

OSDD to set up Chemically Diverse Compound Library

The Open Source Drug Discovery (OSDD), a Council for Scientific and Industrial Research (CSIR) venture, is planning to build a chemical library of chemically diverse compounds for successful drug discovery programmes. The novel initiative could help OSDD researchers discover novel drug leads from the currently unexplored chemical space.

CSIR launched the OSDD programme in 2008 with the objective of discovering drugs for neglected diseases like TB, malaria, etc. Since then, OSDD has emerged as a successful model of open innovation hailed by *Science* (24 February 2012, Vol. 335 no. 6071 p. 909) and *Forbes* (9 April 2012) magazines.

OSDD works in all fields of drug discovery and development from *in silico* predications to actual clinical trials and possesses robust biology and chemistry components to support discovery and development modules. One of the novel initiatives of OSDD during the 11th Plan was an open innovation model in chemistry called the Chemistry Outreach Program (OSDDChem).

Under this programme, OSDD Chemistry Outreach Centres across various CSIR laboratories train students in synthetic chemistry and the compounds synthesized in the universities, institutes and colleges are submitted to the OSDDChem database and sent to CSIR-CDRI. These molecules are then taken up for screening at CSIR-CDRI for anti-TB and anti-malarial activity. Different projects from 34 academic institutions across the country have been submitted to OSDDChem.

Following the successful launch of the OSDDChem, which had envisioned the development of a national online repository of small drug like molecules, OSDD is now venturing into building chemical libraries with diverse compounds for driving successful drug discovery programmes. This aligns with the OSDD policy of 'no molecule will be left behind' for screening against neglected diseases and the assurance that the molecules submitted to OSDD will be taken up for screening against neglected tropical infections like TB and malaria.

Lack of chemically diverse compounds has been recognized as a crucial factor for

The screenshot displays the OSDD website interface. At the top, the logo for 'OPEN SOURCE DRUG DISCOVERY' is visible. A navigation menu on the left includes links for 'Home', 'What is OSDD', 'Who we are', 'How OSDD works', 'OSDD Portals', 'Join the movement', 'Publications and Presentations', 'Media Centre', 'News updates', 'Contact Us', 'FAQs', and 'Sitemap'. The main content area features a 'Message from Chief Mentor, OSDD' with a portrait of a man and a quote: "I believe that affordable healthcare is a right for all. But, pragmatically speaking, when it comes to health, we need to have a balanced view between health as a right and health as a business." Below this, there are three buttons: 'I am a Student', 'I am an Organisation', and 'I am a Researcher'. A 'SysBorg' section describes it as OSDD's cyber infrastructure for collaborative research, mentioning over 17000 participants from 130 countries. The 'OSDD Chem' section describes it as a web interface for large scale synthesis of diverse chemical compounds. On the right, there are sections for 'Current Events and Updates' with news items like 'Results of Temporary Research Project Posts At OSDD Unit, Delhi & Bangalore' and 'Position of a Junior Research Fellow to Work on DST Sponsored Project'. A 'News Updates' section includes a post about the 'SysBorg portal' being back for the OSDD Community. The bottom of the page shows a Windows taskbar with various application icons and the system clock showing 3:30 PM on 20-Apr-13.

the poor success rates of anti-infective drug discovery and development in the past years. Diversity of chemical compounds used for screening increases the chances of identifying novel chemical scaffolds and hence availability of compound libraries with diverse set of molecules forms a critical component of successful drug discovery programmes.

While pharma companies invest in therapeutic areas with larger revenues, infectious diseases particularly tropical infections like TB, malaria and leishmaniasis are neglected and the modern compound libraries often lack diverse molecule pool with potential antibacterial properties. OSDD aims to bridge this gap in drug discovery through a chemically diverse compound library, which could be used for screening various drug targets of discovery programmes of OSDD.

The initiative aims at the synthesis, characterization, storage and management of chemically diverse compounds for screening against pathogens like *Mycobacterium tuberculosis* and research under OSDD umbrella. The compounds can also serve as probes for chemical biology research, which will, in turn, help solve the biologically relevant questions in tuberculosis.

All the compounds deposited under this initiative will be available for screening against M. tb, malaria, filariasis, and leishmaniasis. OSDD is planning to make the library available for screening against other neglected diseases once a significant number

of compounds has been built up.

OSDD aims to make use of the vast and talented pool of chemists available across different CSIR laboratories to achieve this task of design and synthesis of novel compounds. Chemistry expertise available in different CSIR laboratories including CSIR-IICT, CSIR-NIIST, CSIR-NCL, CSIR-CLRI, CSIR-CDRI, CSIR-IIIM and CSIR-NEIST are being tapped by OSDD to achieve this purpose.

The compound library is to be created using three important synthetic approaches – target-oriented synthesis, focused synthesis and diversity-oriented synthesis to generate novel compounds belonging to different classes.

The compounds generated under this programme will be received and stored in the dedicated space of OSDD within MOL bank facility of CSIR-IICT and CSIR-CDRI. To ensure purity and identity, quality control is carried out and well characterized compounds are to be registered with unique accession codes. OSDD also employs expert personnel for management of samples, handling of data and appropriate distribution of plates/compounds for screening.

OSDD has over 7500 participants across 130 countries. It aims to acquire at least 2000 compounds every year from the CSIR laboratories with chemically diverse characteristics under this initiative.

**Haridas Rode and
Geetha Sugumaran**

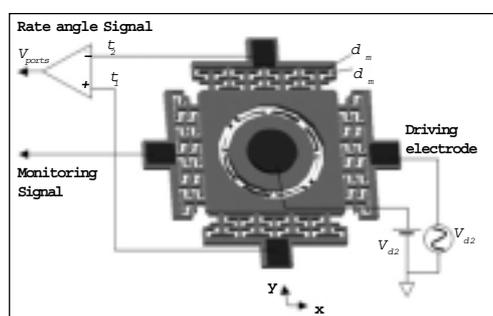


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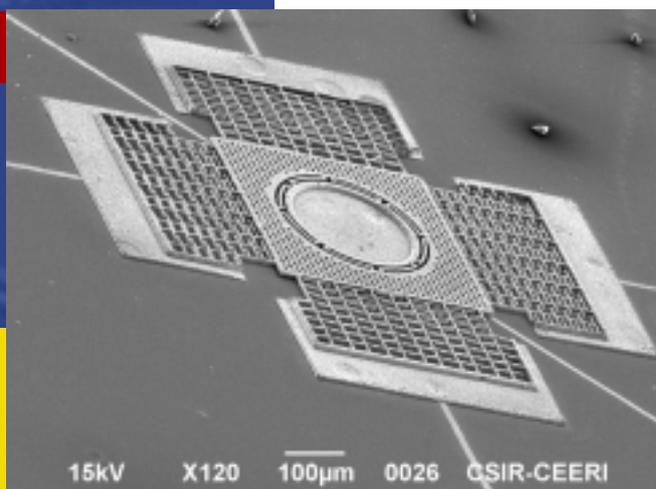
MEMS Technology-based Gyroscope Developed at CSIR-CEERI

CSIR-Central Electronics Engineering Research Institute (CEERI) has, for the first time in India, designed and developed an MEMS gyroscope for aerospace applications. A strategic requirement for the country, the task was sponsored by the Aeronautics Development Agency (ADA), Bangalore.

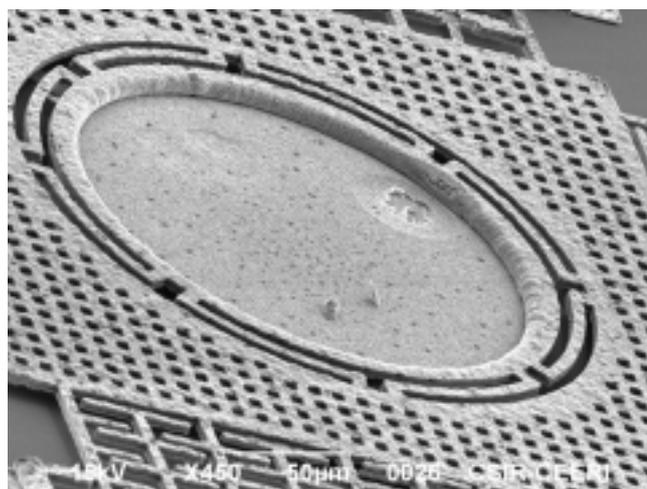
The gyroscope design is based on Lagrangian analysis. Based on this analysis,



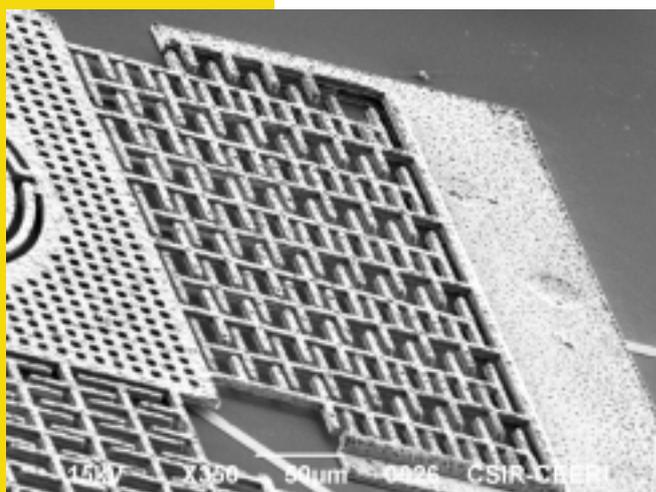
Proposed structural view of nickel Gyroscope



Complete structure of fabricated nickel micro Gyroscope



SEM microphotograph showing proof mass and cantilever springs of Gyroscope



Detailed SEM microphotograph of actuation fingers of Gyroscope

lumped differential equations for both sense and excitation modes of the device have been constructed and then solved analytically for both transient and frequency responses.

The design parameters considering nickel as a structural material are: 47.76 kHz resonance frequency, 1.45 µgm proof mass value and 0.25 mV/degrees/s sensitivity. The total chip size is 4x4 mm².

Considering nickel-specific designed parameters, mask layouts were generated and masks were made subsequently. The basic structure of nickel for the gyroscope was then built by electro-forming technique using UV-LIGA process.

Measured frequency-amplitude characteristics and corresponding phase of Gyro device showed resonance frequency of 45.6 kHz, which is close to design frequency (47.76 kHz). The bandwidth estimated is 450 Hz.

R&D Highlights

Paper with 1000+ Citations Published in CSIR-NISCAIR Journal

A recent study had revealed that there are 36 papers with at least one author from India that have received 1000 or more citations. As of April 2013, such papers have gone up to 38 with two more Indian papers receiving 1000 or more citations.

Incidentally, out of the 38 papers, there is only one paper that has been published in an Indian journal. All the other papers that have received 1000+ citations have been published in foreign journals. The lone Indian

paper published in a CSIR-National Institute of Science Communication and Information Resources (NISCAIR) journal is by P. Kakkar, B. Das and P.N. Viswanathan [A modified spectrophotometric assay of superoxide-dismutase, *Indian Journal of Biochemistry and Biophysics*, **21** (2) (1984) 130-132].

The paper describes a simple and rapid method for the assay of superoxide dismutase in biological samples. The method takes advantage of the inhibition of NADH-

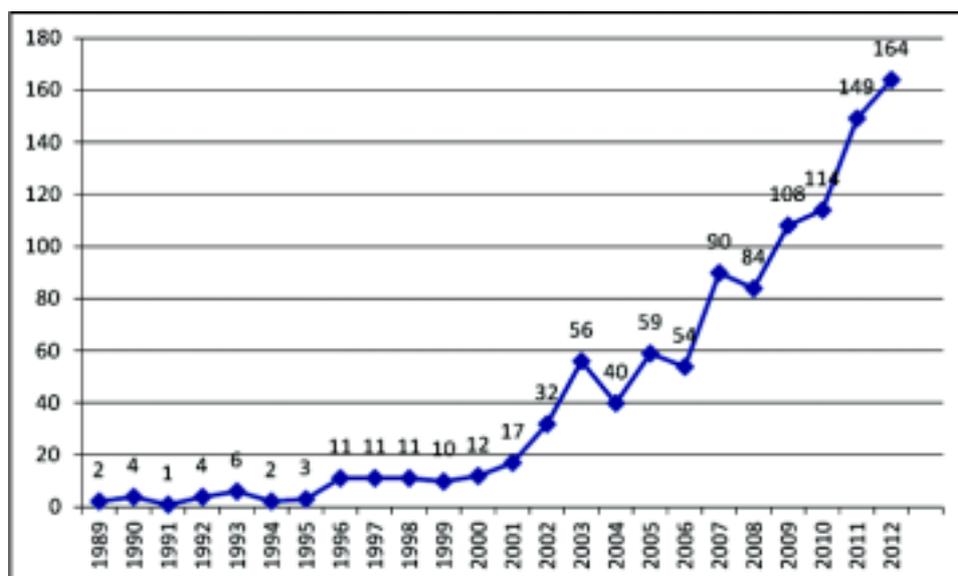


Fig. 1. Growth of citations

dependent-nitroblue tetrazolium reduction by the enzyme. The study found that inhibition of the formazan formation by superoxide dismutase was linear with increase in enzyme concentration and the formazan extracted in butanol was stable even up to

48 hours.

As per the Science Citation Index-Expanded database of the Web of Science, the paper has received 1070 citations as on 4 April 2013. The citation count is higher in Google Scholar and Scopus owing to the

The paper has facilitated estimation of superoxide dismutase, an important antioxidant enzyme whose level is found to be altered in many disease conditions. The method has been used even in laboratories where sophisticated equipments are available.

In conversation with the first author Dr. Poonam Kakkar, Scientist 'G' and Head, Herbal Research Section, CSIR-Indian Institute of Toxicology Research (IITR), Lucknow

GM: Please give us a brief history of the paper.

PK: The paper describes a simple and sensitive method for estimation of superoxide dismutase. This modified method was developed during the period when I was trying to purify superoxide dismutase from lung tissue as a part of my PhD work. It was difficult to estimate the enzyme in more than hundred samples in a day. Hence, we thought of developing an endpoint measurement assay to measure the formazan formed in large number of samples with convenience.

GM: Did you expect your paper to become so hugely cited?

PK: The paper was published in 1984 and soon after its publications we started getting large number of reprint requests. I had no idea that this method would become so popular. However, with passage of time, I came across many people who were using this method.

GM: What are the major findings of the manuscript?

PK: The method described in the manuscript for estimation of an antioxidant enzyme superoxide dismutase, is a rapid, simple and sensitive method. Large number of samples can be assayed simultaneously in test tubes. The formazan formed at the end of the reaction once extracted in butanol is stable up to 48 hours, thus providing freedom to measure it at a convenient time after stopping the reaction.

GM: What has been the impact of your paper?

PK: The paper has facilitated estimation of superoxide dismutase, an important antioxidant enzyme whose level is found to be altered in many disease conditions. The method has been used even in laboratories where sophisticated equipments are available.

Dr. Poonam Kakkar
CSIR-IITR

Table 1. Citations from top 10 countries

Countries/Territories	Citations
India	909
USA	40
Peoples R China	35
Iran	32
Pakistan	26
Saudi Arabia	26
South Korea	20
Egypt	15
France	9
Japan	6

Table 2. Citations from top 10 organizations

Organizations	Citations
Annamalai Univ	303
University of Kerala	79
Indian Institute of Toxicology Research, CSIR	56
Bose Institute	39
Central Drug Research Institute, CSIR	34
Jadavpur University	34
Metabolic Disorders Research Centre	32
All India Institute of Medical Sciences	30
Defence Research Development Establishment	30
Gujarat University	26
Med College Hospital, Trivandrum	26

Table 3. Citations from top 10 journals

Journals	Papers	JIF
Journal of Ethnopharmacology	41	3.014
Food and Chemical Toxicology	33	2.999
Indian Journal of Experimental Biology	26	1.295
Molecular and Cellular Biochemistry	25	2.057
European Journal of Pharmacology	22	2.516
Chemico Biological Interactions	21	2.865
International Journal of Neuroscience	21	0.967
Journal of Pharmacy and Pharmacology	20	2.175
Toxicology	19	3.681
Clinica Chimica Acta	16	2.535

As per the Science Citation Index-Expanded database of the Web of Science, the paper has received 1070 citations as on 4 April 2013. The citation count is higher in Google Scholar and Scopus owing to the wider coverage of these two sources.

wider coverage of these two sources. However, here we look at the citations as available in the Science Citation Index-Expanded.

It can be seen from Figure 1 that the 1984 paper received its first two citations in 1989, nearly five years after its publication. In the first decade of the paper's publication, it received less than ten citations per year and about 50% of the citations were received in the first 24 years. Since 2009, the number of citations has surged with the paper receiving more than hundred citations every year.

The paper has been cited from 39

countries but more than 90% of the citations (909 citations) are from India followed by USA (40), China (35), Iran (32) and so on. Table 1 gives the top ten countries from where the article has been most cited.

We also looked at the institutions that have cited the paper and it is seen that researchers from the Annamalai University have cited the paper 303 times followed by University of Kerala (79 papers). The Indian Institute of Toxicology Research, the institute that published the hugely cited paper, is the third (56 times) in the list of institutions that have cited the paper the most (Table 2).

The 1070 citations are of papers that have been published in 315 journals with *Journal of Ethnopharmacology* citing the *IJB* paper 41 times followed by *Food and Chemical Toxicology* (33) and another CSIR-NICAIIR journal, *Indian Journal of Experimental Biology* citing the paper 26 times. Incidentally, the source journal, *Indian Journal of Biochemistry and Biophysics*, has self-cited the paper only 11 times.

The average IF of all the citing journals is 2.148 and the journal with the highest IF that has cited the article is *Biomaterials* (2 citations, IF 7.404) followed by *International Journal of Cardiology* (3 citations, IF 7.078).



G. Mahesh and Yatish Panwar
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Resources

Beta-glucosidase Inhibitors Hidden in the Microbial World

Glucosidase inhibitors are responsible for disruption of the activity of enzyme glucosidase. These inhibitors have played a vital role in revealing the functions of glucosidases in living systems, leading to practical applications in agriculture and medicine.

The antibiotics nojirimycin and validamycin derived from the microbial species of *Streptomyces* and *Bacillus* are being extensively used as β -glucosidase inhibitors. Owing to their therapeutic potential in the treatment of certain metabolic disorders like diabetes, obesity, lysosomal storage disease and viral infections of HIV, the quest for new glucosidase inhibitors is crucial. Yet, the search for β -glucosidase inhibitors in microorganisms is extremely limited, though natural sources like plant extracts, microalgae, cyanobacteria and mushrooms have been explored.

Microorganisms, particularly marine microorganisms, have an unparalleled distinction of producing valuable compounds because of their metabolic diversity. Moreover, the microbial production process is scalable using biotechnological methods, so as to circumvent the supply problem associated with marine invertebrates and plankton.

Screening microbial culture extracts for uncovering novel inhibitors is therefore of immense interest. However, few beta-glucosidase inhibitors have so far been reported from natural sources, maybe due to the practical difficulties in performing the

inhibition tests and interpreting the results. The methods employed, till date, indirectly assess the inhibition activity by measuring the intensity of a glucosidase positive reaction.

PNPG (*p*-nitrophenyl- β -D-glucopyranoside) has been the most commonly used substrate in either TLC autographic or microplate screening assay. The reaction product, a nitrophenyl chromophore, is faint yellow and not in contrast with the surroundings for clear visual distinction of the inhibitor.

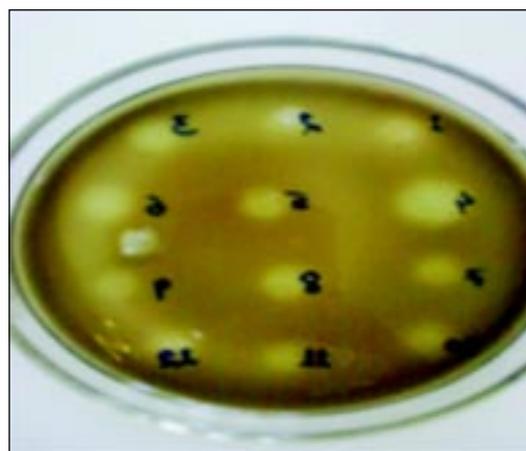


Fig. 1. β -glucosidase inhibition using the agar plate method developed in this study

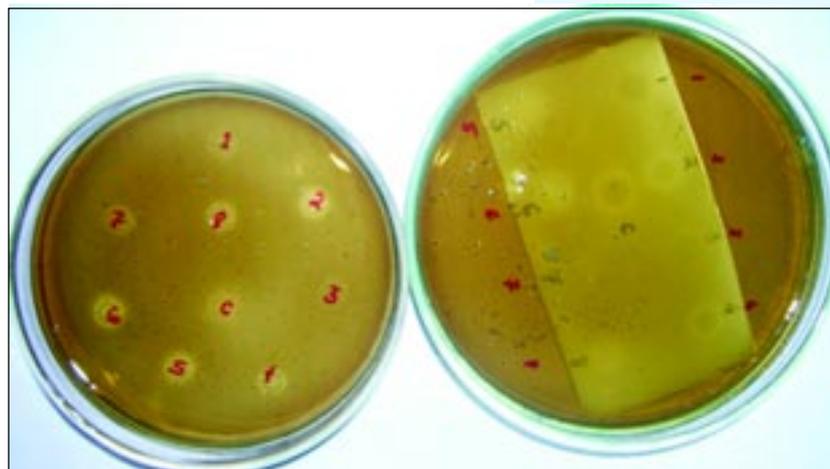


Fig. 2. Side-by-side comparison of agar plate method with TLC autography method. Samples labelled as 1, 2, 3, 4, 5, 6, 7 and 8 are the methanol extracts of marine microorganisms and, C is for control-0.75 μ g conduritil β -epoxide

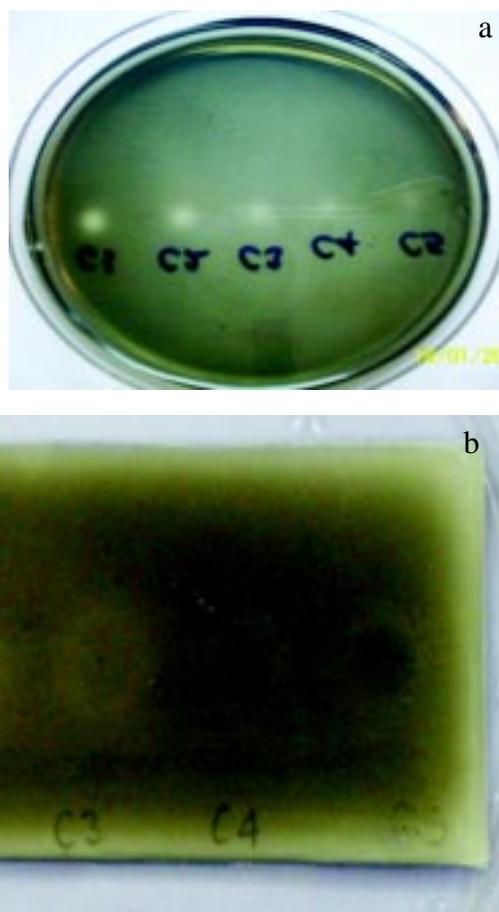


Fig. 3: Conduritol β -epoxide in different doses in: a) agar plate method – samples spot inoculated on the agar surface b) TLC autography method C1 - 2.5 μ g, C2 - 1.0 μ g, C3 - 0.50 μ g, C4 - 0.10 μ g and C5 – 0.05 μ g

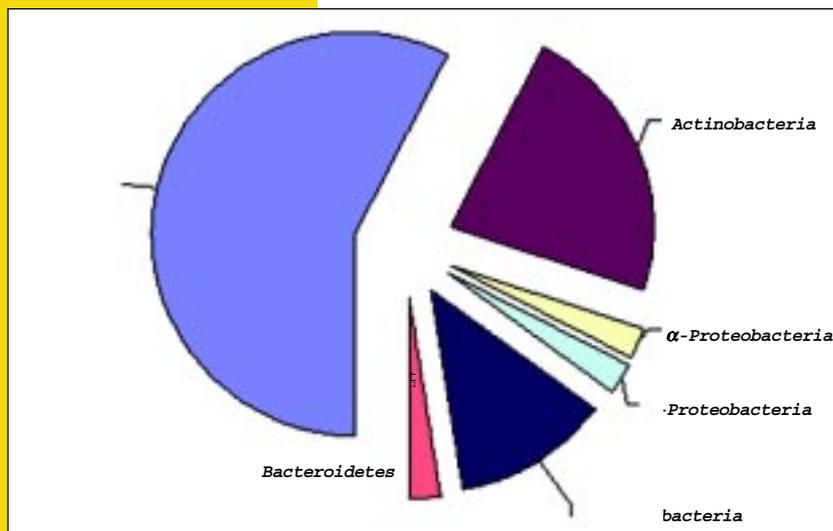


Fig. 4. Distribution of β -glucosidase inhibiting marine isolates in different bacterial phyla showing Firmicutes making up the major fraction followed by Actinobacteria, Proteobacteria and Bacteroidetes. Within Proteobacteria, the γ -Proteobacteria constitute the major fraction.

Another TLC autographic method, using esculin as substrate, was a better alternative to the methods using PNPG, since esculetin released from esculin, due to the enzyme substrate reaction, formed a blackish brown precipitate with FeCl_3 that could be clearly observed. However, TLC autographic methods are not suitable for high throughput screening as they are more laborious, time consuming, and uniform separation of compounds in all extracts cannot be achieved with single solvent system. Hence, spotting all the extracts on one TLC plate to rapidly perform the assay would be frustrating.

For screening a large number of natural extracts, TLC autography was performed without developing the plate so that activities resulting from synergistic action of multiple components of extracts are detected. In this context, we considered the use of TLC plate to be unnecessary because it increases the time, cost and labour, but does not give satisfactory results. The redundancy of TLC plate in this method is more pronounced since the enzyme-agar solution does not spread uniformly on the TLC plate, making it difficult to observe the inhibition activity as clear spots in contrast to the brown surrounding area. Although some zones were visible, chances of losing a few promising natural extracts were there as it was difficult to ascertain certain samples as positive or negative.

Another important drawback of this method was that the assay required around 4.5 to 5 hours, including an incubation time of two hours each for the enzyme-inhibitor and enzyme-substrate reaction. In a nutshell, accurate assessment of glucosidase inhibition activity in several extracts at a time is difficult and time consuming by conventional methods.

In an effort to investigate microbial extracts from marine sponge and sediment associated bacteria for β -glucosidase inhibitors, we developed a novel agar plate based method. The enzyme β -glucosidase (0.01 U/ml) was incorporated in 0.7% agar solution along with the indicator 0.6% weight/volume FeCl_3 and poured into petri dishes. Then the samples of microbial

extracts were spot inoculated on the agar surface for the enzyme-inhibitor reaction and air dried for fifteen minutes. The plate was flooded with 0.2% esculin solution and left at room temperature for 15-30 minutes for the enzyme-substrate reaction.

With the new agar plate method, pale yellowish zones against the blackish brown background could be visually observed with more clarity in sample extracts where β -glucosidase inhibitor was present (Figure 1). The new method was compared with the closest existing method and established clearly. The clarity and contrast of zones in agar plate based method, when compared side by side with TLC autographic method is quite prominent in Figure 2 and Figure 3.

Conduritol β -epoxide, an irreversible inhibitor of beta-glucosidase, was tested in a dose dependent order to confirm the effectiveness of this method. Imidazole derivatives – 1-(3-aminopropyl)-imidazole and 2-aminobenzimidazole – were also tested as reversible inhibitors of β -glucosidase. This whole procedure required about one hour for minimum 12 samples and the throughput could be increased with the size of the agar gel plate or by using a multiple of plates. The new protocol was simple, rapid and effective in detecting beta-glucosidase inhibitors in a large number of microbial extracts in a short span of time.

A large number of methanol extracts of microorganisms were screened using the new method, and we found 98 extracts (32%) containing inhibitors out of 304 extracts tested. The significant number of glucosidase inhibiting microorganisms found in this study prompted us to look into the taxonomic diversity of microbial associates of marine sponges and sediments producing β -glucosidase inhibitors. We found 41 (22.7%) out of 181 bacteria, produced such inhibitors.

All the active isolates were identified by partial 16S rDNA sequencing in the V1-V3 variable region and confirmed by culture characterization. The phylogenetic tree constructed shows active isolates are distributed in different bacterial phyla – Firmicutes (23), Actinobacteria (9), Proteobacteria (7) and Bacteroidetes (1),

which is pictorially depicted in Figure 4.

The inhibitors are abundant in bacterial associates of marine sponge *Aka coralliphaga*, and majorly belong to phylum Firmicutes followed by the phylum Actinobacteria. Species of *Bacillus* and *Streptomyces* are already known for their ability to produce diverse bioactive compounds; our finding is more important in the context of genera like *Staphylococcus*, *Stenotrophomonas*, *Pseudochrobactrum*, *Advenella*, *Dietzia* and *Chryseomicrobium*, which are hitherto unknown as producers of antimicrobial and anti-enzyme compounds.

This work fills a huge gap in the literature concerning the use of microorganisms as producers of beta-glucosidase inhibitors. It was being speculated that compounds producing glucosidase inhibitors exist in the microbial world, but there are discrete and few published reports. Many authors have emphasized that phylogenetic diversity is the source of varied biological activity.

Thus, within the realm of possibility we may assume these microorganisms have a potential to produce new glucosidase inhibitor compounds. Probably the missing link between the phylogenetic diversity and functional diversity can be established, if all these inhibitors are structurally identified and their reaction mechanisms established.

We believe our revelations form only the tip of an iceberg, and this work will set a new path to search for these compounds and find many more “cell factories” hidden in the deep sea. The search for better molecules is never ending, so as to replace or augment the ones which are already on the stands.

More details can be found in:

1. Pandey et al. Diversity of marine bacteria producing beta-glucosidase inhibitors. *Microbial Cell Factories* 2013 12:35. doi:10.1186/1475-2859-12-35 (IF: 3.55).
2. Pandey et al. A novel method for screening beta-glucosidase inhibitors. *BMC Microbiology* 2013 13:55. doi:10.1186/1471-2180-13-55 (IF: 3.04).

**Sony Pandey and collaborators at
CSIR-IMMT**



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MoU between CSIR-CRRI and Volvo Construction Equipment



MoU being signed between CSIR-CRRI and Volvo

CSIR-Central Road Research Institute (CRRI), New Delhi has entered into a MoU with Volvo Construction Equipment Division, Volvo India Private Limited, Bengaluru. Dr. S. Gangopadhyay, Director, CSIR-CRRI and Shri A.M. Muralidharan, President, Volvo signed the MoU on 30 April 2013 at CSIR-CRRI, New Delhi.

The broad objectives and terms and conditions of the MoU are as follows:

- To establish a working relationship between CSIR-CRRI and Volvo in areas of road construction equipment and technology and skill development of involved manpower so as to achieve overall productivity improvement for road construction industry.
- To enhance awareness of latest road construction equipment amongst trainees of CSIR-CRRI.
- To conduct training programmes of common interest for engineering professionals.
- To conduct short term courses for manpower skill development in areas of machine operation, thereby addressing prevailing concern of shortage of skilled machine operators for road construction equipment.
- To come out with a white paper on Construction and Maintenance Machinery for the Road Sector in the form of catalogues, technical papers, manuals, etc.
- To explore opportunities for collaborative projects for development of instrumentation for road construction equipment.
- To jointly undertake projects in India and abroad.
- To organize joint conferences and seminars in India and abroad.

RINL Chief Appreciates CSIR-CGCRI's Technology on Value Added Ceramic Products from Solid Wastes of Vizag Steel Plant



Rashtriya Ispat Nigam Limited (RINL) Chairman-cum-Managing Director Mr A.P. Choudhary recently praised CSIR-Centre for Glass and Ceramic Research Institute (CGCRI) for developing a technology for effective utilisation of Vizag Steel Plant's solid wastes. He was speaking after inaugurating a workshop on *Utilisation of Solid Industrial Wastes for Ceramic Projects – Scope and Opportunities*. The workshop was held on 27 April 2013 in the Training and Development Centre, Visakhapatnam Steel Plant.

Mr. Choudhary said the intrinsic ability of steel to be completely recycled, offers great prospects for sustainable development. However, one of the major concerns of the steel industry is the effective utilization of wastes generated at various stages of steel making. It has been estimated that around 0.8 tonne of solid waste is generated for every tonne of steel produced. Therefore, the opportunity was huge for effective utilisation of the wastes generated, not only from the environmental perspective but also as an effective tool for cost reduction.

Mr. Choudhary highlighted that stringent environmental norms had transformed the scenario of 'waste dumping' into 'waste management.' The technologies being developed today to economically convert waste into wealth were providing new business opportunities for budding entrepreneurs, he added.

Later he visited an exhibition arranged along the sidelines of the workshop and looked at CSIR-CGCRI's pavement products developed from wastes.

The products were an output of the project *Development of value-added ceramic products utilizing solid wastes generated at Visakhapatnam Steel Plant* sponsored by Vizag Steel Plant (VSP). Two major objectives of the project that have been successfully completed are:



Dr. Swapan K. Das, Chief Scientist & Project Leader, showing pavement blocks developed by CSIR-CGCRI to Mr. A.P. Choudhary as Mr. Umesh Chandra, Director, Operations RINL-VSP looks on



Pavement specimens developed from solid wastes of steel produced by RINL-VSP

- (i) To develop value-added ceramic products such as pavement blocks, tiles utilizing solid wastes such as LD slag, BF slag, fly ash generated at Vizag Steel Plant for application in construction industries. (ii) To motivate

local entrepreneurs at Visakhapatnam to manufacture such items through organizing workshops utilizing the knowhow jointly created by CSIR-CGCRI and RINL-VSP R&D.

Among the delegates who made presentations in the workshop from CSIR-CGCRI were Chief Scientists Dr. Swapan Kumar Das and Dr. A. Ghosh, and Senior Scientists Dr. H.S. Tripathy and Dr. M.K.

Haldar. A pilot plant was being envisaged to demonstrate the technology to local entrepreneurs.

The workshop was organized by the R&D department of RINL-VSP in collaboration with the CSIR-CGCRI, the Indian Institute of Metals (Visakhapatnam Chapter) and The Indian Ceramic Society (Visakhapatnam Chapter).

National Technology Day

CSIR-Indian Institute of Petroleum

The National Technology Day was celebrated at CSIR-Indian Institute of Petroleum (IIP), Dehradun on 17 May 2013. Padma Vibhushan Prof. M.M. Sharma, Former Director, ICT Mumbai delivered the Technology Day lecture.

Vibhushan (2001), and Padma Bhushan (1987). Professor Sharma was editor of one of the most prestigious journals in Chemical Engineering, namely, *Chemical Engineering Science* (Pergamon Press, UK) from 1975 to 1986. In addition, he has been member of Editorial Advisory Boards of several international journals of repute. For outstanding publication, he got the Moulton Medal of the Institution of Chemical Engineering, UK in 1971 and 1977.

In his lecture, Prof. M.M. Sharma appealed to the scientific community to come out with innovative technologies since technology is the biggest sea of capital. Many Nobel laureates have underlined this fact, attributing it to the growth of developing as well as of developing nations. He said there should be serious efforts to develop innovative technologies. Innovation does not come from the routes followed by others, it comes by logical thinking and by doing things the way no body could do. He lamented that the term "Innovation" is being used very loosely by today's researchers.

In his lecture, *Innovation in Chemical Industry*, he cited many examples of technologies from history that changed the entire scenario of the world. Polymerization was observed by many people from time immemorial like formation of gum by tree but the technology of polymerization like polystyrene, polyester, and butadiene led to drastic changes in the lifestyle of the people. Polystyrene gave mankind all types of plastics, polyester gave all types of clothes



Dignitaries on the dais

On 11 May 1998, India conducted the second successful nuclear test at Pokhran and secured its position among the list of nuclear powers of the world. To commemorate the occasion, the day is celebrated as the National Technology Day all over India.

The Chief Guest, Prof. M.M. Sharma, has been recognized for his contributions through several honours and awards including the SS Bhatnagar Prize in Engineering Sciences, FICCI Award, Vishwakarma Medals, UK Leverhulme Medal of the Royal Society, Padma



Prof. M.M Sharma addressing the audience

and butadiene gave mankind rubber, tyres etc. This changed the entire transport system.

He stressed upon the need for industry to adopt techniques that would eventually lead to the successful implementation of many technologies, resulting in substantial improvement in turnover and financial advantage in different sectors of industry such as petrochemical, pharmaceutical and petroleum refining.

that initially in 1999 the National Technology Day was celebrated to recognize excellence in Science & Technology of the defence and security of the motherland. But now it is celebrated to recognize achievements in all fields of Science and Technology. He said that day gives an opportunity to derive inspiration and strength from our past achievements, to critically review our present position and to plan for the future.

Dr. M.O. Garg, Director, CSIR-IIP, gave an overview of the technological capabilities of India. He emphasized on the need for the development of cutting-edge technologies that have low cost of operation and are environment friendly. He expressed concern over the rising prices of crude oil and its availability.

Dr. S.K. Sharma, Chairman of the Celebration Committee, said



CSIR-National Botanical Research Institute

The National Technology Day was celebrated by CSIR-National Botanical Research Institute (NBRI), Lucknow on 11 May 2013. The day was observed as 'Open Day' and the laboratories, Exposition, Herbarium, Library, and Botanic Garden were visited by a large number of students from various local schools and colleges.

On this occasion, Prof. Narpinder Singh, Department of Food Science and Technology, Guru Nanak Dev University, Amritsar, the Chief Guest of the function, delivered the National Technology Day lecture on *Food Security and Post Harvest Processing – A Challenge*. Distinguished guests and scientists and staff of CSIR-NBRI, CSIR-CIMAP, researchers and students were present on this occasion.

In his welcome address, Dr. C.S. Nautiyal, Director, CSIR-NBRI and CSIR-CIMAP, said that NBRI has made commendable progress



Planting material being transferred during the function

in research in the past few years. Working together, CSIR-NBRI and CSIR-CIMAP have

Water level in various parts of the country is falling day-by-day due to over-drawing of water for crops like paddy. If this trend continues, very soon all states would turn into desert states.

Prof. Narpinder Singh,
Guru Nanak Dev
University, Amritsar

been able to develop some herbal products successfully.

Delivering his lecture, Prof. Narpinder Singh said that India's food security mission aimed at feeding the population by supplying food grains at subsidized price to each Indian could well run into problems in the long run if the government does not take immediate measures to halt the degradation of the natural resources, including the soil and groundwater.

Prof. Singh, one of the best-known food scientists of the country, observed that food security is worsening day by day, mainly due to the ever increasing population. He pointed out that agricultural output, including that of paddy, wheat and pulses was bound to fall in the years to come if over-exploitation of the soil and groundwater continues at the rate at which it is being done today. Climate change will also alter the cropping pattern and in the process hit production. Prof. Singh said that the government should encourage the cultivation of those crops that earn more money instead of consuming water during growth.

He said that water level in various parts of the country is falling day-by-day due to over-drawing of water for crops like paddy. If this trend continues, very soon all states would turn into desert states. India produces around 7 million tons of basmati rice, of which two-third of the country's produce is exported. For producing one kilogramme of basmati, 3,000-5,000 litres of water is required. Citing the example of Punjab, which produces 70-75% of the country's basmati rice output, Prof. Singh said that rice cultivation in Punjab is depleting water at a faster rate. Referring to the Asparagus fiasco in Peru, cultivation of which sucked the Peru's Ica valley dry, the country should learn lessons in time, he warned.

Prof. Singh further said that that if the country wants to accomplish its food security goals, then the government will have to ensure that the fertile land is preserved and not given away to multi-nationals or real estate developers. India's per capita availability of agricultural land has shrunk to 0.3 hectare

per farmer compared to over 11 hectares in the developed world, he informed. "Rich governments and corporations are buying up the rights to millions of hectares of agricultural land in developing countries in an effort to secure their own long-term food supplies," he said. "FAO has warned that the controversial rise in land deals could create serious food security issues for poor states producing food for the rich at the expense of their own hungry people."

Considering the rate at which the population was growing, every inch of cultivable land should be preserved, he advised. Prof. Singh also laid stress on improving post-harvest technologies to minimize food or grain loss. In particular, he stressed on paying special attention to developing infrastructure for the food-processing sector to take care of the fruits and vegetables and milk and dairy products, and cultivation of GM crops.

On this occasion, an agreement was signed between CSIR-NBRI and M/s Vedic Biocare Pvt. Ltd. for transferring the know-how of *Herbal Sindoor* developed by CSIR-NBRI. Dr. C.S. Nautiyal elaborated that *Herbal Sindoor* is natural, eco-friendly and does not contain any toxic metals or chemicals.

A tobacco- and nicotine-free herbal product, *Herbi-Chew*, jointly developed by CSIR-NBRI and CSIR-CIMAP was also released on this occasion.

CSIR-NBRI also transferred planting material (corms/rhizomes/plants) of potential varieties of ornamentals of Bougainvillea, Canna and Gladiolus to farmers, nurseries and entrepreneurs of Lucknow and adjoining areas. Some of the beneficiaries were: Friends Rosery Mahanagar, Lucknow; Adhunik Pushp Utpadak Kalyan Samiti, Bakshi ka Talab, Lucknow; Audanik Pushp Utpadak Avam Vipanan Sahkari Samiti Ltd., Dafedar Purva, Barabanki and Meghalaya Basin Development Authority. The main purpose of these transfers was popularization of newly developed varieties of ornamentals for societal benefit and further multiplication so that these could be commercialized in future on a large scale.



CSIR-National Metallurgical Laboratory (NML), Jamshedpur celebrated the National Science Day on 28 February 2013. In addition to CSIR-NML scientific and technical staff, more than 250 students from eminent schools including Mrs. KMPM Inter College, Karim City College, KPS, Burmamines, NML KPS, Mount View School, Mango, Little Flower, and Rajendra Vidyalaya participated in the programme.

The celebrations included screening of a documentary film on Sir C.V. Raman, the Indian physicist whose work was influential in the growth of science in India. He was the recipient of the Nobel Prize in Physics in 1930 for the phenomenon now known as Raman scattering.

A popular film on Fermat's Last theorem, which states that no three positive integers a , b , and c can satisfy the equation $a^n + b^n = c^n$ for any integer value of n greater than two, was also screened. The films were thought provoking and motivating for the young students.

While welcoming the gathering, CSIR-NML Director, Dr. S. Srikanth said, "It is great to have assembled here to pay tribute to one of India's outstanding scientists, Sir Chandrashekhara Venkataraman, whose announcement of the Raman Effect is what we today celebrate as Science Day." He highlighted in his speech the breakthroughs that had taken place in the field of science like the discovery of decimal and number system, the world's first university established in Takshila, the value of 'pi' calculated by Bodhayana, invention of chess in India, etc. Dr. Srikanth emphasized the fact that these discoveries were made prior to 1500 AD.

However, since Independence, the impact on global science has been negligible. He added, "On this day of the discovery of the Raman Effect, it is time to introspect what is going wrong." Dr. Srikanth stressed that we should start thinking differently. We should learn to "Question the Answers" and should learn to enjoy what we do.

The Chief Guest, Dr. Parthasarathi Mukhopadhyay, Associate Professor in Department of Mathematics at the Ramakrishna Mission Residential College, raised the issue of "What do the Dividers do in our Geometry Box?"



Vignettes from Science Day Celebrations at CSIR-NML

Dr. Mukhopadhyay said "dividers are used to transfer the line segment from one place to another on a paper. This is the general concept that we all agree with, but is there anything exclusive that dividers can do and compasses cannot?" He gave a brief introduction of the Greek construction that began only with the help of an "unmarked ruler" (more commonly known as "straightedge"), and a "collapsible compass".

Dr. Mukhopadhyay explained how, with the use of only these two instruments, almost all the constructions are possible. These were proved long before the discovery of the marked ruler and a regular compass that we

are using today. He traced the history and development related to Mathematical Science in the country. Dr. Mukhopadhyay also cited how algebrisation of mathematics was a new approach in the field of Maths. He also mentioned about Gauss's theorem and how he proved the concepts that were not possible before.

There was also an interactive session with students present where Dr. Mukhopadhyay attended to their queries. The students expressed their excitement and happiness over the laboratory visit, as well as interaction with the scientists and research scholars.

National Safety Week Celebrations

CSIR-National Chemical Laboratory



Dr. Sourav Pal (left), releasing a pocket card with Dr. G.S. Grover, Head, Safety Management, CSIR-NCL with Mr. Rama Krishna looking on

CSIR-National Chemical Laboratory (NCL), Pune, celebrated the National Safety Week with several awareness campaigns and activities. On this occasion, a lecture on safety awareness was organized on 7 March 2013.

Mr. M. Rama Krishna, Vice President, Alexandria Equities Management (India) Pvt. Ltd., Hyderabad, delivered a lecture on *Safety in Chemical Laboratories*. He talked about the key elements of lab design, standard operation procedure, emergency preparedness and disaster mitigation plans.

Dr. Sourav Pal, Director, CSIR-NCL and Chairman of the Statutory Committee on Lab Safety, stressing the importance of safety, reminded students and researchers to follow safe practices. He asked them to be alert and cautious while performing chemical reactions and handling instruments. He urged the committee to conduct lab inspections regularly. He also released a pocket card with information on fire safety and emergency contacts.

CSIR-NCL is surmounting safety issues by conducting safety-oriented programmes for its staff, students, project assistants and trainees every month. These involve sensitization of students for material safety data sheets (MSDS), standard operating procedures (SOP), use of personal protective equipments (PPE), hazards and risk assessment, emergency procedures, disaster management and fire safety, besides incident case studies. A few short films related to chemical process safety were also



Fire control demonstration by students using portable fire extinguisher

screened. A live demonstration was arranged to control small fires using portable fire extinguishers.

In 2012, eighteen special orientation courses of four hours each were organised. During the first quarter of 2013, over 150 new aspirants including research fellows and project staff benefited from the safety

awareness programmes.

CSIR-NCL has upgraded its facilities and infrastructure for reducing the possibility of fire and exposure to toxic chemicals. This awareness agenda has raised the consciousness of people working in laboratories, reducing the number of accidents.



Lectures

10th PrIEST Lecture *Minimization of Solid Waste Generation in Tannery* organized by CSIR-CLRI

The 10th PrIEST lecture titled *Minimization of Solid Waste Generation in Tannery* was organized by the Regional Centre for Extension and Development (RCED), CSIR-CLRI on 4 April 2013 at the Calcutta Leather Complex. Dr. J. Kanagaraj, Principal Scientist, Leather Processing Division at CSIR-Central Leather Research Institute (CLRI) delivered the lecture. More than fifty people from various sections of the leather industry turned up to listen to the lecture.

The programme started with the Presidential Address by Shri Arnab Kumar Jha of the Indian Leather Technologists' Association. Shri Jha welcomed the gathering and highlighted the serious problems facing the industry concerning the safe disposal of tannery solid waste. He pointed out that research is going on all over the world for finding better solutions to this problem. Emphasizing that prevention was better than cure, Shri Jha urged the industry to take effective steps to reduce the generation of solid waste as much as possible. He said the PrIEST programme would go a long way in solving various technology-related problems of tanners. Shri Jha proposed to compile the PrIEST lectures in the form of a book that would be helpful for tanners.

Dr. Dipankar Chaudhuri, who is currently heading the RCED, CSIR-CLRI, Kolkata reminded the participants of the various technologies discussed and demonstrated under the PrIEST and wondered as to why



Shri Arnab Kumar Jha, President, ILTA welcoming the participants



Dr. Dipankar Chaudhuri, Scientist and Head, RCED, CSIR-CLRI, Kolkata giving an update on the lectures and demonstrations held so far under the PrIEST programme

Dr. Kanagaraj cited a number of new technologies developed at CSIR-CLRI to illustrate the proposed strategy. For instance, he talked about three alternative systems based on silica gel, boric acid and sodium metabisulphite that could be used to replace the conventional salt-based curing system to reduce solid waste and keep the environment clean.

Kolkata region could not do what Chennai had already done in the area of cleaner technology practice. Dr. Chaudhuri expressed apprehension about the future of the tanning industry due to lack of cleaner processing techniques and urged the CLC tanners to work as an industry to take effective measures to improve upon its environmental performance. He drew the attention of the participants to a four-page document developed by CSIR-CLRI for the CLC tanners for efficient operation of their pre-treatment plants.

Dr. J. Kanagaraj covered a review of various solid wastes generated in the leather industry and stressed the need for minimizing such waste in leather processing. He classified the tannery solid waste into various groups and also gave a detailed estimate of their corresponding volumes. He identified the unit operations from which the tannery wastes emanate, and proposed a strategy for minimizing their generation in leather processing.

Speaking about the implementation of the waste reduction initiative, Dr. Kanagaraj emphasized the practice of cleaner leather processing techniques as an important part of the strategy. He also stressed the need for recycling and reuse of some potential solid wastes and possible consideration of some other tannery wastes as raw material for making value-added products.

Dr. Kanagaraj cited a number of new technologies developed at CSIR-CLRI to illustrate the proposed strategy. For instance, he talked about three alternative systems based on silica gel, boric acid and sodium metabisulphite that could be used to replace the conventional salt-based curing system to reduce solid waste and keep the environment clean. Likewise, a variety of chrome exhaust aids developed at CSIR-CLRI from tannery solid waste could be used to reduce chromium in sludge. Dr. Kanagaraj concluded his lecture by highlighting the key role played by clean and green chemistry in the reduction of solid waste in tannery.

The presentation was followed by an interactive session. Shri Misbahul Haque, a

veteran leather manufacturer in CLC, appealed to ILTA and CSIR-CLRI to invite the technicians working at CLC and train them in the application of new technologies discussed in the lecture. He appealed to all the CLC tanners to check the quality of the lime used in their respective tanneries. He felt that the CLC tanners should ensure a minimum of 70% available lime to reduce the volume of lime sludge, which is augmented by the presence of significant quantity of calcium carbonate. Shri Haque expressed interest in the salt-less and less salt preservation systems of raw hide and skin. On the possible reduction of environmental impact of salt used in conventional curing, he highlighted the initiative taken by CLC tanners for removing the salt adhering to the leather by physical means. Shri Haque opined that adopting this technique would not only reduce the water consumption but also minimize the total dissolved solid in the wastewater.

Shri Arup Mitra, a renowned leather professional in CLC, appreciated the salt-less and less salt alternative cleaner curing systems developed at CSIR-CLRI. However, he felt that it would be difficult for the tanners to convince those engaged in curing to change over to cleaner curing systems as tanners have no control over them. Shri Haque responded to this by saying that each tannery should take proactive steps to encourage their rawhide suppliers to adopt cleaner curing process for the benefit of the industry. He recalled the recent constitution of an expert committee by the Govt. of West Bengal to look after the environmental issues in CLC. Shri Haque warned the tanners that negligence on their part in curbing pollution in CLC might lead to heavy penalty or even cancellation of their licenses by the regulatory authority.

Shri Tarak Saha, a well-known leather technician, felt that apart from tanners and technicians, students of leather technology should also be made familiar with the clean technologies. He suggested revision of the syllabus of B. Tech. in Leather Technology to include the cleaner technology options.

Diamond Jubilee Lecture at CSIR-NBRI

In the series of Diamond Jubilee Lectures at CSIR-National Botanical Research Institute (NBRI), Padmabhusan Prof. Asis Datta, Distinguished Emeritus Scientist, National Institute of Plant Genome Research (NIPGR) delivered a lecture titled *Dream to bring Science to Society* on 17 May 2013. Prof. Asis Datta is also Founder Director and Professor of Eminence, National Institute of Plant Genome Research and Former Vice Chancellor, Jawaharlal Nehru University, New Delhi. Dr. C.S. Nautiyal, Director, CSIR-NBRI welcomed the Guest Speaker and other eminent scientists present on the occasion.

Commencing his talk, Prof. Datta said that science is a journey not a destination. Progress is a constant journey where many variables keep coming up at odd hours and turns. Prof. Datta said that plant biotechnology can play a critical role in the betterment of farming systems by increasing genetic diversity and deficiency of economically important species. He advised that potential application of genomic technologies need to be adopted to increase food security, nutritional adequacy, poverty alleviation, environmental protection and sustainable agriculture.

The world population will increase upto 10 billion by 2015 and, therefore, food demand will also increase by 1.7 times. Plant biotechnology will facilitate the farming of crops with multiple durable resistances to pests and diseases. In the absence of pesticides, development of high yielding crops will be needed to feed the world and save land for the conservation of plant biodiversity in natural habitats, he elaborated.

Prof. Datta said that the term nutritional genomics is used to describe work at the interface of plant biochemistry, genomics and human nutrition. The goal of nutritional genomics has been to create crops that are tailored to provide better nutrition for humans and their domestic animals. Modifying the nutritional composition of plant foods is an urgent worldwide health issue, as basic nutritional needs for much of the world's population have still not been



Prof. Asis Datta delivering the lecture

met. The goal is to increase crop productivity, improve crop quality, and maintain the environment, he said. Genetic improvement in crop plants beyond current capabilities are needed to meet the growing world demand not only for more food, but also for greater diversity, high quality, and safe food, while at the same time, conserving natural resources.

Prof. Datta cited examples of service to society through his work in the areas of pathogenicity in *Candida albicans*, food security through GM crops, nutritional genomics, enhancing shelf life in fruits and vegetables by using novel genes involved in fruit ripening, and expression of oxalate decarboxylase for reducing the accumulation of oxalic acid in crop plants.

Speaking on nutritional improvement of crop plants by expressing a seed albumin gene (AmA1) from *Amaranthus hypochondriacus*, he said that transgenic potatoes with high nutritional value have been developed because of high lysine and sulfur containing amino acids. The transgenic tubers also contained more total protein as compared to control potato tubers, he said. He also informed that oxalate-free transgenic tobacco and tomato plants have been developed which are resistant to phytopathogenic fungus *Sclerotinia sclerotiorum*. He also touched upon the biosafety issues related to genetically modified food crops.

The present trend on genome research has already posed a special challenge and dire

The goal of nutritional genomics has been to create crops that are tailored to provide better nutrition for humans and their domestic animals. Modifying the nutritional composition of plant foods is an urgent worldwide health issue, as basic nutritional needs for much of the world's population have still not been met.

Prof. Asis Datta,
Distinguished Emeritus
Scientist, NIPGR

threat to the economics of the nations who are unable or unwilling to take advantage of the available technology. Limitations of water resources, decreased fertility of arable land, skyrocketing cost of energy and galloping increases in the population make it imperative that food supplies of the 21st

century will depend on a new form of agriculture in which custom-made food plants will dominate the world market, he concluded. Prof. Datta appreciated the role of CSIR-NBRI in this regard, saying that it has made significant contributions in the area of genomics and developing transgenic plants.

Training Programmes

Training Programmes Conducted at CSIR-NEIST Branch Laboratory, Imphal



A view of the two-day DNA Club programme

The Branch Laboratory of CSIR-North-East Institute of Science and Technology (NEIST), Imphal recently organized various training programmes in the region.

A two-day DNA Club Educational Programme during 2-3 May 2013 was conducted under the aegis of the externally funded project *DNA Clubs: DBT-TERI Mentoring Schools of the Northeast*.

The programme included activities like (i) Essay Writing Competition on forest and water conservation, (ii) Extempore Speech for teachers and students, (iii) Science Film Show and (vi) Lecture Series.

The lectures included a talk delivered by Dr. R.C. Sundriyal from GB Pant Institute of Himalayan Environment and Development, Almora on the topic

Himalayan Biodiversity. Dr. Manju Sundriyal, Uttarakhand Science and Education Research Centre, Dehradun spoke on the topic *Wild edible plant and its sustainable development*.

Prizes were distributed to the winners by Chief Guest Dr. R.C. Sundriyal and Guest of Honour Dr. Manju Sundriyal, as well as LAC Members. Dr H.B. Singh, Scientist-in-Charge, Branch Laboratory, Imphal presided over the prize distribution ceremony.

A two-day programme consisting of Science Model Making Competition and Tree Plantation was also organized during 9-10 May 2013.

Dr. B.G. Unni, Chief Scientist and Area Coordinator and Director's Nominee, Shri Uttam Laisram, Director, Science and Technology, Manipur, Shri Th. Surendranath Singh, Director, MASTEC, and Prof. B. Manihar Sharma, Senior Professor of Life Sciences, Manipur University (Local Advisory Member) attended the programme which was coordinated by Dr. H.B. Singh, Principal Scientist and Incharge, CSIR-NEIST Branch Laboratory, Imphal, Manipur.

Cash and merit certificates were awarded to winning schools and students by Shri Uttam Laisram in the presence of LAC members. During the programme, tree plantation was carried out inside the campus of the Branch Laboratory, Imphal.

A field study tour to Keibul Lamjao National Park and its surrounding wetlands was also organized on 25 May 2013. Ten students and a coordinating teacher from the 57 DNA Club Schools and Local Advisory members attended the programme.

Honours & Awards

CSIR-IIP Awarded 3rd National Award for Technology Innovation for 2012-2013



CSIR-Indian Institute of Petroleum (IIP), Dehradun was awarded the 3rd National Award for Technology Innovation for 2012-2013 in the category of *Innovation in Polymer Waste Management and Recycling Technology* and subcategory of *Academics and R&D Institution* for its innovation “Technology to convert waste plastics (polyolefins) to automotive grade fuel and petrochemicals”.

The award was presented by Shri Srikant Kumar Jena, Minister of State (Independent Charge) for Chemicals and Fertilizers, Statistics & Programme Implementation, Government of India at a glittering ceremony held at the Manekshaw Centre in New Delhi on 7 May 2013. The award carries a plaque, a citation and a reward of Rs 2 lakhs. The award has been instituted by the Government of India to promote and appreciate innovations in polymer industry and is awarded every year.

The technology to convert waste plastics (polyolefins) to automotive grade fuel and petrochemicals is a unique technology developed by CSIR-IIP in collaboration with GAIL (India) Ltd. Using this technology, waste polyolefins (polyethylene and polypropylenes like carry bags, packaging materials, household plastics, agricultural pipes, etc.) can be converted exclusively into

any one of the products, viz. gasoline, diesel or petrochemicals. The liquid fuel (gasoline/diesel) meets most of the Euro III specifications and their performance is comparable to commercial automotive fuel. The petro-chemicals consist mainly of toluene and xylenes, which are important raw materials for polymer industry.

Based on the process developed, 1 kg of polyolefinic waste, devoid of contaminants, can produce either 550-600 ml gasoline or 750-800 ml diesel or 450-500 ml petrochemicals, along with LPG in each case. The technology has been developed at the bench scale and a 10 TPD pilot plant is being set up with GAIL. The process has the potential to solve the problem of plastic waste disposal in an economical and environment friendly way, augment the supply of fuel and also provide economic benefits to the weaker segments of the society.



Proud recipients of the award

CSIR-NIO Scientist Selected for INSA Medal

Dr. Rajeev Saraswat, Scientist, CSIR-National Institute of Oceanography (NIO), has been selected for the award of the INSA Medal for Young Scientists (2013).

Indian National Science Academy (INSA) – one of the largest science academies in India – instituted these medals in 1974 with the aim of distinguishing young scientists of extraordinary promise and creativity who have made notable research contributions in Science and Technology. The INSA Young Scientists Award,

considered to be the highest recognition of promise, creativity and excellence in a young scientist, is made annually to those distinguished for these attributes as evidenced by their research work carried out in India.

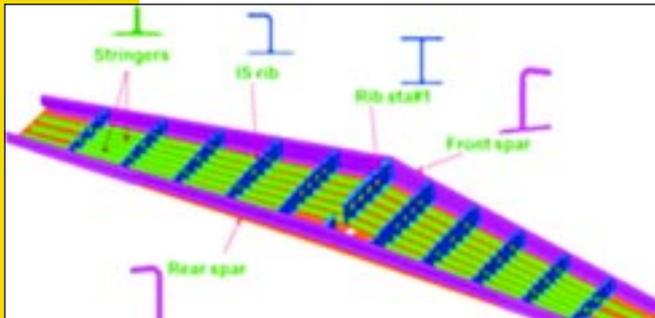
Dr. Saraswat's professional interests are in the application of stable isotopic and elemental analysis of microorganisms for paleoclimatic and paleoceanographic reconstruction. He is also a recipient of the CSIR Young Scientist Award 2011.



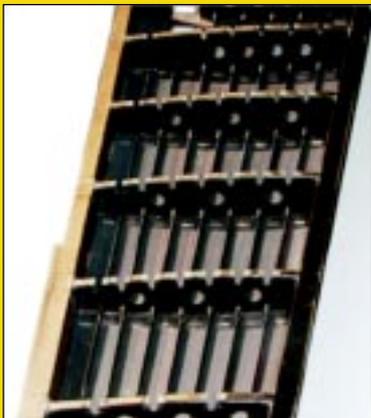
JEC Asia 2013 Innovation Award

Three scientists of the Advanced Composites Division, CSIR-National Aerospace Laboratories (CSIR-NAL) have won the JEC Asia 2013 Innovation Awards.

The JEC Innovation Awards Program seeks to promote innovation worldwide. The objective is to spot, promote and reward the most effective solutions that create more value for end users. The jury this year selected the best composite innovation breakthroughs in 16 categories based on their technical interest, market potential, partnerships, financial & environmental impact and originality.



3D Model of bottom integrated skin



Close up side view of bottom



Part bagged before the autoclave



Cocured bottom integrated skin

Mr. M.N.N. Gowda, Dr. Byji Varughese, Mr. A. Giridharan and Mr. B.R. Ganesh of CSIR-NAL were the recipients in the Aeronautics category.

CSIR-National Aerospace Laboratories (NAL), Bangalore, has taken up the development of a 14-seater civil aircraft, *Saras*. For this aircraft, the empennage is one of the primary structures being designed and developed using composites. One of the main components of the Horizontal Tail (HT) is the 'bottom integrated skin'. The entire bottom substructure (5.1 m x 1 m), which consists of the skin, 2 spars, 11 ribs and 8 stringers has been cocured in one single operation!

The entire cocured structure has been developed using innovative tooling technology consisting of 'hybridized silicone rubber tooling and CFRP tools'. The key challenge was meeting the tight dimensional tolerances. The innovative tooling concepts included the development of tools having the 'required stiffness' at the 'required location', so as to ensure uniform consolidation.

The main challenge in the development of any aircraft structure is the reduction in cost and weight. Compared to an equivalent box in aluminium, the weight savings was about 25% for the composite part. The integral construction not only reduced the number of individual parts but also eliminated 2500 fasteners and resulted in a cleaner aerodynamic surface. This innovative technology has resulted in reduction in manufacturing time and cost from many different aspects which include: a) reduced inspection and documentation, b) fewer individual parts and fasteners during assembly and c) reduced usage of sealants.

The technology has resulted in an overall savings of 24% in weight as compared to the metal structure.

CSIR-NCL Honoured as Best Laboratory for its Innovative Efforts by DRDO



CSIR-National Chemical Laboratory (NCL), Pune has received The Best Laboratory Award for its innovative efforts. The Board of Directors of BrahMos Aerospace, DRDO has announced CSIR-NCL as a recipient of The Best Laboratory Award for the indigenous development of critical components for BrahMos Aerospace for the year 2012.

Dr. Sourav Pal, Director of CSIR-NCL received this award recently at Brahmos Headquarters, New Delhi from Union Defence Minister Shri A.K. Antony.

CSIR-NCL has prepared high-temperature resistant polymeric resins of fifteen types and catalysts for the backward integration of BrahMos missile system. Polyimide was identified as the most critical material. This major significant non-metallic



Dr. Sourav Pal receiving the Best Laboratory Award from Union Defence Minister Shri A.K. Antony

component, polymerizable monomeric reactant type polyimide resin, along with fourteen other chemicals was successfully developed.

CSIR-CLRI Wins NRDC Meritorious Invention Award

Prof. A.B. Mandal, Director, CSIR-Central Leather Research Institute (CLRI), Chennai and his team comprising Dr. C. Muralidharan, Mr. V. John Sundar and Mr. T. Rangasamy were conferred with the *Meritorious Invention Award* by the National Research Development Corporation (NRDC), Ministry of Science and Technology, Govt. of India. This prestigious award for the invention entitled *A Novel Composition for Eco-Benign Tanning* under the category "Innovation Award of the Year-2011" was given in the backdrop of the conference on *Innovation for Equitable Growth* organized by NRDC during 21-22 February 2013 at Mohali, Punjab.

This novel salt-free tanning technology has contributed to the economic and environmental benefits in the leather making process. It has not only eliminated the usage of salt in the tanning process but also shortened it by avoiding the steps of acidification and basification. While addition of the salt in the process helps in retaining

the strength and quality of leather, it leads to high amount of Total Dissolved Solids (TDS) and chlorides resulting in pollution in the effluents. This salt free tanning technology provides an enabling solution to address the issue of TDS through a change in the century old tanning process.

CSIR-CLRI has already implemented this technology in select tanneries across India, Saudi Arabia and Qatar. Recognizing the importance of this technology, the United Nations Industrial Development Organization (UNIDO), Vienna has joined hands with CSIR-CLRI to establish *UNIDO-CLRI Centre for Salt Free Tanning* to disseminate this technology globally.



The CSIR-CLRI team with the award

Padma Bhushan Prof. N. Seshagiri Passes Away



Padma Bhushan Prof. N. Seshagiri, founder Director-General of the National Informatics Centre (NIC), died recently after a brief illness at the age of 73.

Prof. Seshagiri was an Emeritus Scientist at the CSIR-Centre for Mathematical Modelling and Computer Simulation (CMMACS) in Bangalore, where he is credited with the setting up of the first V-SAT (very small aperture terminal) network outside the US. He was also the Chairman of the Research Council of the CSIR-National Institute of Science Communication and Information Resources (NISCAIR), New Delhi.

Prof. Seshagiri founded the National Informatics Center (NIC) in 1975 and was its Director-General till 2000, while simultaneously holding the post of Additional Secretary since 1984, Special Secretary in the Planning Commission since 1993 and in the Ministry of Information Technology up to 2000. He is credited with drafting the software and hardware policies that revolutionized information technology (IT) in the country.



Prof. N. Seshagiri with former Director-General, CSIR Dr. R.A. Mashelkar

Seshagiri had been one of Rajiv Gandhi's 'Computer Boys'. The former Prime Minister's patronage encouraged Seshagiri to modify the computer policies that were being debated by the Electronics Commission and

adapt them to the urgent need for the computerization of the government, industry and business, and to set a new tempo for the country to move forward. The 1984 and 1986 telecom policies were championed by Prof. N. Seshagiri, who had long argued that India's policies were too restrictive, its procedures too cumbersome and the idea of self-reliance was self-defeating.

He set up NICNET, the first nationwide computer network in India and under his guidance computer centres were set up in every Ministry/Department of the Central Government, State/UT Governments, and over 500 District Administrations. Under his sustained initiative NIC developed over 6,000 databases and associated software packages including several Nagar Palika and Rural databases as well as Urban and Rural Planning software.

Prof. N. Seshagiri was instrumental in the setting up of the software technology parks of India. This eventually led to the emergence of Indian IT heavy weights such as Infosys, Wipro and TCS.

During his lifetime, Prof. Seshagiri was bestowed with several awards and honours, including Padma Bhushan, Asiad Jyothi, Udyog Jyothi Award, Om Prakash Bhasin Award for Telecom, Vikram Sarabhai Research Award, DATAQUEST Award for Lifetime contribution to IT, ELCINA Lifetime Award; and Systems Society Gold Medal. He was an elected Governor of the International Council for Computer-Communication at Geneva, a nominated Governor of UNESCO Institute for IT in Education at Moscow, and a Director of IT Pour La Development International at Paris.

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