), Nagpur, will conduct the EIA over land through which the proposed channel passes, while the Indian Institute of Management, Bangalore, will carry out cost-benefit analysis. The Project, estimated to cost Rs 9.45 crore (over \$2 million), is scheduled to be completed within 18 months.

The Project led by Dr. Sanil Kumar of NIO, Goa, would be assisted by the Regional Centre of NIO at Kochi. This Project involves extensive year-round environmental data collection in the Gulf of Mannar, Palk Bay, Adam's Bridge and the surrounding areas. It is poised to significantly improve our understanding about the oceanography of this region, besides determining feasibility of the Sethusamudram Canal from the point of view of environment and economics.



NIO to carry out the Environmental Impact Assessment (EIA) study for a new alignment of the Sethusamudram Channel



High Level Delegation from Oman Visits CSIR

H. E. Dr. Hilal bin Ali bin Zahir Al Hinai, Secretary General of The Research Council of Oman (TRC) led a three-member delegation from Oman to the Council of Scientific and Industrial Research (CSIR) during 11-13 January 2010 to hold wide-ranging deliberations with the top scientists of CSIR to provide inputs for the forthcoming Indo-Oman 6th Joint Commission Meeting (JCM) for intensifying S&T partnership with India involving CSIR as a major player. The visit was planned and coordinated by the International S&T Affairs Directorate (ISTAD), CSIR, New Delhi, on the request of the Indian Ambassador in Oman, Mr Anil Wadhwa.

The delegation comprised Dr. Hilal, Secretary General, TRC; Dr. Mohamed Al-Mughairi, Asstt. Secretary General, TRC and Dr. Abdullah Al-Zakwani, Director, Public Establishment for Industrial Enterprises (PEIE).

The delegation visited the National Physical Laboratory (NPL), National Research Development Corporation (NRDC), the Central Road Research Institute (CRRI), Intellectual Property Management Division (IPMD), Department of Biotechnology (DBT), Department of Science and Technology (DST) and the Council of Scientific & Industrial Research (CSIR) Headquarter at New Delhi and called on the Director General of CSIR.

During the wide-ranging deliberations and visits to advanced scientific facilities at the premier laboratories and scientific establishments, the delegation dwelt, at



Mr. A. Chakraborty, Head, ISTAD addressing the delegation

Secretary General, TRC with Ambassador of Oman

length, on diverse facets of S&T collaborations in tune with their national requirements in order to work out a suitable *modus operandi* to kick start S&T cooperation between the two countries.

Arising out of the preliminary discussions, the following areas were identified by the Omanese side for immediate focus:

- Enhanced oil recovery
- Calibration services and standards
- Setting up a Centre of Excellence in marine biotechnology
- Road safety & road design for reducing accidents
- Solar energy for diverse applications
- Nanotechnology for newer materials for desalination of water
- Pest infestation in date palms

- Environment
- Training of Omanese researchers
- Setting up of a joint CSIR-TRC Centre

Oman has been informally involved in S&T cooperation with CSIR over the years. In September 2004 a trilateral cruise on board *RV Sagar Kanya* was organized involving scientists from Oman (Marine Science & Fisheries Centre and Sultan Qaboos University), USA (Princeton University, University of Washington and Woods Hole Oceanographic Institution) along with the National Institute of Oceanography



Director General of CSIR with the Omanese delegation



(NIO), Goa, wherein various physical, chemical and biological measurements were carried out along the Oman coast.

During the 6th JCM scheduled to be held in June 2010 at Muscat, the process

of cooperation between CSIR and the TRC is expected to take a concrete shape. Also, on the agenda of the JCM is the finalization of the inter-governmental S&T cooperation

agreement between India and Oman, which will provide the much-needed fillip to the endeavours of the TRC to forge a vibrant S&T collaboration with India under CSIR's active stewardship.

Book Released

The Comet Assay in Toxicology

Professor Alok Dhawan, Scientist, Indian Institute of Toxicology Research, Lucknow, edited a book with Professor Diana Anderson, University of Bradford, U.K. entitled, *The Comet Assay in Toxicology*. This has been published by The Royal Society of Chemistry, U.K. under its Series: "Issues in Toxicology" in September 2009.

The vast number of chemicals existing or being added into the environment have globally aroused great concern regarding their adverse effects on human populations. Development and validation of sensitive and better test systems, which can assess the adverse effects of chemicals at an early stage for intervention strategies to be implemented in time is currently in progress. This book documents latest research in this area and showcases the versatile, state-of-the-art technique — the Comet Assay — useful in modern toxicology. The assay is a simple, sensitive, rapid and visual technique for the quantitative and qualitative assessment of DNA damage in single cells.

This book is devoted exclusively to the Comet Assay and its applications as an important tool in current toxicology. Specialists from the fields of genetic toxicology and human epidemiology, with first-hand knowledge of their chosen specialities, have contributed to this peer-reviewed scientific venture. Thirty eight authors from 11 countries have contributed the 17 chapters in this book. This multi-author book will serve as both a reference and a guide for investigators in the biomedical, biochemical and pharmaceutical sciences.

The Comet assay is simple, rapid, versatile and easy to perform while being relatively inexpensive. It can be used to assess DNA damage in all kinds of single cells ranging from prokaryotes, eukaryotes, plants and animals including humans,

involving both somatic and germ cells.

The book is divided into four sections, reflecting the range of interest in the exploitation of this assay. It begins with an introductory section reviewing the genesis of the assay for those new to the technique, and details the various fields in which it finds wide acceptance. This sets the scene by explaining why the assay has become the most sensitive and sought after assay in modern toxicology.

Section II of the book describes the protocols being followed to assess various types of DNA damage in different cell types. The third section brings together the specific applications of the assay in diverse areas ranging from genetic toxicity testing to human monitoring and environmental toxicology.

The last section considers strategies for the conduct of the assay using *in vitro* and *in vivo* systems, based on internationally accepted guidelines. The book draws to a close with an assessment of image-analysis principles and the statistics used for evaluating the data generated by the assay.

The book is aimed at students as well as scientists in the area of molecular epidemiology and genetic toxicology.



Prof. Alok Dhawan with a copy of the book



Indo-Dutch Seminar & Training Programme on Process Safety

The Indian Institute of Chemical Technology (IICT), Hyderabad, organized an Indo-Dutch Seminar cum Training Programme on *Process Safety* from 3 to 5 March 2010 at IICT. It was attended by 46 delegates who were from industry, R&D and academic institutions, and CSIR laboratories. This event was sponsored by the CSIR, Safety Solutions Consultants, The Netherlands and Andhra Pradesh Industrial Infrastructure Corporation Ltd, Hyderabad.

The programme was inaugurated by Shri Shyamal Ghosh, IAS Chairman, Data Security Council of India and former Secretary to Government of India. Dr. J. S. Yadav, Director of IICT while welcoming the delegates said that IICT has been organizing safety seminars earlier also, at regular intervals. He mentioned that IICT was involved in investigations on the Bhopal disaster under the leadership of Dr. S. Varadarajan, former Director General, CSIR, and his team members for neutralizing the remaining MIC.

Dr K. V. Raghavan, INAE Distinguished Professor and Convenor, International Scientific Advisory Committee of the Conference highlighted the programme events. He said that Bhopal Gas Tragedy is one amongst the most horrifying accidents that had taken place in the world. Recalling the pioneering contributions made in Chemical and Process Safety during the three Indo-Dutch workshops



A view of dais

held in 1986 after the Bhopal Gas Tragedy, he stressed on the need for sharpening safety legislation framework and emergency management in India. He further stated that terrorism employing chemical precursors has brought in new dimensions in disasters related to Chemicals. He strongly recommended the development of training simulators for process safety management.

Dr. C. M. Pietersen, Chief Executive of Safety Solutions Consultants, The Netherlands spoke on the technical content of the Training Programme. He said that incident and accident analyses are important aspects of safety studies and the Bhopal Gas Tragedy and Mexico disasters have changed the way these aspects are looked into. He said that new methods have been developed for identifying industrial risks and measures to lower them.

Dr. G. Thyagarajan, former Director of NEIST, CLRI and IICT, who was the Guest of Honour, stated that the year 1984-1985 provided the turning

point in industrial safety, even in the most industrialized countries. Two major disasters have occurred namely Bhopal, Gas Tragedy and Mexico disaster in quick succession. He said that we are asking questions till today as to what went wrong in these two disasters and social and cultural factors that have to be taken into account. He also opined that studies on human errors in accidents have to be studied in detail.

Shri Shyamal Ghosh, who delivered the Presidential Address, said that 25 years after the Bhopal Gas Tragedy, it is good to review various facets of emergency management and process safety like technology, rehabilitation, relief, process control, legislation, etc. After Bhopal Gas Tragedy, process technology had undergone major changes. Safer rules of production cannot be followed purely from environmental considerations but they should have techno-economic advantages. Storage of large quantities of MIC cannot be practiced today. He stated that developments subsequent to Bhopal tragedy had necessitated much more detailed planning for meeting process emergencies.

The technical programme of the Seminar consisted of four Keynote Lectures on: *Recounting Bhopal and Mexico Disasters, Process Safety and Post Bhopal Disaster Developments*. They were delivered by Dr. C. M. Pietersen, Mr. T. R. Chouhan, Dr. K. V. Raghavan and Dr. Hans J. Pasman



respectively, and a panel discussion on *Process Safety* took place on the following topics:

- Sharing of Experiences and Lessons Learnt from Bhopal Gas Disaster;
- Future Strategies for Preventing Bhopal Type Disasters Through Online Alert Systems;
- Expert Systems for Emergency Information Dissemination;
- R&D Initiatives for Pre-assessing Process Safety;
- Role of Professional/Academic Bodies in Planning/Devising Disaster Mitigation Strategies;
- Areas for International Cooperation in Quantitative Process Hazard Analysis; and
- Proactive Government Policies/Initiatives on Disaster Mitigation.

The Seminar was followed by a two-day Training Programme during 4 - 5 March 2010 conducted by Dr. C. M. Pietersen. It dealt with novel methodologies/techniques like TRIPOD Beta and its utility to bring out the underlying factors for near misses and accidents (latent failures). The second part of the Training Programme was on SIL/LOPA method of risk assessment to evaluate the acceptability of risks of potential hazards and to classify the safety and integrity of the protective measures. Case studies and group exercises were conducted to expose the participants to the new methods.

The third part of the Training Programme on Process Safety Analysis was conducted by Dr K. V. Raghavan and Dr. M. Surianarayanan of Thermochemical Laboratory, CLRI-Chennai. Dr. Raghavan reviewed the process safety evaluation methodologies. He highlighted the factors responsible for the chemical and process hazards and the methodologies for their quantification. The chemical hazards are generally associated with fires, explosions, toxic or corrosive gas/vapor effects. The process hazards are associated with reaction energy and he presented the heat generation/removal rate curves to assess the reactor performance under thermal runaway situations involving change from one steady state condition to another. Dr Raghavan also explained the hazard rating approach to assess the severity of any unit operation/process.

Dr. M. Surianarayanan delivered three lectures to demonstrate the use of microcalorimetry techniques to identify the hazards associated with exothermic/endothermic processes. He discussed the microcalorimetry techniques such as thermal analysis (DSC, DTA and TGA), accelerating rate calorimetry (ARC), reaction calorimetry (RC) and reaction system screening tool (RSST) for identifying the thermal runaway potential to forewarn process engineers. He presented four case studies to demonstrate the application of these techniques.

Workshop on Sustainable Agri Growth and Agri Technology

As a part of Golden Jubilee Celebrations, the Central Scientific Instruments Organisation (CSIO), Chandigarh, organized, One-Day Workshop on *Sustainable Agri Growth and Agri Technology* on 23 February 2010. Dr. Pawan Kapur, Director, CSIO while welcoming the distinguished guests said that this event was not merely a one-day programme but a brainstorming session wherein the discussions would evolve a roadmap for the future development in the area of Agrionics. He expressed that Agrionics is a merger of Agricultural knowledge bank and engineering technology.

Reflecting on the historical background, Dr. Kapur said that the importance of agriculture cannot be overemphasized since it transformed wanderers into settlers and now there is a need that academicians, researchers and other engaged in agriculture to synergize by judicious convergence of technologies so as to prepare the nation to face the challenges of today and future. He also highlighted the expertise available at CSIO besides various R&D activities being pursued in the laboratory.

Prof. Manjit Singh Kang, Member of Research Council of CSIO and Vice Chancellor, Punjab Agricultural University, Ludhiana, delivered a talk on the *Strategies and Practices for Agricultural Sustainability*. According to him, sustainable development is one that meets the needs of the present without compromising the ability of future generations. He emphasized that awareness among people and their attitude towards conservation are vital for making sustainable development feasible. He stressed the need of transgenic crops and application of newer tools of genetic engineering to break yield barriers and genetic resistance to stresses and intensification of research to improve nutritional



and other quality attributes to match international standards.

Earlier, Dr. M. L. Singla, Head, Agrionics, CSIO, apprised the audience of the objectives of the Conference, which included the societal benefits of technological innovation. He highlighted several significant changes that have been taking place in agricultural Sciences with the emergence of biotechnology. This included the development of Bt Brinjal and Bt cotton.

Dr S. K. Pandey, Director, Central Potato Research Institute (CPRI), Shimla, presented the role of CPRI in Potato Research and Development in India. He highlighted the importance of potato farming in the country, which contributes about 4.0 times more yield than both wheat and paddy from unit area to the national economy in agricultural sub-sector. In today's scenario of rising prices, he termed potato the most economical option for nutritive diet.

Prof. D. V. S. Jain, Em. Prof. PU Chandigarh; Dr Manjeet Singh, Director, DMR Solarn, Cdr. V. R. Dahake Sc. Incharge MERADO, Ludhiana and Dr Sanjay Kumar, Scientist, IHBT, Palampur were also among the distinguished speakers who in their lectures touched upon various aspect of agri technologies.

The Workshop concluded with a panel discussion. It was the unanimous view of the panel that to achieve food security, we will have to opt for the crops based on energy conservation, recycling of water resources, adding new knowledge aided with advanced sensors and intelligent instrumentation.

Workshop on *Extension Strategy for Innovative Housing Technologies*

Workshop on 'Extension Strategy for Innovative Housing Technologies' was organized on 9 February 2010 at the Central Building Research Institute (CBRI), Roorkee. In view of the objectives of CSIR 800 mission programme, the main focus of the Workshop was to deliberate, discuss and evolve a consensus strategy for extension of innovative housing technologies leading to improvement in the construction practices, habits and standards for better quality, speed, economy, safety, durability and hygienic housing to extend economical, environmental and societal benefits to the people of the country.

Housing R&D and extension experts from all over the country were invited to participate and contribute in evolving effective and consensus extension strategy.

Prof. S. K. Bhattacharyya, Director, CBRI, with a team of 17 senior scientists and 13 outside experts associated with housing promotional activities and representing various nodal organizations including BMTPC, Delhi; State Councils of Science and Technologies, Uttarakhand and Himachal Pradesh; District Urban Development Agency, NITTTR Bhopal; innovative practitioners, architects/builders, scientists and non-governmental organizations participated in the Workshop.

Prof. Bhattacharyya, who chaired the Workshop stressed on need-based R&D and effective mechanism for quick transfer and field implementation of suitable technologies for the ultimate benefit of masses.

Shri S. G. Dave, Scientist G, Workshop Coordinator, while briefing on

the objectives of the Workshop, highlighted various CBRI technologies that have been well received and absorbed by the building industry and stressed on the need of evolving a consensus strategy by integrating the efforts of all promotional agencies, for commercial exploitation and mass acceptance of newer R&D and housing technologies.

Dr Shailesh Agarwal, Executive Director, BMTPC, New Delhi, presented the efforts made by BMTPC for extension and promotion of need based low-cost housing technologies and sought the association of CBRI in successful implementation of various housing schemes of MoUD & MoRD like *Rajiv Awas Yojana*, *Indira Awas Yojana*, Building Centers, and a scheme on shelter for all. He was of the opinion that joint efforts may encourage industrial production of energy efficient, substantially cheaper, high quality and faster building systems and technologies utilizing locally available materials and agro-industrial wastes.

The presentation made by Shri Pramod Adlakha, an innovative practitioner and architect-builder on successful implementation of many housing projects using CBRI technologies in several thousand houses in Delhi and other parts of country was appreciated by all.

Dr. R. Dobhal, Director, Uttarakhand Council of Science and Technology, DehraDun and Dr. S. S. Randhawa, Scientific Officer Himachal Pradesh Council of Science, Technology and Environment, desired to plan a Joint strategy for organization of a series of



Workshop on *Extension Strategy for Innovative Housing Technologies* in progress

Training Programmes to generate trained artisans in the implementation of newer technologies.

Dr. A. K. Jain, Director, National Institute of Technical Teachers' Training and Research (NITTTR), Bhopal, highlighted the important role of community polytechnics in training, dissemination and technical support right up to panchayats and users and expressed that joint programmes can cover a vast population. Dr. Narendra Rai, Ashok Sansthan, Bihar, Shri S. K. Tiwari, Rajiv Smriti Sewa Sansthan, Muzaffarpur, Shri Rishi Jaiswal, a management professional running an NGO and other NGOs narrated their experiences about implementation of CBRI rural housing technologies. They earnestly sought technical guidance from CBRI for mass extension and dissemination activities in their respective areas.

Almost all participants had good experience of field implementation of CBRI technologies like improved mud and thatch construction, low cost sanitation, prefabricated building components etc. and opined that there is great potential in these technologies but improvements are needed to incorporate semi-mechanization for faster construction and quality assurance. They were also of the opinion that resources available with different

agencies can be pooled to make an appreciable dent for an all round impact.

The day long deliberations and discussions concluded into following recommendations that could help in developing an effective strategy for extension of cost-effective housing technologies:

- To meet the huge housing shortage of the lower and lower-middle income group, affordable housing technologies need to be widely promoted;
- Appropriate level of mechanization has to be introduced in the Indian construction system to significantly increase the pace of construction and to ensure quality and durability;
- Industrialization of the production of building materials using low energy pollution free processes is the need of the hour;
- Regular and systematic training and certification system for skilled construction workers of different building trades is an essential requirement for better quality of construction and maintenance;
- Development of regional demonstration centers and parks highlighting innovative housing technologies appropriate to the region and to provide technical back-up to the interested users;

- There is a need to develop database and documentation of region-wise specifications and technology packages highlighting advantages over traditional construction systems. Engineering institutions may be associated to collect and generate local resource database;
- CBRI may develop a technology museum with working machines and infrastructure which may be seen and used by interested users to try and make products using their local raw materials so as to gain confidence about the technology;
- Model housing projects incorporating newer sustainable and affordable technologies may be explored on Public-Private Partnership (PPP) mode with technical back-up from R&D Institutes with financial and field implementation support from private builders/promoters;
- CBRI may have collaborations with different organizations and other stake holders for planned extension and promotional activities in different parts of the country; and
- CBRI may provide technical back-up for regular trainings, demonstrations and technical guidance for field implementation of newer technologies and establishment of production centers/entrepreneurs using latest IT facilities.



Lecture Course on *Flow Measurement Techniques*

The Experimental Aerodynamics Division (EAD) of the National Aerospace Laboratories (NAL), Bangalore, conducted a three-day lecture course on, *Flow Measurement Techniques* for engineering college faculty, undergraduate and graduate students during 2-4 February 2010. The aim of this lecture course was to leverage the vast knowledge base generated in the past decade by NAL on flow measurement and to enable its dissemination for the benefit of students and practitioners alike. Dr. G. Ramesh, welcomed the participants. Dr Venkatakrishnan, Coordinator, of the Lecture Course, outlined the aims and objectives of the Course and the schedule to be followed.

Dr. Sajeer Ahmed, Adviser (M&A) and Head, EAD, while inaugurating the Course, introduced the goals of EAD and the purpose of the Course. He elaborated on the need for new experimental tools for flow measurement. This understanding would then be used for flow modeling and later used for its control. He explained the need for such tools to be non-intrusive and be able to address complex flows. The Inaugural Function concluded with Dr. K. T. Madhavan thanking the various people involved in organizing the Course.

A total of seven topics in flow measurement ranging from traditional to futuristic techniques were covered in the Course. Each afternoon was devoted to a demonstration of the practice of these techniques.

While the initial envisaged participant strength for this Course was 30; there was an overwhelming response for this Course with the final count at 53 participants. At the end of the Course, the participants were given a feedback form to rate various aspects of the Course on a scale of 1 to 5, with 5 being the highest. The overall averaged score was calculated to be 4.25 showing that the Course had a significant impact. The major suggestions distilled from the feedback were to extend the duration of the Course to five days, conduct this Course at least once a year if not twice; and provide accommodation for outstation students.



NEIST Celebrates its Foundation Day

The North-East Institute of Science & Technology (NEIST), Jorhat, celebrated its 49th Foundation day on 18 March 2010, and stepped into its Golden Jubilee year. Dr Mridul Hazarika, Director of Tocklai Tea Research Association was the Chief Guest and Prof. B. K. Das, of Department of Chemistry, Gauhati University was the the Guest of Honour.

Welcoming the gathering, Dr. P. G. Rao, Director, NEIST, said that in addition to pursuing high level of R&D, the Institute is also involved in improving socio-economic condition of the people through S&T inputs. He said that we should rededicate ourselves to achieve more in S&T for the benefit of the society.

Addressing the distinguished gathering, Dr. Hazarika in his brief illuminating speech said that with the change in the millennium, subjects like biotechnology and environment have become of great significance. He added that biotechnology has the potential to feed the hungry, reduce environmental damages and make productive items from waste etc.

Regarding environment, Dr. Hazarika said that the demands created by increased population have made negative impact which may be responsible for climate



Seated on the dais (from left) are: Dr Mridul Hazarika, Director of Tocklai Tea Research Association; Dr. P. G. Rao, Director, NEIST and Prof. B. K. Das, Department of Chemistry, Gauhati University



Releasing the Annual Report of NEIST

change. He further added that we should think about how much pressure the environment can take and concluded by saying that we can make a change only if each one of us is concerned about these issues.

Prof. B. K. Das, in his address spoke on 'Chemical & Fuels From Renewables' in which he highlighted the fact that the country produces a huge amount of biomass, most of which is wasted. These wastes can be an important source for making chemicals and fuels. He talked about the production

of chemicals like lactic acid, succinic acid and terephthalic acid from renewables. He concluded with the words that "efforts need to be made locally to develop processes to convert locally available renewable biomass to chemicals and fuels" and in this regard the NEIST can play a major role.

The Chief Guest released two of the Institute's publications viz. Annual Report 2008-09 and Highlights 2009-10. The NEIST staff who showed exemplary research performances during this financial year were awarded

the certificates of appreciation.

Also, on the occasion, people who retired from the Council's service during the last financial year were felicitated and presented with mementoes by the Director in recognition of their services for the growth and development of the Institute. Ms Ilika Zhimo, Scientist, proposed the Vote of Thanks.

Earlier, the day was also observed as 'Open Day' and the laboratory was visited by students, teachers and others in the morning hours in large numbers, who freely interacted with the scientists.

CBRI Celebrates its Foundation Day

The Central Building Research Institute (CBRI), Roorkee, celebrated its 64th Foundation Day on 10 February 2010 with great enthusiasm. The Institute organized many technical, cultural and sports activities in the fortnight long celebrations from 26 January to 10 February 2010 of which some important events included the Foundation

Day Workshop on 'Extension Strategy for Innovative Housing Technologies'; games and sports activities competitions for CBRI employees and wards, a Technical Lecture on, *Green and Intelligent Buildings*, release of CBRI Logo and its Annual Report and the launch of a new website.

The main programme of the

Foundation Day Celebrations was organized in the morning of 10 February 2010 wherein about 500 dignitaries, professionals, staff and retired employees of the Institute and press representatives participated. Three eminent professionals namely, Prof. S. C. Saxena, Director, IIT, Roorkee; Prof. P. B. Sharma, Vice Chancellor, Delhi Technological



FOUNDATION DAY CELEBRATIONS



A view of the dais

University, Delhi; and Dr. M. O. Garg, Director, IIP, Dehra Dun were the Chief Guest, Guest of Honour and Special Guest respectively. Prof. S. K. Bhattacharyya, Director, CBRI, presided over the function.

Shri S. G. Dave, Scientist G while welcoming all the guests and VIP's, briefly traced the history of the Institute highlighting its main R&D achievements. He mentioned about the professional and societal contributions of CBRI in overcoming the problems of durable, safe and economical housing for the people of the country. He also introduced the Chief Guest, Guest of Honour, and Special Guest to the audience.

Prof. S. K. Bhattacharyya, highlighted a new vision and the thrust of the forthcoming R&D programmes of the Institute. He informed about the initiation of a PG programme at CBRI and collaboration MoU with IITs and other academic housing institutions of the country for planning of appropriate HRD programmes and focused R&D work.

Prof S. C. Saxena, stressed on the need of immediate R&D on energy

efficient, cleaner processes and cost-effective building materials required for mass construction activities. He appreciated the efforts of CBRI in this direction and advised scientists to engage actively in newer frontier areas like green housing, intelligent buildings, sustainable and affordable housing, nano technology etc.

In his special lecture delivered on the occasion on 'Green and Intelligent Buildings' he introduced the new subject in a very impressive manner and stressed on the need of taking R&D initiatives by CBRI highlighting its necessity, importance and relevance in the global scenario. Over 200 scientific and Technical staff of the Institute attended the lecture and participated in discussions.

Prof. P. B. Sharma, in his address highlighted importance of

taking lab research to the ultimate user at appropriate time. He said that it is a joint effort and equated extension responsibility like a *Panchamrit* i.e. involvement of R&D Institutions, Academic Institution, Industries, Society and Government for the overall integrated development of the country. Prof. Sharma also informed on his vision of Building Technology Park, which he intends to establish first at Delhi Technological University and subsequently in each state. These technology parks may serve as a useful platform for creating mass awareness and technical understanding on this subject among the professionals and the general public.

Dr. M. O. Garg shared his experiences while heading both the institutes, IIP and CBRI, and mentioned about the enormous potential and unique position that CBRI has because of its availability of multi-disciplinary diversified expertise in all areas related to the housing spectrum.

On the occasion, a Diamond Jubilee Director's Award specially instituted for the development of best technology/innovation/know-how having maximum societal impact for the year 2009-10 was given jointly to Dr. B. Singh and



The CBRI Annual Report (2008-09) being released during the Foundation Day Celebrations



Dr. Manorama Gupta, Scientists, for their work on “*Development of Manufacturing Know-how on Rice*

Husk Plastic Wood”. The technology know-how was recently transferred to the industrialist who intends to set up a

manufacturing plant at Gwalior, Madhya Pradesh. The Award comprised of a citation and cash award of Rs 5000/-.

Prof. Jeremy Sanders delivers the Foundation Day Lecture at NCL

Prof. Jeremy K. M. Sanders, FRS, Deputy Vice Chancellor and Head of School of Physical Sciences, University of Cambridge, UK, delivered the National Chemical Laboratory (NCL), Pune, Foundation Day Lecture titled ‘*Adventures in Molecular Recognition: Dynamic Combinatorial Chemistry and Supramolecular Nanotubes*’ at NCL, on 4 January 2010. Prof. Sander’s lecture marked the Diamond Jubilee of NCL’s founding, a red letter day in the historic annals of NCL. The lecture was organized under the auspices of NCL Research Foundation (NCL-RF).

Prof. Sanders touched upon various contemporary aspects of dynamic combinatorial chemistry and its usefulness in developing chemical probes of great importance. Prof. Sanders illustrated the power of dynamic combinatorial chemistry which allows chemists to concentrate on the design of experiments rather than on the molecules by reducing the number of compounds to be prepared.

One of the many examples given by Prof. Sanders is of an NMR (nuclear magnetic resonance) spectroscopy of intact webs from the common garden spider. He illustrated that the elasticity of the spider web is the result of water induced mobility at a molecular level and proved that glycoproteins have an important presence in the structure of the web. He said that different carbon-



Dr. M. V. Badiger; Dr. C. V. Ramana; Dr. Srinivas Hotha and Dr. Pankaj Poddar receiving the Awards from Prof. Jeremy K. M. Sanders

13 labelling patterns of webs are achieved by feeding spiders either with carbon-13 glucose or with carbon-13 amino acids. Prof. Sanders, sharing his research work, presented the complex structures by explaining the creation of equilibrating mixtures.

Prof. Sanders also described the work carried out in his lab using bulk solutions. His team showed that dynamic solutions can be created that evolve in response to chemical stimuli, i.e. templates. One could envisage extending the approach to other stimuli such as photons, electrons or magnetic fields, but these needed to be explored. The

question for discussion is whether the ideas and the approach can be applied to individual molecules on surfaces and, in particular, in an ordered way to create functionally useful and structured surfaces.

In principle, the same approach should work on an ordered surface to yield a surface that is decorated by template bound receptors. The idea of tethering one of the building blocks to the surface was found to be more interesting. In the presence of a template one might be able to generate, firmly bound to the surface, receptors that after removal of the templates which helped



create them, would respond to reintroduction of the same (or related) templates.

In his concluding remarks, Prof. Sanders quoted Matt Ridley: “the fuel on which science runs is ignorance. Science is like a hungry furnace that must be fed logs from the forests of ignorance that surrounds us. In the process, the clearing that we call knowledge expands, but the more it expands, the longer its perimeter and the more ignorance comes into view. A true scientist is bored by knowledge; it is the assault on ignorance that motivates him and the mysteries that previous discoveries have revealed”. He implored young scientists to exploit surprising results and failures of logic and reasoning rather than pursuing mundane answers for unimportant problems.

Earlier, Dr. S. Sivaram, Director NCL, and Chairman, NCL-RF, gave the Welcome Address and presented a short glimpse of the history of NCL by giving snapshots starting from the formal opening of the NCL by the first Prime Minister of independent India, Pandit Jawaharlal Nehru followed by important historical events till date. Dr. Sivaram mentioned that NCL commemorated its Diamond Jubilee year by conducting various workshops and symposia in all areas of interest to the Laboratory.

Dr. Sivaram also acknowledged and thanked the contributions of all those who were associated with NCL in making it a great institution. He further added that to sustain excellence, NCL's grasp must be higher than its reach. NCL must dream big and align its activities to the national agenda. Dr. Sivaram said that NCL has much to learn from Cambridge University which is celebrating its 800th Anniversary, an unbroken record of sustained excellence for over eight centuries. The Curtain raiser of the Diamond Jubilee Year of NCL was performed by Prof. S. K. Brahmachari, Director General, CSIR on 3 January 2009.

Prof. K. N. Ganesh, Director, Indian Institute of Science Education and Research, Pune, introduced Prof. Sanders to the audience. Prof. Sanders distributed the NCL Research Foundation Awards including Scientist of the Year Award (Sponsored by Maneckji & Shirinbai Neterwala Foundation) to Dr. C. V. Ramana and Dr. M. V. Badiger; Scientist of the Year Award (Sponsored by Dr. R. A. Mashelkar Endowment Fund) to Dr. Srinivas Hotha and Dr. Pankaj Poddar. Award for “A new Initiative taken by the R&D Support System” to support staff, Director's Commendation Awards and Individual Merit Awards were also given away by Prof. Sanders.

Mr. G. Prabhakaran, Secretary, NCL-RF concluded the program with a formal Vote of Thanks. The function was attended by eminent personalities from reputed institutes, former scientists and invitees.

Aerofest 2010 Organized at Bijapur

Aerofest 2010 was jointly organized by the National Aerospace Laboratories (NAL), Bangalore, and BLDEA's V P Dr. P. G. Halkatti College of Engineering and Technology, Bijapur at Bijapur on the 19-20 February 2010.

Dr. Arwika, Principal, BLDEA, welcomed the gathering. This was followed by formal introduction of persons on dais viz. Dr. V. Mudkavi, Mr Giriraj, Dr. Khincha, Vice Chancellor, VTU and Mr. Patil, President, BLDEA and MLA. Mr. Giriraj gave the programme overview. He stated the objectives of Aerofest and detailed on the components of the same, viz., technology exhibition, one-day Seminar, paper plane contest and aeroquiz.

Dr. V. Mudkavi spoke on the activities of NAL and said that the aerospace sector is highly interdisciplinary and requires high science content. Switching to a related topic, Dr. Mudkavi said that while aviation has received a boost in our country, aeronautics has still not received the same kind of boost. There are several opportunities for all engineering students since the country has embarked on the major aerospace projects in recent years.

Dr. Khincha dealt with both student and faculty perspectives. He spoke on the important role of the faculty and the institution. He also said that aerospace is highly multidisciplinary in nature. He was very appreciative of the fact that NAL has come to regions like Bijapur which should provide a good exposure.

As part of Aerofest 2010, a one-day Seminar on NAL technologies was held on 20 February 2010. The papers presented in the Seminar were, *How Things Fly* presented by Dr. V. Y. Mudkavi, *Failure Analysis and Aircraft*



Glimpses of the Aerofest 2010



Accident Investigation Programme by Dr. Subir Kumar Bhaumik, *Wind Tunnel Testing of Aerospace Structures* by Mr Gireesh Yanamasheeti and *Flosolver Technologies* by Dr. T. N. Venkatesh.

The papers were very much appreciated and well received by the delegates. The student community evinced great interest in NAL's technologies, programmes and exhibits. They were eager to know if they could pursue projects at NAL. Even the faculty were keen to do doctoral and post-doctoral courses under NAL's scientists.

The flying show of NAL MAVs/ UAVs not only attracted the students community but also had imported the objectives of NAL mission into their mind, that their contributions would be very much essential for the growth of aeronautics in the country.

Exhibition stall were informative in the sense they had displayed the various technologies and expertise NAL has had developed in the past; as well as they conveyed the road map to go further in their future mission. Technical session had covered both basic and applied aerospace technologies. Interestingly,

the engineering students/faculties were more responsive and attentive. In all this event proved that research being pursued at NAL could motivate young minds.

A comprehensive and systematic presentation of NAL's technologies, programmes and facilities in different areas was poised to help the student community. The magic of Aerofest was so much that many teachers expressed the desire of wanting their children to grow up and become scientists. The programme was organized by Dr. V. Mudkavi and Mr C. V. Giri Raj.



CSIR Programme on Youth for Leadership in Science (CPYLS), at CSIO, IHBT, IMMT, NAL and NCL

Central Scientific Instruments Organisation (CSIO), Chandigarh

The CSIR Programme on Youth for Leadership in Science (CPYLS) for attracting young and brilliant minds towards science stream was organized at the Central Scientific Instruments Organisation (CSIO), Chandigarh, on 1-2 December 2009. Meritorious Students from the State of Haryana, who have scored distinction in Matric Examination from various Educational Boards in the year 2009, participated in this two days programme.

Prof. N. Sathyamurthy, Director, Indian Institute of Science Education and Research (IISER), Mohali, was the Chief Guest on the occasion. While delivering his lecture on '*Curiosity Driven Science*' Prof. Sathyamurthy mentioned that curiosity is fundamental to life and is an important attribute of 'aptitude for science.' He mentioned that children are an important asset of the country and they should opt science stream to pursue it passionately for advancing the frontiers of knowledge. While emphasizing that curiosity is very important for making new discoveries, Prof. Sathyamurthy pointed out how the children have an advantage over the elders. They are free of biases and can

think differently leading to new paths. He encouraged them to pursue science as a career that will help them in achieving their aspirations as well as social status. During his lecture, he elaborated his recent research work related to fullerenes based molecular clusters and mentioned how fullerenes can be used to realize different designs of new kind of nanomaterials by generating a variety of shapes, which could be used beneficially for different applications.

Dr Pawan Kapur, Director, CSIO, in his Welcome Address informed that the basic purpose of CPYLS programme has been to motivate and attract young minds towards leadership in science. Dr Kapur highlighted the possibilities offered by the fascinating world of science and the clue one can get from the wonderful natural phenomena to develop a scientific temperament and inquisitiveness. He expressed hope that the bright young minds while interacting with scientists of CSIO shall be triggered to take science as a career.

During the programme students attended interactive sessions in which

scientists from various departments of CSIO discussed about their research, technologies developed and the upcoming trends.

The students were taken around various laboratories of CSIO to get a feel of how an actual R&D workplace looks like and to see various instruments that they had only read about. Students also got an opportunity to closely interact with the researchers in various laboratories, where experiments had especially been set up for them to help them understand basic principles of how things work.

A multimedia Science Quiz Competition was also organized for the participating students. Popular science lectures by CSIO scientists were arranged to inspire and motivate students for developing scientific temperament.

Dr Pawan Kapur, Director, CSIO, presided over the Valedictory Session of the programme on 2 December 2009. Dr. Kapur in his Valedictory Address said that CSIO enjoyed interacting with the young students during their two days stay in CSIO. He advised the students for staying in touch with CSIO for any further information.

Institute of Himalayan Bioresource Technology (IHBT), Palampur

The CSIR Programme on Youth for leadership in Science-2009 (CPYLS) was organized at the Institute of Himalayan Bioresource Technology (IHBT), Palampur, during 21-22

December 2009. It was attended by 55 meritorious students selected from Himachal Pradesh region. The programme was coordinated by Dr. Aparna Maitra Pati.

Dr. P. S. Ahuja, Director, (IHBT), while inaugurating the programme, in his address, gave an overview of the S&T infrastructure of the country and its scientific achievements. He highlighted



Students visiting the laboratories of the Institute

Biodiversity Unit to see herbarium, GIS, mapping and Computational Facility. In the evening of the first day, a science fiction movie was screened. An informal, interactive session was organized with the Director.

the importance of innovation and emphasized on creativity.

Based on the interest of the students, they were divided into two groups viz; Biological Science and Chemical Science groups. The students of the Biological Science group visited the Tissue Culture Lab and got hands-on-experience on inoculation technique. They also visited Plant DNA Fingerprinting Lab, Genomics,

Metabolomics and Proteomics Facility; Microbiology Lab and Plant Virology Lab.

The students of the Chemical Group got exposed to various techniques used for isolation of natural colours and dyes, isolation of chemotypes and development of herbal products. They also visited Distillation Units and Herbal Processing Plants. Students of both the groups visited Nanobiology Facility,

In the Concluding Session, the students expressed their great satisfaction and gratefulness for the opportunity given to them by CSIR, which enabled them to get acquainted with the frontline research being carried out at IHBT. They expressed their desire to visit IHBT again and for a longer duration. The Director presented Certificates for Participation to all the students.

Institute of Minerals and Materials Technology (IMMT), Bhubaneswar

CPYLS at IMMT was conducted during 22-23 December 2009. More than 100 students from schools/colleges across the State of Orissa were invited to participate in this event. The aim of the programme has been to expose young minds to the exciting world of Science and encourage them to take up basic sciences as their career.

After the Inaugural Function, Dr. R. K. Paramguru, Scientist 'G' and Co-chairman, CPYLS 2009 delivered the Welcome Address. This was followed by the Address of Prof. B. K. Mishra, Director, IMMT and Chairman of CPYLS 2009 who gave an overview of the CPYLS-2009 programme and also introduced the Chief Guest, Dr. B. Ravindran, Director, Institute of Life Sciences, Bhubaneswar.



Above: CPYLS being conducted at IMMT

Left: Participants of CPYLS attending the programme



During the Plenary Session, Dr. Ravindran gave a thought-provoking lecture on *'Improved Scenario of Life Sciences that Has Taken Place in the 21st Century'*. Then, the students were taken around to visit different laboratories of the Institute and were given live demonstration of sophisticated equipment at IMMT and were briefed on the R&D activities being carried out. The afternoon session started with the lecture by Prof. Rajesh Prasad, IIT, Delhi, on *'Material Science'*.

On the second day, the programme started with the lecture on *'SCIENTOON'* by Dr. Pradeep K. Srivastava, Scientist 'E-II', CDRI, Lucknow, followed by lecture on *'Computations'* by Prof. B. K. Mishra. Students were also taken to visit laboratories during the break. In the afternoon session, Dr. B. Bag, Scientist, IMMT, delivered a lecture on *'Molecular Engineering: Futuristic Domain in Chemistry'*. An audio-visual show on the activities of IMMT

and CSIR was also shown to the students to have glimpse of various R&D activities under CSIR.

During the Valedictory Session, Prof. Mishra, Prof. Rajesh and Dr. Paramguru gave the students some tips on career development. Both students and parents were very much impressed about the programme as some of them gave their views about it to the audience. Finally, all the students were given certificates for participation.

National Aerospace Laboratories (NAL), Bangalore

The two-day CPYLS Programme at NAL was conducted during 21-22 December 2009. This was the eleventh CPYLS programme conducted by NAL. The top 75 students from State, CBSE and ICSE Boards were invited to NAL. The programme included lectures by eminent scientists and visits to the various Divisions to get acquainted with the R&D activities of NAL. Dr. M. N. Sathyanarayana, Joint Head, Knowledge and Technology Management Division (KTMD) and CPYLS Coordinator, welcomed the august gathering.

Dr Ranjan Moodithaya, Head, KTMD gave a brief introduction about the CPYLS programme. Dr A. R. Upadhyaya, Director, NAL, in his opening remarks advised the young achievers to take Science & Technology to greater heights. He said that all of us must strive to work for a social cause.

This year the Chief Guest for CPYLS was Prof. Vasant Natarajan from Department of Physics, Indian Institute of Science, Bangalore, who did

B. Tech. from IIT, Madras, MS from Rensselaer Polytechnic Institute, USA and Ph.D. from Massachusetts Institute of Technology, USA.

Prof. Vasant delivered a very inspiring lecture on *'Calling the Sun God – Ra Ra Ra! Solar Appliances in a Climate Changing World'* – a topic of great relevance. He spoke about the green environment and the pivotal role

we play to do our bit. He said there was a large potential of solar energy that needs to be tapped, and emphasized on how this energy could be used in our daily lives and what we could do to strive for it. This was followed by a lecture by Dr Girija Gopalaratnam, Deputy Head, Flight Mechanics & Controls Division, NAL, who spoke on *'Landing in Low Visibility with Enhanced and Synthetic*



Vision’, with some interesting demonstrations.

The second day of the programme was marked with an invited lecture by Mr H. R. Madhusudan, Scientific Officer, Jawaharlal Nehru Planetarium, Bangalore, on “*Open Ended Experiments in Physics*”.

He demonstrated a lot of simple but very interesting experiments. The students were enthralled by the presentation. Mr Madhusudana is involved with various academic programmes of the planetarium — from Class III to Post-graduation — by way of planning the programmes as well as

teaching these programmes. He conducts Workshops for science and math teachers at various levels both for content enrichment and using creative methods of teaching. He is also involved in Physics Olympiad Programmes. The young students had the opportunity to visit R&D divisions at NAL like ACD, FRPD, STTD, FMCD, ATF, 4ft Trisonic Wind Tunnel and C-CADD (F).

In the Valedictory Function of CPYLS, the students thanked the management for providing them the opportunity to see some of the best facilities. Most of them also expressed that the duration of the programme

should be extended. Mr Madhusudan, Dr. Ranjan M, Dr. Girija Gopalratnam and Dr. M. R. Nayak, Adviser (M&A) answered the queries raised by the participating students.

Cash prizes were distributed to the following students for posing best questions from the lectures: Ms Himani Anand Galagari from V. V. S. Sardar Patel High School ; Mr Brijesh S. P. from J. Navodaya Vidyalaya; Ms. Ramya R. from Poorna Prajna Edu Centre; Mr S. Sreecharan from Sindhi High School and Mr N. Nanjundeshwara from Sri Kumarans Children’s Home.

National Chemical Laboratory (NCL), Pune

CPYLS at the National Chemical Laboratory (NCL), Pune, was organized during 28-29 January 2010 for meritorious students. NCL, being an implementing laboratory for this programme in Maharashtra, invites students who have topped class X examination from Maharashtra State Board of Secondary and Higher Secondary Education, CBSE and ICSE Boards. About 170 students including their teachers and parents from Pune, Kolhapur, Nashik, Aurangabad, Mumbai, and Latur Boards attended the counselling programme with great interest to know and gather new career opportunities in the area of science and technology.

About seventy students from remaining two Boards from Maharashtra i.e., Nagpur and Amravati Boards attended the counselling session at National Environmental and Engineering Research Institute

(NEERI), Nagpur. The counselling lectures were organized to encourage young minds to take up science and research as a career.

Mr. S. B. Katte, Coordinator of this CSIR human resource development programme introduced the CPYLS scheme and its benefits to the audience. The purpose of the programme is to motivate the students to build scientific temper at an early age by exposing the young minds to the exciting world of opportunities in science.

Dr. Sourav Pal, Head, Physical and Materials Chemistry Division, NCL, through his brief address motivated the students to take up science as a career. Citing examples of great scientists such as Newton, Archimedes, Einstein, Pauli, Faraday, etc. he encouraged the students to be curious and ask questions. Dr. Pal shared with the audience the quote from Lao-tzu, a Chinese philosopher, which says, ‘to know that you do not know is



Dr. Sourav Pal addressing the audience

the best, to pretend to know when you do not know is a disease’. Dr. Pal clarified the theme of CPYLS saying that the objective of this programme was to fire interest on ‘why one should take up science’. The programme gave an opportunity to students to pursue research and understand first hand, the thrill of pursuing scientific inquiry.

This was followed by several lectures delivered by NCL scientists on



various topics of interest. The programme also touched upon several career opportunities in science and a visit to the laboratory facilities was made. The programme ended with an interactive session with the scientists.

Dr. S. Sivaram, Director, NCL, concluded the programme by informally addressing the students and encouraging them to pursue creative endeavours. He exhorted the students to pursue intellectual activities, and added that it is more satisfying if one lives to work rather than works to live. Dr. Sivaram said that people who indulge in creative thinking by using their minds live longer and healthier. He encouraged students to excel in whatever they pursue. It is also necessary to pursue education to its logical end and acquire the highest possible qualifications early in one's career.

Dr. Sivaram said, learning was easier but forgetting was more difficult by quoting Alvin Toffler, 'the illiterate are not those who cannot read and write, but those who cannot learn, unlearn, and relearn'. Dr. Sivaram explained to the students that a little bit of adventure, nonchalance and recklessness were good and desirable.

Quoting Robert Frost, Dr. Sivaram said that it is always better to take a path less travelled because it opens new doors of opportunities while taking a beaten path only makes one a follower. Dr. Sivaram delivered a strong message through his informal conversation with the audience that was both thought-provoking and humorous.

Dr R. K. Tiwari Awarded IGU Decennial Award

Dr. R. K. Tiwari, Scientist G, (Director's Grade), National Geophysical Research Institute (NGRI), Hyderabad, has been awarded the prestigious Indian Geophysical Union Decennial Award for his outstanding contribution to the field of Earth Sciences. The Award, a gold medal,



Dr. R. K. Tiwari (left) receiving the IGU Decennial Award from Honorable Minister Shri Harish Raval (centre) and Dr. B. R. Arora, Director WHG, Dehra Dun

was presented to him on 5 October 2009 at the Inaugural Function of the IGU 46th Annual Convention at Wadia Institute of Himalayan Geology, Dehra Dun.

Dr. Tiwari has made seminal research contributions to the field of Modeling and Theoretical Geophysics, particularly for his original work on the Astronomical cycle in Earth system processes.

Dr. Tiwari and his co-workers have developed new techniques using the concept of non-linear dynamical system theories and contributed immensely on geophysical modeling by using the modern non-linear forecasting and artificial neural network approaches. Non-linear forecasting and modeling of historical earthquake records from the crucial tectonic regions of North East India and Himalayas provided significant evidence for "high-to low dimensional chaos" revealing the fact that the earthquake processes in these regions, hitherto assumed as "random phenomena", are governed by non-random physical processes triggered by seasonal frequencies.

Dr. Tiwari has to his credit a number of research papers published in high impact national and international journals. He has also authored a book entitled, *Geospectroscopy* published by the Cap Pub Comp.

Dr. Tiwari is also a recipient of the prestigious Krishnan Gold Medal of IGU, National Mineral Award of Ministry of Mines, Government of India and Platinum Jubilee Lecture Award of the Indian Science Congress. He is a Fellow of the Indian Geophysical Union and Geological Society of India.



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Phone: 25846301; **Fax:** 25847062; **E-mail:** pchawla@niscair.res.in; pcheena@gmail.com; meenakshi@niscair.res.in;

Website: <http://www.niscair.res.in>

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