

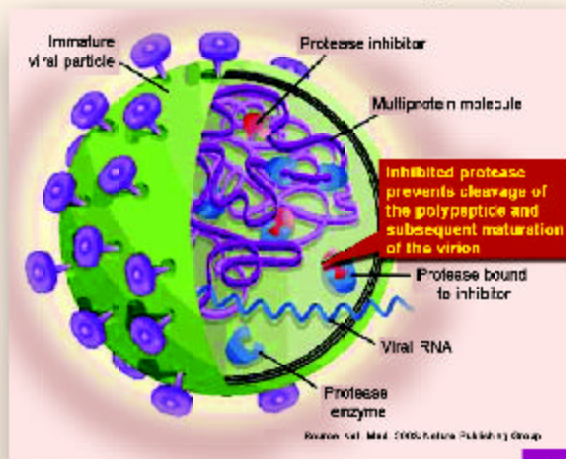


## Aspartic Proteases Inhibitors: Implications in Drug Development

**HUMAN immunodeficiency virus (HIV)**, the causative agent of the acquired immunodeficiency syndrome (AIDS), infects a human cell and uses proteins and chemicals inside that cell to multiply. HIV-1 Protease is an enzyme that HIV needs to make new viruses. Protease inhibitors (PIs) block the protease enzyme. When protease is blocked, the production of immature non-infectious viral particles takes place demonstrating that the function of this enzyme is essential for proper virion assembly and maturation. HIV-1 protease belongs to a group of proteases termed as aspartic proteases. Aspartic proteases are involved in a great variety of physiological and pathophysiological functions and include the mammalian pepsins, chymosins, cathepsins and renins.

They have evoked tremendous attention because of their significant role in human diseases like Alzheimer's disease, malaria, and candidal infections. In recent years, the introduction of highly active antiretroviral therapy (HAART) has dramatically decreased the mortality due to HIV. The HAART regimen combines three or more different drugs including a protease inhibitor. Presence of protease inhibitors in HAART reduces viral load in HIV patients. There are very few approved protease inhibitors and challenge lies in identifying more protease inhibitors that can be combined with drugs.

Dr Mala Rao and her research team at National Chemical Laboratory (NCL), Pune, have isolated a bacterium (*Bacillus* sp.) that lives under extreme environmental condition and produces an





aspartic protease inhibitor (ATBI). ATBI has been characterized for its inhibition against HIV-1 protease, pepsin, and the protease from the fungus *Aspergillus saitoi*. The inhibitor is found to be a hydrophilic peptide with a molecular mass of 1147 Da. Sequence homology exhibited no similarity with the known peptidic inhibitors of HIV-1 protease. Investigation of the kinetics of the enzyme-inhibitor interactions revealed that ATBI is a non-competitive and tight binding inhibitor of HIV-1 protease.

The inhibitory action of ATBI on HIV infection in cell cultures to understand the precise mechanism of action is in progress. Based on the sequence of inhibitor, synthetic peptide has been made and is being evaluated for its potency.

ATBI showed effective inhibition against the phytopathogenic and saprophytic fungi. The inhibitor was found very effective against the human pathogenic yeast such as *Candida kefyr* and *C. krusei*. The efficacy of inhibitor was evaluated in animal model infected with *C. albicans* and a significant reduction in the *C. albicans* cell count per gram of kidney tissue was observed. ATBI is also a potent inhibitor of xylanase, an enzyme that deconstructs plant structural material by breaking down hemicellulose, a major component of the plant cell wall. Plant cell walls are necessary to maintain physical integrity and are a barrier against invasion of pathogens. Antixylanolytic activity of ATBI led NCL scientists to envisage a paradigm shift in the concept of fungal growth inhibition. The research team has also established the bifunctional nature of an aspartic protease inhibitor pepstatin using a glycosidase. Currently, investigations are on to exploit the antifungal property of the inhibitor against plant diseases

## Central Electronics Engineering Research Institute, Pilani

### R&D Highlights

#### Paper Dirt Speck Analyzer

The Central Electronics Engineering Research Institute, Pilani, has designed and developed a paper dirt speck analyzer by using image-processing technique. As paper dirt measurement is a very important parameter, the development of such an instrument will be of great use to the pulp and paper industry.

The main components of the system are PC, monitor, illumination system and image processing software for computation of dirt speck in paper. The indigenously developed instrument using the latest available image analysis techniques combined the computing power of the personal computer helps the paper maker in analyzing dirt specks in paper, based on physical area as well as EBA computation of the captured image of the sample paper.



Paper Dirt Speck Analyzer

#### Specifications

Sensor	Progressive scan CCD
Calibration	Using TAPPI standard T 563 pm-97 EBA and count of visible dirt by image analysis
Display	Captured and analyzed image and dirt quality parameters
Field of View	40 mm x 30 mm sample area
Accuracy	0.002 mm resolution
Repeatability	± 2 %
Sample	15-120 GSM
Power supply	230 V/50 Hz, 12 V 500 mA, 14 V 3 A



## Salient Features

- ▣ Operation through several user-friendly page screens
- ▣ Provides password protected supervisor and calibration page
- ▣ Login by ID and password
- ▣ Adding users name through supervisor
- ▣ Manual and scan mode measurements
- ▣ Calibration features
- ▣ Dirt speck measurements based on physical area and TAPPI EBA
- ▣ Measurement on wide range of GSM paper grades and dirt sizes
- ▣ Measurement on single sheets, hand-made sheets and continuous sheet (reels /deckles)
- ▣ Numerical and graphical display of results

- ▣ Storage and retrieval of results
- ▣ Multiple reports
- ▣ Printout support for test results and reports

## 3 MW S-band Magnetron

A glass version of water-cooled mechanically tunable unpackaged pulse magnetron, with peak power 3 MW in S-band, was successfully developed by the National Institute of Oceanography (NIO), Goa, in collaboration with Centre for Advanced Technology, Indore. This is intended, primarily, for use in LINAC/Microtron. The anode consists of 12 'hole and slot' cavities of similar size, which are distributed uniformly across its circumference. The alternate cavities are strapped at the end by echelon strapping system with one missing segment. RF power generated is coupled out with the help of two loops, one at each end of output cavity. The other

end of both the loops is connected to loop support system,

which acts as antenna to excite  $TE_{11}$  mode in the circular waveguide section of output coupler. It has an indirectly heated Mush-type oxide-coated cathode. Heater is supported inside and at the middle of cathode sleeve with alumina ring. The cathode assembly is supported at the axis of the anode with coaxial end mounted type cathode support structure for better dissipation of thermal power (by radiation as well as conduction processes) on account of back bombardment of cathode by non-useful electrons as compared to radial type, which dissipates the thermal power by radiation process only.

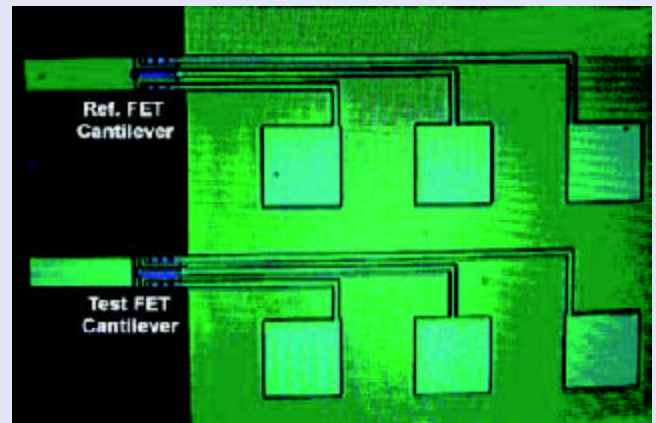
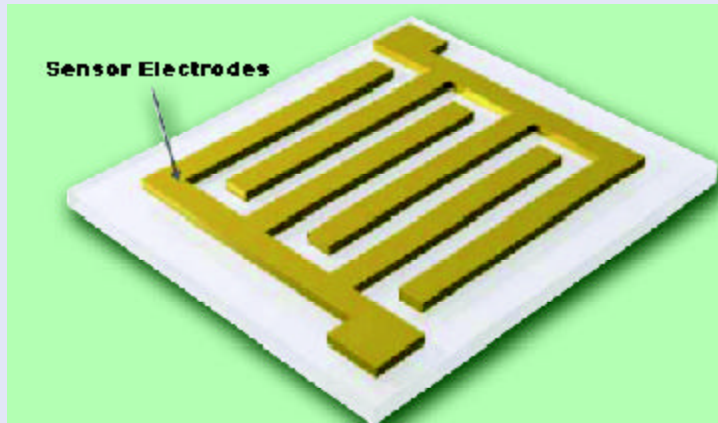
Magnetron and its parts were designed using scaling/empirical approach. The performance characteristics were computed using the program developed by CEERI. The cold test model and a demountable test diode were also developed and optimised for their performance in respect of RF, thermal and electron emission. The related techniques/processes were also developed from mechanical fabrication to finished tube.



3 MW S-band Magnetron

## Specifications

Frequency	: 2998 MHz
Tuning range (min)	: 2992-3002 MHz
Peak output power (min)	: 3.0 MW
Average output power (max)	: 4.0 kW
Peak anode voltage (max)	: 50 kV
Peak anode current	: 120 A
Magnetic flux density	: 1550 Gauss
Pulse width (max)	: 4 $\mu$ s



Cantilever based FET Nano-sensors



Pt Heater

## Platinum Heater and Sensor Electrodes

Conductor for platinum heater was printed on front side of 11 alumina substrates of size 1.0 " × 1.0" × 0.025" and fired. Conductor pattern for sensor electrode was printed on back of these alumina substrates, and fired. The size of alumina substrate for each Pt heater with sensor electrode is 5.0 mm × 5.0 mm × 0.25 mm. Resistance of Pt heater was measured and found to be ~ 10.0 Ω depending upon width and length. The adhesion of the Pt

conductor was also examined and found to be very good. Twenty-five samples were delivered to NPL, New Delhi. Five samples of Pt heater with sensor electrode were sent to IIT, Kharagpur.

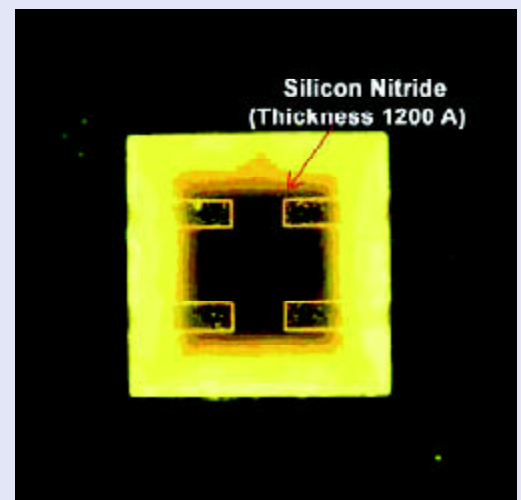
## FET Integrated Cantilever Nano-sensors: Bio and Magnetic Sensors

The basic advantages of the FET sensors are that they are very small in size, more efficient and dissipate low-power for their operation, which is a key issue for battery operated portable systems. These devices possess a fast thermal response time, and are made at relatively low-cost and also permit the integration of associated electronics. Such micro-devices find wide applications in the field of biosensors and also in locating low intensity magnetic fields.

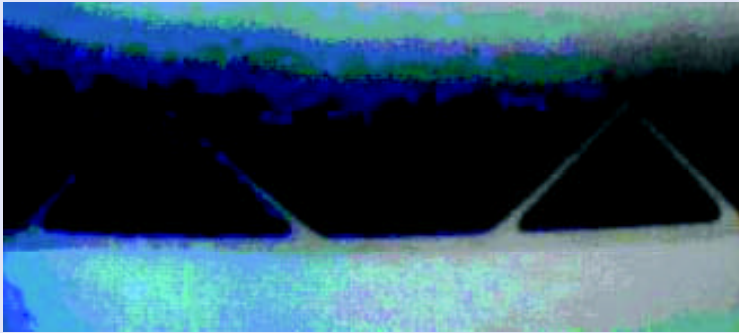
A novel FET Integrated Cantilever Nano-sensor structure has been designed at CEERI for the detection of biological analyts and for locating magnetic fields. The required technology has been

developed to fabricate a springboard type micro-cantilever structure and a FET structure near its base. The exact placement of the FET structure on the cantilever was determined by using simulation tools, suggesting that the location should be at the base of the cantilever. The structural features decide this point of placement of MOSFET and the geometries involved. The method/process technique will also influence the device and its electrical parameters.

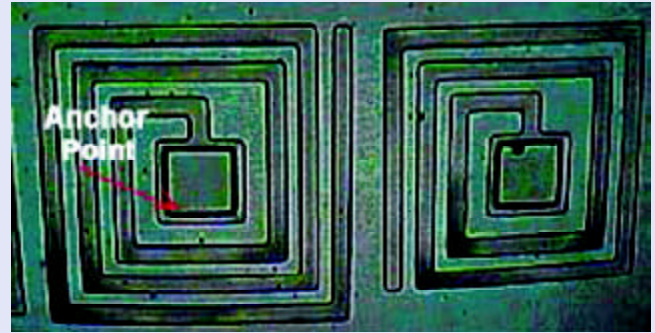
The working principle of the



Si<sub>3</sub>N<sub>4</sub> Cantilevers (by Bulk Micromachining): 200µm×50µm×0.12 µm



Triangular shaped cantilevers realized by bulk micromachining



Anchored poly-Si free-ended springs (by surface micromachining)

device is primarily same as that of AFM imaging. However, in AFM the deflection of cantilever probe is measured by optical technique. In nano-sensors, CEERI has implemented a novel concept of measuring cantilever deflection through measurement of change in device drain current of MOS transistor due to stress generation, when the cantilever bends. The change may arise due to mass gain at the cantilever tip or any external force acting on it causing the deflection. In biosensor, intramolecular forces between molecules attached to the cantilever cause the beam bending of cantilever. In the magnetic sensor, nano-film of a magnetic material is coated onto the cantilever at the free end. On application of magnetic field the cantilever bends to produce stress at its base. The change in the drain current is a direct measurement of the magnetic force.

For a biosensor, the reference film is typically gold to attach the bio-molecules, whereas, in magnetic sensor, a film of magnetic material like nickel, iron or cobalt is used. The MOSFETs of these two cantilevers are connected to a differential amplifier configuration to eliminate the stray noise of the

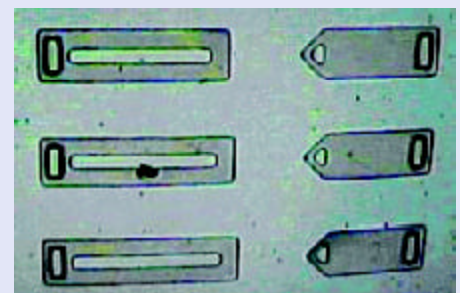
environment and for a common signal input. In one chip, ten such pairs of cantilevers are fabricated. There are 6 levels of masking steps to define the required FET structure on the cantilever. The variation of *I-V* characteristics in working FET devices has been demonstrated. Change in device drain current has been observed on bending of test cantilever through a micro probe of an IC Probe Station, typically used for IC testing, that provided the required mechanical stress. In magnetic sensor, the cantilever bending has been observed through a microscope on application of magnetic field generated by flowing a fixed amount of DC current in a coil placed below the cantilever chip. The quantitative measurements and calibration need elaborate arrangements and will be taken up shortly.

### Surface Bulk Micromachining Techniques

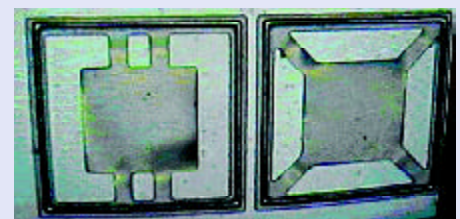
Surface and bulk micromachining techniques have been developed to fabricate a variety of cantilever structures in silicon. These structures include: spiral cantilevers, single anchor multi-edge feature cantilevers, and

thin diaphragm platforms for different applications in MEMS. For bulk micromachining, the silicon nitride cantilevers have been realized by using KOH based etchants. In the case of surface micromachined structures, sacrificial low temperature CVD deposited oxide (LTO) is used to realize the features.

LPCVD silicon nitride and poly-Si have been employed to make structures and silicon dioxide has been used as sacrificial layer to



Anchored poly-Si cantilevers (by surface micromachining)



Suspended poly-Si platforms (by surface micromachining).  
Dimensions: 200µm×200µm×; Thickness: 1.0µm, Air-gap: 3.0µm



realize these structures. A thickness of 1200 Å is strong enough to withstand the bulk micromachining experiments. The triangular shaped features have been also realized in the similar fashion. It is easy to obtain this type of cantilevers because of angle advantage of etch-front associated with < 100 > oriented silicon substrates. Here the inertness of silicon nitride to KOH solution is an advantage. The lattice mismatch of silicon nitride with silicon restricts the useful thickness and a large amount of thermal stresses are always present in the silicon-silicon nitride interface. For stress-free structures, one has to work with polycrystalline silicon-based cantilevers and suitably select the chemical etchants that do not react with polysilicon. It is also possible to realize the suspended platforms (200 µm × 200 µm) and one can create an air gap between the substrate and the platform for thermal isolation.

### New Technologies developed at CFTRI

THE following new technologies have been developed at the Central Food Technological Research Institute (CFTRI), Mysore, in the recent past:

- **Quick cooking germinated and dehydrated pulse**

Fresh germinated pulses such as horse gram, green gram and bengal gram are available in polyethylene packets in the market. Due to high moisture content, shelf-life of these products is generally 1-2 days. In order to overcome this disadvantage, CFTRI has developed a process for the preparation of dehydrated shelf-stable pulse.

In this novel method, pulses are treated, germinated and subjected to hydrothermal treatment parallelly and dehydrated in the end.

The product has shelf life of around four months and the cooking time is also reduced. As pulses prominently find place in various traditional preparations, quick cooking, germinated and dehydrated pulse could be an energy saver while ensuring increased nutritive value to consumers. Presently there is no such

product available in the market and the innovation is backed by an Indian Patent.

- **Fructooligosaccharides**

Fructooligosaccharides (FOS) are short chain oligomers of fructose with a DP 3-10 linked to a terminal glucose moiety. They are mainly used as prebiotic, low-calorie sweetener, bulking agent, mineral absorption improver and also as a non-carcinogenic agent. They are also being considered as a natural food ingredient and dietary fibre.

CFTRI has developed a process for the production of FOS. The yield of FOS is 52-54% and the substrate for the production of FOS is easily available.

The product can be used in milk products, beverages, baking and confectionery products. The institute has developed a few products based on FOS. The process is backed with an Indian patent.

### New Processes released by CFTRI

THE following new processes have been released by the Central Food Technological Research Institute (CFTRI), Mysore, in the recent past:

- **Dehydration of green chilli**

Chilli (*Capsicum annuum* L.), is one of the most widely consumed vegetable spice globally. Chilli accounts for 16.7% of total spice trade in the world. India is one of the major players in the world market. Chilli is an indispensable condiment in every Indian household. It has wide range of sensory attributes such as colour, pungency and distinctive aroma. These qualities make insipid bulk nutritive flesh and cereal foods more

delicious.

In view of large consumer base attributed to this spice globally, CFTRI has developed a process for the dehydration of green chilli, which ensures longer shelf life and wider market outreach.

- **Heat tolerant white sesame seeds**

Sesame seed (*Sesamum indicum* L.), a major commercial source of sesamol, is grown in India, China, Mexico and

Sudan. The seeds vary considerably in colour, size and texture of the seed coat. Sesame seed is often added to baked wheat flour products, such as biscuits, breads and crackers. Generally, white bold seeds are preferred due to their appealing appearance compared to other seeds. Dehulled sesame seeds find application in the preparation of candies, confectionaries, bakery products and other traditional foods. The dehulled seeds are white in colour and are sprinkled on the bakery products after proofing.

Sesame seeds turn brown while baking and the seeds may turn transparent on cooling. This affects the sensory profile of the product. CFTRI has developed a process for the preparation of enhanced heat tolerant white sesame seeds under optimal temperature, treatment and other processing parameters.

A patent on the process has also been filed in India.

## Patents filed by IIP in Countries under PCT

**T**HE Indian Institute of Petroleum (IIP), Dehra Dun, in the recent past, has filed following patents in India, USA, and other European countries under PCT :

- A composition of hydraulic fluid and process for the preparation thereof, A.K. Singh, N.K. Pandey and A.K. Gupta, Application No. 3332DEL2005, dt. 09.12.2005.
- A composition of lubricating oil for two-stroke gasoline engine and process for the preparation thereof, A.K. Singh, N.K. Pandey and A.K. Gupta, Application No. 3335DEL2005 dt. 09.12.2005.
- A composition of insulating fluid and process for the preparation thereof, A.K. Singh, N.K. Pandey and A.K. Gupta, Application No. 3336DEL2005 dt. 09.12.2005.

## CSIR-NSFC

### Workshop on Genome Informatics

**T**HE Institute of Genomics and Integrative Biology (IGIB), New Delhi, organized the second CSIR-NSFC Workshop on Genome Informatics between India and China under the agreement between Council of Scientific and Industrial Research (CSIR, India) and Natural Science Foundation of China (NSFC, China) in the recent past. Leading scientists from China and India participated for effective sharing of research ideas. The main aim of the workshop was to explore potential fields of collaboration with the Chinese Scientists in the area of Genome Informatics.

The inaugural function was organized at the SSB Savagriha, CSIR Headquarters. Theme of the workshop was described by Dr S. K. Brahmachari, Director, IGIB, and Dr Huanming Yang, Director, Beijing Genomics Institute, China, stated their expectations from the workshop. Dr V. S. Ramamurthy, Secretary, DST, briefly talked about the Bilateral Collaboration. Honorable

Shri Kapil Sibal, Minister for Science and Technology and Ocean Development, Government of India also attended the inaugural function and delivered a talk on Asian Science and Technology for Global Good. Scientific presentations were made by Prof. P. P. Majumder, ISI, Kolkata and Dr Huanming Yang, BGI, China.

Prominent Chinese and Indian scientists presented their work in the following scientific sessions: Comparative and Functional Genomics and Evolution; Bioinformatics: Sequence to Function; Disease Genomics and Proteonomics; Biological Systems and Regulation; Genome Annotation and Function; Databases and Statistical Methods; Bioinformatics- Emerging Applications; HPC for Bioinformatics; and Structural Genomics.

The Chinese and Indian scientists agreed to form a few collaborative projects, the details of which will be worked out by the participating scientists. An MoU has also been signed to this effect.



### Workshop on Science Policy Interactions on the River Basins and Coastal Zone Management, Goa

**T**HE National Institute of Oceanography (NIO), Goa, recently organized a two-days workshop on 'Science Policy Interactions on the River Basins and Coastal Zone Management, Goa'. The workshop was aimed at creating awareness of the scientific findings about the pressures on the coastal zone. The deliberations of the workshop were categorized into six technical sessions in which 29 papers were presented, which dealt with issues such as: Mandovi-Zuari ecology; Coastal zone and living and non-living resources of Goa; Pollution of Goa's ecosystems; Impact of tourism; Fresh water resources and their management; Goa's salt and its importance and policy considerations.

Dr S.R. Shetye, Director, NIO, welcomed the gathering and Dr Sugandha Sardesai, Senior Scientist and Convenor of the workshop, highlighted the aims and objectives of the workshop.



A view of distinguished audience

(Inset) Seated on dais are: Dr N. Ramaiah, Dr Lokabharathi and Dr Sugandha Sardesai, Senior Scientists, NIO



Dr N.P.S. Varde, Director and Joint Secretary, Department of Science, Technology and Environment, Government of Goa, delivering his inaugural address during the workshop.

The workshop was inaugurated by Dr N.P.S. Varde, Director and Joint Secretary, Department of Science, Technology and Environment, Government of Goa. In his inaugural address, Dr Varde said that our former Prime Minister late Smt. Indira Gandhi sowed the

seeds of the coastal zone management in India in the year 1981, declaring the entire stretch up to 500 mts from the High Tide Line (HTL) as 'No Development Zone', following which Goa could maintain the pristinity of its environment. However, due to the increasing population pressure the present scenario has been changed.

The workshop concluded with an interactive session. Dr Lokabharathi, Senior Scientist, NIO, chaired the valedictory function. In her concluding remarks Dr Lokabharathi emphasized that by way of this workshop the scientists have conveyed that it is not only the output but also the outcome of science is important. Dr Ramaiah summarized the deliberations and Dr Sugandha Sardesai proposed the vote of thanks.



## Training Programme on Fundamentals of Laboratory Health and Safety and Laboratory Design

**T**HE Indian Institute of Chemical Technology (IICT), Hyderabad, and HRDC, CSIR, New Delhi, jointly organized a three-day training programme on Fundamentals of Laboratory Health and Safety and Laboratory Design, recently. About 150 participants comprising teaching professionals from academic institutes, research scientists in chemical and biological sciences and engineering, environmental and health and safety personnel, and laboratory supervisors and managers from all over India took part in the programme.

The main theme of the programme was to bring out awareness amongst the participants about the design, construction and renovation of major laboratory facilities for safety, which are complex, technically sophisticated and expensive to build and maintain. Also, as strict environmental and occupational health regulations are coming into force, it is mandatory for all the organizations and individuals to pay more and more attention to these vital aspects.

The faculty for the training programme comprised pioneers in the field, namely, Dr Douglas B Walters, Scientific Director of the Advisory Board for Flow Sciences Inc. and former Head of the



Training programme on Fundamentals of Laboratory Health and Safety and Laboratory Design in progress at IICT. Seated on dais (third from left) is Dr J. S. Yadav, Director, IICT, along with other dignitaries and resource persons

Laboratory Health and Safety, NIH, USA; Mr Michael R. Labosky, Associate Director, Environment, Health and Safety Department, Harvard University and Mr Louis Di Berardinis, Director, Environment, Health and Safety, Massachusetts Institute of Technology, USA.

The programme consisted of important lectures on Principles of Industrial Hygiene and Laboratory Health and Safety Programmes; Chemical Hazardous Waste, Generation, Storage and Disposal; Facility/Laboratory Design

Considerations; Mechanical Hazards and Controls; etc. Also, there was a Question/Answer session and Quiz Programme for the benefit of the participants. Earlier, Dr J. S. Yadav, Director, IICT, welcomed the participants and Shri S. N. Sharma, Consultant, HRDC, CSIR, Ghaziabad and introduced the participants about the activities of HRDC, CSIR. Dr K. Babu Rao, Scientist F, Chemical Engineering Division, IICT, convenor of the workshop, introduced the speakers and briefed about the objectives of the training programme.



### RRL-Jorhat celebrates Foundation Day

**T**HE 45<sup>th</sup> Foundation Day of the Regional Research Laboratory (RRL), Jorhat, was celebrated with much enthusiasm and gaiety. The function was presided over by Dr G. Thyagarajan, Chairman, RRL Research Council and former Director of RRL, Jorhat. Dr Sukumar Devotta, Director, National Environmental Engineering Research Institute (NEERI), Nagpur, graced the

occasion as the Chief Guest and delivered the Foundation Day Lecture while Prof. J.L. Dutta, Chairman, Pollution Control Board of Assam, graced the function as the Guest of Honour. The celebration was clubbed together with the inauguration of a special Study Centre of the POGL Institute for Petroleum and Energy Development at the laboratory, of which the laboratory is a collaborating partner.

A special brochure entitled 'Highlights 2005-2006' focusing the significant achievements of the laboratory during last year was formally released by Dr V. Prakash, Director, Central Food Technological Research Institute (CFTRI), Mysore. Notable among others present were Prof G.D. Sarmah, Vice Chancellor, Nagaland University and Member, RRL Research Council, Prof A.R. Balakrishnan, IIT, Madras and



Seated on dais during the RRL, Jorhat's Foundation Day Celebrations (from right) are: Prof. J.L. Dutta, Chairman, Pollution Control Board of Assam; Dr V. Prakash, Director, CFTRI, Mysore; Dr P.G. Rao, Director, RRL, Jorhat; Dr Sukumar Devotta, Director, NEERI, Nagpur

Member, RRL Research Council, Dr M. Hazarika, Director, Tea Research Station, Tocklai, Jorhat and Shri Dulal Chandra Baruah, a prominent citizen of the town.

The meeting was largely attended by distinguished invitees, guests, members of press and media, students of the POGL Study Center, students from local schools and colleges and other public beside the scientific brethren of RRL, both old and new.

Welcoming the audience, Dr P.G. Rao, Director, RRL, Jorhat, reminisced with deep gratitude the contributions made by the past leaders of the laboratory and informed the gathering that it was due to the foresightedness of the past leaders that the laboratory has been able to keep the flag of glory flying through the years. Delivering the Foundation Day Lecture on the topic 'Science and Technology

for Sustainable Development', Dr Devotta gave a very in depth and vivid picture of the checks and balances of the complex topic sustainable development – that what it actually means in a lucid manner to the delight of the house.

In his inaugural lecture of the POGL study center, Dr J.L. Dutta dwelt at length on the various activities being undertaken by the Pollution Control Board

of Assam for checking the environmental degradation in the state, especially with regard to biomedical wastes, municipal solid wastes and biodegradables, etc. and sought the cooperation from all towards fulfilling the task. It was followed by release of the brochure 'Highlights 2005-2006' by Dr V. Prakash. In the presidential remark, Dr Thyagarajan mentioned that the Research Council was very much impressed by the output of the institute. He said that 41 publications in journals of repute in last less than one year alone speaks very high about the quality of work the institute has been performing. They should be very happy about what they are doing, he commented. Commenting on Prof Devotta's Foundation Day Lecture, he remarked that Prof Devotta very lucidly articulated the complexity of the topic.

## Shri Kapil Sibal visits NBRI

**S**HRI Kapil Sibal, Minister of State for Science and Technology and Ocean Development, Government of India and Vice President, Council of Scientific and Industrial Research, New Delhi, visited National Botanical Research Institute (NBRI), Lucknow. Shri Sibal had an absorbing session with the scientists of the institute during an informal meeting. He also interacted with the scientists individually. Dr Rakesh Tuli, Director, NBRI, welcomed the minister and apprised him of the activities and achievements of the institute and his vision of these areas in which NBRI will enhance its efforts. Shri Sibal took keen interest in the research in progress in the area of agri-biotechnology and herbal drugs. He appreciated the efforts of the scientists in areas like Bt cotton, herbal hair dyes,



Shri Kapil Sibal, Minister of State for Science & Technology and Ocean Development, interacting with the scientists of NBRI

standardization of herbal drugs, study of biodiversity in Antarctica, opportunities in lower plants, digitization of databases, etc. He emphasized on the need for scientists to think 'out of box', function in bigger teams and

enhance focus on making science competitive and relevant to the industry and society. Later Dr Tuli thanked the minister for his encouraging remarks, guidance and motivating scientists for carrying out fruitful research.



Shri Kapil Sibal being shown some of the R&D exhibits at NBRI by Dr R. Tuli, Director, NBRI



Shri Kapil Sibal being taken round the NBRI by Dr R. Tuli, Director, and scientists of NBRI



## Prof. C.N.R. Rao delivers the XXXI K.S. Krishnan Memorial Lecture at NPL

**I**N the memory of a great scientist, as an yearly event, this prestigious lecture is being organised at the National Physical Laboratory (NPL), New Delhi, since 1965. Dr Kariamanikkam Srinivasa Krishnan (KSK) was the founder Director of National Physical Laboratory and is mostly known as co-discoverer of the famous Raman effect. He played an important role in the development of science and technology in India. Past speakers to this lecture series have been eminent scientists of national and international repute including Nobel Laureates from all over the world. This year's XXXI K.S.K. Memorial Lecture on 'Transition Metal Oxides – Some New Directions' was delivered by Prof. C.N.R. Rao, FRS, Linus Pauling Research Professor and Honorary President, Jawaharlal Nehru Center for Advanced Scientific Research, Bangalore.

Prof. Rao has carried out extensive work on Solid State Materials Chemistry, Spectroscopy and Molecular Structures including seminal work on high T<sub>c</sub> superconductors, Colossal Magneto-resistance, Metal Insulator Transitions and Nano Structures. Prof. Rao is the recipient of several prestigious medals, awards and prizes along with *Padma Shri* and *Padma Vibhushan*. He was also honoured with David Dan Prize and India Science Prize. He has been the Chairman and

distinguished member of several committees and is currently the Chairman, Scientific Advisory Council to the Prime Minister of India, Third World Academy of Sciences and member of Atomic Energy Commission, International Advisory Board of UNESCO, International Council of Chemistry etc.

At the very outset, Dr Vikram Kumar, Director, NPL, extended a hearty welcome to Prof. C. N. R. Rao, Dr R. A. Mashelkar, Director General, CSIR and the distinguished audience and talked in brief about Dr Krishnan



Prof. C.N.R. Rao delivering XXXI K.S. Krishnan Memorial Lecture at NPL

and the memorial lecture series. Dr R. A. Mashelkar, who presided over



Prof. C.N.R. Rao interacting with young researchers during poster session



the function, introduced the speaker in his inimitable style.

Prof. C.N.R. Rao in his lecture on 'Transition Metal Oxides – Some New Directions', dealt with all aspects related to metal oxides with wide range of properties from  $\text{ReO}_3$ ,  $\text{NbO}$  to super conducting oxides like  $\text{BaPb}_{0.75}\text{Bi}_{0.25}\text{O}_3$  and  $\text{YBa}_2\text{Cu}_3\text{O}_7$  to Colossal Magneto resistance (CMR) oxides  $\text{La}_{0.7}\text{Ca}_{0.3}\text{MnO}_3$ . The investigations on Mn- and Co-doped ZnO established negativity of their ferromagnetism and threw considerable doubt about the ferromagnetic nature of these materials. Therefore, he emphasized that it seemed unlikely that these materials would be candidates for spintronics. In order to obtain robust ferromagnetism, it may be worthwhile to investigate the effect of co-doping of Mn- or Co-doped ZnO samples with other cations to induce additional charge carriers or

samples with defect induce carriers. A flurry of activity in BI-Ferroics i.e. materials having both ferroelectric and ferromagnetic orderings was also discussed by him. Certain specific oxides, which could be suitable for applications in spintronics, were also highlighted in his presentation.

Dr A. K. Gupta, Head, Engineering Materials Division, proposed the vote of thanks.

On the occasion, a separate pre-lunch session on poster presentations was arranged by the young researchers of NPL in which research students displayed the research activities being carried out by them. Prof. Rao accompanied by Director, NPL and senior scientists of the lab showed keen interest in listening to their research work and interacted with each individual with words of appreciation, guidance and valuable suggestions.



Dr R.A.Mashelkar, Director General, CSIR, with distinguish audience listening to XXXI K.S. Krishnan Memorial Lecture at NPL

## Demonstration of Glass Beads Making in Science Fair at Amethi

THE Council of Scientific and Industrial Research, CSIR, New Delhi, organized a five-days 'Exhibition cum Fair on Rural Technologies' at Bahadurpur Jais (Rai Bareili) in the recent past. Shri Kapil Sibal, Hon'ble Minister of Science & Technology and Ocean Development, Government of India, inaugurated the event and Shri Rahul Gandhi, Hon'ble Member of Parliament, Amethi, was the Chief Guest.

Dr T.K. Dan, Scientist from the Central Glass & Ceramic Research Institute (CGCRI), Kolkata; Dr L.K. Sharma, Scientist-in-charge, Shri Yad Ram, Technical Officer, Shri Bhikari Chand, Technician and Shri Rajendra Singh, Glass Beads Maker, CGCRI Khurja Centre, Khurja, participated in the exhibition-cum-fair.

Glass beads of different shapes and designs, glazed and unglazed terracotta products and stone ware quality pottery products were displayed in the exhibition. Live demonstration of glass beads making on environment friendly LPG gas fired portable kiln and environment friendly oxygen – LPG gas fired bench burners was conducted in the exhibition. More than one-lakh people saw the live demonstration and most of them



Dr L.K. Sharma, Scientist-in-Charge, CGCRI Khurja Centre, explaining to Shri Rahul Gandhi, Hon'ble Member of Parliament, Amethi, about glass beads making

made the enquiries regarding setting up of units of glass beads making in their villages. Shri Kapil Sibal, and Shri Rahul Gandhi, saw the live demonstration of glass beads making

and appreciated the programme during the discussion held with Dr L.K. Sharma, Scientist-in-charge, CGCRI Khurja Centre, Khurja.

### Dr G. Parthasarathy elected Fellow of Andhra Pradesh Academy of Sciences

**D**R G. Parthasarathy, Scientist and Deputy Director, Geological Studies Division, National Geophysical Research Institute (NGRI), Hyderabad, has been elected a life Fellow of the Andhra Pradesh Academy of Sciences in the field of Earth, Planetary, Atmospheric and Ocean Sciences. The life fellowship certificate was issued to Dr Parthasarathy at the Induction Ceremony of the new Fellows at the annual convention of Andhra Pradesh Academy of Sciences at Osmania University, Hyderabad.

Dr Parthasarathy is also a Life Fellow of Mineralogical Society of India, w.e.f. 2005 and a member of International Lunar Working Group (India) since 2006. His research areas include, high pressure mineral physics, environmental mineralogy, Physics of planetary materials and nano-geoscience.



### IICT bags Best Patent Award from IDMA

**T**HE Indian Institute of Chemical Technology (IICT), Hyderabad, has received the Best Patent Award from Indian Drug Manufacturers' Association (IDMA) for the patent of Dr Ahmed Kamal *et al.* (US Patent number US 6,800,622 B1 covering 'Pyrene-linked pyrrolo[2,1-c][1,4] benzodiazepine hybrids useful as anticancer agents'). This award was presented by Shri G. S. Sandhu, Joint Secretary, Department of Chemicals and Petrochemicals, Government of India to Dr Ahmed Kamal, Scientist-F, IICT, during the 44<sup>th</sup> Annual Day Celebrations of IDMA at Mumbai recently.

The present invention relates to the design and synthesis of novel pyrrolo[2,1-c][1,4] benzodiazepine hybrids useful as anticancer/antitumour agents. This invention also relates to a process for the preparation of new pyrrolo[2,1-c][1,4]benzodiazepine hybrids as potential anticancer agents. More particularly, it provides a process for the preparation of 7-methoxy-8-[N-(1''-pyrenyl)-alkane-3'-carboxamide]-oxy-(11aS)-1,2,3,11a-tetra hydro-5H-pyrrolo[2,1-c][1,4]benzodiazepine-5-one, with aliphatic chain length variation of these compounds. In literature



Dr Ahmed Kamal, Scientist, IICT, receiving the best patent award from Shri G. S. Sandhu, Joint Secretary, Department of Chemicals and Petrochemicals, Government of India

pyrrolo [2,1-c][1,4]benzodiazepines (PBDs) have been prepared as cross-linking dimers. However, hybrids of PBDs i.e., other DNA-interactive ligands linked to PBDs have not been explored. This patent describes novel approach of linking a known DNA-intercalator like pyrene to PBD ring system through varying length of alkane spacers. These hybrids have been evaluated for their DNA binding ability apart from their anticancer activity. Interestingly, these new molecules have shown sequence specificity for GC-rich DNA regions, in particular for Pu-G-Pu triplets.

One of the compounds (three carbon chain linker) from this series has shown promising *in vitro* anticancer activity in a panel of 60 human cancer cell lines evaluated by the National Cancer Institute, Bethesda, USA. This activity is more specific to non-small cell-lung and colon cancer cell lines. The same compound has exhibited good DNA-binding ability determined by thermal denaturation studies. Presently, this molecule is undergoing preclinical studies and this patent is one of the US patents that have been licensed to IndUS Pharmaceuticals, USA.

## Dr Samir V. Sawant receives Innovative Young Biotechnologist Award



**D**R Samir V. Sawant, Scientist-C, National Botanical Research Institute (NBRI), Lucknow, has been awarded the prestigious innovative Young Biotechnologists Award — 2005 by Department of Biotechnology for his outstanding contribution and innovative approach to Biotechnology. Dr Sawant has been associated with a research project on plant genomics under the NMITLI programme. He has designed artificial promoters by computational methods and studied the mechanism of regulation of gene expression in plants.

Shri Kapil Sibal, Union Minister for Science and Technology and Ocean Development, Government of India, presented the award to Dr Sawant at a function organized by DBT, New Delhi, on its Annual Day. The award is based on excellence on academic and research career and is given on the basis of innovative ideas suggested. The award includes financial support for independent research project and a cash prize of Rs 1,00,000 for three years during the course of project.



### Dr R. A. Mashelkar selected for RSA Fellowship

**D**R R. A. Mashelkar, Director General, CSIR, has been selected by Lady Arthur and the Trustees of the Royal Society for the Encouragement of Arts, Manufacture and Commerce (RSA) for the RSA Fellowship.



RSA Fellowships are awarded to those who have both a record of achievement and an ability to make a difference measured against the following criteria:

Professional Position - the 'role' played by a potential Fellow in their organization or business ; and

Intellectual or Creative Ability - the capacity and desire to find solutions to the problems or opportunities offered by contemporary society.

The RSA is an independent, non-aligned, multi-disciplinary body that goes back to 1754 when William Shipley founded it with the manifesto "to embolden enterprise, enlarge science, refine arts, improve our manufactures and extend our commerce".

From its very beginning, the RSA has encouraged and supported innovation and creativity throughout society. Today the RSA's work is framed by five manifesto challenges that reflect the original mission contemporary terms.

Primarily based in London, the RSA also has a number of regional Fellowship groups around the UK and across the world.

### Alumnus Award to Dr Satish R. Shetye

**D**R Satish R. Shetye, Director, National Institute of Oceanography (NIO), Goa, is one of the two selected for the Distinguished Alumnus Award of Indian Institute of Technology (IIT), Bombay,



for the year 2006. He received this award at the 47th Foundation Day of IIT, Mumbai, at the hands of Dr K. Kasturirangan, MP, Rajya Sabha and Director, National Institute of Advanced Studies, Bangalore.

During the Silver Jubilee Celebrations in 1983, IIT, Bombay felt the need to recognize the alumni who distinguished themselves in their field of work. The first Distinguished Alumnus Awards were presented on the occasion of Silver Jubilee Celebrations of the institute in 1983. In 1996 the awards were made an annual feature and have been bestowed on a few distinguished alumni every year since then.

The awardees receive a scroll containing a citation and a memento. The memento is a spiral-asymptote sculpture that symbolizes diligence and perseverance without which there can be no enduring feats of success.

Dr Shetye joined NIO in 1982 and contributed significantly to the physical oceanographic studies of the Northern Indian Ocean. He has, since then, received a large number of honours and awards for his contributions.