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CSIR NEWS

Progress, Promise and Prospects

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C O N T E N T S

CMERI Developed AUV-150 Ushers in a New Era
in Underwater Robotic Research



NEIST organized National Seminar on,
Plants in Diabetes



NGRI Organizes International Workshop on,
*Deep Scientific Drilling to Study Reservoir
Triggered Earthquakes at Koyna, India*



Golden Jubilee Lecture Series
Held at NEIST, Jorhat



CIMAP Bags *Krishi Sansthan
Samman 2011 Award*



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further complicated by the presence of significant surface currents, which resulted in considerable drift after the deployment of the AUV at sea, where it was to perform a set of seven operational tests. Two functional tests comprising two functional soak tests, besides launching, retrieval and tracking system deployment were needed to be carried out, followed by five sub-sea tests targeted towards the fulfillment of specified depth qualifications and overall system functionality.

These tests commenced on 13 July 2011. From July 13 to July 16 the diving depth of the AUV-150 was increased in stages, when it could reach consecutive depths of 35.79m, 79.96 m and 119.95 m, all well within the estimated time in spite of the adverse weather conditions. Finally, on 17 July 2011 AUV-150 reached a depth of 150 m.

Different tests were carried out, which are summarized as follows:

- Endurance in extreme rough sea environments (with recorded sea-states of 4 and above) could not be ascertained. Surface operations were almost impossible due to high sea states and presence of high surface waves.
- AUV-150 suffered from considerable drifts due to the presence of high surface/sub-sea currents.
- Sub-sea pressure hulls did not spring any leakage. AUV-150 exhibited considerable roll stability



The CMERI AUV team posing beside the system

and leak, withstanding at various depths.

- Depth corrections could be carried out with an accuracy of 0.1~0.7 m.
- Specified depth of 150 m was achieved as ensured from relevant sensor data.
- Significant underwater tracking was done with USBL Positioning System and acoustic communication whenever AUV-150 was within the acoustic range, thereby reflecting various significant mission parameters, and further verifying the success of sub-sea operations. The presence of strong sub-sea currents, however, kept AUV-150 out of its acoustic ranges most of the time.
- Satisfactory CTD profiling could be performed resulting in good observations for variations in conductivity, salinity and temperature at different depths.
- On-board sensors like PHINS,

DVL, Depth sensor and Altim exhibited functional consistency and integrity.

- Thrusters were operational. Efforts were made to keep AUV-150 in position at various depths and perform surge operations with heading corrections to follow a predefined mission.
- Minor problems were faced in recording video frames from the underwater camera attached with AUV-150.
- Underwater terrain data was logged successfully by Side Scan SONAR. Data logging from the Forward Looking SONAR (FLS) was also successful, as verified from mission log files.

The successful sea trial of AUV-150 marked a momentous entry into the annals of robotic research in India and marked the beginning of a more ambitious underwater robotic programme for venturing to 3000 m of ocean depth, to be taken up during the 12th Five Year Plan period.



IIP, Dehradun Excels in Pinch Analysis Pinch Technology: A Tool for Energy Conservation

The key to maximizing energy efficiency is in capturing and reusing of waste heat within the processes and total sites, cutting the need for additional heating and cooling, thereby eliminating some equipment as well as savings in hot and cold utilities. Pinch analysis is a systematic procedure, based on fundamental thermodynamic principles (First and Second Law of Thermodynamics), that guarantees finding the best possible solution. The prime objectives of pinch analysis are to achieve financial saving and green environment by better process heat integration. This is achieved by maximizing the process-to-process heat recovery and reducing the external utility load.

In any pinch analysis problem, a well-defined pinch analysis procedure (Table:1) is followed. Additional activities such as re-simulation and data modification are required as the analysis proceeds.

Table 1: Steps of Pinch Analysis

- Data extraction
- Data consistency check (software, simulations, practical experiences)
- Selection of ΔT min. value based on experience/general practice
- Generation of Composite Curves (Fig.1)
- Determining of optimum ΔT min. using ΔT min. vs Cost Diagram (Fig.2)
- Generation of final Composite Curve
- Plus-minus Principal Applications
- Generation of Grand Composite Curve (Fig.3)
- Heat Exchanger Network
- Utility placement and optimization

Benefits of Pinch Analysis

Following are the benefits of Pinch Analysis:

- Ability to set energy and capital cost target for individual process or entire production site ahead of design.
- Lower energy consumption, due to better process heat integration.
- Lower energy cost, due to lower consumption as well as shifting load from higher to lower cost utilities
- Debottlenecking of boiler/cooling tower and refrigeration system capacity

- To help reduce local environmental emission
- Update or modify process flow diagrams
- Determine opportunities for Combined Heat and Power (CHP) generation

Application Areas

Pinch analysis has been successfully used across the full spectrum of chemical process industries, namely, Oil refining; Petrochemicals; Fertilizers and Pesticides; Polymers and Fibres; Pulp and Paper; Food Processing and Distilleries and Breweries.

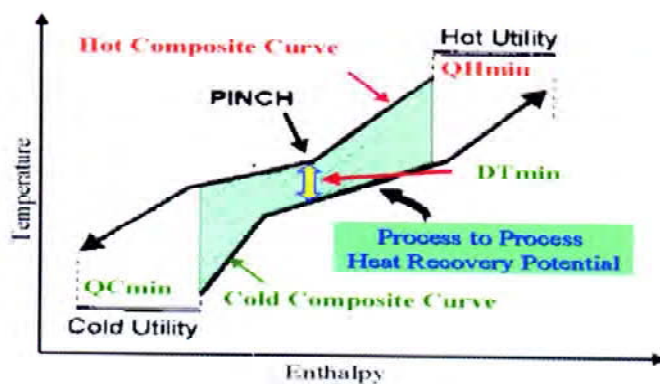


Figure 1: Hot and Cold Composite Curves

Composite Curves are used to estimate the minimum energy (hot & cold utilities), area and number of heat exchanger units required.

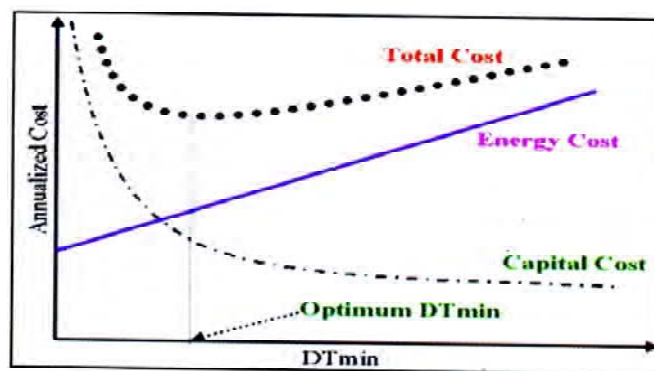


Figure 2: ΔT min vs Cost Diagram

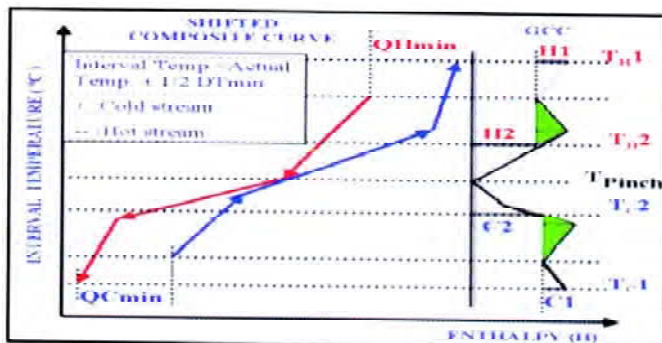


Figure 3: Grand Composite Curve

Grand Composite Curve (GCC) is used to select appropriate level of utilities to meet the energy requirement.

In pinch analysis area, Indian Institute of Petroleum (IIP), Dehradun has got immense expertise and has already carried out a large number of projects.

IIP's Major Pinch Analysis Projects	
Projects	Benefits Achieved
Crude Distillation Unit's (CDU's) preheat train, IOCL, Guwahati	For the same hot utility consumption, CDU's throughput could be increased from 1 MMTPA to 1.3 MMTPA
Delayed Coker Unit's preheat train, IOCL, Guwahati	4715 MMkcal energy savings per annum
Crude Distillation Unit's preheat train, Reliance Industries Ltd., Jamnagar	For the same hot utility consumption, CDU's throughput could be increased by 30M ³ /hr
Lube Extraction Unit, HPCL, Mumbai	Hydrodynamic debottlenecking of Solvent Recovery Circuit (SRC) furnace for proposed unit capacity of 48M ³ /hr from 36M ³ /hr
FCC Unit at IOCL Refinery, Panipat	Furnace duty saved by 1.26 MMkcal/hr

CSIR Hamsa Developed by NAL, Bangalore

National Aerospace Laboratories (NAL), Bangalore has developed an air propelled ferry system, *CSIR Hamsa*, to access difficult terrains such as marshy land and water. *Hamsa*, with a likely tag of Rs. 4 lakh, can be used for eco-tourism, fishing, leisure, geometrics, law enforcement, besides search and rescue operations.

The ferry is named after the mythological bird, which does not fly but moves in land and water. It is a self-propelled multi-terrain vehicle, which depends primarily on air thrust for propulsion. "In India, over 400 million people live along the coastline and water bodies like rivers, lakes, shallow water regions of which many are filled with weeds. The air ferry can be used in a wide variety of applications where access is a problem," said Dr. S. Selvarajan, NAL scientist and Project Leader.

Hamsa has undergone trial runs at Ulsoor Lake and can be custom-built with different hull designs. One of the models is a six-seater Parisil-boat, an all terrain vehicle, which operates on a Simonini mini aero engine. Another model is a three-seater, which can be used for clearing weeds and for rescue operations in lakes and rivers.

The third model is based on the Indian coracle. Called *water auto*, it is a basic coracle which can be rendered very stable by attaching 'strap-on out triggers.' It would cost around Rs 10,000 per unit. "Coracles are banned in Karnataka after many capsizing incidents. However, with the strap-on out triggers, the coracle is unsinkable. Discussions of CSIR scientists are on with the State Government for enhancing the applications of this unique vehicle.



India Hopes to Fly Indigenous 90-Seater Aircraft in Five Years

India hopes to test fly its first indigenously developed 90-seater regional transport aircraft in the next five years. According to the DG-CSIR, Prof Samir K. Brahmchari, the 90-seater RTA will be developed as a Team India initiative led by National Aerospace Laboratory (NAL), Bangalore, which could also see some global participation. A Committee headed by former ISRO Chairman, Dr G. Madhavan Nair has submitted a feasibility study to CSIR in this regard.

The Committee, which had top bureaucrats and aerospace scientists as members, has suggested a two-pronged approach – Design & Development and Production Unit – to realize the objective. “The Committee has come to a conclusion that the RTA should be a narrow body turbo-fan aircraft with a seating capacity for 70-90 persons and stretchable to 80-100 persons,” said Dr. Brahmachari. The total project cost is estimated at Rs 7,700 crore that includes Rs 4,500 for the design and development stage and Rs 3,200 for the production unit.

The Nair Committee has also suggested that the government pick up the entire tab for the design and development state and has favoured a joint venture route for setting up the production facility. The panel has set a target of six-eight years for completion of the development and production stage of the Project. It is hoped that the prototype would be ready in the next five years assuming that the Project takes off in 2012.

Development Partnership between NAL, Bangalore and Mahindra Group

Mahindra Aerospace has planned to manufacture utility aircrafts with seating capacity of five, eight, ten and 18. The Company's Chief Technology Officer, Karthik Krishnamurthy recently said that the aircrafts would be used for tourism, cargo and adventure sport rather than as commercial aircraft. The prototype of the five-seater aircraft would be jointly developed by Mahindra along with National Aeronautics Laboratory (NAL), Bangalore in public-private partnership.

International Forum for Aviation Research

Director General, CSIR has approved the proposal for NAL to be a member of International Forum for Aviation Research (IFAR), which connects and represents leading worldwide aerospace research organizations and responds to political, economic and public demands as an independent advisor. IFAR aims on focusing global research topics such as climate change, noise, efficient operations, security and safety by the development of an IFAR Road Map based on scientific and engineering competence.

IFAR also aims at an International Aviation Road Map, specifically addressing the most important questions for a global air transport system. Therefore, IFAR interacts with the public, politics and industry, takes up the challenges identified by them and acts as an independent and politically neutral advisor.

The idea of IFAR was born at the Berlin Summit 2008 where the key leaders of 12 International aeronautical research organizations met to address the question of *The Air Transport of the Future* in the context of climate changes. In this regard, the participants agreed that any research and strategy contributing to new solutions will have to reconcile with the increasing need for International mobility in a globalized work-sharing economy. The challenge is to simultaneously develop new solutions to balance the climate effects of the accompanying worldwide air traffic growth.

The next IFAR summit will be held on 18-19 June 2011 in Méry-sur-Oise near Paris in connection with the Paris Air Show in Le Bourget.



Novel Techniques for Preservation of Microorganisms

Dr. Swaranjit Singh Cameotra



The normal practice of a culture collection to maintain microorganisms for long-term is to preserve them by at least two different methods viz. Freeze drying (lyophilization) and by storage under liquid nitrogen. Some microorganisms do not stand these preservation techniques and thus, alternative techniques have to be applied to preserve them long term. Such microorganisms can be preserved under mineral oil (m.o.), in silica gel and in liquid medium with periodic transfers to fresh medium. Interestingly, these methods are very useful for laboratories that use simple and economic preservation techniques. The microbes are viable for several years by storage under mineral oil.

Conservation of stock cultures of bacteria and fungi in mineral oil (m.o.) has been successfully used by many researches. Heavy m.o. is as good as light oil for use as an overlay material. Owing to the slower growth of cultures under m.o., subculture periods may be lengthened from four weeks to as many months and years, with savings in effort, labour, time, and materials. In some cases subculturing has to be done for microbial cultures viable on slants/plates only every month and this is labour-intensive.

Frequent subculturing also leads to changes in the characters of the culture. Same is the case with preservation of some *Thiobacillus*, *Sulfolobus* and

Acidophilium cultures that have to be maintained in liquid medium only. In all cases microorganisms under m.o. survived longer than in the control tubes without m.o. layered over them. In our laboratory we routinely use m.o. layering of about 1.5 to 2.0 cm above the culture slants and the cultures are viable for 20-25 years or more. This method of preservation was started in 1987 in the Microbial Type Culture Collection (MTCC), Chandigarh that is now an International Depositary Authority (IDA).

Many fungi cannot stand Freeze Drying like the bacterial strains. Culture collections therefore, preserve such cultures by m.o. overlays. Some examples of fungi that are maintained by this method are isolates of *Phytophthora*, *Pythium*, basidiomycetes and mycelial forms which do not readily survive freeze-drying. Apart from the m.o. overlay, the cultures unable to stand freezing are preserved in silica gel and good results are obtained. The genetic stability of cultures

stored in m.o. is poor, however, this method is used as an alternative method for storage due to its efficiency and convenience. Storage in silica gel on the other hand, is good for genetic stability in microbes. Some other methods used in conjunction are preservation in soil, gelatin beads and water. The genetic stability in the case of preservation in soil is moderate to low and is moderate in water.

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CSIR's Memorable Mark with Indelible Ink

Dr. P. Cheena Chawla



Come elections and a black mark on the voters' left forefinger is a familiar sight. What most of us are, however, not so familiar with is the fact that the inerasable ink mark is a gift of CSIR to the Nation. Once applied, this mark indicates that the voter has cast his/her vote, and thus, prevents that person to vote a second time. Thanks to CSIR scientists working in the National Physical Laboratory (NPL), New Delhi, for their painstaking efforts that led to devising the chemical formula of indelible ink.

One of the earliest achievements of CSIR, it was to counter the challenge of fraudulent voting that research work on formulating indelible ink was initiated in 1950's by scientists in the Chemical Division, NPL, now called the Analytical Chemistry Section. The originators of this ink, Dr. B. G. Mathur, Dr. V. D. Puri and Dr. M. L. Goel have all left for their heavenly abode long back but in reality, they are truly immortal for the uniqueness of the product they have gifted us. This formulation of indelible ink was patented by the National Research Development Corporation (NRDC), New Delhi. The increasing

demand of indelible ink has immensely benefitted the families of the originators of this product as they have been receiving handsome royalties for its sale, over so many years.

The Mysore Paints & Varnish Ltd., a Karnataka Govt. Undertaking, has been licensed to manufacture the ink. This more than seven decades old Company was set up by Nalwadi Krishnaraja Wadiyar, the ruler of the then Princely State of Mysore, which was taken over by the State in 1947. The Company entered the business of making indelible ink only in 1962. Today lakhs of 10 ml bottles are supplied to the State administration on receiving the purchase orders from the Chief Electoral Officers of individual States, and consequently, the bills are also settled by individual States. Today this indelible mark has changed from a simple dot to an extended line on the nail covering a part of the skin. With this, the Company's sale orders of this product have also dramatically risen 2.5 times the previous sales and so has the overall profit.

It is a matter of pride that today this innovation of CSIR is going places, as Mysore Paints & Varnish Ltd., is already

exporting the indelible ink to about 25 countries that include Canada, Ghana, Nigeria, Mongolia, Malaysia, Nepal, South Africa and the Maldives. However, as different countries follow a different mode for applying the ink, the Company supplies the ink as per customer specifications. For example, in Cambodia and the Maldives, voters needs to dip his/her finger into the ink while in Burkina Faso the ink is applied with a brush, and nozzles are used for its use in Turkey. Use of marker pens having the indelible ink are also in vogue in some countries.

Interestingly, more than half of the Company's profits accrue from the sale of CSIR-developed indelible ink, which includes the sale in the country and that in the global market. As the name of the Company suggests its other products include decorative coatings, industrial paints, wood polishes, primers, varnish and thinners. According to figures in 2008-09, the Company did business worth Rs. 11 crore by selling non-ink products, while the domestic orders for indelible ink for this period was Rs. 13 crore plus Rs. 2.5 crore earned from exports of this product.



indelible ink mark (earlier)



indelible ink mark (now)

As the ink is photo-sensitive, it needs to be protected from exposure to direct sun rays. Therefore, amber-coloured plastic containers are used for storing the ink, which in earlier times was stored in brown-coloured glass bottles. On application, the ink remains on the fingernail for at least two days, to even up to a month depending upon the person's body temperature and the environment. The ink contains silver nitrate, which on reaction with the nail and on exposure to light gets darker. This water-based ink also contains a solvent like alcohol to allow its faster drying, besides having some dyes. The composition of indelible ink is optimized such that it diffuses into the skin spontaneously to give a definite marking which is resistant to chemical and mechanical manipulations.

The precise protocol for making this ink including its chemical composition and the quantity of each constituent is, however, not known to many people. Though the basic chemical formula of this ink has not been altered since 1952, NPL scientists are still working to make the formulation better. For example, efforts are being made to devise a variant formulation that dries up faster.

In the year 2000, a new research

approach to develop a better version of indelible ink was proposed by Dr. Krishan Lal, Emeritus Scientist at NPL, and former Director, NPL. The scientific team led by Dr. Lal comprised Dr. A. K. Sarkar, Dr. Prabhat Gupta and Mr. Niranjn Singh who discussed and mutually agreed upon this new approach in a joint meeting with the Election Commission, NRDC and Mysore Paints & Varnish Ltd. The idea was to remove water base for the ink to make it dry faster. So a two-component model of indelible ink was devised where a sensitizer was first used to clean the skin and then the ink was applied that was contained in a fluid which did not have a water base.

This Project was fully funded by the Election Commission. Besides being a two-component model of the ink, the colour of the indelible mark was deep saffron, which is why the Election Commission suggested the scientists to use another dye. As of date this formulation has not been used in any election, even though a patent has been filed for it. "Sure, this Project needs to

be activated," says Dr Lal. "Rigorous testing is a very important parameter for this new version of indelible ink," he added. "Efforts are also on to make a variant of indelible ink that does not use silver, as this will greatly reduce the cost of this high-utility product," Dr. Lal informed.

According to Dr Lal, the monopoly of Mysore Paints & Varnish Ltd., in manufacturing the indelible ink is due to 50-year old trust the Election Commission has with this Company. Notwithstanding, before every assembly or by-election, the Election Commission sends a consignment of the ink to NPL for testing the product quality. The Company also puts the samples to in-house stringent quality control tests before they are dispatched to various customers in and outside the country.

Not only is the formulation of indelible ink innovative, but the prospective new uses of this age-old process also appear quite novel, as besides being used during elections, the ink is now finding applications in select hospitals to mark out cancer-affected areas in the body.





NEIST organized National Seminar on, *Plants in Diabetes*

The North East Institute of Science & Technology (NEIST), Jorhat organized the 2nd Indian National Seminar on, *Plants in Diabetes: Prospects & Challenges* during 8–9 April 2011 jointly with Asian Network of Research on Anti-diabetic Plants (ANRAP), Dhaka, Bangladesh along with ERD Foundation, Srimanta Sankaradeva University of Health Sciences and Government Ayurvedic College and Hospital, Guwahati.

Held at Phanidhar Dutta Seminar Hall, Guwahati University, this Seminar was largely attended by many distinguished scientists and doctors, under and post graduate students and scholars from various Institutes of Bangladesh, Govt. Ayurvedic college, Guwahati, Guwahati Medical College, Gauhati University, besides NEIST scientists.

Dr. P. G. Rao, Director, NEIST chaired the Inaugural Programme where Prof. M. Mosihuzzaman, Chairman, ANRAP was present as the Chief Guest and Prof. U. C. Sarma, Vice Chancellor of Srimanta Sankaradeva University of Health Sciences and Prof. O. K. Medhi, Vice Chancellor of Gauhati University as Guest of Honour.

In his Welcome Address, Dr. R. K. Sharma, Vice-Chairman, Organizing Committee mentioned this as a significant seminar on diabetes in the NE Region. Prof Sharma stressed on the need for collaborative research work and the importance of such seminars for



Invited dignitaries on the dais

promoting scientific knowledge between the scholars and scientists of India and Bangladesh.

Prof. Medhi laid out the importance of plant-based drugs in the management of chronic disorders. Prof. Liaquat Ali, Coordinator, Organizing committee outlined the objectives of ANRAP and its future plans. Prof. A. K. Azad Khan, Secretary General, ANRAP and Prof. Biswapati Mukherjee, Member, ANRAP also spoke on the occasion.

The Chief Guest Prof. Mosihuzzaman, also spoke about ANRAP and the need for more research into anti-diabetic plants. A total of four plenary lectures were delivered by eminent scientists from India and Bangladesh, 13 lectures were presented by invited guests from India and Bangladesh during the two-day Seminar. Nearly 30 scientific papers were presented in the oral paper sessions of the Seminar, while 20 papers were presented as Posters. One oral paper session was chaired by Dr. Rao.

In the Valedictory Function, Prof. Khan mentioned that Bangladesh, India, Pakistan and other SAARC countries should collaborate to harness natural products from medicinal plants using modern scientific methods. He encouraged more participation to carry out research under ANRAP. Prof. Mosihuzzaman mentioned that presently Europe and America put more emphasis on herbal medicines. Therefore, the efficacy of herbal medicines is required to be validated with modern medical research. He also laid emphasis on forging ties with institutions like NEIST and University of Health Sciences, Gauhati University.

“Some common food items of North-east India and Bangladesh have anti-diabetic activity and their potency needs to be tested,” informed Dr. B. P. Sarma, Associate Prof. Department of Kayachikitsa (Medicine), Govt. Ayurvedic College & Hospital, Guwahati and Organizing Secretary. Prof. Mukherjee mentioned the urgent



need to groom young researchers specifically for expertise to be developed in the areas like producing a STZ induced rats (Diabetic model rats) etc., from India and Bangladesh.

“All medicines under different categories like, Ayurveda, Unani, Siddha, Homoeopathy and Allopathy should be brought under one umbrella of *Unified Medicine*,” Prof Ali mentioned. “Public as well as Private collaborations are needed to work towards the upliftment of human lives. Encouragement and involvement from people of different fields and discipline are needed,” he suggested.

Dr. Rao hoped that participation in such seminars would increase in future.

He assured that the proposal of *Unified Medicine* by Prof. Ali would be pursued on priority basis. He further suggested to develop standard procedures for testing of popular herbal drugs for finding their actual mode of action. He laid emphasis on the exchange of students between Bangladesh and India, and expressed that scientists of these countries must publish papers jointly and share their ideas through e-

mails for research progress. The Seminar ended with the high hope of fighting the challenge of diabetes



Dr. P. G. Rao, Director, NEIST delivering the speech

through multi-disciplinary and multi-institutional collaborative research at both National and International level.

Indo-European Workshop on *Recent Advances in Shape Memory Materials*

A one-day Indo-European Workshop on, *Advances in Shape Memory Materials* was organized by the Centre for Societal Missions and Special Technologies (CSMST), NAL, on 21 March 2011 at S. R. Valluri auditorium, NAL. The audience were scientists, researchers and engineers from NAL and other R&D organizations like DRDO, HAL, ISRO, ADA, ADE, General Motors, etc., apart from a few engineering colleges.

This Workshop focused on some of the recent advances made in the area of shape memory alloys (SMAs), their thin films, and shape memory polymers (SMPs) and Ferromagnetic SMAs; while their the potential application areas were also identified.

In his Welcome Address, Dr. G. N. Dayananda, Head, CSMST, said that the objectives behind conducting this Workshop were to create a common awareness and impart rudiments of knowledge on Shape Memory Materials to scientists, academicians and design engineers who are working towards development of smart mechanisms/ devices and structures based on these materials.

Shape Memory Materials have highly discerning applications such as morphing of aircraft, energy absorbing systems for seismic structures, deployment mechanisms for space vehicles, micro systems etc. Dr. Dayananda said, “The thermal and super elastic SMA systems have established

themselves to some extent in aerospace, biomedical, automobile, consumer appliances, to name a few.” However, he continued, “There are certain other shape memory material systems such as polymers and magnetic alloys that have attracted the attention in recent times due to their functional efficacy and versatility. These new materials enhance the range of smart materials available and thus broaden the horizon of the designer. In addition, this Workshop would provide more insight into the behaviour of shape memory materials vis-a-vis their potential utility, degradation aspects, consistency and reliability for use in various device forms.”



In his Inaugural Address, Dr. A. R. Upadhyaya, Director, NAL expressed happiness that Dr. Dayananda, Head, CSMST has taken a 'smart' initiative to organize such a useful Workshop. He also shared a lighter moment with the audience: "If a technical note had to be prepared in Hindi, what could be the gender of SMA?" He also suggested that the participants should make best use of this unique opportunity with the technical lectures from the experts in the field, including two European speakers, Prof. Jan Van Humbeeck, Catholic University, Belgium, and Dr. Petr Sittner, Institute of Physics, Prague. The Vote of Thanks was proposed by Dr. Shylaja Srihari, R&D Coordinator, CSMST.

In the Technical Sessions that followed, the speakers of the first session, chaired by Dr. K. Vijayaraju, ADA, presented illuminating lectures:

Dr. Petr Sittner, Institute of Physics, Prague, discussed the shape setting of NiTi for smart structures and composites; Prof. Jan Van Humbeeck, Catholic University, Belgium, gave an overview of the basic mechanisms and applications of SMPs, and Prof. Abhijit Deshpande, IIT/M, Chennai, spoke on tailoring the shape memory behaviour of cross-linked polymers.

In the post-lunch session, chaired by Prof. S. Gopalakrishnan, IISc., Prof. Madangopal, BARC, gave a very focused talk on, *Ferromagnetic SMAs and Their Potential for Varied Applications*. This was followed by a very informative and interesting presentation on, *SMPs for Space Applications* by Dr. C. Gouri, VSSC, Thiruvananthapuram. The next lecture by Prof. S. Mohan, IISc., Bangalore, was centered around *SMA Thin Films*

for MEMS and SMA Devices, Their Versatility and Collaborative Research Potential.

The concluding lecture was presented by Dr. G. N. Dayananda, NAL, who gave an overview of the application-oriented SMA-based activities being carried out at NAL to realize morphing airframe structures as well as that for efficient energy dissipating mechanisms. His talk also dwelled on the various issues that need to be addressed to realize SMA-integrated flight-worthy structures.

The Technical Lectures and the Panel Discussions that followed brought out the fact that each type of shape memory material has its own inherent merits and limitations; and there is a strong need to bring about a synergic effect through the development of hybrid/conjoint systems and/or devices.

NGRI Organizes International Workshop on, *Deep Scientific Drilling to Study Reservoir Triggered Earthquakes* at Koyna, India

An International Workshop on, *Deep Scientific Drilling at Koyna, India* was organized by the NGRI, Hyderabad during 21-25 March 2011. Koyna is a well-known site of artificial water reservoir triggered seismicity. This isolated zone of continued seismicity at shallow depths, provides an excellent opportunity for earthquake studies. A borehole observatory in this active zone has been under consideration, which would enable direct and continuous monitoring of an intra-plate seismic zone at depth, leading to a better understanding of the mechanics of

faulting, physics of reservoir triggered earthquakes, and would contribute appreciably to earthquake hazard assessment and forecasting.

The principal objectives of the Workshop were to fully review the motivation behind deep drilling down to focal depths of ~7 km at a classical RTS site in an intra-plate setting, and to design the entire experiment through discussions with national and international experts. The first two days of the Workshop were held at NGRI, followed by a field trip to Koyna-Warna area and the final day's discussions were

at Karad, Maharashtra. The Workshop was supported by the Ministry of Earth Sciences (MoES), Government of India and the International Continental Scientific Drilling Program (ICDP).

The participants of the Workshop included seismologists and experts associated with active fault zone drilling projects worldwide such as the San Andreas Fault Observatory at Depth (SAFOD) in western USA, the Chi-Chi earthquake of Taiwan, the Kobe earthquake of Japan, the Gulf of Corinth in Greece and the Latur earthquake of India. Twenty six International delegates



from the USA, Japan, Germany, France, Italy, Poland, Taiwan, Canada and New Zealand, and 50 national delegates from major Earth Science Organizations, Institutes and Universities in the country participated in the Workshop which included the MoES, NGRI, Geological Survey of India, Atomic Minerals Directorate for Exploration and Research, Oil and Natural Gas Corporation, North-East Institute of Science and Technology (NEIST), India Meteorological Department, Institute for Seismological Research, Wadia Institute of Himalayan Geology, National Institute of Rock Mechanics, Central Water and Power Research Station, National Centre for Antarctic and Ocean Research, Pune University, Sivaji University (Kolhapur) and M.S. University of



Group photograph of participants to the field trip at Koyana. Background view shows the Koyana dam and near-horizontal basaltic lava flows

Baroda.

On the basis of intensive discussions among the participants and important suggestions received from experts from India and abroad, a few key areas were identified for detailed preparatory studies. Foremost among those are the needs to establish the hydrological connectivity between the reservoir and host country rock and to constrain the

fine structure of the seismic zone in the area including detailed mapping of the causative faults, both of which would be critical in locating the deep borehole observatory in the region. A three-tier action plan was agreed upon, which included revisiting old data and acquiring new data, studying hydraulic connectivity in the region and planning the main borehole based on the above.

Workshop on, *Biology Leading Towards Bio-inspired Engineering* at CMERI, Durgapur

In engineering, all devices are synthesized by assembly of discrete and often pre-existing components unlike the naturally-grown, fully-integrated biological systems whose function drives the evolution of form at all levels simultaneously. Better understanding of exquisite performance of these integrated biological systems over many hierarchical levels is the key to emulate their functionality in an engineered system. This new and emergent discipline applies biological principles to

develop new engineering solutions, and is broadly known as Biomimetics or Biologically Inspired Engineering.

Biologically inspired engineering encompasses specialty areas in biology, engineering and the physical sciences, and aims to revolutionize the underlying principles of synthetic design through radical thinking. Even though the field of Biomimetics has just started developing, some tangible applications are on the horizon. The extremely high-density nano-wires have the capability

of acting as high-density storage media due to enhanced ferromagnetic properties.

Nature uses fewer materials to create a variety of life forms, and the same material is used in many different ways to meet various needs, as can be seen in the case of collagen. Natural materials are mostly constituted from organic, inorganic crystals and amorphous phases. Biomimetics is a discipline addressing the design and fabrication of synthetic materials using



the strategies adopted by living organisms. The organic/ inorganic composites synthesized by the principles of living organisms often display unique and desirable morphological, structural and mechanical properties, and represent informative models for the synthesis and design of complex functional materials.

Self-assembly of materials includes synthesis of self-generating, hierarchical, multi-functional, non-linear, composite, adaptive, self-repairing and biodegradable behaviour of materials. For example, bones slowly add or lose mass and change their form in response to modifications of applied stresses. Being subjected to cyclic loading *in-vivo*, it changes and thickens with an increased applied load. If it is kept continuously under lower than the usual load, it thins and reduces in density and weight. This phenomenon is indicative of the ability of bone to adapt itself to the changing demands of the levels of applied load. In this respect, bone is a smart material even though the response time is longer. Current interest of many branches of science ranging from electronics to molecular biology is the creation of complex, heterogeneous structures of well-controlled architecture and function.

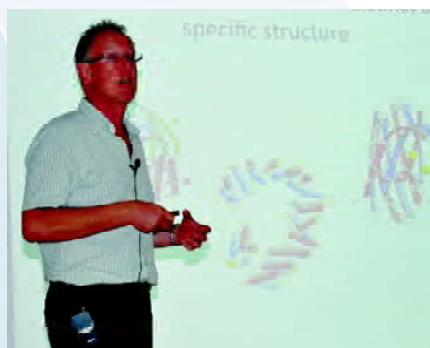
In view of the immense potential Biomimetics holds in store, it was appreciated that CSIR scientists have the responsibility of integrating Biology with the Physical, Chemical and Engineering Sciences so that the capabilities are fused coherently in order to evolve relevant and useful devices. As a primer, CMERI organized a Workshop covering the gamut of Biomimetics under the auspices of the generic theme, *Biology Leading towards Bio-inspired Engineering* during 18-19 April 2011 at CMERI, Durgapur. The purpose of the Workshop was initiating engineering-scientists and physicists on a track, so that they comprehend and recognize the scopes of enriching Biology and find out a Pareto-Optimal way of integration.

The Workshop accommodated invited lectures by eminent experts such as Prof. Ron Kopito, Stanford University, USA; Prof. Ranga Narayanan, University of Florida, USA; Prof. Amitabha Chattopadhyay, CCMB, Hyderabad; Prof. Sudip Chattopadhyay, NIT, Durgapur; Prof. Debashish Bhattacharya, IICB, Kolkata; Dr. Sanjay Kumar, IHBT, Palampur; Dr. Sudit Mukhopadhyay, NIT, Durgapur and Prof. Pradyumna Ghosh, Banaras

Hindu University, Varanasi.

In his talk entitled, *Quality Control in the Protein Assembly Line*, Prof. Ron Kopito of the University of Stanford, USA outlined the problem of protein folding – the process by which linear polypeptide chains are assembled into the correct precise three-dimensional structures that are essential for the performance of varied functions. In contrast to the ‘folding problem’ – hitherto traditionally the domain of biophysicists and theoretical biologists – Prof. Kopito and his group are focusing on areas that lie at the interface between Human Genetics and Cell Biology.

In the course of the Workshop, Prof. Kopito discussed the majority of genetic mutations that cause devastating inherited brain disorders, like Parkinson’s and Huntington’s diseases, interfere with the process of protein folding, leading to the production of proteins that, if not rapidly destroyed, become toxic to brain cells. Prof. Kopito and his co-researchers are trying to understand how brain cells are able to make the decision to destroy these aberrant proteins and why these processes sometimes fail, with devastating consequences.



Prof. Ron Kopito speaking on ‘Quality Control in the Protein Assembly Line’



Prof. Ranga Narayanan speaking at the Workshop



Prof. Amitabha Chattopadhyay at the Workshop



Speaking on his chosen theme, *Oscillatory Flows as a Means of Separation of Species*, Prof. Ranga Narayanan of the University of Florida, USA succinctly explained how oscillatory flows in tubes can be used as a mechanical means to partially separate species and increase mass transport. The theory behind the phenomenon can be traced to the Taylor dispersion in tubes. The idea of species separation, he illuminated, originated with hyperventilation in lungs and has since been applied to separation of species in the gas phase.

In his lecture, Prof. Narayanan explained in detail the physics of mass transfer in oscillatory flow, and thereafter proceeded to outlining the application to separation of species in the gas phase through the presentation of comparing experiments to theory. Future applications of separation in the liquid phase were also discussed along with potential problems and opportunities.

Biological membranes are complex assemblies of lipids and proteins that allow cellular compartmentalization and act as the interface, through which cells communicate with each other and with the external milieu. The biological membrane, therefore, constitutes the site

of many important cellular functions involving transfer of information from outside to the interior of the cell.

In physical terms, membranes can be treated as a complex oriented fluid which is a weakly coupled, non-covalent and anisotropic assembly of molecules in two-dimensions (and can, therefore, be treated as soft matter). Membranes are heterogeneous in the context of a wide range of spatiotemporal scales. A unique aspect of such an assembly is its dynamics spanning a large range of time scales, which supports a wide variety of biological processes, necessary for cellular function. Monitoring membrane dynamics with all its complexities continues to be a challenge in contemporary membrane biophysics.

A fundamental issue of biological relevance is how cell membrane dynamics could be related to cellular signaling. Another important emerging area is the role of cellular membranes in the entry of pathogens to host cells. These insights emerged from the extremely lucid presentation of Prof. Amitabha Chattopadhyay, Scientist, CCMB, Hyderabad as he enumerated the *Current Excitements and Challenges in Membrane Biology* and provided a broad overview of these

issues with examples taken from literature as well as his own work.

Dr. Sanjay Kumar of IHBT, Palampur felt that there was a need to automate measurements on the visible characteristics or phenotype of plants which include measurement of leaf growth, leaf architecture, surface characteristics, photosynthetic characteristics, leaf temperature, biomass, evapo-transpiration, water use efficiency, disease symptoms, etc. These traits, he felt, need to be monitored in a high throughput and non-invasive mode at various stages of growth and development of a plant.

Dr. Kumar's deliberations on, *Plant processes that need Technological Interventions*, opened up the very interesting possibility of automating measurements for estimating metabolites (critical for medicinal and aromatic plants), protein, DNA, RNA, and nitrogen content. The root zone of a plant, he surmised, is yet another important area that could utilize non-invasive methods to monitor root growth, soil characteristics, soil volume, water potential, all being critical parameters determining plant performance. Modules should be developed to validate these parameters for measurements



Prof. Sudip Mukhopadhyay of NIT, Durgapur



Prof. Sudip Chattopadhyay of NIT, Durgapur



Dr. Sanjay Kumar speaking on 'Plant processes that need Technological Interventions'



Prof. Ron Kopito being felicitated by Prof. Amitabha Chattopadhyay



Prof. Amitabha Chattopadhyay being felicitated by Prof. Gautam Biswas, Director, CMERI, Durgapur

under controlled as well under field conditions.

Light controls growth and development throughout the plant life cycle. In unfavourable environmental conditions, an intact and healthy seed remains dormant in a dry state. A wide spectrum of light, in particular far-red, red, blue and ultraviolet (UV) light induce photomorphogenesis. It is, therefore, not surprising that plants have adopted the ability to sense multiple parameters of ambient light signals, including light quantity (fluence), quality (wavelength), direction and duration. Light signals are perceived through at least four distinct families of photoreceptors, which include phytochromes, cryptochromes,

phototropins and unidentified ultraviolet B (UV-B) photoreceptor(s).

Prof. Sudip Chattopadhyay of NIT, Durgapur and his team had been investigating the molecular basis of light-mediated seedling development in a model plant, *Arabidopsis thaliana*, and was successful in cloning and functionally characterizing several regulatory proteins signaling that light plays an important role in *Arabidopsis* seedling development. The team had recently demonstrated the genetic interrelations of ZBF1 with two well-characterized negative regulators of light signaling, COP1 and SPA1, in photomorphogenic growth and light regulated global gene expression. This

very interesting vista was exposed to the Workshop participants through the lecture of Prof. Sudip Chattopadhyay on the theme, *Light-Controlled Arabidopsis Seedling Development*.

The Workshop participants were then taken through an *Introduction of Life and Life Engineering* by Prof. Sudit Mukhopadhyay of NIT, Durgapur, wherein he outlined the basic idea of Genetic Engineering along with the scope of engineering in biology. Biologists are now creating genetically modified life of laboratory animals for understanding human diseases and also for drug discovery. Today genetically modified plants have been created which are insect- and- pathogen-resistant, drought-resistant and salinity-resistant. Genetically modified disease resistant veterinary animals have also been produced successfully. Genetically modified microbes are being used for removal of different pollutants. Bio-engineering has evolved as a discipline, where engineering knowledge is being used to develop artificial tissues, artificial organs etc. for treatment of human diseases.

One-day Workshop on, *Faculty Training and Motivation & Adoption of Schools & Colleges* at CBRI by Vigyan Prasara

Vigyan Prasara (An autonomous organization under the Department of Science & Technology, Govt. of India) has been engaged in extensive in-house research conceptualizing different programmes of science & technology. All the programmes are evolved by understanding the needs and

requirements of the users at different levels and are designed and developed with an objective to create scientific awareness among the faculty members and students.

The scientists of Vigyan Prasara, Mr. R. Nath, Scientist E and Mr. Kapil Tripathi, Scientist C organized a

Workshop on 29 March 2011 at the Central Building Research Institute (CBRI), Roorkee to promote interest, excitement and excellence in science education for students and faculty members of schools and colleges of Roorkee under the *Faculty Training & Motivation and Adoption of Schools*



Scientist, Vigyan Prasar delivering the lecture (left), Faculty members and students during the Workshop (right)



Faculty members and students receiving kits on Innovative Activities in Physics



Faculty members and students interacting with scientist of Vigyan Prasar (above & below)



& Colleges Programme of CSIR.

A total of 12 science faculty members and more than 50 students of the following six schools and colleges of Roorkee participated in the Workshop: K. L. DAV (PG) College, Methodist Girls Inter College, 7th Day Adventist Inter College, Government Inter College, Bal Vidya Mandir School and CBRI Junior High School. Mr. H. K. Jain, PTO and Mr. Nagesh Babu Balam, Scientist C of CBRI, Roorkee who have been actively associated with all activities of this CSIR Programme also attended the Workshop.

The Workshop was inaugurated by Shri S. G. Dave, Scientist G and Head (DC&E), CBRI who is also one of the Advisers of this Programme and coordinated by Dr. P. K. Bhargava, Scientist F, CBRI. Shri Dave said that the Workshop is a unique opportunity for school students to learn the basic principles of science through real experiments. Mr. R. Nath told the faculty members and students that innovation has no boundaries.



NGRI Participates in an International Collaborative Program

An International collaborative program entitled, *Exposing the Gold Potential of the Neoproterozoic "Himalaya" of the Dharwar Craton in Southern India* has been approved under the scheme of 'Indo-Australian Strategic Fund Scheme'. The Project is aimed at understanding the time and space relationship between the Closepet Granite batholith and adjacent gold-hosting terranes of the Eastern and Western Dharwar craton and reliable geochronology of other significant gold deposits.

A tectonic synthesis of existing and new data as a template for future research and to underpin and revitalize

future gold exploration activity is envisaged. Apart from the National Geophysical Research Institute (NGRI), Hyderabad, Pondicherry University and Curtin University from Australia are also involved in this Program.

As a part of the proposed project, a Workshop was held from 12-14 February 2011 to assess the present status on the Project and to chalk out the future plan of action. Prof. Neal McNaughton, Project Leader along with Dr. Ayyasami, Dy.DG, GSI, Hyderabad; Dr. V. N. Vasudev,



A view of the participants

Geomysore, Bangalore; Dr. Y. J. Bhaskar Rao, Acting Director, NGRI; officers from Hutti Gold Mines, and other Scientists from NGRI participated in the discussions.

CGCRI Conducts Orientation Programme for Summer Interns-2011

The Central Glass & Ceramic Research Institute (CGCRI), Kolkata has instituted a special Summer Internship Programme to attract bright Engineering students, pursuing four-year engineering

programme, to participate in result-oriented research projects for two months duration. This year 30 candidates were selected through a rigorous screening and short-listing process. The

students were assigned specific projects as independent components of on-going supra-institutional or network projects to supplement the overall R&D activities at CGCRI.

In order to acquaint with the infrastructure and current activities of CGCRI, an Orientation Programme was organized on 27 June 2011 for the summer intern students where the Director addressed the students and explained the present mandate of CSIR and the specific areas of research in focus at CGCRI. Subsequently, the Heads of the Divisions made brief presentations about their divisional activities and future aims. The students were later divided into groups and taken for a visit to different Divisions of CGCRI.



The Summer Trainees along with Director, CGCRI and Head, Programme Management Division



Golden Jubilee Lecture Series Held at NEIST, Jorhat

Ninth & Tenth Lecture Series

The 9th and 10th Golden Jubilee Lecture Series were held on 18 March 2011 as part of the Golden Jubilee celebration of NEIST, Jorhat. The Guest speakers were Dr. N. Chattopadhyay and Dr. S. Bandyopadhyay, Senior Scientists, Central Drug Research Institute (CDRI) Lucknow and Indian Institute of Toxicological Research (ITRC), Lucknow respectively. The Function was presided over by Dr. P. G. Rao, Director, NEIST which was largely attended by invited dignitaries from various Institutes, scientists, research students besides the scientific fraternity of NEIST.

Dr. Rao while delivering the Welcome Address mentioned that the distinguished speakers were specialized in human health related areas and their lecture topics will lay more emphasis on the future project work in the field of health envisaged in the 12th Five Year Plan. He further expressed hope that it will enrich the knowledge of researchers on the related subjects.

Dr. B. G. Unni, Scientist G & Area-Coordinator (Biotechnology/Biological Sciences) gave the introductory speech of the speakers. Dr. Unni also spoke in brief about the programme undertaken so far by the Laboratory as a part of the Golden Jubilee celebration. Dr. Chattopadhyay, Scientist F and Head, Endocrinology Division, CDRI, Lucknow delivered the 9th Golden Jubilee Lecture on, *Constituents of Medicinal Plants*



Dr. N. Chattopadhyay (Left) and Dr. S. Bandyopadhyay (Right) delivering the lectures

Positively Impact Bone Metabolism More Than Those Derived From Dietary Sources: Evidence From in vitro, in vivo and Pharmacokinetic Studies.

Dr Chattopadhyay said that bone is the depot for calcium in the body, and bone remodeling occurs constantly at 1-2 million discrete sites in the adult skeleton. "The bone is constantly remodeled in order to maintain constant levels of Ca^{2+} and PO_4^{3-} and as a result of mechanical stress, a particular bone site endures. The functional portion of bone responsible for the remodeling are the osteoblasts, responsible for creating collagen to strengthen bone; osteocytes, responsible for controlling the mineral balance; and osteoclasts which destroy bone mineral tissue," he added.

Dr Chattopadhyay lamented that the most common bone disease, *Osteoporosis*, is a disorder which causes bone resorption to exceed bone

formation. "In this condition, the osteoclasts become more numerous, while the number of osteoblasts greatly declines, and thus the marrow cavities seem to get larger as trabeculae have unfilled cavities," he opined. "The mass of a skeletal site is strongly affected by Marrow Volume Fraction (MVF), or amount of marrow compared to the total skeletal mass, and osteoporosis changes the MVF, and thus changes the bone mass," he said. He also said that accelerated loss of bone after menopause is accompanied by reduced ability to form new bone, giving rise to menopausal osteoporosis.

Informing that there is an estimated 350 million Indians who suffer from osteoporosis and as a result there is a growing interest in assessing the role of plants and plant-derived compounds in the prevention of menopausal osteoporosis, Dr Chattopadhyay said that currently his team has identified some



bone conserving plant extract used for the treatment of osteoporosis. These plants include soya, red clove, green tea and extract of *Ginkgo biloba*, Egb 761. He also demonstrated the development of a standard extract derived from natural source comprising the stem bark of *Butea monosperma* and stem bark of *Ulmus wallichiana*, which are very effective at preventing post-menopausal bone osteoporosis.

Dr. (Ms) Bandyopadhyay, Scientist C in Developmental Toxicology, ITRC, Lucknow delivered the 10th Golden Jubilee Lecture from the same dais on the topic, *Metals, Neuroinflammation and Therapeutics in Alzheimer's Disease*. She informed that two major findings in the Alzheimer's brain, a degenerative disease are amyloid plaques and neurofibrillary tangles. "Amyloid plaques are found outside the neurons, whereas neurofibrillary tangles

are found inside the neurons," she said. She added that plaques and tangles are found in the brains of people without Alzheimer's but the gross amount of them is significant in Alzheimer's disease.

Dr. Bandyopadhyay also said that metals such as aluminum (Al), copper (Cu), zinc (Zn) and iron (Fe) have been implicated in the pathogenesis of Alzheimer's disease (AD) because trace amounts of these metals present in drinking water raises the possibility for low-dose chronic exposure. "Since the presence of Al and Cu in drinking water has been shown to adversely affect the progression of AD, these two metals may aggravate some of the events associated with the disease process," she said. "The role of Al and Cu in causing an inflammatory response within the aging brain is well known and this gets upregulated in the AD brain

which may be one of the mechanisms by which the metals potentiate neurodegeneration," she informed.

Dr. Bandyopadhyay stressed on the fact that the neuropathological hallmarks of AD include extracellular β -amyloid (amyloid precursor protein (APP) deposits, intracellular neurofibrillary tangles (NFT)), dystrophic neuritis and amyloid angiopath. Therefore, the mismetabolism of APP and the defective clearance of β amyloid generate a cascade of events including hyperphosphorylated tau (τ) mediated breakdown of microtubular assembly and resultant synaptic failure which results in AD. In his concluding remarks, Dr. Rao urged the interested researchers to interact with the speakers further for initiating future collaborative research work. The programme concluded with the Vote of Thanks offered by Dr. Nileema Saikia, Scientist, NEIST.

Eleventh Lecture Series

The 11th Golden Jubilee Lecture Series of NEIST was held on 23 March 2011. The Guest speaker, Dr. P. V. Subba Rao, Deputy Director & Scientist F (retired), Central Salt & Marine Chemicals Research Institute (CSMCRI), Bhavnagar, Gujarat delivered the lecture on, *Seaweed Resources and Societal Benefits*. The Function was chaired by Dr. R. C. Boruah, Scientist-in-Charge, NEIST which was largely attended by invited dignitaries, scientists, research students, school teachers and students, besides the scientific fraternity of NEIST.



Dr. P. V. Subba Rao, delivering the lecture

In his Welcome Address, Dr. Boruah mentioned that NEIST was established in 1961 as one of the multi-disciplinary laboratories of CSIR under

its Chemical Science Group of laboratories and has limited work on seaweed resources. However, an active group has been working on the development of drugs from natural resources. Dr. Subba Rao gave a bird's eye view on the vast potential aspects of seaweed cultivation for rural development and economic upliftment of people residing in the coastal areas of Indian peninsula. He said that 71 percent of the Earth's surface is covered by oceans. Many plants live in oceans like the seaweed and seagrass that can thrive in salty ocean water and provide



food, feed, fodder and shelter for many marine animals.

Marine algae commonly known as seaweeds are of various shapes and sizes, and consist of thousands of species mainly of three types – red, green and brown algae that are classified into three different kingdoms: the Protists, Chromists and Plantae, respectively. Dr. Rao said that seagrass is a flowering plant that lives in estuaries, protected bays and lagoons, and like regular grass it has a strong root system that prevents erosion and also produces oxygen and acts as shelter and food source for many

marine animals. He said that seaweeds contain more than 60 trace elements in a concentration much higher than in land plants, and also vitamins, proteins, essential amino acids, iodine, bromine and antibiotics besides several bioactive substances. Agar produced mainly from red seaweeds of *Gracilaria edulis*, *Gelidiella acerosa*, *Gracilaria verrucosa* and from *Euclima* and *Hypnea* is used in all biochemical laboratories. “Alginic acid and mannitol are manufactured from brown seaweeds of *Sargassum* and *Turbinaria*,” he informed.

“The green seaweeds such as *Ulva*, *Enteromorpha*, *Caulerpa*, *Codium* and *Monostroma*; brown seaweeds such as *Sargassum*, *Hydroclathrus*, *Laminaria*, *Undaria* and *Macrocystis* and red seaweeds such as *Porphyra*, *Gracilaria*, *Euclima*, *Hypnea*, *Laurencia* and *Acanthophora* are consumed as vegetables, in soups, salads, porridges and pickles,” he said. Dr Subba Rao mentioned that seaweeds are used as human food, mineral supplements, health foods, medicine, feed for livestock, poultry, fish and prawn and as manure for many plantation crops, and are used even to combat global warming.

Twelfth Lecture Series



Dr. Shailesh Nayak, Secretary, MoES, delivering the 12th Golden Jubilee Lecture at NEIST (left).
Dr. Shailesh Nayak, Secretary, MoES, interacting with NEIST scientists (centre) and NE Wide Seismic Network inaugurated by Dr. Nayak (right)

The 12th Golden Jubilee Lecture was delivered by Dr Shailesh Nayak, Secretary, Ministry of Earth Sciences (MoES) under the banner of *World Environment Day Celebration* at the NEIST Auditorium on 3 June 2011. The Function Chaired by Dr. P. G. Rao, Director, NEIST, was largely attended by invited guests, scientists, research students and others besides the scientific

fraternity of NEIST.

Delivering his lecture on, *Societal Benefits of Earth System Science*, Dr Nayak spoke about the importance and need for Earth System Science for developing scientific understanding about natural cycles on Earth, which will help in improving prediction of climate, weather and natural hazards. In this connection, Dr Nayak spoke about the

activities of Weather Forecasting System in India and its services that find wide applications in Agriculture, Aviation, Shipping and Sports. Forecasting of weather and air quality, wind, temperature, humidity, etc. are some of the activities of this System.

Dr. Nayak discussed the numerical weather prediction system with different time intervals and air quality forecasting.



“The linkage with Doppler Weather Radar and High Computing System is absolutely essential for accurate short-term weather forecasting,” he opined. Among other things, he also mentioned few interesting areas like Eco-morphological zone of coral reef, harmful algal blooms and ornamental fishery. In coastal ocean monitoring and prediction system, he highlighted modeling for

Tsunami and Vulnerability mapping like sea level rise.

Summarizing his lecture, Dr. Nayak mentioned that scientists should develop technology, which can benefit the people up to grassroot level. In his remarks, Dr. Rao expressed his appreciation for the illuminating and informative lecture delivered by Dr. Nayak and mentioned about the relevance of the issues

discussed with the Environment Day celebrations. To mark the day, Dr. Nayak inaugurated the NE Wide Area Seismic Network (NEWSN) in the presence of Director, Dr. P. G. Rao and the distinguished gathering. The Function came to an end with Vote of Thanks offered by Dr. Prabhat Kotoky, Chief Scientist, NEIST.

CIMAP Bags *Krishi Sansthan Samman 2011* Award

CIMAP was recognized for its remarkable achievements when it was conferred the *Mahindra Samridhi India Agri Award 2011*, in the area of Agriculture, under the category, Public Sector Organizations called *Krishi Sansthan Samman-2011* in a glittering Award ceremony held in New Delhi in recent past.

Shri Sharad Pawar, Minister of Agriculture & Food processing Industries was the Chief Guest. Instituted by Mahindra & Mahindra Group in partnership with Zee News, the Award comprises a cash prize of Rs. One lakh one thousand besides a citation. The Award was received by Professor Ram Rajasekharan, Director, CIMAP.

CIMAP has been involved in creating improved agro-technologies and plant varieties of menthol mint, agro- and processing technology and improved variety CIMAP-Arogya of *Artemisia annua* (the anti-malarial drug plant),



Prof. Ram Rajasekharan, Director, CIMAP with Trophy of the Award

technology for rose scented geranium for Uttarakhand regions and recycling of plant agro-waste. It has also contributed immensely in the formulation of innovative farming technology. CIMAP took the initiative for the all-round development of promising medicinal and aromatic plants (MAPs) and has developed technology packages for cultivation of important plant varieties, including genotypes producing quality nucleus material

acceptable in the world market.

The agro-technologies developed by CIMAP have been beneficial for the farmers (especially marginal farmers) as well as industries. CIMAP continuously guides farmers through spot trainings and demonstrations to adopt improved plant varieties with agronomic practices that ensure quality production. As essential oils/herbs fetch premium price in the market,

CIMAP focuses on developing newer products from these oils resulting in higher demand for essential oils and plant extracts.

The agro-technologies developed and disseminated by CIMAP have been adopted by a large number of farmers in the country starting with small areas of half an acre or less. Today these technologies have attained an industrial scale yielding very high returns and immense employment opportunities.



Vigyan Ratna Samman to CDRI Scientist

Council of Science & Technology, Uttar Pradesh honours eminent Scientists, either born in Uttar Pradesh or having worked continuously for the last 10 years in Uttar Pradesh, under its *Science Awards Scheme - 2000*. This year, Dr. Madhu Dikshit, Scientist F & Head, Pharmacology Division of Central Drug Research Institute (CDRI), Lucknow received the prestigious *Vigyan Ratna Samman*, which carries a citation and a cash award of Rs 50000/-.

Dr. Dikshit is the first and foremost researcher in the country pursuing investigative pharmacology to delineate the role of NO, free radicals and neutrophils in various pathologies. Her high quality conceptual work has been amply cited and has implications in several pathologies. She has identified a new class of anti-platelet molecules, exhibiting anti-thrombotic and collagen antagonistic activity, having immense potential as a new class of anti-platelet drugs. She has more than 120 research papers to her credit and mentored more than 20 Ph.D. students.



Dr. Madhu Dikshit with *Vigyan Ratna Samman* Memento and Citation

Dual Honour for CDRI Scientist

Dr. Chandishwar Nath, Scientist G and Head, Division of Toxicology, Central Drug Research Institute (CDRI), Lucknow received Fellowship of two prestigious scientific societies: National Academy of Medical Sciences, India (FAMS) and Indian Academy of Neurosciences. Dr. Nath is a well-recognized Neuropharmacologist. His research work is of quite significance for knowledge generation as well as applied use.

Dr Nath's basic research work is on central neurotransmitter systems in Neurobehavioural disorders, Dementia, Parkinsonism, Drug Dependence, Depression and Aggressive behaviour that has received



Dr. C. Nath receiving the Fellowship certificate of Indian Academy of Neurosciences from Prof. Torsten N. Wiesel, Nobel Laureate (Medicine) at 5th Congress of Federation of Asian-Oceanic Neuroscience Societies (FAONS) in Lucknow

wide recognition. He has published 100 research papers in internationally reputed scientific journals. His research group is currently working on molecular neuropharmacological aspects of

memory functions, and conducted pioneer studies on acetylcholinesterase (AChE) enzyme and brain insulin receptors.

Dr Nath's group has demonstrated potential anti-dementia activity of gugulipid an anti-dyslipidemic drug developed by CDRI and obtained US & European patents. Recently, US & European patents were granted to newer synthetic anti-cholinesterase (memory improvement) of CDRI which were pharmacologically evaluated by his group. The studies conducted by his team may open new dimensions in understanding memory dysfunctions.



OBITUARY

The Indian scientific community lost an accomplished colleague on 15 July 2011. Dr. Vinod Bhakuni died of a sudden heart attack in Lucknow. Dr. Bhakuni headed the Division of Molecular and Structural



Biology at the Central Drug Research Institute (CDRI), Lucknow where he had worked and taught since 1984. He obtained his Ph.D. from CDRI and returned to the Institute after spending two years as a post-doctoral fellow at the Johns Hopkins University, USA.

Among the leading Protein Chemists in the country, he pursued aspects of equilibrium protein folding, stability and function. His initial work included the understanding of the binding mechanisms of hydrophobic dyes and different alkaloids on cytochrome C, catalase and other proteins and deciphering their folding patterns and pathways. His laboratory's work on glucose oxidase revealed the importance of ionic interactions in the function and stability of this biosensor. The unique stoichiometry of the cofactor in serine hydroxyl methyl transferase (SHMT) of *Mycobacterium tuberculosis* was first demonstrated by his group.

Dr. Bhakuni further characterized SHMT from different sources to decipher their mechanism of action and folding patterns. More recently, his interests revolved around understanding the role of protein domains in cofactor binding, stability, and function. For the last two or three years he was also working on different aspects of amyloidogenesis and

trying to understand the mechanism of its formation and remedy. His research contributions were recognized by many Awards, including the *Bhatnagar Prize* in 2006, and fellowships of the three Indian Science Academies. He is survived by his wife, son and daughter besides the scientific legacy that is carried forward by the many students he mentored.



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