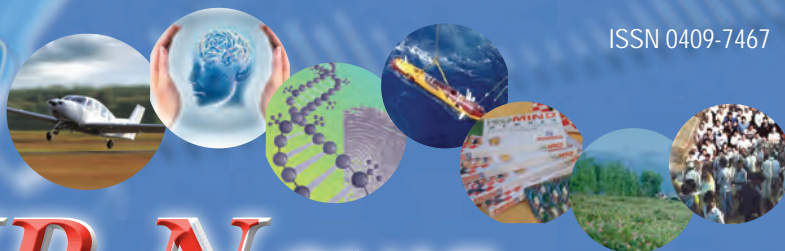




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In The News

CMERI-developed “Solar Tree” Can Light Five Houses

THE CSIR-Central Mechanical Engineering Research Institute (CSIR-CMERI) in Durgapur has come up with a ‘Solar Power Tree’ that can be squeezed on rooftops and highways. The ‘tree’ design that takes up only four square feet of space enables production of three kilowatts (kW) of power – enough to power about five households. It resembles a tree with branches at different tiers thus saving space.

As per a rough estimate, five acres of land is required to generate one MW of power. And one conventional solar photovoltaic system of five kW requires 400 square feet of area. But the ‘tree’ design that CSIR-CMERI scientists have come up with meets the challenge of generating more solar power in less land space.

The “Solar Tree” was inaugurated recently by Union Science and Technology Minister Dr. Harsh Vardhan during his maiden visit to the CMERI.

The branches of the solar tree hold



up the 30 photovoltaic panels and the system costs around Rs. 3 lakh with battery back-up. It has been decided to install one ‘Solar Power Tree’ at the Ministry of Science and Technology.

Technology Developed at CSIR-CIMFR Makes Pit Water Potable

The CSIR-Central Institute of Fuel and Mining Research (CSIR-CIMFR), Dhanbad has developed technology that can make mining water potable. Pit water, abundant near mining sites, is not fit for drinking. The new technology treats this water and makes it potable, which can then be supplied to the villages near the mining area.

The system has been successfully installed at Baliahar in Putki and handed over to Bharat Coking Coal Limited (BCCL). Within the next two years, 25 such projects would be completed at

different places to solve the drinking water crisis.

CSIR-CIMFR recently announced another success in its “Coal dust collecting and briquetting system”. The system uses a vehicle that moves around the mining area, sucks the coal dust and turns it into briquette which can be later used for domestic and industrial purposes. The system, which minimizes wastage of coal dust and also brings down pollution level, has already been sold to Tata Iron and Steel Company (TISCO).

CSIR-CFTRI Boosts Returns of Banana Growers

CSIR-Central Food Technological Research Institute (CSIR-CFTRI), Mysuru is setting its sights on giving a boost to the banana processing industry.

With a range of technologies developed at the CSIR-CFTRI for making banana-based products such as banana nectar, ready-to-serve (RTS) beverages, banana bar and so on, the Institute hopes to mitigate hardships of farmers in Karnataka, who were forced to sell plantains for a meagre Rs 2 per kg in December 2015.

The institute has even planned to establish a semi-processing unit through

farmers’ cooperatives with support from government and other agencies, transfer of technology free-of-cost to such agri-enterprises, and training and creating a network amongst them for ensuring proper returns to growers.

At a workshop held at the CFTRI campus recently, Prof. Ram Rajasekharan, Director, CSIR-CFTRI, unveiled a model referred to as FRIG (Farmers, Government, R&D and Industry) for helping farmers. Prof. Rajasekharan also announced that the institute would be releasing a new plant variety which had the potential to protect banana crop from spoilage. The plant can be grown as an intercrop along with other plantations.

The workshop also included demonstration of value-added products from banana apart from some quantity of RTS beverage made from pulp, which was then made available through the CFTRI canteen for sale to staff and students of the institute. The workshop also involved interactions with farmers of Chamarajanagar district.



Prof. Ram Rajasekharan, Director, CSIR-CFTRI, meeting banana farmers

CSIR-NPL – Implementing the Indian Standard Time



CSIR-National Physical Laboratory (NPL), the National Metrology Institute of India, has the mandate to maintain the Indian Standard Time (IST) as per the act of Parliament (Govt. of India Gazette No. 589). With most up-to-date technologies being used, the National Time, IST, is maintained by an ensemble of five Cesium atomic clocks, one hydrogen maser connected to the global navigation satellite system for inter-comparison with the Universal Coordinated Time (UTC).

IST needs to be disseminated to one and all in the country. It is imminent for everyone to synchronize the time to a common standard in order to reduce confusion and legal troubles. On a national level, time synchronization is essential for all kinds of financial transactions, stock handling, digital archiving, time stamping, international trade, national security and so on.

Synchronization of all the computers and telecommunication networks is essential for preventing cyber-crimes. All banking facilities also rely on precise time synchronization. The smart grids for

electricity distribution networks have made it essential to use precise time synchronization.

Network synchronization requirement also applies to high-speed communication which facilitates voice over internet protocol (VOIP) calling and video conferencing. Another example is of satellite-based navigation system where the spatial resolution is decided by precise synchronization of the clocks embedded in the end user's device with clocks in the satellites. The accuracy of satellite navigation systems depends critically on the proper synchronization of onboard clocks e.g. a difference of just ten nanoseconds can lead to a positioning error of 3 m.

So, it is important to have time synchronization to a common reference for the nation which is IST. CSIR-NPL is disseminating IST to the various users in the country. The dissemination techniques currently available with CSIR-NPL are depicted in Fig. 1. Internet time service is readily available to the users having computer with internet connectivity. The settings

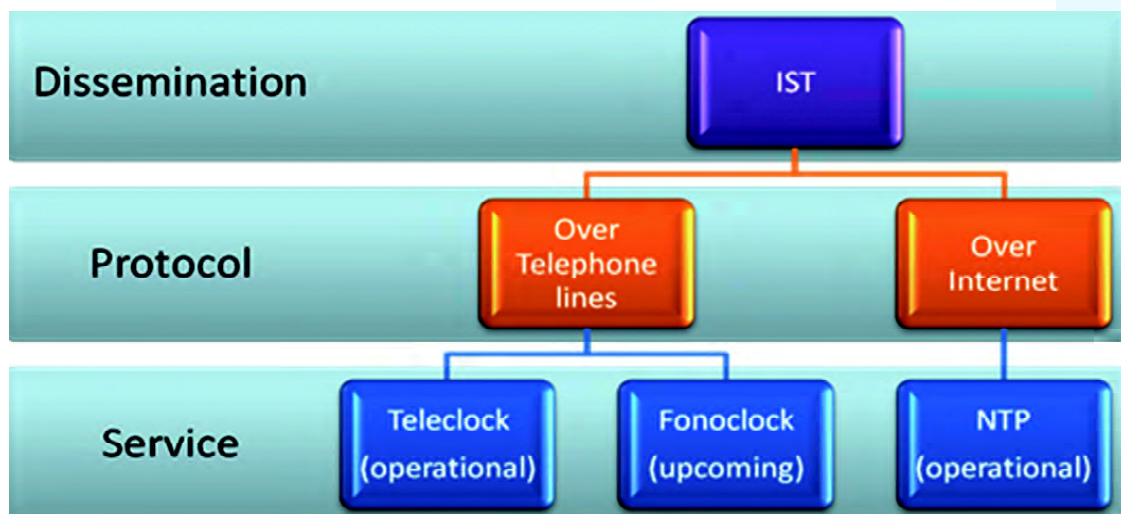


Fig. 1. Techniques to disseminate Indian Standard Time (IST)

required for IST synchronization are described in Fig. 2. In order to access this service, users need to query at CSIR-NPL's domain from their computer at the address "time.nplindia.org" and their computers will get synchronized to IST with ± 100 ms uncertainty.

Users can also get synchronization to IST via telephone line and there are two services in this category. Teleclock

service is already operational and Fonoclock service is currently being developed. For availing these services, users need to have a receiver attached to a telephone line. The receiver will call the transmitter hosted at CSIR-NPL and connected to dedicated phone line. On call set-up, the time data will be transferred to the receiver via the telephone line. On setting up the call for

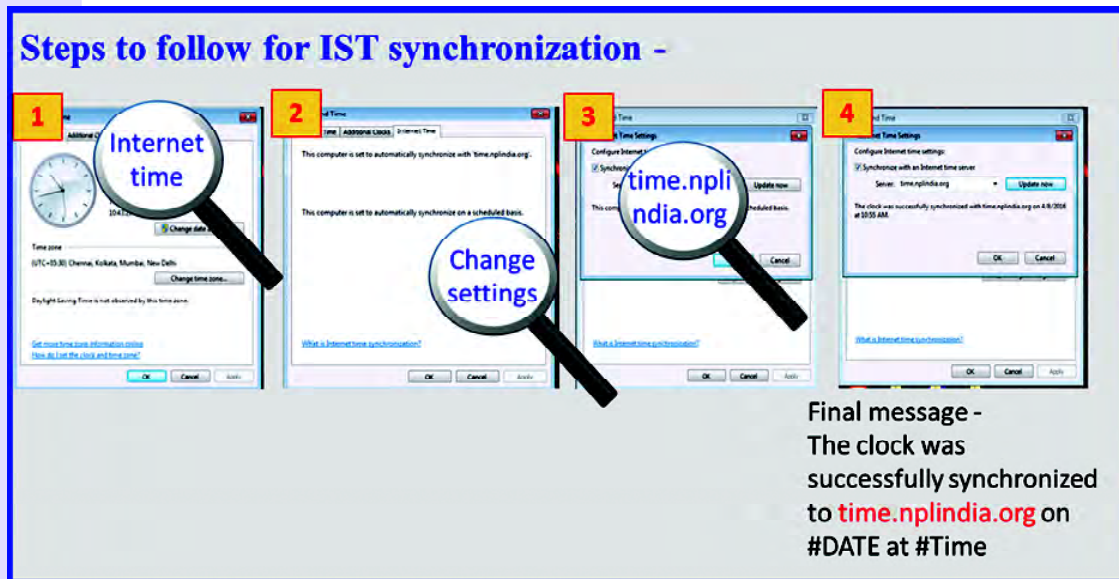


Fig. 2. Steps to follow in a Windows-based computer system to synchronize the computer time to IST. User needs to change the date and time settings as shown.

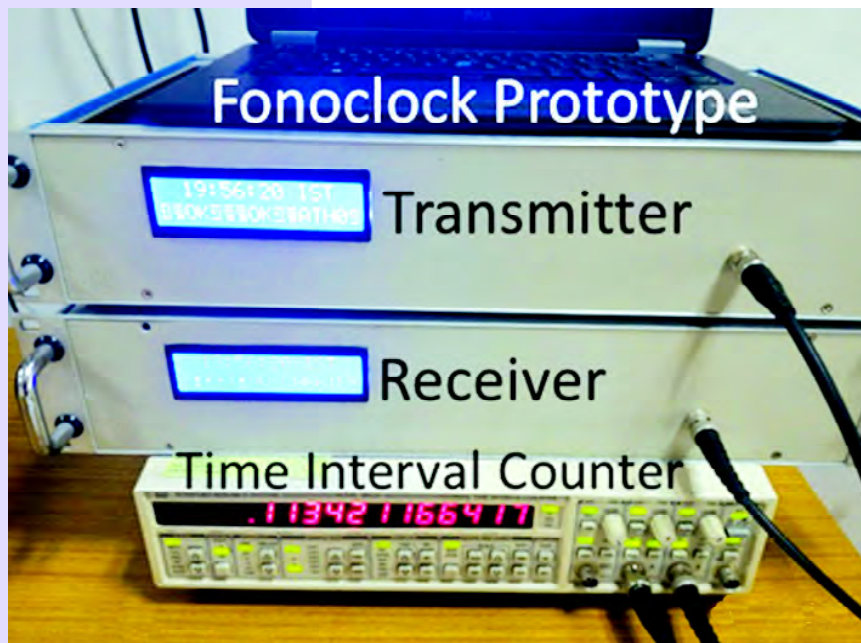


Fig. 3. Fonoclock prototype in operation

Fonoclock service, the transmitter will calculate the loop time delay automatically and transfer the delay compensated time (IST) along with day and date to the receiver. The receiver module will display the corrected time after synchronization.

The teleclock service provides time synchronization with ± 1 second uncertainty while Fonoclock is a new and upgraded technology (using communication delay compensation) which provides time synchronization with ± 10 ms uncertainty. A prototype of Fonoclock is shown in Fig. 3.

CSIR-NAL Develops New Magnetic Sensor for Antilock Braking System



Digital technology has rejuvenated the era of magnetic sensors by introducing new sensors in the market such as Hall-Effect sensors, Magnetoresistive (AMR, GMR, TMR) sensors and many more. The magnetic sensors offer the contactless and consequently wear-free measurement of physical quantities such as angle of rotation, angular speed, linear position, linear speed, current, etc.

According to a global market survey, in the year 2016, it is predicted that 7143 million units of magnetic sensors will be required for various sectors, for which the market revenue is around \$2.0 billion. The Indian automotive sensors market is segmented on the basis of types of sensors (Temperature, Pressure, Speed, Level/Position, MEMS, Magnetic, Oxygen and Inertia) and the overall market is expected to grow to \$1.51 billion by 2018 at a CAGR of 11.64% over the period 2015-2020.

To capture such huge automotive market, there is a requirement for indigenous development of magnetic sensors with higher sensitivity, low hysteresis and high thermal stability. As the volume requirement is very large,

therefore, the greatest challenge is to make magnetic sensors with reliable signal conditioning interface as per the automotive standard with affordable price.

CSIR-National Aerospace Laboratories (NAL) Bangaluru, has developed a series of Giant Magnetoresistance (GMR) based magnetic field sensing chips for rotary and linear position sensing applications. The sensor has the following features :

The sensor is now integrated with CMOS-based automotive grade programmable ZSC31150 (ZMDI, Germany) signal conditioning chip. The product was tested for speed measurements with commercially available different types of ABS toner wheel used in the automobile sector. The maximum air gap was achieved in the range of 3-4 mm which is significantly larger than existing Hall sensor.

CSIR-NAL has already sent sensor boards to TVS Motor Company limited, Hosur, Tamilnadu for performance testing as ABS toner wheel and Gear transmission speed sensors. Successful testing of these sensors could lead to more than half a million requirement per

Parameters	Min	Typ.	Max	Unit
Single Bridge Resistance	6	6.3	6.8	kΩ
Input Voltage	1	12	30	V
Linear Range	± 5		± 100	Gauss
Saturation of GMR Sensor Elements	- 150		+ 150	Gauss
Single Resistor Sensitivity		0.08		%/ Gauss
Temperature Coefficient of Resistance		0.003		Ω/ °C
Temperature Dependence of GMR		-0.03		%/ °C
Storage Temperature Range	- 70		+ 150	°C
Operating Temperature Range	- 40		+ 125	°C
Nonlinearity			2	% (FS)
Hysteresis		9		% (FS)

year as indicated by M/s TVS motor companies. They are also looking for its potential in other two wheeler

applications if the cost of the final product is within the range of the existing one.

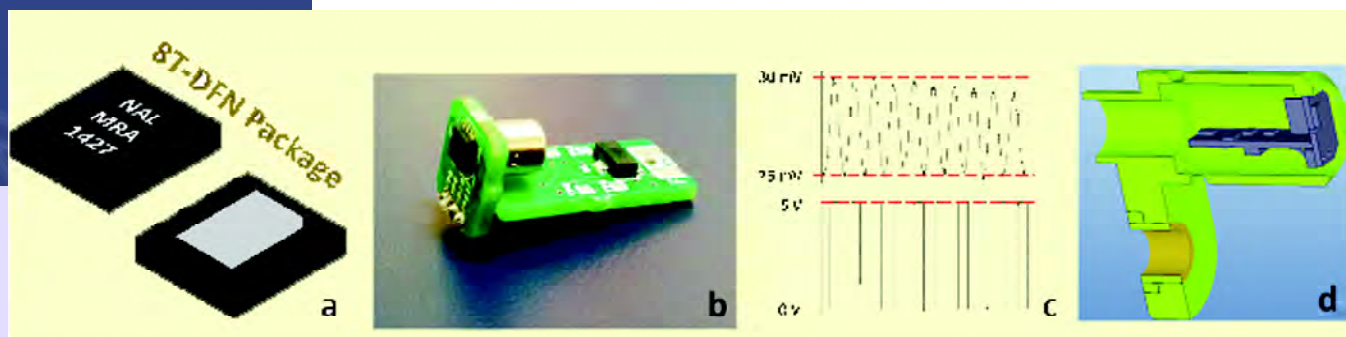


Fig. 1. (a) Plastic packaged (3 mm x 3 mm) magnetic field sensor chip, (b) ABS toner wheel sensor board made with NAL MRA 1427 and CMOS ASIC IC (ZSC31150), (c) Both analog (top) and digital (bottom) output characteristics of the board with an air gap of 3.6 mm between the toner wheel and the sensor and (d) CAD model of board housing assembly for testing and validation at industrial sites.

Bacillus subtilis and other Marine Bacteria as Potential Producers of Anti-cholinesterase Compounds

Acetylcholinesterase (AChE) inhibitors or anti-cholinesterases reduce the activity of enzyme acetylcholinesterase that degrades the neurotransmitter acetylcholine in the brain. These inhibitors play a significant pharmacological role in neurodegenerative disorders like Alzheimer's, Parkinson's, dementia, etc.

Four out of five FDA approved drugs (such as tacrine, galanthamine, donepezil, and rivastigmine) for Alzheimer's treatment are AChE inhibitors, which act by counterbalancing the acetylcholine deficiency and provide symptomatic relief, thus improving the acetylcholine level in the brain and slowing down the neurofibrillary degeneration. There is no cure yet for this disease.

However, the importance of acetylcholinesterase inhibitors cannot be

underestimated because recent research has shown that these inhibitors protect the brain cells against free radical injury and β -amyloid toxicity in Alzheimer's disease (AD). Despite the quest for new treatments to stop, slow or prevent AD, researchers around the world are exploring new sources of AChE inhibitors, due to major concerns about the bioavailability and side-effects issues, associated with the existing, mostly synthetic drugs for AD.

The majority of AChE inhibitors (AChEI) are derived from plants; however they are also isolated from extracts of some algae, fungi, cyanobacteria, marine phytoplankton and marine sessile organisms like sponges and soft corals. There are few serendipitous discoveries of microorganisms producing such inhibitors; however, microbes were never systematically screened for this



activity.

In the recent past, marinoquinoline A (a new alkaloid possessing pyrroloquinoline skeleton) was isolated from a marine gliding bacterium, *Rapidithrix thailandica* (phylum Bacteroidetes). The AChE inhibitory activity of marinoquinoline A was discovered after the compound was found to be structurally related to tacrine, an AChE inhibitor. Marinoquinoline A was also reported from another novel marine Bacteroidetes member, *Obtaekwangia kribbensis*; hence this organism may, as well, inhibit AChE.

In view of the potential of marine bacteria as promising resources of these important compounds, we initiated a basic search for a function, i.e. acetylcholinesterase inhibition, among the diverse microbial associates of sponges, sediment and soft corals. The marine sources are favoured for screening AChE inhibitors since they present enormous possibilities of discovering novel chemical molecules with better properties, considering the huge diversity of marine microorganisms.

Considering this fact, a study on the

prevalence of acetylcholinesterase inhibitors in marine bacteria was conceived and the first account of AChE inhibition activity among the microbial associates of the marine invertebrates and sediments was published in *Microbial Cell Factories* in February 2014. According to Altmetric – which scores research articles based on the activity around a piece of scholarly content, measured in terms of online attention like tweets and downloads, etc. – this article stands on 78th percentile among billions of all other articles published across all journals at the same time. It also has a very high score (93rd percentile) compared to outputs of the same age and source. It ranks in the top 25% of all research outputs scored by Altmetric (<http://www.altmetric.com/details/2134639>).

Marine bacteria isolated from different samples of marine sponges, soft corals and sediments were screened using a high throughput microplate based assay for inhibition of electric eel enzyme, acetylcholinesterase. The presence of acetylcholinesterase inhibitors was reported in 15.8% of the 887 marine

Table 1: AChE inhibition activity in marine isolates

Sl. no.	Isolation source	No. of isolates screened	No. of active isolates	Percentage of active isolates (%)	No. of isolates showing >10% AChE inhibition activity
1.	<i>Acanthella cavernosa</i>	39	9	23	0
2.	<i>Dracmacidon agariciforme</i>	110	17	15	4
3.	<i>Fasciospongia cavernosa</i>	8	2	25	1
4.	<i>Leiodermatium pfeifferae</i>	72	7	10	0
5.	<i>Rhabdastrella globostellata</i>	127	18	14	2
6.	<i>Siphonodictyon coralliphagum</i>	31	13	42	12
7.	<i>Xestospongia testudinaria</i>	36	5	14	4
8.	<i>Sarcotragus fasciculatus</i>	77	0	0	0
9.	Soft coral	66	16	24	2
10.	Sediment	321	53	17	26
	Total	887	140		51

bacteria which is quite significant (Table 1).

Majority of the active isolates were bacterial associates of soft corals followed by sediment isolates, while most of the potent inhibitors belonged to the bacterial associates of marine sponges (Fig. 1). Figure 2 shows a comparative picture of AChEI activity among the various sponge isolates.

A close examination of Table 1 shows that the maximum number of active isolates belonged to the sponge *Siphonodictyon coralliphagum*, which have shown consistently higher percentages of inhibition as compared to all other

isolates. Earlier, a number of new meroterpenoid and spirosesquiterpene aldehyde compounds like corallidictyals and liphagal; siphonodictyal sulfate and akadisulfates, have been isolated from the extracts of the sponge *Siphonodictyon coralliphagum* (= *Aka coralliphaga*), which showed protein kinase C inhibition, PI3K inhibitory activity and radical scavenging activity, respectively.

Some siphonodictyals and corallidictyals have also been reported to exhibit antimicrobial activity. The other sponges from which compounds with antimicrobial activity have been isolated are *Fasciospongia cavernosa* and *Acanthella cavernosa*. A careful study of several compounds isolated from the sponges shows that they are mostly derivatives of alkaloids and terpenes, which are known to exhibit AChEI activity based on the previous literature.

However, anti-cholinesterase activity of the compounds of the above mentioned sponges or their microbial associates is not reported so far, which may be due to limited research being carried out in this area. Recently, a web resource Dragon exploration system on marine sponge compounds interactions (DESMSCI) was developed for knowledge generation on marine sponge compound interactions including a useful “hypothesis generation” feature. Using this web resource, the authors could generate and theoretically validate a hypothesis, by linking terms from different dictionaries. According to this hypothesis, there is a possibility of finding a novel mode of action for a sponge compound, variolin (an alkaloid) for AD therapy. Thus, it is apparent that sponge compounds, like alkaloids, may not just inhibit AChE to provide symptomatic relief in AD, but may even have a disease modifying effect which needs to be studied in depth.

Maximum AChE inhibition (54%)

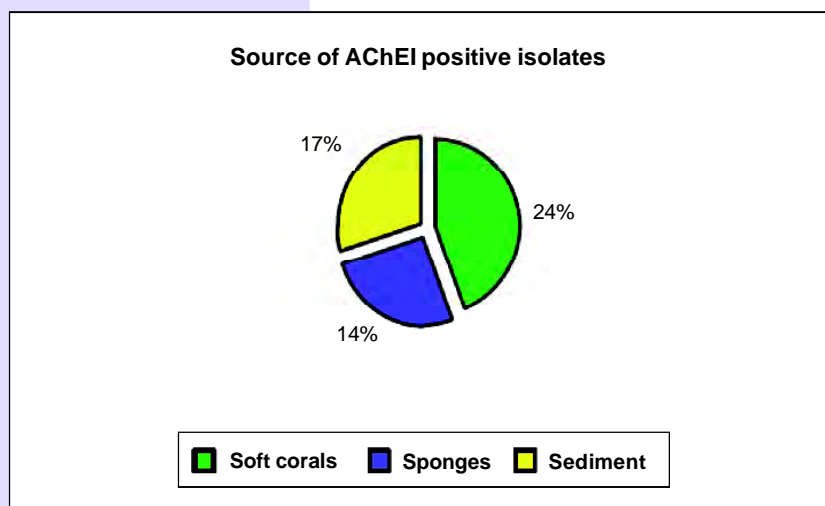


Fig. 1: Distribution of AChEI positive isolates among soft corals, sponges and sediment

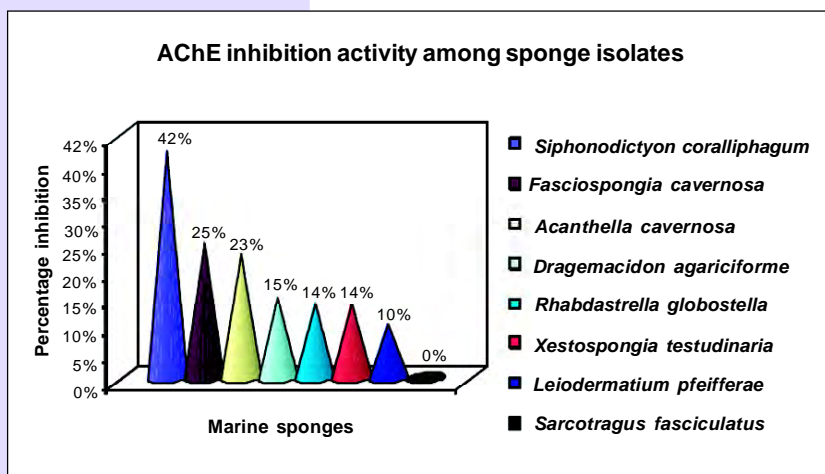


Fig. 2: Comparison of AChE inhibition activity among sponge isolates

was exhibited by a bacterial strain M18SP4P(ii), isolated from the marine sponge, *Fasciospongia cavernosa*. Based on phenotypic characterization, 16S rDNA sequencing and phylogenetic analysis (Fig. 4), the strain was identified as *Bacillus subtilis* – revealing yet another activity in a strain of a robust microorganism, amenable to manipulation and biotechnological scale-up for the production process. Recently, it was suggested that *Bacillus subtilis* can be engineered into next-generation super-secreting cell factory using a combined systems and synthetic biology approach.

TLC bioautography of the methanol extract of this culture revealed the presence of two major components bearing this activity, when compared to the positive control, galanthamine (Fig. 3). Thus, the detection of acetylcholinesterase inhibition in a strain of *Bacillus subtilis* is certainly a significant finding.

In our taxonomic investigation of some marine bacteria, we found several different genera of bacteria producing AChE inhibitors, like *Psychrobacter*, *Microbacterium*, *Stenotrophomonas*, *Planococcus*, *Nocardia*, *Streptomyces* sp., *Leucobacter*, *Bacillus* sp., *Virgibacillus* and *Brevibacterium* sp., apart from the *Bacillus subtilis* strain. Involvement of diverse groups of microorganisms in AChE inhibitor production increases the chances of finding structurally unique metabolites. With such data, and the previous studies on beta-glucosidase inhibitors (Pandey et al., 2013), one can also infer that the contrary of the OSMAC (one strain many compounds) theory is also true – many different bacterial lineages

produce same chemical compounds (many strains one compound).

Acetylcholinesterase inhibitors in bacteria have not received adequate attention of the researchers. From the results of our study, we conclude that acetylcholinesterase inhibitors are quite prevalent in marine bacteria, particularly the bacterial associates of marine invertebrates. *Bacillus subtilis* – a well studied and exploited species – presented acetylcholinesterase inhibition activity, though it remains to be investigated whether the compound responsible for this activity is new or

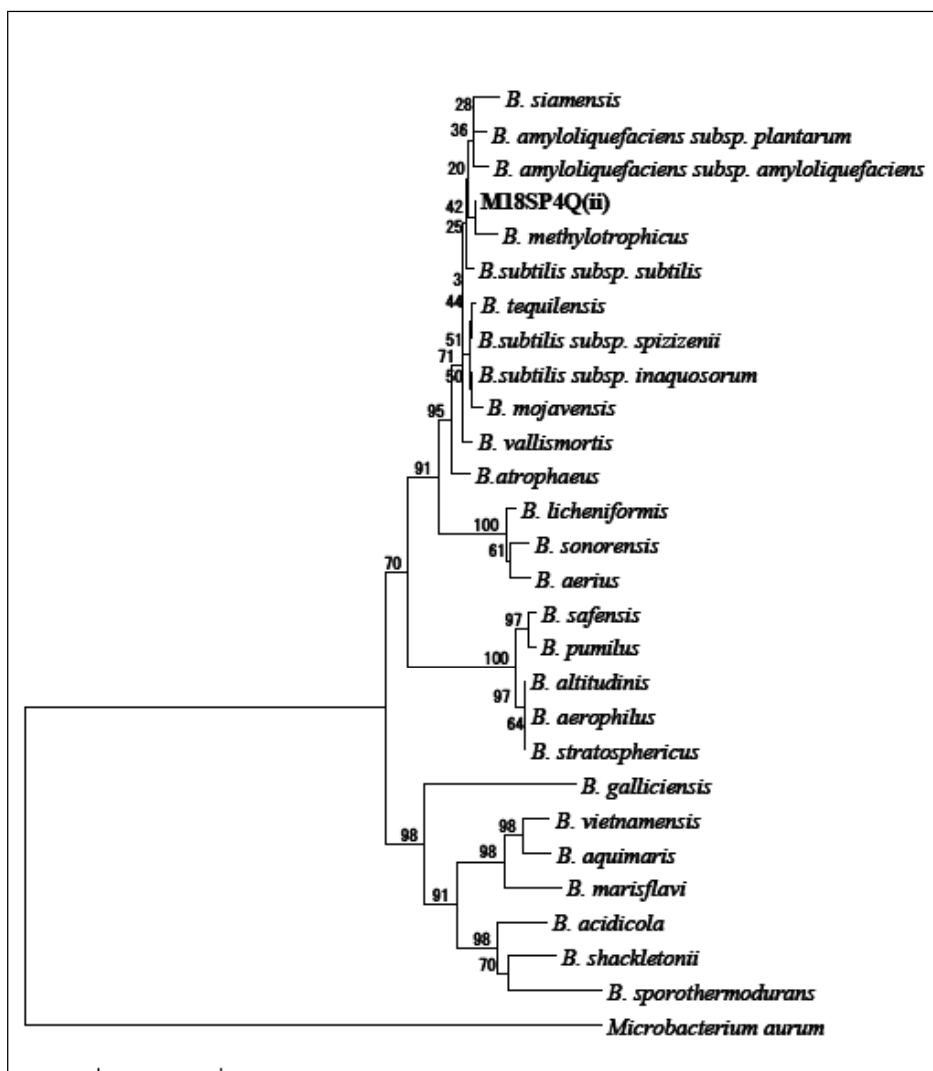


Fig. 3: Evolutionary relationship of this strain M18SP4Q(ii), with the 16S rRNA gene sequences of its closely related strains is shown in the neighbour joining phylogenetic tree

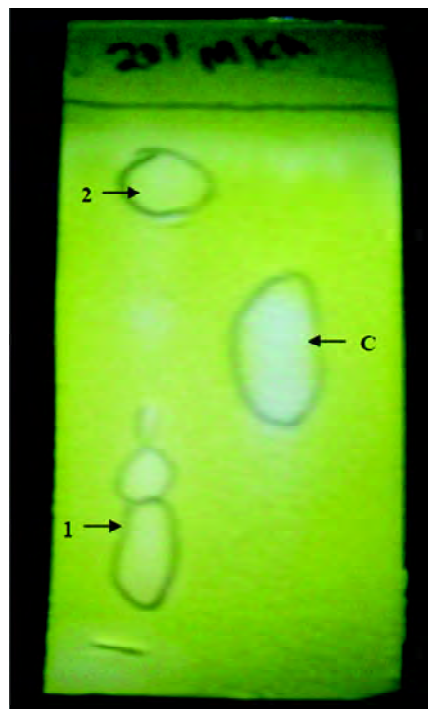


Fig. 4: TLC bioautography of IMM46 extract showing two compounds (1 & 2) containing the acetylcholinesterase inhibitor, and (C) - control (0.1 μ M Galanthamine)

known. Several more potential AChE inhibitors present among marine bacteria are waiting to be discovered to provide easily manipulable natural sources for the mass production of these therapeutic compounds.

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1. Pandey *et al.* A marine sponge associated strain of *Bacillus subtilis* and other marine bacteria can produce anticholinesterase compounds. *Microbial Cell Factories* 2014, 13: 24; doi:10.1186/1475-2859-13-24.
2. Pandey *et al.* Diversity of marine bacteria producing beta-glucosidase inhibitors. *Microbial Cell Factories* 2013, 12:35. doi:10.1186/1475-2859-12-35.

Sony Pandey¹, Chityal Ganesh Kumar² and colleagues from CSIR-IMMT and CSIR-IICT

MoUs

CSIR-CLRI Signs MoU for Resurgence of Leather Industry

The CSIR-Central Leather Research Institute (CLRI), Chennai recently signed a Memorandum of Understanding with the Erode Tannery Owners' Association for technology-infusion to contain pollution in the leather industry sector.

The new waterless chrome tanning technology has already been trial tested in a few industries in Erode district and once product validation is made by overseas buyers, all the 30 leather units in the district will implement the technology, the association has assured.

The MoU signed by CSIR-CLRI Director Dr. B. Chandrasekaran and

President of the Erode Tannery Owners' Association Mr Mohamed Hyder could see the breakthrough technology being employed for safeguarding water bodies from pollution caused by toxic effluent containing chromium and sulphates.

This would also lead to enormous saving of water since 50 litres of water is utilised to treat one kilogram of animal skin and hide. The new technology using a conventional drum-tanning method involves utilising the patented additives instead of lime and water, thereby resulting in the saving of water and reduction in solid waste.

CSIR-IICB Organizes 2nd B.K. Bachhawat Memorial Lecture and Symposium on Chemical Biology Research



Sitting on dais, from left, Dr. G. S. Kumar, Prof. S. Roy, Prof. S. Chattopadhyay, Prof. S. Pillai, Dr. C. Mandal and Dr. N. Ali

CSIR-Indian Institute of Chemical Biology (CSIR-IICB), Kolkata is planning to celebrate its 80th Anniversary with various scientific programmes throughout the year. As a part of this celebration, the Institute organized the Second Lecture of the “B.K. Bachhawat Memorial Lecture” series, followed by a symposium on Chemical Biology Research on 3 June 2016.

The event was organized by the B.K. Bachhawat Memorial Lecture Organization Committee and Chemical Biology Society, India at the J.C. Ray Auditorium of CSIR-IICB. All the scientists and scholars gathered to commemorate the contribution of Late Prof. Bimal Kumar Bachhawat, a stalwart scientist and former Director of CSIR-IICB, towards development and excellence of this Institute. The programme was aimed to encourage and nurture new scientific ideas in the minds of research scholars from both Biology and Chemistry disciplines.

The symposium was inaugurated by Prof. Samit Chattopadhyay, Director,

CSIR-IICB, who in his welcome address described the influence of Prof. Bachhawat in not only improving CSIR-IICB and setting up several other scientific Institutes across India but also promoting science as a whole in different parts of the country.

Prof. Siddhartha Roy, President, Chemical Biology Society, in his introductory speech, informed that the term “Chemical Biology” itself was first coined by Prof. Bachhawat. He also reiterated the role of Prof. Bachhawat in glorifying India’s scientific endeavours at global platforms. As an ex-Director of CSIR-IICB, Prof. Roy explained how the Institute conceived the plan of organizing this Lecture and how Chemical Biology Society helped to materialize the project.

Prof. Nahid Ali and Prof. Chitra Mandal of CSIR-IICB, being ex-scholar and close associates of Prof. Bachhawat shared their fond memories of him and portrayed his generosity and humbleness as a human being. Prof. Shiv Pillai, orator of the Memorial Lecture and also an ex-

student of Prof. Bachhawat, gave a short remembrance explaining how Prof. Bachhawat kindled research interest in him. Dr. G.S. Kumar proposed the vote of thanks.

Prof. Shiv Pillai, Professor, Medicines, Health Sciences and Technology, Harvard Medical School, USA, in his 2nd B.K. Bachhawat Memorial Lecture oration on “*Epigenetic Regulation in Lymphocyte Biology and Human Disease*” enlightened on how study of diseases today has become one of the frontier areas in biology. He talked about different diseases and explained why Mendelian disorders, infectious diseases

and cancer are becoming relatively easy to explain today in molecular terms. He then shifted his focus to “complex diseases” and stressed on the importance of epigenetic alterations as the causal factor of this group of diseases. Prof. Pillai suggested Next Gen sequencing based tools to be the answer to the enigma of molecular basis of disease pathogenesis.

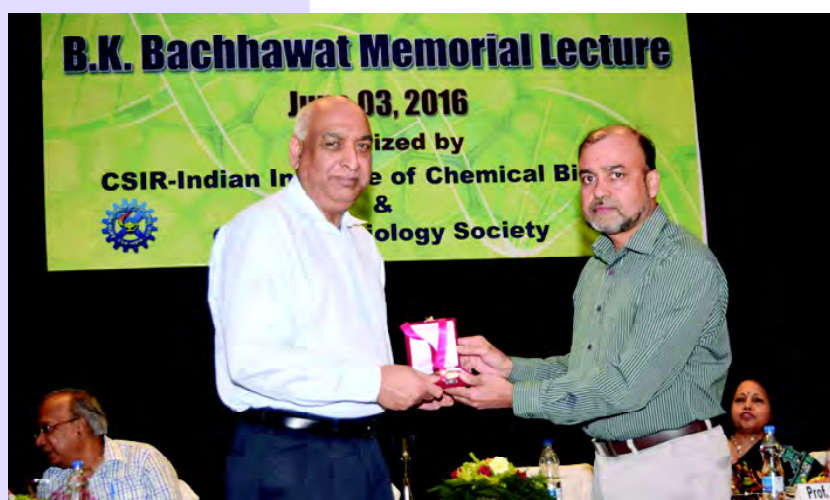
Prof. A. Ajayaghosh, Director, CSIR-NIIST, was the first orator of the symposium on Chemical Biology Research. He spoke on *Fluorescent Molecular Probes for Sensing and Imaging of Bio-analytes*. Prof. Ajayaghosh lucidly explained his work on fluorescent molecules important from the perspective of biological imaging and security purposes. He reported a few fluorophores based on bipyridyl systems as sensors for the detection of Zn^{2+} and cyanide ions.

Prof. Joyoti Basu, Senior Professor, Chemistry, Bose Institute talked about *Meeting the Challenges of Controlling Tuberculosis: Understanding Host-pathogen Crosstalk*. She addressed the issue of immune responses in macrophages infected with *Mycobacterium tuberculosis*. Prof. Basu, through her experimental results, suggested miRNA-regulating adjunctive therapy to be a promising alternative for treatment of tuberculosis. She also talked about her lab’s approach of targeting the bacterium by inactivating the genes required for its survival under stress.

The last speaker, Dr. Sandip Paul, Ramanujan Fellow, CSIR-IICB, spoke on *Adaptive Evolution in Bacterial Genomes*. His lecture explored microbial evolution through whole genome sequence analysis. Dr. Paul also explained the need for cross-annotation in publicly available bacterial genomes to accurately interpret the contribution of accessory genes in bacterial evolution.



Dr. A. Ajayaghosh delivering his lecture



Prof. S. Pillai receiving memento from Prof. S. Chattopadhyay, Director, CSIR-IICB

Training Programmes

Training Programme held at Regional Centre for Extension and Development (CSIR-CLRI), Kolkata for Leather Goods Sector



A skill development training programme for the Leather Goods sector in the eastern part of India was conducted at the Regional Centre for Extension & Development (RCED), Kolkata of CLRI. A total of 150 boys and girls belonging to the SC community underwent this programme. It was a part of the 'Skill India Mission' of the Honourable Prime Minister, Shri Narendra Modi. National Scheduled Caste Finance & Development Corporation (NSFDC), a Govt. of India organization, supported this programme.

The duration of the training programme was 35 days. In order to train 150 candidates utilizing the limited capacity available with RCED, Kolkata, the programme was held in four batches during the period from 8th December 2015 to 3rd May 2016. The training was conducted for developing skill in two operations: a) Cutting and clicking, and b) Assembling and stitching as these are the two main operations where skilled manpower is in great demand. While boys were preferably selected for cutting and clicking, the girls, who have an inherent sense of beauty and aesthetics, were chosen for skill development in stitching and assembling jobs.

Since the background of the selected trainees was diverse, along with the practical lessons, 8–10 lectures covering general properties of leather as a material and its selection, grading, storage, care and maintenance were arranged for each batch of trainees to supplement their skill. This additional arrangement will



Shri Chinmay Das from West Bengal SC & ST Development and Finance Corporation, Govt. of West Bengal in an interactive session with the trainees. Shri Das provided information on various schemes of financial assistance available for the trainees.

enable the trainees to utilize their newly acquired skill more intelligently and enhance the employability potential of the trainees considerably.

It is hoped that this programme will support the leather goods industry in this part of the country in building its capacity further. RCED, Kolkata (under the direction of CSIR-CLRI) has elaborate plans to organize such skill development programmes in the financial year 2016-17 too.

CSIR-CECRI Celebrates National Technology



Dr. Madhavan Nair delivering the National Technology Day Lecture

According to Padma Vibhushan Dr. G. Madhavan Nair, the formula for success is to avoid finger pointing. He told a gathering at the CSIR-Central Electrochemical Research Institute (CSIR-CECRI), Karaikudi that a leader should accept responsibility for failure and applaud his colleagues for success. This would strengthen team work and ensure success of mission-mode projects.

Taking an example from ISRO, he said that when the SLV-3 mission of 1979 failed, Prof. Satish Dhawan, the then Chairman of ISRO, met Prime Minister Indira Gandhi and took the full responsibility for the failure. However, when the mission succeeded in 1980, he sent Dr. A.P.J. Abdul Kalam, the Project Director of the satellite launch vehicle program, to the Prime Minister to hog all the limelight.

Delivering the 18th National Technology Day lecture on *Science and Technology Challenges for National Development* at the Institute, the former

Chairman of ISRO recalled his organizations' long association with CECRI and pointed out the technological inputs received from CECRI in silver–zinc batteries for early space missions, electrolytic ammonium perchlorate production (the basis for the 1000 tonne per year plant at Alwaye), solutions to corrosion of aluminium alloys, electroforming of cryogenic engine thrust chamber, and gold plating of key components.

Dr. Madhavan Nair said that the Indus Valley, one of the earliest human habitats, was an example of community living and that evidence for the use of metallic objects of copper, tin, bronze and iron even during 1500 B.C. was available. In fact, up to 600 A.D., India held a lead position in areas such as metallurgy, medicine, mathematics, astronomy and astrological computation. India's rich heritage plunged into darkness with repeated invasions. Except for a few scientific highlights such as those of Raman and Ramanujan, India



had nothing to showcase until independence. India is rebuilding its institutions and capabilities: today the country boasts of several IISERs and IITs, in addition to achievements such as the green revolution (ushered in by M.S. Swaminathan in the 1960s), the Pokhran nuclear test of 1998 (establishing India's mastery over the atom) and space program (launched in 1962).

India, in fact, plunged late into space, said Dr. Nair. The country today has very powerful rockets. ISRO is among the most sought after agencies in the world for satellite images for its 1-metre resolution pictures. Apart from remote sensing, India's space programme has diversified into satellite communication, weather forecasting and disaster management.

Space technology is today part and parcel of our life thanks to its penetration into agricultural yield forecast, drought and flood management, direct-to-home television broadcast, and educational satellite. The success story is highlighted by the *Chandrayaan*, which went as close as 100 km to the Moon's surface and sent high-resolution stereoscopic images back to Earth. We have established the presence of water on the Moon. Today, India can boast of planting its flag on the Moon's surface. India has mastered the cheapest space missions as evidenced by its *Mangalyaan* programme, said Dr. Nair.

He also said that India's 60-year-old space programme has come from hard work and dedication. Every failure was a lesson. In such mission-mode projects, every support activity must be planned with a long vision. This is the kind of mission mode that Prime Minister Modi wants to adopt for poverty alleviation.

It has emerged that India has a surplus of power. However, the problem lies in poor transmission, capacity

limitation and lack of connectivity. India is expected to be the third largest economy by 2020. Yet a large swathe of its population lives below the poverty line. The biggest obstacle is physical connectivity to its 600,000 villages. It is here that digital connectivity comes in, merging age-old wisdom with modern knowledge. It is also time for a second food revolution, which must aim for a 50% increase in agricultural production in the next 20 years. It is also necessary to adopt eco-friendly processes. A healthy debate on GM foods, backed by experiments, is called for.

It is imperative that we harvest water, he said. We experience an average of 1 m rainfall. Methods must be put in place to recharge the soil and to economically recycle water. Healthcare is another area that begs attention. It is said that the average medical expenses in the state of Kerala is Rs 35,000 per person. This is not affordable medical care. Ayurveda could offer cheaper solutions.

Knowledge transfer is an area of concern, where attention needs to be paid on the appropriateness of the content for locals. As for renewable power, India is blessed with sunlight for



Dr. Madhavan Nair signing the visitors' diary

nine months a year. Scientists must pitch in to increase the efficiency of solar cells from its present 20%. Localized energy storage can solve a number of problems related to grid transmission. It is safe to assume that the space programme has yielded one-and-a-half times the investment in terms of services.

Dr. Vijayamohan Pillai, Director, in his presidential remarks said that CSIR was at a crossroads and that

adopting ISRO's success formula was a way forward. Pointing out that low-cost space mission was the most visible face of ISRO today, he urged CECRI scientists to work towards turning low-hanging fruits such as sensors and zinc-bromine battery into commerce.

Earlier, Prof. V.S. Raja of IIT Bombay summarized recent achievements of CECRI. Dr. S. Syed Azim, Chief Scientist, proposed the vote of thanks.

National Technology Day Celebration, CSIR-CGCRI

CSIR-Central Glass & Ceramics Research Institute (CSIR-CGCRI), Kolkata celebrated the National Technology Day on May 31, 2016. Shri Kamal Dasgupta, Chief Scientist and Head, Fibre Optics and Photonics Division, CSIR-CGCRI delivered the National

Technology Day Lecture on "Technology Developments at Fibre Optics and Photonic Division".

Shri Sitendu Mandal, Senior Principal Scientist & Head, SGPS, Glass Division talked about "Technology Development of Specialty Glasses for Strategic Sector". Dr. Vamshi Krishna Balla, Senior Principal Scientist and Head, Bio-Ceramics and Coating Division spoke on "Recent Technologies Developed at Bio-Ceramics and Coating Division". Dr. Arup Ghosh, Chief Scientist and Head, Refractories and Traditional Ceramics

Division dwelt on "Recent Technologies Developed at Refractories and Traditional Ceramics Division". Shri Swachchha Majumdar, Principal Scientist, Ceramic Membrane Division talked about "Recent Technologies Developed at Ceramic Membrane Division".

Finally, awards were distributed by the Director for Best Technologies and Best Developmental Projects followed by Staff Awards.



Shri Kamal Dasgupta delivering the National Technology Day Lecture



A view of the celebrations

World Environment Day Celebrated at CSIR-IMMT



The World Environment Day was celebrated at the CSIR-Institute of Minerals and Materials Technology (CSIR-IMMT), Bhubaneswar jointly with Institute of Quality and Environment Management Systems (IQEMS) on 5 and 6 June 2016. To mark the occasion, several events were organised on June 5 by young scientists in the institute's premises. Children enthusiastically participated in drawing and green-art competition and each of them carried home a plant sapling, provided by the Forest Department through IQEMS. Young research scholars also gave ideas on how to make the CSIR-IMMT campus environment friendly.

On 6th June, the programme began with plantation of saplings in the CSIR-IMMT premises by the Director Prof. B.K. Mishra and Chief Guest Mr. Siddhanta Das, PCCF (Wild Life) along with other prominent personalities like Prof. S.C. Naik, NIT Rourkela, Shri A.K. Das, Member Tech OERC and Shri S.K. Mishra, Scientist-in-charge CSIR-IMMT.

Inaugurating the programme, Principal Chief Conservator of Forests (Wildlife) Siddhanta Das expressed concern about the rapid degradation of the environment due to rampant industrialisation resulting in global warming and appealed to everyone to take necessary measures to protect the environment for sustainable development. He also talked about the role of forests in the overall carbon budget.

NIT Rourkela Retired Professor S.C. Naik delivered the keynote address and spoke at length about the current environmental issues and the role of young individuals in initiating sustainable processes.

Member of Odisha Electricity Regulatory Commission (OERC) Er. A.K. Das who was the guest of honour, expressed his concerns about the deteriorating environmental conditions in the current scenario and how it was going to affect the future generations.



Awards were presented to winners of drawing, green-art and concept note competition in which children from the campus and young research scholars as well as summer trainees participated.

This was followed by an interesting panel discussion between eminent scientists, industrialists and senior officers from the Government. The discussion was coordinated by Mr Dillip Satpathy, Bureau Chief, Business Standards. Er. A. K. Das (Member Tech, OERC), Er. UPS Yadav (Director, Bureau of Indian Standards), Mr. Subrat R. Prusty (Director, MGM Agritech), Dr. Sunamani Kerketa (Director MoEF Eastern Region) were the main panellists along with Shri S.K. Mishra (Chief Scientist CSIR-IMMT). The discussions revolved around the role of each individual in sustainable practices in a range of activities from agriculture to industry. This was the most thought provoking part of the program.

A major initiative was taken to plant almost 1000 plant saplings inside the CSIR-IMMT campus.

CSIR-NPL Celebrates World Metrology Day



Dignitaries on the dais (From left): Dr. S.S.K. Titus, Dr. D. K. Aswal (Director, CSIR-NPL), Dr. Anil Kakodkar (Chief Guest), Dr. Girish Sahni (Guest of Honour), Dr. A. Sen Gupta (President MSI) and Dr. V. N. Ojha

Metrology, the science of measurement, is crucial for the development of industries and technology. The World Metrology Day, observed each year on May 20, celebrates the signing of the Metre Convention on this day in 1875 by representatives of seventeen nations.

This day was commemorated at CSIR-NPL on 20th May 2016, sponsored jointly by CSIR-NPL and Metrology Society of India (MSI). The function was presided over by the Director General, CSIR, Dr. Girish Sahni and the Chief Guest for the occasion was Dr. Anil Kakodkar, Padma Vibhushan, INAE Satish Dhawan Chair of Engineering, former Chairman of the Atomic Energy Commission and BARC.

The theme for this year's Metrology Day was "Measurements in a Dynamic World". The topic was chosen to align with the rapid pace of changes in measurement science, and indeed of the world around us.

Dr. V. N. Ojha gave the welcome address and briefly highlighted the importance of this day for worldwide uniformity of measurements and for global collaboration in its industrial, commercial and societal applications. Dr. A. Sen Gupta, President MSI addressed the audience about the history and achievements of the MSI.

In his inaugural address, Director NPL, Dr. D.K. Aswal spoke about the strides made by NPL in various sectors and the initiatives taken towards the realization of mission mode projects. Director General, Dr. Girish Sahni emphasized about the importance of research contributing towards providing scientific and technical solutions to the problems faced by the general population while making strides in scientific research also.



Dr. Anil Kakodkar (Chief Guest) delivering 'Keynote Address'

Dr. Anil Kakodkar delivered a talk on “Translation of Science into Technology: The Indian Context” and gave examples of villages being adopted with efforts made towards targeted solutions.

Subsequently, posters were released to commemorate the ‘World Metrology Day’, followed by release of the leaflet to mark the commencement of the second phase of the “CSIR-NPL Outreach for National Development [NPLONE]” program. To mark the success of NPL in the development of low-cost smart toilets using tiles made from plastic waste and fly-ash, another poster and a model of the same were released. This was followed by the releasing of the Bhartiya Nirdeshak Dravya (BND) or Certified Reference Materials (CRM) of ‘Trace elements in high purity Quartz powder’ which has been jointly developed by BARC and NPL.

Finally, the Chief Guest and the DG were presented mementos by Director,

NPL and the function concluded with a vote of thanks by Dr. S. S. K. Titus.

Following this programme, the inauguration of the “National Facility for Efficiency Measurement of the Organic Solar Cells at CSIR-NPL” was held.



Visits

Dr. Harsh Vardhan Appreciates Facilities at CSIR-NML

Dr. Harsh Vardhan, Hon’ble Minister took note of the glorious history and achievements of the CSIR-National Metallurgical Laboratory (CSIR-NML), Jamshedpur. On 15 May 2016, he visited different R&D laboratories of CSIR-NML and the mineral beneficiation pilot plant and enquired about the positioning of developed technologies and processes vis-à-vis international benchmarks.

Interacting with scientists, the Hon’ble Minister motivated them to have a unique dream aimed at technology development and to work hard to achieve the same. Various technologies were

demonstrated to him, related to minerals, metals, materials, and devices/products. The linkages with Indian industry were elaborated. Hon’ble Minister took keen interest in smokeless foundry designed for artisans. He was happy to see at CSIR-NML the second largest creep testing facility in Asia and its working to support Indian energy and defense sectors.

Hon’ble Minister in his address to NML staff said, “I am very happy to see the well positioned R&D activities in progress. The facilities created over the years are also praiseworthy. This laboratory has contributed for nation’s

socio-economic development. The scientists here should come out of their routine, should excel in the R&D they pursue, should achieve technological innovations and deploy the same to create the desired technological niches for the country.”

Appreciating CSIR, Hon'ble Minister expressed his satisfaction on CSIR achieving the 84th rank amongst world's top 100 research organizations. Dr. Harsh Vardhan conveyed the

message of the Hon'ble Prime Minister of India and President of CSIR that CSIR should carry out research benefitting the poorest of the poor in the country. He quoted the message of former Prime Minister of India Shri Atal Bihari Vajpayee Ji: “JAI JAWAN-JAI KISAN-JAI VIGYAN”. Hon'ble Minister said that the scientific community at CSIR should feel proud to serve the society and to solve the day to day problems of the common man.

Pursue R&D with Focus on Affordability & Environment Friendliness, says Dr. Harsh Vardhan at CSIR-CIMFR



Hon'ble Minister addressing the gathering

Dr. Harsh Vardhan reviewed CSIR-CIMFR's R&D activities related to Mining & Energy during a recent visit on 16 May 2016 to the CSIR-Central Institute of Mining and Fuel Research (CSIR-CIMFR), Dhanbad. These sectors account for about 4% of the GDP of the country. He advised the scientists and staff of CSIR-CIMFR to respond to the clarion call of “Make in India” made by Hon'ble Prime Minister. The Minister felt that CSIR-CIMFR is uniquely positioned to deliver the desired knowledgebase in

the domains of its operation.

The Hon'ble Minister discussed with the scientists several intractable and intriguing issues associated with mining and energy sectors causing damage to environment and ecology. He felt that the challenges the mining and mineral resources face today relate to more complex extraction conditions namely deeper placement of the deposits, hazardous conditions, environmental restrictions and several obligations related to national and international policies. Technological advancement focused on development of environment friendly clean technologies of mineral extraction and mitigation of emissions during combustion of fossil fuels is the need of the hour, felt the Hon'ble Minister.

Dr. Harsh Vardhan said that CSIR-CIMFR is poised to deliver various R&D solutions pertaining to coal and mineral technology for enhancing production, productivity and safety giving due cognizance to environmental issues.

CSIR-CIMFR has taken initiatives for societal upliftment as well. These include development of mine water reclamation technology, pollution management technologies, reclamation of mined out land, watershed management in rural areas and the adoption of schools and villages.

CSIR-CIMFR has developed several guidelines related to safe blasting practices and standards for blast induced vibrations, noise, flyrock, etc. which have been accepted by the mining community and statutory authorities in India and abroad.

The Hon'ble Minister appreciated CSIR-CIMFR developed technology for Road Dust Collection and Briquetting (*Dhulkan-Sangrahak*) which can be termed as *Swachhha Bharat Ke Taraf Ek Kadam*. The technology has been licensed to M/s TATA Motors Limited. Also, CSIR-CIMFR has developed a

Mine Transport Surveillance System (*Khadan-Chowkasi*) which is a step towards *Sashakt Bharat*. The system has eight modules for different purposes. It is useful for improving safety and productivity of mines. The system has been installed at Tirap Mine of North Eastern Coalfields, Assam.

The Hon'ble Minister in his address to CSIR-CIMFR scientists and staff called for pursuing those R&D activities on priority which would lead to the development of world class technologies with a focus on affordability and environment friendliness. He said young scientists should play a key role in India's march to become a technology power and senior scientists should mentor them. CSIR has been playing a key role in the country for socio-economic development and the effort in that direction should be further leveraged, emphasized the Hon'ble Minister.



Glimpse of the visit

Honours & Awards**Two CSIR-CDRI Scientists Receive 'Innovative Young Biotechnologist Award' (IYBA)-2015**

The 'Innovative Young Biotechnologist Award' (IYBA) was instituted by the Department of Biotechnology, Govt. of India in the year 2005, as an attractive, career-oriented scheme to identify and nurture outstanding young scientists with innovative ideas and desire to pursue research in frontier areas of Biotechnology.

The award consists of financial support for a project and Cash Award/Fellowship for the awardees. Awardees having a regular employment receive cash award of Rs. 1.00/- Lakh every year

during the course of the project in addition to grants-in-aid of Rs. 50.00/- Lakhs for a project. The duration of the project is normally for a period of three years. In case of research of outstanding merit, based on a review of the project by a committee of experts and their recommendations, the duration of the project may be extended by two more years to a maximum period of five years.

For the year 2015, two scientists of the CSIR-Central Drug Research Institute, Lucknow have received the 'Innovative Young Biotechnologist Award'.

**Dr. Rajender Singh**

Dr. Rajender Singh is presently working as Senior Scientist, Endocrinology Division, CSIR-Central Drug Research Institute, Lucknow. He has received this award for "Study on Protein Mechanism". His current research areas of interest are Identification of genetic markers for male infertility, Treatment of

male infertility, and Development of male contraceptives. Earlier, he received various awards including Young Scientist Award from the Indian Society of Human Genetics (ISHG), and India Young Scientist Award from the Indian National Science Academy (INSA), India.

**Dr. Niti Kumar**

Dr. Niti Kumar is presently working as Scientist, Parasitology Division, CSIR-Central Drug Research Institute, Lucknow. She has received this award for study on "Protein Folding and Degradation". Her current research areas of interest are investigating the extra-ribosomal functions of ribosomal proteins during stress and infection and understanding the role of Heat Shock Proteins during stress using *Plasmodium*

falciparum model.

Earlier, she received various awards and fellowships including the INSA Medal for Young Scientist (2010) by Indian National Science Academy, Ramalingaswami Fellowship (2013-2018), EMBO Post-Doctoral Fellowship (2010-2012), Alexander von Humboldt Fellow (2010), Max Planck Post-doctoral fellowship at Max Planck Institute of Biochemistry (2009).

Appointments

Prof. Satish Chandra Joins as Director, CSIR-CRRI



Prof. Satish Chandra, Professor, Department of Civil Engineering, IIT Roorkee has taken over the charge as Director, CSIR-Central Road Research Institute (CRRI).

Dr. Chandra did his Post Graduation in Transportation Engineering and Doctorate from the University of Roorkee in the year 1985 and 1994, respectively. He joined the University of Roorkee (presently IIT Roorkee) as Lecturer in 1985 and became Professor in May 2006.

He has more than 30 years of experience in the field of Civil Engineering and has contributed significantly in teaching, research and consultancy in the areas of Highway Capacity and Bituminous material characterization. He has published 45 research papers in international journals, 90 papers in national journals and 73 papers in conference proceedings. Many of his research papers are refereed widely in India and abroad.

Dr. Chandra developed the original concept of Dynamic Passenger Car Unit for converting heterogeneous traffic stream into a homogeneous stream of passenger cars, while retaining the impact of individual vehicle type in the flow analysis. The concept has been well received by researchers in India and abroad and has been used in several studies relating to highway capacity in India and other developing countries like Egypt, Vietnam, Cambodia, China and Thailand. He has delivered several invited lectures/keynote speeches on this concept of Dynamic PCU in various institutes and conferences.

He is also a key member of the team



responsible for preparing the Indian Highway Capacity Manual, a major research project sponsored by the Planning Commission through CSIR, New Delhi.

Dr. Satish Chandra has completed several research projects, guided 16 Ph.D. theses and about 100 M.Tech dissertations. He was invited by IIT Bhubaneswar as adjunct faculty in May 2014 for guiding their M.Tech and Ph.D. students. He has also trained more than 800 field engineers through various training courses on rural road construction and completed several consultancy assignments to help the user organizations in solving their field problems.

He has authored three books on Engineering Graphics, Air Transportation Planning and Design and Railway Engineering.

Dr. Chandra has been recipient of INSA visiting fellowship in 1994 and several outstanding research paper awards by the Institution of Engineers and the Indian Road Congress. He was conferred with outstanding teacher award by IIT Roorkee in the year 2006

and then in 2014. He has been a member of the Traffic Engineering Committee of the Indian Road Congress for a long time and contributed immensely in the development of different codes and specifications. He was also a member of

the Technical Evaluation Committee for World Bank aided projects in the state of Uttar Pradesh. He is a member of the Research Council of National Transportation Planning & Research Centre (NATPAC), Thiruvananthapuram.

Dr. Rakesh Kumar Mishra Takes Over as CSIR-CCMB Director



Dr. Rakesh Kumar Mishra, a noted expert in the study of function of genes, has been appointed as the new Director of the CSIR-Centre for Cellular and Molecular Biology (CCMB), Hyderabad.

After completing his M.Sc. (Chemistry) in 1981 and Ph.D. (Organic Chemistry) in 1986 from the University of Allahabad, Dr. Mishra joined CSIR-CCMB in 2001 as a senior scientist after stints at the IISc, Bangalore, the University of Bordeaux, France, Saint

Louise University, USA and the University of Geneva, Switzerland for post-doctoral experience.

At CCMB, Dr. Rakesh Mishra was Head of the Genome Organisation and Nuclear Architecture lab. The primary research focus of the lab is to understand the role of genome organization and nuclear architecture in epigenetic mechanisms and hence the gene expression during development. The lab uses fruitfly (*Drosophila melanogaster*) and zebrafish (*Danio rerio*) as model organisms of choice. It employs genetics, molecular and cell biology combined with high-throughput genomics, proteomics and bioinformatic approaches to answer the intriguing and exciting questions in this field of biology.

Dr. Mishra is a Fellow of the Indian Academy of Sciences, National Academy of Sciences, India, Indian National Science Academy and Andhra Pradesh Academy of Sciences. He has more than 95 articles in national and international journals.

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

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