



CSIR News

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In The News

Minister of Science and Technology visits CSIR-NIO

“We must turn to the Ocean for our Future,” says Dr. Harsh Vardhan

THE ocean holds the potential of being the source of limitless, sustainable resources, were the words of Dr. Harsh Vardhan, Minister of Science and Technology and Earth Sciences, as he addressed the public at the inaugural programme of the Golden Jubilee Year celebration of the CSIR-National Institute of Oceanography (NIO), Goa on 1st January 2015.

“Science has taught us that all things began in the Ocean, and so it is to the ocean that we must turn for the future,” added the Minister.

The importance of ocean science was underlined during his address. “The nation must strive for big time commercialization of bioactive substances that lie in the ocean because these have great potential of discovering new drugs and pharmaceuticals.” Our future lies in

collaboration with integrated marine ecology and fisheries research, he added. Dr. Vardhan also spoke about the importance of keeping our ocean and seas safe and clean.

Earlier during the day, Dr. Harsh Vardhan laid the Foundation Stone of the rain water harvesting tank at the Institute. He later interacted with the scientists of the Institute and was briefed about the ongoing research.

Dr. S.W.A. Naqvi, Director, CSIR-NIO welcomed the gathering and expressed happiness that the Institute had entered into the 50th year of its existence.



Dr. Harsh Vardhan, Minister of Science and Technology and Earth Sciences, addressing the staff members at CSIR-NIO



Dr. Harsh Vardhan taking a round of the Institute and inaugurating the rainwater harvesting tank



Ocean Expedition (IIOE). He stated that NIO proposes to organise IIOE-2 this year with participation of research ships from various countries. In the future, NIO would

also network with other Indian Ocean countries to understand the processes leading to climate change and other oceanographic processes, he added.

CSIR Scientists Investigate Role of Metformin in Heart Disease

Metformin, a widely used anti-diabetic drug all over the world, has now been shown to be effective against atherosclerosis – a disease related to hardening of the arteries leading to heart attack.

Metformin is the first-line drug of choice to manage Type 2 diabetes especially in obese and overweight people and even those with normal kidney function. Metformin primarily controls blood glucose levels by inhibiting the glucose



Dr Srigriridhar Kotamraju

production by the liver. Recently, metformin has been shown to slow the aging process and increase the life span.

Scientists at the CSIR-Indian Institute of Chemical Technology (CSIR-IICT) in collaboration with CSIR-Centre for Cellular and Molecular Biology (CSIR-CCMB) showed that, metformin effectively inhibited the angiotensin-II-induced atherosclerotic disease process when

administered to Apolipoprotein (Apo)E knockout mice.

Atherosclerosis is a vascular disease in which plaque (made up of calcium, cholesterol and fat) builds-up inside the arteries and thereby hampers the oxygen-rich blood flow to different organs of the body. It may cause serious problems including heart attack and stroke.

In the study, the results of which were recently published in the journal *Diabetes*, a prestigious journal of the American Diabetes Association, Metformin was found to greatly inhibit the monocyte-to-macrophage differentiation and the associated inflammatory processes during monocyte differentiation via affecting STAT3 phosphorylation. Enhanced monocyte/macrophage infiltration is considered to be one of the major factors responsible for exacerbating the progression of atherosclerosis by causing the release of inflammatory cytokines and proliferation of smooth muscle cells. All these result in the narrowing of arteries, ultimately leading to decreased blood flow.

Metformin treatment significantly decreased the macrophage levels around the sub-endothelial space in the aorta of mice. Also, metformin administration resulted in the inhibition of plaque formation and aortic

aneurysms (localized balloon-like bulge in the wall of the artery) in mice. The beneficial effects of metformin were further extended by observations that it significantly elevated the HDL levels and decreased the LDL and triglyceride levels. It is likely that the anti-atherosclerotic effects of metformin are in part mediated by perturbing monocyte-to-macrophage differentiation during angiotensin-II-mediated atherosclerosis.

From these observations, it appears that metformin may have protective effects in regressing cardiovascular abnormalities not only in diabetic people, but also in non-diabetic people suffering from vascular disorders. However, clinicians may have to take a closer look at these beneficial effects of metformin and see whether such a correlation exists in patients who are on metformin prescription.

The lead authors of this study are Dr. Srigiridhar Kotamraju, Senior Scientist, CSIR-Indian Institute of Chemical Technology, and his team including Sathish Vasamsetti, Santosh Karnewar and Koteswararao Kanugula, Dr. Jarald Mahesh Kumar and Avinash Raj from CCMB.

**For further information, contact
Dr Srigiridhar Kotamraju,
Sr. Scientist, IICT on 9908213979**



Heat-resistant Shoe Sole from CSIR-CLRI

Scientists at the CSIR-Central Leather Research Institute (CLRI), Chennai have developed a shoe sole that can withstand temperatures up to 250 degrees Celsius. The technology would enable indigenous production of safety shoes which are currently being imported.

Of great use for safety workers who enter fire and hazard zones, the fibre reinforced plastic (FRP) sole is made from glass and carbon fibre coated with phosphorous based adhesives. Glass and carbon fibre can withstand high temperatures as their melting point is 1200

degrees Celsius and 3500 degrees Celsius respectively. To make the material flexible and suitable for functioning as a shoe sole, certain chemicals have been added.

Hundreds are killed and thousands injured across the country in fire accidents. The heat-resistant shoe soles developed at CSIR-CLRI will give sufficient time for a person to escape. And shoe soles made with this material will also come in handy for safety workers. Besides, apart from safety shoes, the lightweight and elastic soles can also be used in regular shoes.

CSIR-CBRI Working on Anti-termite Barrier for New Buildings

Termites have existed for 50 million years. They are strong enough to eat up a house. Once a colony of termites moves in, it may be difficult to exterminate them.

Many approaches have been tried to protect building structures from termites. The most common practice is treating the ground with insecticides or pesticides (termiticides) in order to poison the soil against termites. The major disadvantage of pesticide-based anti-termite treatment is the effect of toxic chemicals on health and the environment. Due to such concerns, many commonly used termiticides have been outlawed, restricted or banned.

Besides, pesticide-based anti-termite treatment often requires special precautions and specially trained personnel during application of termiticides, which increases the cost of construction as well. Another disadvantage of conventional methods of

anti-termite treatment is the necessity for retreatment at periodic intervals.

The ultimate goal of most approaches of the anti-termite treatment is to create a physical or chemical barrier between the termite and its food source. Therefore, scientists at CSIR-Central Building Research Institute (CBRI), Roorkee are working on providing an effective, long lasting and completely pesticide-free anti-termite barrier for buildings. It is also envisaged to provide an anti-termite barrier that may be easily installed and does not substantially increase the cost and complexity of construction.

The scientists studied a variety of inert materials e.g. stone dust, glass waste, granite waste, marble, ceramic waste, local sand, C&D waste, etc. for penetration behavior of termites. Materials were crushed, washed, sieved and various particle sizes (granules) ranging from 0.7 mm to 3.0 mm were prepared and studied in the laboratory. Specific materials were identified and its particles were prepared, modified, altered, optimized and engineered in the laboratory to support structural units or foundations and to protect structure from termites.

Some of the specifications of the desirable material that the scientists have zeroed in so far are any suitable hard material or stone type raw material with desirable particle size 1.4 to 2.36 mm (60% approx.), 1.0 to 1.4 mm (30% approx.), and 0.7-1.0 mm (10% approx.). The particle shape is irregular and sharp edged with fineness modulus 3.5 to 4.5. The desirable thickness of the anti-termite layer is 100 to 150 mm (Figs1 & 2). Work on other aspects is in progress.

The resulting termite barrier may be used to resist, prevent, delay, inhibit or

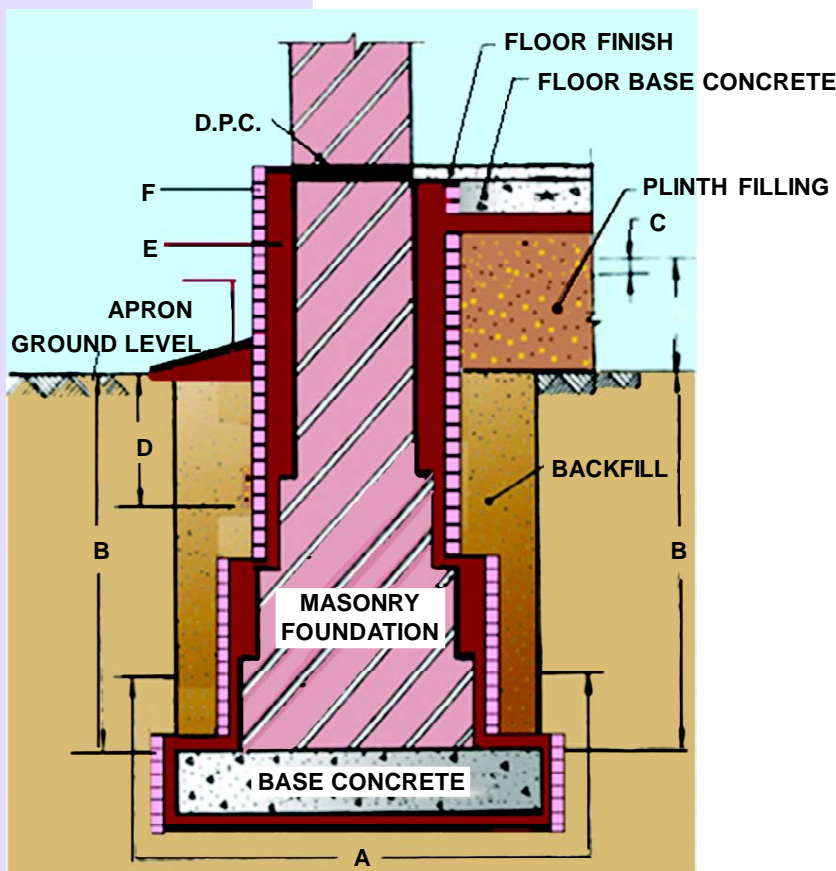


Fig. 1: Anti-termite barrier (E) with 100 mm barrier support wall (F)

- A Bottom and sides of trenches
- B Backfill in immediate contact with foundation walls
- C Top surface of plinth filling
- D External perimeter of building
- E Anti-termite barrier
- F Barrier support wall (100 mm)

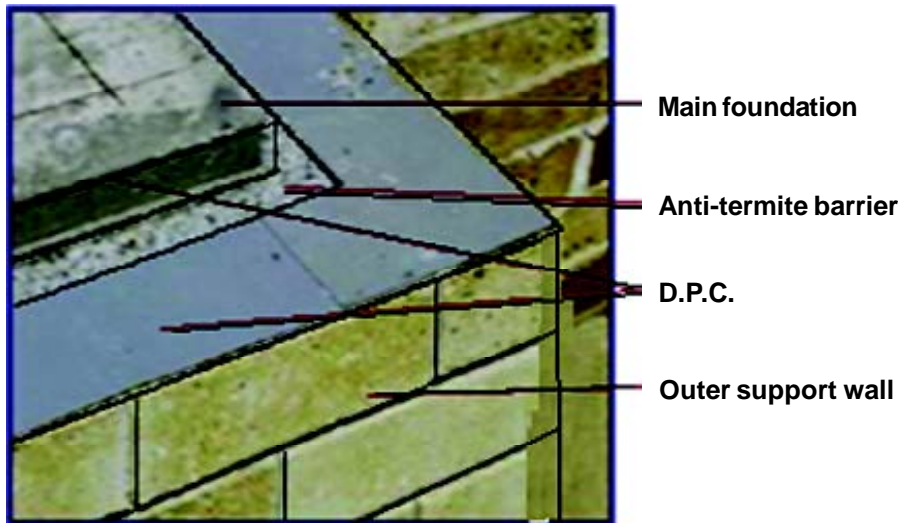


Fig. 2: Top and side view of foundation with anti-termite barrier

otherwise obstruct entry of termites into a structure. The building structure may be a house, shed, patio, pergola, garage or any other building structure that is directly in contact with ground or otherwise potentially prone to entry, infestation and/or damage by subterranean termites.

The anti-termite barrier may be installed:

- a) Between a concrete slab and a sub slab;
- b) Between a concrete slab or sub-slab and ground;

- c) In one or more cavities associated with a concrete slab;
- d) Between ground and a suspended floor;
- e) Between internal and external walls, and/or
- f) Surrounding the outer edge of a concrete slab or walls.

**B. S. Rawat, Ashok Kumar,
S.K. Negi & Team at CSIR-CBRI**

R&D Highlights

MEMS-based Piezoresistive Pressure Sensor Developed by CSIR-CEERI

MEMS-based piezoresistive pressure sensors have become the most popular choice in various applications due to their small size, high sensitivity, low cost and simple fabrication.

In line with the requirements of the strategic sector, CSIR-Central Electronics Engineering Research Institute (CEERI), Pilani has developed another version of MEMS absolute piezoresistive pressure sensor for the pressure range of 0-30 bar. The pressure sensor structure consists of four piezoresistors placed on a diaphragm and connected in the Wheatstone bridge configuration. The schematic of the pressure

sensor is shown in Fig. 1.

Implanted polysilicon piezoresistors were used as the sensing elements and the

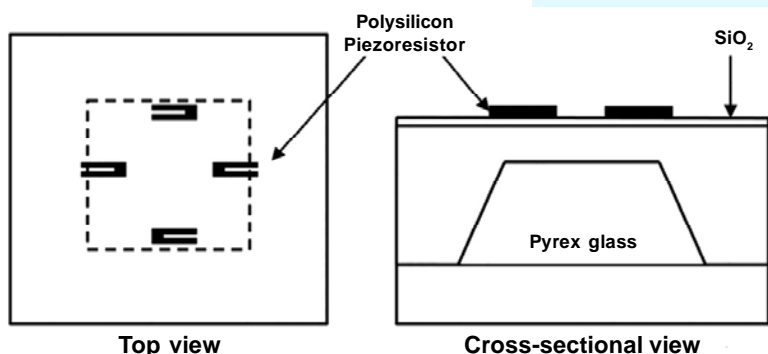


Fig. 1: Schematic of the pressure sensor

diaphragm of the pressure sensor was fabricated by bulk-micromachining using TMAH. The meander-shaped piezoresistors were placed in high stress regions to obtain good sensitivity and linearity. The cavity formed under the diaphragm was sealed in vacuum with pyrex glass in order to obtain an absolute pressure sensor. The SEM images

of the fabricated device are shown in Fig. 2.

The pressure sensor was characterised at three different temperatures (-5 °C, 25 °C and 55 °C) and a sensitivity of 3.34 to 3.73 mV/Bar was obtained. Non-linearity of less than 0.3 % was obtained at all the temperatures. The characterisation results are shown in Fig. 3.

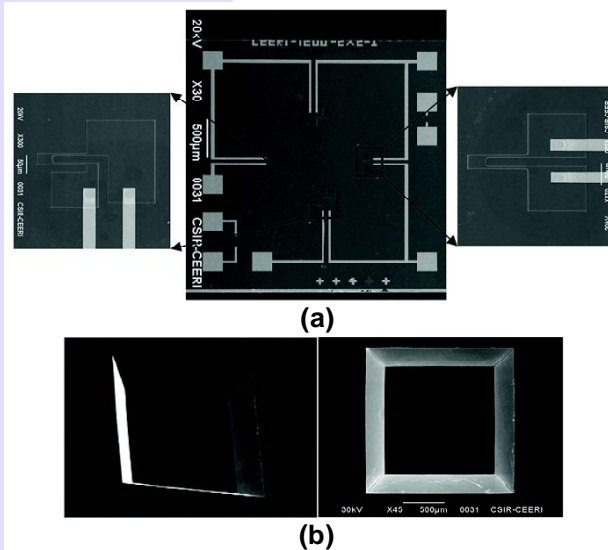
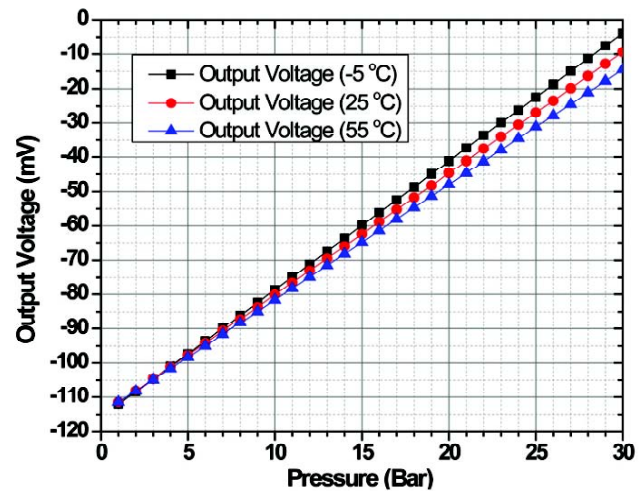


Fig. 2: SEM images (a) Fabricated pressure sensor – top view (b) Diaphragm fabricated using wet bulk-micromachining – bottom view



Temperature (°C)	Sensitivity (at 3.3 V) (mV/Bar)	Non-linearity (%/Full Scale)
-5	3.73	< 0.3
25	3.52	
55	3.34	

Fig. 3: Output characteristics of the fabricated pressure sensor

CSIR-CEERI Develops ZnO-based EGFET as a Disposable pH Sensor

In the development of MEMS-based medical diagnostic systems, cost and disposability of the devices are the two essential requirements. Extended-Gate Field-Effect

Transistor (EGFET) is an extended arm connected electrically to the commercial MOSFET. The disposable part is ZnO-EGFET, which makes it a cost effective tool for pH monitoring.

ZnO is a biocompatible material, and is, therefore, well suited for biological sensing applications. CSIR-CEERI has developed an EGFET pH sensor using ZnO as the sensing film. Cross-sectional views of the EGFET device and the packaged EGFET device are shown in Fig. 1 and Fig. 2, respectively. The measured characteristics of the pH sensor are shown in Fig. 3. pH sensitivity was found to be ~ 60 mV/pH. Nanophase of ZnO is

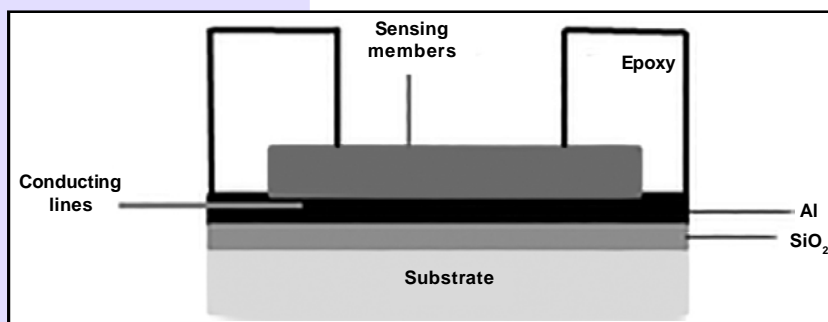


Fig.1: EGFET Structure

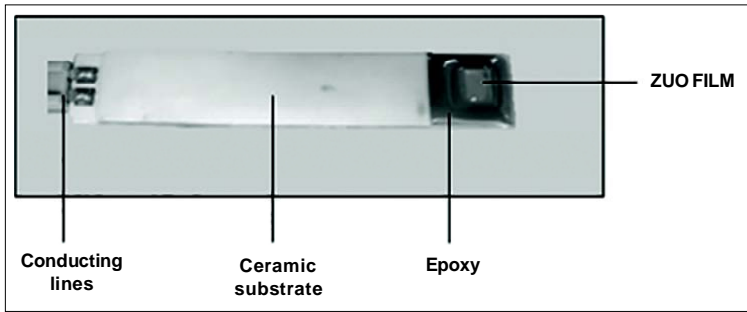


Fig. 2: Packaged EGFET device

the reason for higher sensitivity beyond the Nernstian limit.

The work was supported by DST, New Delhi under the India-Trento Programme on Advanced Research.

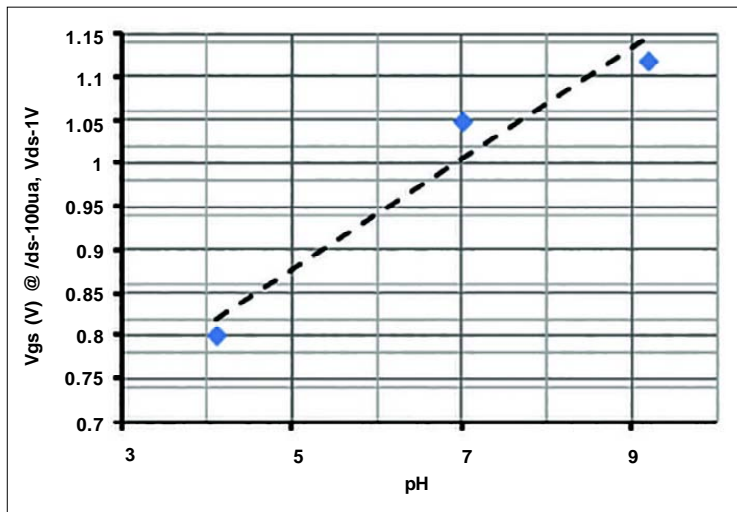


Fig. 3: Drain current vs. reference voltage for different pH solutions

CSIR-CEERI Develops MEMS-based Accelerometer

Keeping in view the country's strategic needs, CSIR-CEERI has designed and developed MEMS-based bulk micromachined piezoresistive accelerometer. The accelerometer is a quad-beam symmetrically suspended structure, which is realised by a combination of wet and dry bulk micromachining techniques. The structure of the accelerometer is shown in Fig. 1.

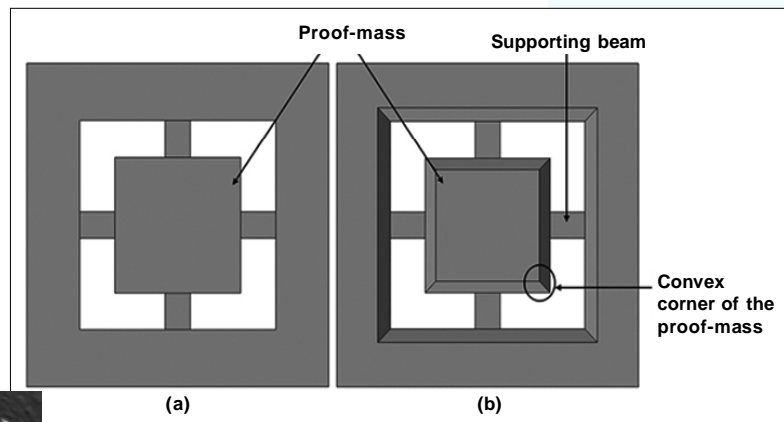


Fig. 1: Top and bottom view of the accelerometer design

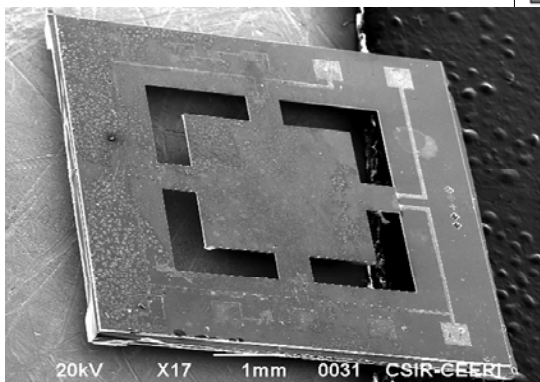


Fig. 2: SEM image of the accelerometer

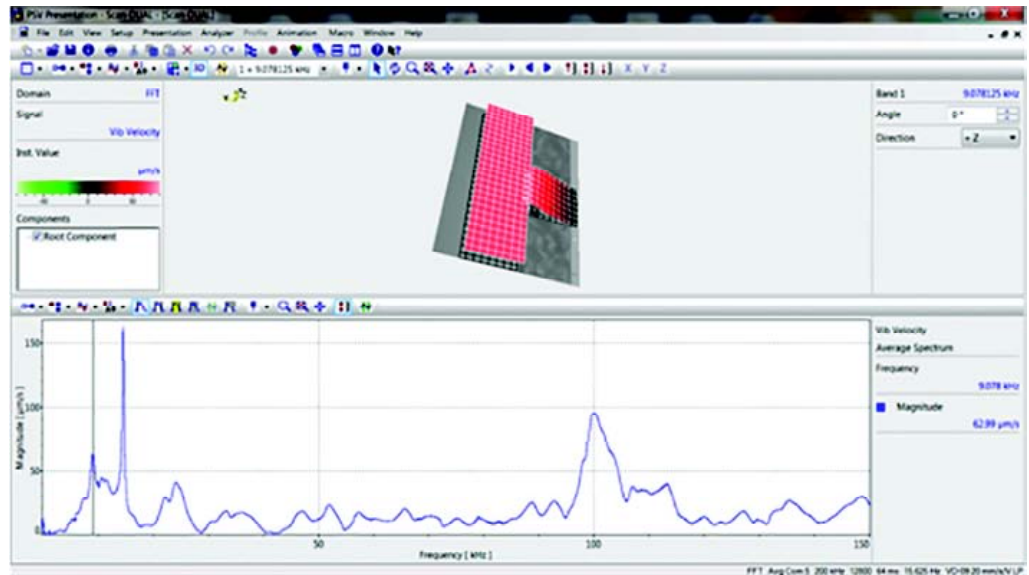


Fig. 3: Frequency response of the accelerometer

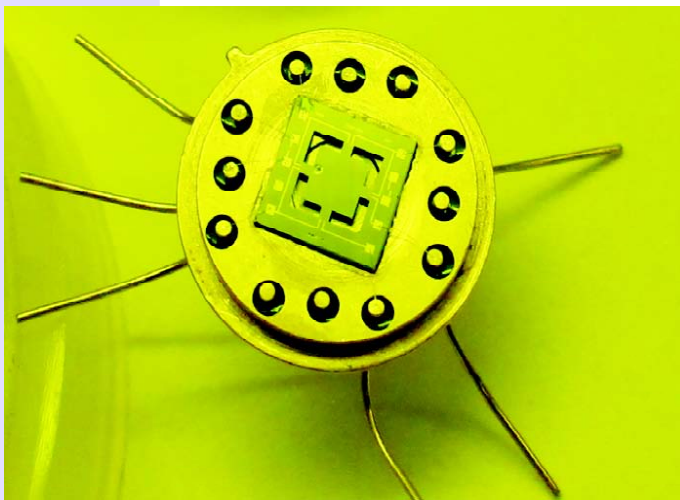


Fig.4: Packaged accelerometer device

Poly-silicon piezoresistors, used as sensing elements, were placed at the maximum stress regions on fixed ends of the four beams. The fabrication process of the accelerometer was CMOS compatible. To realise convex corners of the proof mass specially designed corner compensation structures were used. SEM image of the fabricated accelerometer is shown in Fig. 2.

The fabricated device was characterised using Polytech MSA-500 (Micro System Analyser, at CeNSE, IISc, Bangalore) for determining the resonance frequency (Fig. 3). The resonance frequency was found to be ~ 9 kHz. The packaged accelerometer device using a TO header is shown in Fig. 4.

Engineering of Landslide Disaster Mitigation at CSIR-CBRI

The Indian Himalayas is one of the tectonically most active mountain ranges of the Himalayas and is very prone to a variety of geo-hazards such as earthquakes and landslides. The physical factors of the terrain such as immature geology, unstable geological structures and rugged topography along with the triggering factors like earthquake forces and heavy precipitation during monsoon seasons cause severe land sliding phenomena in the Indian Himalayan region.

Landslides of varying dimensions occur frequently in geodynamically active domains in the Indian Himalayas. These landslide incidences have been of serious concern to the society due to loss of life, natural resources, infrastructural facilities, etc. posing problems for future urban development.

With this in view a project on “Engineering of Landslide Disaster Mitigation” has been undertaken by CSIR-Central Building Research Institute (CBRI), Roorkee under the 12th Five Year Plan.



The objectives of the project are as follows:

- Landslide hazard and risk assessment of Chamoli-Joshimath region
- Development of a landslide early warning system and
- Comprehensive geo-investigation for design & development of cost effective landslide control measures.

The study aims at generating a geological and geomorphological database of landslides and their causative factors in parts of Chamoli District of Garhwal Himalayas based on field investigation and remote sensing and GIS analysis. The landslide hazard maps depicting the existing and potential landslides of different types will be prepared by integrating all the causative parameters. The information pertaining to the travel/flow path and zone of influence of all the landslide hazard zones will also be an integral part of the hazard map.

Further, the risk elements in the region such as habitations and infrastructural facilities will be mapped using available information and remote sensing image analysis and interpretation. Risk information will be finally integrated with the hazard maps to produce the landslide risk map for the region.

Presently, different causative factor layers are being prepared in GIS environment (Fig. 1) through field survey and digital image interpretation of high-resolution remote sensing satellite data (i.e., Cartosat 1 image with 2 m spatial resolution and GeoEye data with 0.6 m spatial resolution). These layers will be useful for large-scale landslide hazard mapping of the study area. The rock discontinuity parameters are being collected from the road-cut slopes to develop the field-based slope-stability assessment technique.

S. Sarkar, D.P. Kanungo & Team at CSIR-CBRI

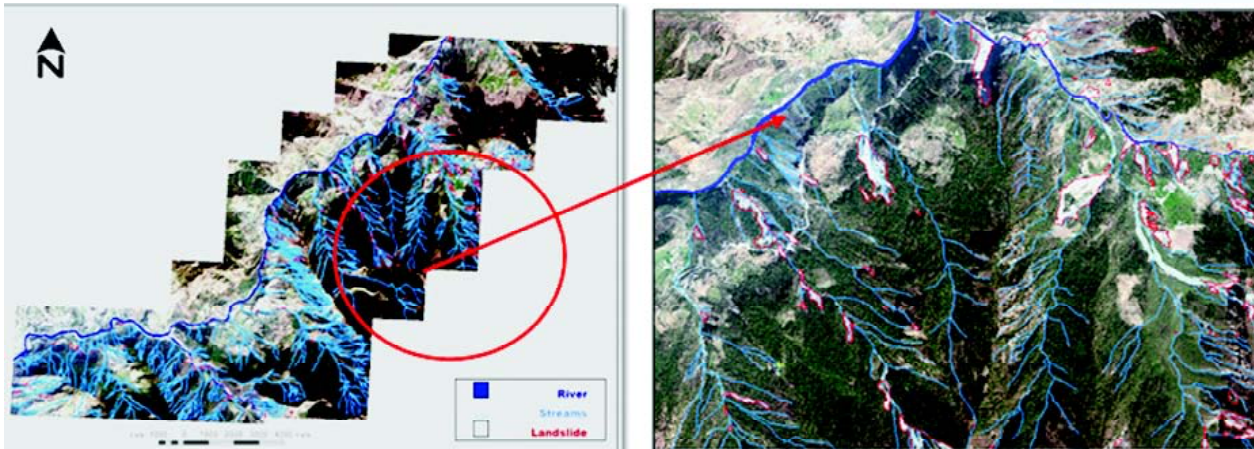


Fig.1: GIS maps



Fig. 2: Field observations of rock discontinuities

MoUs**MoU between CSIR-CRRI and IDAC —
The Training and Assessment Institute**

CSIR-Central Road Research Institute (CRRI), New Delhi has entered into an MoU with IDAC – The Training and Assessment Institute (A Unit of P C Training Institute Limited), New Delhi. Dr. S. Gangopadhyay, Director, CSIR-CRRI and Shri Anil Agarwal, Director and CEO, IDAC signed the MoU on 20th November 2014 at CSIR-CRRI, New Delhi.

As per the MoU, CRRI and IDAC have agreed to utilize each other's strength for offering their services jointly for projects related to research and driver diagnostic training for safe and smooth management of Road Traffic.

**CSIR-NAL and MIDHANI Join Hands for
Development of Carbon Fibers**

CSIR-National Aerospace Laboratories (NAL) and Mishra Dhatu Nigam Ltd (MIDHANI) signed an MoU on 16 October

2014 for development of aeronautical grade carbon fibers and development of a continuous process for the preparation of standard modulus carbon fibers. The MoU is the second in series with MIDHANI.

Under this MoU, in the first phase, MIDHANI will support CSIR-NAL in evolving the continuous process for the preparation of standard modulus carbon fibers. In the next phase, the results of the investigations carried out under this MoU will be utilized for scaling up of the technology to produce large quantities of carbon fiber.

The capacity of the Pilot Plant at CSIR-NAL shall be enhanced to 50 to 80 tons per annum of carbon fiber by augmentation/modification of a few equipments and systems while continuing to use about 80% of the existing plant and machinery.



CSIR-IMMT signs MoU with RDCIS, Ranchi



CSIR-Institute of Minerals and Materials Technology (IMMT), Bhubaneswar and RDCIS, SAIL, Ranchi have signed an MoU to pave the way for research in the field of mineral processing starting from dry beneficiation to recover the values from lean grade resources by wet process.

Prof. B.K. Mishra, Director, IMMT, stressed that working together based on our potential, many problems related to raw materials like iron ore, coal, limestone etc. can be solved. Dr. B.K. Jha, Executive Director (Incharge), RDCIS, Ranchi also said that this MoU was long overdue.

Dr. S.K. Biswal, Head, Mineral Processing Dept., CSIR-IMMT, talked about the major activities and facilities available in the Mineral Processing Dept. He stressed that

mineralogical characterisation, particle dynamics and fluid dynamics are key factors for successful Mineral Processing activities.



MoU signed with RDCIS, SAIL, Ranchi

CSIR-IMMT signs MoU with Montanuniversitaet, Leoben, Austria

CSIR-IMMT signed an MoU with the Montanuniversitaet, Leoben, Austria, represented by the Chair of Ferrous Metallurgy (MU) on 22 October 2014 for collaboration in the area of 'Plasma processing of minerals & materials'.

The ferrous metallurgy division of Montanuniversitaet started way back in 1840. The LD process was developed in 1948 by Austrian companies and it is named after the Austrian towns Unz and Donawitz (a district of Leoben). The technological development obviously has its link to the Ferrous Metallurgy Division of Montanuniversitaet, Leoben, Austria. The department was also engaged with the development of the Bessemer process and subsequent commissioning of multiple Bessemer steelworks in Austria during 1863-1866.

CSIR-IMMT, on the other hand, is a fairly new institute which just celebrated its golden jubilee last year. However in

these 50 years, it has developed S&T capabilities in a wide range of areas from mineral processing to materials engineering. The institute has expertise in conducting technology oriented programmes in extractive metallurgy.

As per the MoU, researchers of CSIR-IMMT and MU propose to work in research areas of common interest and wish to collaborate with each other for sharing and advancement of knowledge in the broad area of ferrous metallurgy with special focus on plasma processing. The cooperation shall include:

- a) Exchange of researchers/faculty to execute research programmes of mutual interest
- b) Exchange of information and publication on the chosen and mutually agreed research area and
- c) Commercialization of research result after protecting mutual rights.

Technology Transfer

The Technology Management and Business Development Department (TMBD) of CSIR-CRRI has taken an initiative to transfer technologies for Mobile Inspection Unit (MBIU) to two companies and for PATCHFILL to four companies.

The Mobile Inspection Unit (MBIU) is an electro-mechanical device mounted on

a truck which provides access to hidden parts of bridges or similar infrastructures for their proper inspection.

PATCHFILL is a machine for quick, safe and economic repair of potholes. Despite its small size, it provides effective results and the efficiency matches even giant machines serving the same purpose.

Symposia/Seminars

CSIR-NEIST organises National Symposium cum Workshop on NER Coals and Minerals

CSIR-NEIST successfully organised the National Symposium-cum-Workshop on 'NER Coals and Minerals: Issues, Challenges and Opportunities' at its premises during 30-31 October 2014, in association with the Indian Institute of Mineral Engineers (IIME)-NE chapter, Jorhat. Supported by the Ministry of Communication & Information Technology, Govt. of India, the workshop saw active participation of eminent scientists, experts and stalwarts in the field of coal and mineral research, researchers and students from different parts of the country, besides

CSIR-NEIST scientific fraternity.

The two-day workshop was kicked off with an inaugural function held at the Dr. J.N. Baruah auditorium. Prof. T.C. Rao, former Director, CSIR-AMPRI, Bhopal graced the function as Chief Guest. Other notable dignitaries present were Dr. P.G. Rao, Vice Chancellor, University of Science & Technology, Meghalaya, Mr A.K. Bharali, GM, Coal India Ltd., Margherita (Assam), Dr. A. Sinha, Director, CSIR-CIMFR, Dhanbad and Dr. S.K. Biswal, Vice President (R&D), IIME & Chief Scientist, CSIR-IMMT.

Prof. T.C. Rao in his lecture on, *Challenges for Mineral Industry in NE India* said that there is an urgent need to have a centrally located Technology Cell at CSIR-NEIST to undertake the Mineral Industry Development activity on a central platform while coordinating with all the stakeholders. He also expressed the need for a paradigm shift in our thinking process for bringing prospective solutions to the mineral industry.

Dr. P.G. Rao emphasized a uniform policy or guideline for coal mining in the NER. Mr A. K. Bharali stressed on the importance of use of overburden material as a resource for further research. Dr A. Sinha informed that CSIR-CIMFR has been catering to the coal industry since inception with solutions such as clean coal technology, coal quality analysis, coal carbonization and coal gasification.



Dr. B.P. Baruah, Organizing Secretary, Principal Scientist, delivering welcome address. Dignitaries on the dais from left Dr. S.K. Biswal, Chief Scientist, IMMT, Bhubaneswar, Dr. P.G. Rao, VC, USTM, Prof. T.C. Rao, former Director, AMPRI, Bhopal, Dr. D. Ramaiah, Director, CSIR-NEIST, Dr. A. Sinha, Director, CSIR-CIMFR, Mr A.K. Bharali, GM, Coal India Ltd., Dr. R.C. Boruah, Outstanding Scientist, CSIR-NEIST



Dr. S.K. Biswal spoke about technological challenges in low-grade iron ore beneficiation and pelletization. Dr. D. Ramaiah, Director, CSIR-NEIST & President of the Symposium called for a concerted effort of think tanks from the state govt., central govt., industries and R&D organizations to bring appropriate solutions for problems and tap the potential of NER.

Dr. R.C. Boruah, Outstanding Scientist (CSIR-NEIST), discussed the common problems and future prospects of coal beneficiation in the region. Dr. B.P. Baruah, Principal Scientist (CSIR-NEIST) & Organizing Secretary, spoke about the genesis of IIME and some research activities on coal and minerals. Dr. P. Sengupta, Chief Scientist (CSIR-NEIST) & Vice President spoke briefly about the background of the symposium.

To commemorate the occasion, a souvenir was released by the dignitaries. Also, the IIME-NE chapter was inaugurated to promote study, practice and disseminate knowledgebase amongst the stakeholders, agencies (Govt./Non-Govt.) for gainful utilization of coal and mineral resources and sustainable development of the NER as well as the nation.

The two-day symposium included 13 technical lectures delivered by eminent

scientists and professors on various themes viz., Coal characterization, beneficiation and its utilization; Mineral characterization and beneficiation; Coal utilization technologies; Carbonization, gasification and combustion; Underground coal gasification; Feasibility and issues in NER coal mines; Environmental issues in mining, coal & mineral utilization; Issues in industry-academia relationship in mineral sector and sustainability and zero waste concept in coal and mineral utilization.

An open discussion was also held wherein a panel of experts from academia, research institutes and industry participated. About 135 participants attended the symposium.



A section of the audience attending the Symposium

43rd National Seminar on Crystallography at CSIR-CDRI

The year 2014 has been declared as the 'International Year of Crystallography' by the United Nations because of the invaluable role played by the discipline in many areas of human endeavor. Therefore, the CSIR-Central Drug Research Institute, Lucknow organized the "43rd National Seminar on Crystallography (NSC43c)" under the aegis of the Indian Crystallographic Association (ICA).

Dr. Girish Sahni, Director, CSIR-Institute of Microbial Technology was the Chief Guest for the Inaugural event. Under his leadership, IMTECH has successfully developed, and transferred several



Dignitaries on the dais at the inaugural function

biotechnologies, such as Recombinant streptokinase, to industry including India's first indigenous Clot-Specific Streptokinase. IMTECH has become an exemplar CSIR laboratory, which is in true spirit undertaking Scientific and Industrial Research and contributing to the economy of the nation. Dr. Girish Sahni delivered the Inaugural Address entitled *Tweaking Mechanistic Insights from Crystallography Using Complementary Approaches*.



Dr. Girish Sahni, Director CSIR-IMTECH, delivering the inaugural speech



Dr. R. Ravishankar briefing about the International Year of Crystallography

Prof. Tej P. Singh from the All India Institute of Medical Sciences, New Delhi delivered a plenary lecture on structure-

based evidence of antibiotic action of innate immunity proteins and their therapeutic applications.

Dr. Ravishankar R., Convener of the Conference, said that crystallography and crystallographic methods have continued to develop dramatically during the last 50 years. After 100 years, X-ray crystallography has become a leading technique for studying the atomic structure and related properties of materials. It is now at the centre of advances in many fields of science. In the last couple of decades, X-ray crystallography has become an important and powerful technique in drug discovery, used by pharmaceutical companies in the discovery process of new medicines. The detailed analysis of crystal structures of protein-ligand complexes allows the study of the specific interactions of a particular drug with its protein target at the atomic level. It is used to design and improve drugs.

The second day of the 43rd National Seminar on Crystallography witnessed five sessions of intense deliberations on Molecular structural biology and Crystallography. Prof. Rajan Sankaranarayanan from CCMB, Hyderabad, spoke about proofreading during translation of the genetic code. Mistakes in incorporation of the correct bases can be damaging to the cell and lead to death. He corroborated this with several crystal structural snapshots that reveal how this fundamentally important process occurs.

Prof. V. Nagaraja, from the Indian Institute of Science, Bengaluru, spoke on an important protein called Hu from tuberculosis and its interactions with topoisomerase. His presentation suggested a novel target for developing anti-TB drugs. Prof. Vinay Nandicoori, in another work, identified an important target GlmU for developing new TB drugs. This has become very important as existing drugs against TB are facing drug-resistance problems.

About 22 eminent scientists/researchers from premier Institutes of the country delivered their talks during the second day of the Seminar in various sessions.

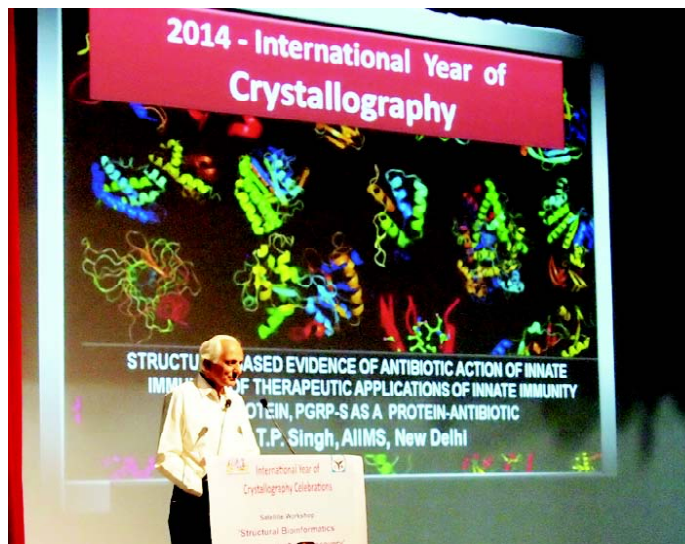
On the third day of the Seminar, many keynote speakers delivered their lectures. Dr. Manjit Bhattacharya from Cotton College,

Gauhati discussed the supramolecular coordination solids and their properties and structural investigation. Dr. Anthony Adlagatta from the Indian Institute of Chemical Technology, Hyderabad discussed about identification of the molecular basis of inhibitor selectivity between the human and bacterial Type I methionine aminopeptidases.

Dr. Nicoleta Galatanu from Xenocs SA, France, explained how macromolecule solution studies can be done with high brilliance, low background SAXS camera. Dr. Krishnamurthy Anand from Accelrys Inc. (BIOVIA), Bengaluru explained about protein design with BIOVIA discovery studio and Dr. Ravikumar from Schrodinger LLC, Bengaluru, presented an overview on Protein Ligand Database (PLDB) to evaluate known biological information to accelerate drug discovery.

Dr. M.V. Hosur from the Advanced Centre for Treatment, Research and Education in Cancer, Navi Mumbai explained

the Crystallographic investigations into mechanism of hen egg white lysozyme denaturation by urea and Dr. Shekhar C. Mande from the National Centre for Cell Science, Pune, gave a detailed account about history of crystallography and early Indian contributions.



Prof. T.P. Singh addressing the audience

Training Programmes

CSIR-NEERI organizes Training Programme in Sri Lanka for Implementation of BRS Conventions

CSIR-National Environmental Engineering Research Institute (CSIR-NEERI), as a Stockholm Convention Regional Centre (SCRC) on Persistent Organic Pollutants (POPs) for Asia Region, organized a training programme on “Capacity building for promoting synergistic implementation of Basel, Rotterdam and Stockholm (BRS) Conventions in Sri Lanka” during 28-30 October 2014 in collaboration with the Ministry of Environment and Renewable Energy, Sri Lanka and Secretariat of Basel, Rotterdam and Stockholm Conventions, Geneva.

The objective of this training programme was to protect the environment and human health from hazardous chemicals and wastes, and provide technical assistance to Sri Lanka to manage such hazardous chemicals and wastes at different stages of their life cycle.

Accordingly, a CSIR-NEERI team comprising Dr. Asha A. Juwarkar, Chief Scientist & Head, Eco-System Division; Dr. Atul N. Vaidya, Senior Principal Scientist & Head, Solid & Hazardous Waste Management Division; Mr. Sanjeev K. Singh, Senior Scientist, Eco-System Division and Mr. Jitendra K. Sharma, Senior Research Fellow was deputed to Sri Lanka to address various technical aspects related to POPs management.

During the training programme, the CSIR-NEERI team guided various stakeholders of Sri Lanka to strengthen their capacity for effective implementation of the BRS conventions in Sri Lanka. This training programme would also be instrumental for Sri Lanka to update its National Implementation Plan on POPs. Mr. B.M.D.U. Basnayake, Secretary, Ministry of

Environment and Renewable Energy (MoERE), Sri Lanka expressed gratitude for the valuable guidance given by CSIR-NEERI on POPs management. During the training programme, Mr. Basnayake briefed about the “Assessment report on the current situation of implementation of BRS Conventions in Sri Lanka” prepared jointly by MoERE and CSIR-NEERI, which will also help other countries to formulate a

strategy for managing hazardous chemicals.

Mr. D.W. Prathapasinghe, Chairman, Central Environmental Authority, Sri Lanka; Dr. Roland Weber, International Expert/Consultant on POPs, Germany and Mr. Piyush Mohapatra, representing Toxics Link and International POPs Elimination Network for South Asia, New Delhi also shared their views during the training programme.



Experts and participants at the training programme in Sri Lanka

CSIR-NEIST organizes Training Programme on Mushroom Cultivation



At the request of the Institute for Cultural and Rural Development (I-CARD), Baghchung, Jorhat, CSIR-NEIST organized a one-day training programme on mushroom cultivation at its premises on 10 October 2014.

A group of 15 school drop outs under I-card received the training aimed at making their livelihood sustainable through commercial cultivation of mushrooms. The programme was coordinated by Dr. S.P. Saikia, Scientist

Participants of the training programme along with CSIR-NEIST staff

CSIR-NEIST, Jorhat organizes Extensive Sensitization Programme on Earthquake Hazards for School Students



Under one of its on-going projects, “M8.7 Shillong 1897 Earthquake Scenario Development: N E Multi-State Awareness Campaign” sponsored by NMDA, New Delhi, CSIR-NEIST has been organizing various awareness campaigns, workshops and live demonstrations on earthquake hazards with mock rescue operations in different parts of the northeast region to create awareness among all sections of the society.

Recently, CSIR-NEIST organized a massive earthquake sensitization workshop in collaboration with ANWESHA on 15 October 2014 at AEI field, Chandmari, Guwahati. The workshop saw participation of more than 2000 school students under the Festival of Books for children.

Dr. R. Duarah, Chief Scientist (CSIR-NEIST) and the Principal Investigator of the

project delivered a talk on, *Earthquake System and Earthquake Processes vis-à-vis the Earthquake Hazard Scenario of NE India* with attractive visuals for better understanding of the students.

Mr R.S. Saxena, Team Coordinator from NDMA, New Delhi also delivered a presentation on, *Earthquake Safety and Precaution*.

A video film on NDRF activities related to search and rescue was also screened for the benefit of the students. Free booklets and DVDs on earthquake science published by CSIR were distributed to all the participating schools on the occasion. Subsequent to the workshop, CSIR-NEIST also staged an exhibition stall on ‘Earthquake Hazards’ in association with ANWESHA during 10-19 October 2014 at the same venue for school students.

Honours & Awards

Research Scholar of CSIR-NEERI gets DST’s Societal Research Fellowship

Department of Science & Technology (DST), Govt. of India has awarded the ‘Societal Research Fellowship’ to Ms. Rajshree Chandekar, who is presently working as Research Scholar at the Environmental Virology Cell of CSIR-NEERI. This scholarship, after extensive review of the research proposals by eminent scientists, is given to such women scholars who like to contribute to nation building through lab to land transfer.

Ms. Chandekar has proposed and initiated research and development activities on ‘novel application of bacteriophage for controlling foaming and bulking in wastewater treatment plant’, as foaming and bulking often pose a problem while operating wastewater treatment plants. This problem

arises due to the excess growth of filamentous bacteria in the activated sludge. These bacteria can even impact the health of persons working at wastewater treatment plants.

Therefore, Ms. Chandekar decided to work on bacteriophages (phages), viruses that specifically infect and multiply within the bacterial cell and ultimately kill bacteria, to overcome this problem. Her research would prove that bacteriophages can be an ideal solution to reduce filamentous bacterial growth in the wastewater treatment plant. Ms. Chandekar will work under the guidance of Dr. W.N. Paunikar, Head, Environmental Virology Cell and Dr. Krishna Khairnar, Scientist, CSIR-NEERI.



Subrata Ghosh Coal Petrology Award of MGMI 2013-2014 to CSIR-CIMFR, Dhanbad

This year's Subrata Ghosh Coal Petrology Award of Mining, Geological and Metallurgical Institution of India (MGMI), Kolkata was conferred on Dr. Ashok Kumar Singh, Principal Scientist and Head, Department of Coal Petrology & Coal Characterization, RQA Division of CSIR-Central Institute of Mining and Fuel Research, Dhanbad.

MGMI is a national body established during the British period and honours Indian

experts in various fields of mining, metallurgy and geology. Dr. Singh was awarded for his outstanding research contribution in the field of coal petrology covering basic, applied and industrial research on coal applying modern techniques. He has published around 90 research papers including international and national journals, seminars and symposia and visited nine countries for scientific presentations. His pioneer work in the field of application of coal petrography for applied aspects on natural cokes (*jbama*) is a milestone for international research in this field.

Dr. Singh is reviewer of several journals on coal and energy under Elsevier and member of several prestigious academic bodies such as ICCP, MGMI, GMMI, Indian carbon Society, etc. He is very actively engaged in different national and international projects on coal for its grading and quality estimation to be used for Indian industries including Power & Steel sectors.

International Committee for Coal and Organic Petrology (ICCP), recognizing his status on coal petrology, for the first time gave opportunity to Dr. Singh to organize/host its 66th Meeting and Symposium at Science City, Kolkata during 20-25 September 2014. The award ceremony was organized by MGMI in 'The Park', Kolkata on 13th September 2014 and the award was presented by the President of the MGMI.



CSIR-IICT Scientist Elected Fellow of the National Academy of Sciences

Dr. Bharatam Jagadeesh is a senior principal scientist at CSIR-IICT, Hyderabad and is one of the leading practitioners of Nuclear Magnetic Resonance (NMR) spectroscopy in India. He has been working in this area of research for the past twenty five years and has made outstanding contributions, especially in structural chemistry.

In recognition of his outstanding scientific achievements, the National Academy of Sciences, India has elected Dr. Bharatam Jagadeesh as a Fellow of the Academy in the year 2014.

Dr. Jagadeesh's notable contributions include:

- (i) Development of novel NMR methods

for solving structures of complex organic molecules and natural products in solution as well as solid-state, including dynamics in ultra-thin polymer and liquid crystal films. He was the first to demonstrate the importance of RDC-enhanced NMR for precise determination of secondary structures in designed organic molecules. This versatile approach has also enabled unambiguous and simultaneous determination of conformation/configuration in multiple-stereocentre drug/organic molecules, with improved accuracy

- (ii) Computational design and NMR experimental determinations of unnatural peptidic scaffolds that mimic natural biomolecular folding, hydrogen-bonding,

backbone regulation and amyloid type aggregation. These molecular designs and NMR experimental confirmations are useful for developing function-oriented molecules. His recent accomplishments also include new NMR-methods that provide dramatic enhancement in the spectral-resolution, thereby resulting in the simplification of complex spectra of organic molecules, natural products and body fluids. In view of his unique expertise in the area of NMR of large objects (inside-out NMR) and spatially resolved NMR, he was chosen to lead a defense project of immense national importance.

Dr. B Jagadeesh is also a Fellow of the Alexander von Humboldt Foundation, Germany.



CSIR-NAL wins Awards from National Instruments US

Drishti Transmissometer – a visibility measuring system developed by CSIR-National Aerospace Laboratories – was declared as the winner of the “System Engineering Award, 2014” on 18 September 2014 in the NI Engineering Impact Awards. This year, Graphical System Design Achievement Awards 2014 has been re-branded globally as the NI Engineering Impact Awards from National Instruments US.

National Instruments is known for its graphical design software (LabView) and hardware (cRIO & PXI) suitable for field-site applications. The Drishti Team (Dr. Shubha V, Sivakumar G, Arul Paligan A. and Krishna Murthy R.) received the award at the NIMHANS Convention Hall on the occasion of NI Days 2014.

CSIR-NAL was also declared as the Winner of the “Application of the Year Award, 2014” at the same function for Drishti Transmissometer.

The President, CEO & Co-founder of National Instruments, Dr. James Truchard made the following comments when he visited NAL on 10 September 2013: “Drishti

is an excellent example of how LabView and LabView FPGA can be used to create incredible cyber-physical systems. The team has efficiently and effectively leveraged a platform-based approach in implementing an impressive solution like DRISHTI.”

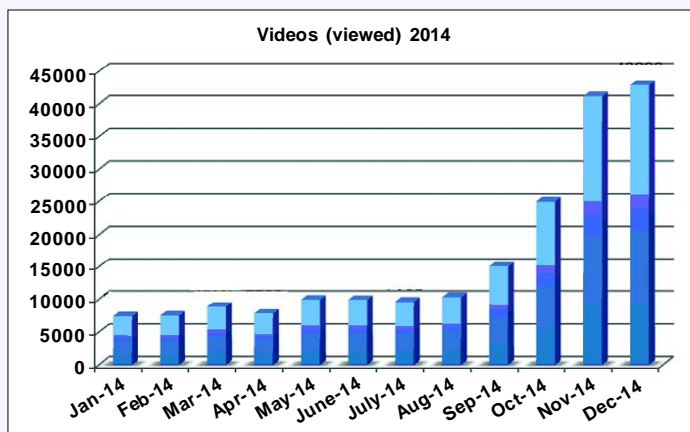
Mr Victor Miers, Vice President, Marketing of Asia/Rest of World, National Instruments commented: “It is a commendable effort by the team from NAL in solving the challenges faced in Aviation. I am happy to see the utility of our tools in enabling such applications.”

CSIR-NAL also received the “Runners-Up award for In-systems Category” for Design and Development of a Real Time Impact Monitoring System, ImpactVIEW, for Aircraft Structures using NI PXIe and LabVIEW. This system is capable of providing real-time information about the location and energy of impact using distributed fiber optic sensors and strain gauges on composite structures. The award was received by Augustin M.J., Harshita B.B., Praveen Nagarajan, Amitabha Datta and Nitesh Gupta of Advanced Composite Division.

CSIR-NAL was also declared as the Winner of the “Application of the Year Award, 2014” at the same function for Drishti Transmissometer.

CSIR-NISCAIR TUBE VIEWERSHIP CROSSES FOUR LAKHS

The *CSIR-NISCAIR Tube* (<http://scm.niscair.res.in>) was launched in August 2011 as a platform to collate science films, lectures, video programmes, audio-visual material, PowerPoint presentations and photo-graphs being produced in the country by CSIR laboratories and other scientific departments, organizations, institutes and individuals. The multimedia content generated as part of CSIR-NISCAIR's Science Communication



Total Eureka viewership: 71,785 as on 9th January 2015
Total CSIR-NISCAIR Tube hits: 4,12,729



through Multimedia (SCM) programme is also uploaded on the CSIR-NISCAIR-Tube.

The user base of *CSIR-NISCAIR Tube* has increased exponentially. The spurt in viewership has been registered especially after uploading of episodes of “Eureka” – a programme being produced by CSIR-NISCAIR in collaboration with Rajya Sabha TV Channel. “Eureka” is devoted to showcasing the contribution of Indian scientists. The viewership of *CSIR-NISCAIR Tube* has crossed 4 lakhs ever since.

While several CSIR labs have uploaded content on the CSIR-NISCAIR Tube, we take this opportunity to invite other labs too to become a part of this initiative and upload scientific content that could be of utility for others.

For more information contact Mr Gauhar Raza gauharraza53@gmail.com Head, Science Communication through Multimedia Division, CSIR-NISCAIR.

Seven Decades of Service to the Nation



The first Indian Governor General, C. Rajagopalachari, once said: “The Council of Scientific and Industrial Research is a national institution in the building of which every section of the Indian community has contributed.” Today, more than 72 years down the line, we can confidently say that CSIR has *also* benefited every section of the Indian community.

Whether it is the first ever baby food in the world from buffalo milk or the first Indian parallel processing computer, the first complete genome sequencing of an Indian or development of the first indigenous two-seater trainer aircraft, the Council of Scientific and Industrial Research (CSIR) has always been at the helm of Indian science.

Established on 26 September 1942, the CSIR today is a well knit and action-oriented network of 38 laboratories spread throughout the country with activities ranging from molecular biology to mining, medicinal plants to mechanical engineering, mathematical modelling to metrology, chemicals to coal, aerospace to oceanography, genomics to drug design and so on.

CSIR has not only provided to the nation innumerable technologies and processes, it has also helped develop a strong scientific base for the country by creating a pool of trained S&T manpower through support to research, and created mass scientific awareness in the country through its science communication programme.

Interestingly, while CSIR constitutes only three percent of India’s scientific manpower, it contributes to 10 to 11 percent of India’s scientific outputs. CSIR also holds the largest portfolio of patents among the public funded R&D institutions in India. Its patent portfolio covers areas of biological, chemical, engineering, physical, environment, earth and information sciences. CSIR has been called the flag bearer of the intellectual property movement in India.

CSIR has always taken up the challenges posed due to technology denial in the past.

When multinationals across the world tried to make us believe that powdered milk food could not be made from buffalo milk, scientists at our Mysore lab, CFTRI, came up with the technology of spray-drying fat-rich buffalo milk which could then be converted to powdered milk food. The Amul dairy picked up the technology and the rest is history. The technology played a significant role in pushing India to the top in world milk production.



When India was denied the services of a top-end supercomputer for research and meteorological purposes, our NAL-Bangalore scientists took up the challenge and came up with the country’s first parallel processing computer – the Flosolver. This galvanized work on India’s first supercomputer and soon we had the PARAM series of supercomputers that could compete with the best at a fraction of the cost.

Similarly, the technology for manufacturing zeolite catalysts, used in producing bulk chemicals and petrochemicals, was a closely guarded secret of some multinational companies. But only until NCL scientists decided to break the cartel. Not only did



they develop the technology, the country soon achieved self-sufficiency in this field saving a lot of precious foreign exchange. These catalysts are now even being exported.

CSIR has even strengthened the roots of our democracy by developing the technology for the indelible ink – an integral part of all elections in the country. In fact, several other emerging democracies have also taken this technology from CSIR to strengthen the democratic process in their countries.

CSIR has several other firsts to its credit. It developed the country's first indigenous all-composite aircraft, Hansa, and India's first 14-seater plane Saras. CSIR also established for the first time anywhere in the world the



Traditional Knowledge Digital Library, which is a documentation of the country's traditional wealth, accessible in five international languages, to prevent this wealth from being plundered through patents.

Mechanization of agriculture

played an important role in making India self sufficient in food grains. CSIR made its contribution to this end with the SWARAJ, a 20 HP tractor, in 1974. CSIR's forays in oceanography helped India become the first country to get the Pioneer Investor status. And in the healthcare sector, while coming

up with cheaper alternatives to highly expensive drugs, which were being imported at huge cost, CSIR developed indigenous drugs that reduced the market share of MNCs in the market.

At the level of the average Indian household, while convenience food mix technology developed by CSIR has reduced drudgery in the kitchen manifold, research in the laboratories of the CSIR has led to development of several drugs for malaria, asthma and even tuberculosis. In fact, CSIR's efforts in drug research have had a major role to play in positioning the fast-growing Indian pharmaceutical industry among the leading players on the global arena.

CSIR is not just known for the cutting edge technologies and processes that have been rolling out of its precincts. Some of its



low-cost and ingenious technologies have also found inroads into rural and remote areas of the country. Our scientists have come up with low-cost water filters, alternative building materials, efficient stoves and even high oil-yielding varieties of crops such as Mint that have significantly boosted farmers' incomes.

CSIR's recent initiatives signal a complete paradigm shift in tackling new challenges. The initiatives are directed at four main challenges: i) strengthening the country's scientific base; ii) promoting innovation in the Micro, Small and Medium Enterprise sector; iii) affordable health for all, and iv) economic empowerment of those at the bottom of the pyramid through S&T interventions.

CSIR recognizes that an infusion of young and bright scientists is imperative if India is to forge ahead in the global science and technology arena. And so, breaking away from the conventional education system, CSIR has now leveraged the infrastructure and scientific strengths of CSIR, in the form of a self-sustaining organization – the "Academy of Scientific and Innovative Research (AcSIR)". The academy will promote inter-disciplinary and trans-disciplinary research that is ordinarily not offered in regular universities and will also increase the number of high quality PhDs in the country who can productively contribute to the growth of the nation.

CSIR is also trying to promote Scientific Entrepreneurship by allowing researchers to have an equity stake in scientific enterprises and spin-offs while still being employed in their organizations. This will enable our scientists, like their peers in all developed countries, to enjoy the commercial benefits of their inventions and patents. The CSIR Tech Private Limited (CTPL) has been created to enhance the innovation capacity of CSIR, and pursue technology commercialization and entrepreneurship of processes, products and services.

Acknowledging the fact that advanced countries and multinational drug companies will always shy away from looking for solutions to diseases that plague the emerging economies, CSIR launched the Open Source Drug Discovery initiative – a

platform to collectively solve the complex problems associated with discovering novel therapies for neglected tropical diseases like Tuberculosis, Malaria, Leshmaniasis, and so on.

With the establishment of the Traditional Knowledge Digital Library, India has become a global leader in protection of traditional knowledge. Citing TKDL evidence the European Patent Office cancelled patents on Melon, Pistachia, Mint and Kalmegh.

CSIR has recently fostered a major strategic partnership with the National Innovation Council (NInC). The alliance will particularly focus on setting up Cluster Innovation Centres to promote innovation at the grass root level particularly the Micro, Small & Medium Enterprises (MSMEs) sector. Through this initiative, CSIR is providing innovative S&T solutions to small industrial clusters from the Krishnagiri cluster in Tamil Nadu, which is the largest producer of mangoes, to the brass cluster at Moradabad, touching the life of millions of people.

Driven by its philosophy of inclusive development, during the 11th Plan period, CSIR implemented the *Rural Development, SC/ST, Women, North-East and Tribals* (RSWNET) programme as a major societal outreach effort. Many of these projects had strong support from entrepreneurs and beneficiaries in rural communities because of the benefits the technologies brought them.

During the 12th Plan, the CSIR-800 programme was launched for the economic benefit of 800 million Indians at the bottom of the pyramid through S&T interventions. The programme is aimed at developing skills and knowledge, which would further lead to enhanced income generation and augmentation in lifestyle. CSIR also plans to consolidate rural technologies, developed over the years, in some of the most backward districts in the country. The scheme would be implemented in village clusters selected in 25 backward districts in the country and aims at empowering 1 million rural citizens out of poverty with appropriate technologies.

Beginning from the next issue, we will profile all the CSIR laboratories throwing light on the areas they work and some of their significant achievements.

Hasan Jawaid Khan

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COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH
HUMAN RESOURCE DEVELOPMENT GROUP
CSIR Complex, Library Avenue
Pusa, New Delhi 110 012

NOMINATIONS INVITED

2015 CSIR Young Scientist Awards

The Council of Scientific & Industrial Research (CSIR) invites nominations for the CSIR Young Scientist (YS) Awards for the year 2015. The awards are to be given for research contributions made primarily in India. The nominee should be a regular scientific staff of CSIR system holding a post of Junior/Trainee Scientist or above (Previously Scientist 'B' or above in Group IV) and should have joined the CSIR laboratory on or prior to 26th September 2014. The age of the nominee should not be **more than 35 years as on 26th September 2014**.

The YS Awards are given annually in the following disciplines: (1) Biological Sciences, (2) Chemical Sciences, (3) Earth, Atmosphere, Ocean and Planetary Sciences, (4) Engineering Sciences, and (5) Physical Sciences (including instrumentation). The YS Award comprises a citation, a cash award of Rs 50,000 (Rupees fifty thousand only), and a plaque.

Nominations addressed to **Scientist Incharge, SSB YSA Unit, Human Resource Development (HRD) Group, CSIR Complex, Library Avenue, Pusa, New Delhi 110 012** should be sent as per the prescribed proforma (original + one copy) latest by **31st January 2015**. A CD/DVD/USB flash drive is also required containing digital photograph (in JPEG format), duly filled proforma and significant publications (*in PDF format*) of the nominee.

The details of the YS Award and the prescribed proforma for nomination may be obtained from above address or may also be downloaded from website: www.csirhrdg.res.in

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Phone: 25848702; Fax: 25847062; E-mail: csirnews@niscair.res.in; hjk@niscair.res.in

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