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## In The News

### "CSIR-IITR Should Become One-stop Solution for Environment & Health Problems Facing the Country": Dr. Harsh Vardhan

**DR. HARSH VARDHAN**, Union Minister for Science & Technology and Earth Sciences, called upon the CSIR-Indian Institute of Toxicology Research (IITR), Lucknow, to strive towards becoming a one-stop solution for the country against environment and health related problems. The Hon'ble Minister was addressing a distinguished gathering at the CSIR-IITR where he appreciated the quality of work done by the Institute in the context of environment and human health and in the areas of food safety and water quality.

Dr. Harsh Vardhan emphasized on the need to develop robust and cost effective technologies for the masses that are easily deployable so as to improve their quality of life. He said that India is a vast nation with diverse



requirements and hence tailor-made solutions are the need of the hour. The government is committed to the people for transferring technological benefits through enhanced R&D. Exhorting everyone to have a dream, Dr. Harsh Vardhan said that the joy and satisfaction that comes from witnessing the fulfillment of a dream is beyond words, and cited his own experience with the Polio eradication programme.

The Minister unveiled a plaque to name the main building of the CSIR-IITR as 'Vishvigyan Bhawan' to mark the milestone of the institute celebrating its Golden Jubilee. He named the Auditorium and Seminar Hall of the institute as the Professor Sibte Hassan Zaidi Auditorium and Professor



Release of CSIR-IITR's Magazine

C.R. Krishnamurthy Seminar Hall respectively, in honour of the first two directors of the Institute. He also dedicated an Advanced Imaging Facility of the Institute to the nation for being used in the area of nanomaterial toxicology and released the institute's magazine *Vishvigyan Sandesh*.

Dr. Harsh Vardhan was also taken around an exhibition showcasing the Institute's R&D activities and significant technologies such as CD Strip and Argemone detection kit for the detection of adulterants in mustard oil, portable water analysis kit, Bact-O-Kill for online disinfection of water, etc. He also took keen interest in the environmental monitoring approaches and safety aspects of plastic products carried out by the institute.

Director, CSIR-IITR, Professor Alok Dhawan, made a detailed presentation to the Minister regarding the ongoing projects and the road map indicating CSIR-IITR's role in public, private, strategic and social goods. He informed that the activities of the institute are aligned to the National Missions like Swachh Bharat, Swasth Bharat, Skill India, Namami Gange and Make in India.

## CSIR to Start Incubation Centres to Promote Technology Startups

The Council of Scientific and Industrial Research (CSIR), one of the largest networks of scientific laboratories anywhere in the world, is now set to give the government's "Startup India" mission a big push by setting up incubation centres in over 30 of its laboratories spread across the country. The move involves identifying technologies from the CSIR's laboratories that can be commercialized on a large scale.

Until now, startups have been more or less confined to the Information

Technology sector. CSIR plans to considerably expand the startup space. With a network of 38 laboratories across the country doing research on an array of topics ranging from medicines to chemicals, farm technologies to medicinal plants, minerals to materials, and molecular biology to biotechnology, CSIR is granted 90% of the US patents granted to any Indian publicly funded R&D organization. The proposed incubation centres will help spin-off technologies rolling off the precincts of

the CSIR laboratories into Technology Startups that will be able to reach a much wider audience.

Incubation centers have already been opened during the last six months at the Central Food Technological Research Institute (CFTRI), Mysuru, Indian Institute of Chemical Biology (IICB), Kolkata, Central Leather Research Institute (CLRI), Chennai, Central Institute of Medicinal and Aromatic Plants (CIMAP), Lucknow, National Metallurgical Laboratory (NML), Jamshedpur, and Institute of Microbial Technology (IMTEC), Chandigarh.

The task of identifying technologies developed in CSIR laboratories, which can be commercially exploited, has already begun. Some of these include advanced clinical trials of TB vaccine, taking forward certain drugs for large-scale use, hybrid solar and wind generation equipment. The incubation centres being set up in CSIR laboratories are likely to

generate employment.

The first incubation centre is likely to come up at the CSIR-CIMAP, Lucknow. The Technology, Business and Incubation Center (TBIC) would cater to manufacturing of herbal products. It will guide entrepreneurs who want to start a business without the risk of investing in machinery, infrastructure and technology. The entrepreneur would also be given marketing rights and no licence fee for CIMAP herbal products technology would be charged. They will be free to decide the MRP of the product and also have the option to select from CIMAP's herbal products or come up with their own idea of new herbal products.

While the first production unit will manufacture liquid and semi-liquid products such as herbal face washes, shampoo, and hair and pain relief oil, the second production unit would manufacture herbal creams, balms and gels.



## CSIR-NBRI Develops Low-arsenic Rice Grain

Rice is a much favoured crop in most parts of the country. But arsenic contamination in rice has been posing serious health risks like kidney disease, cancer and skin problems. Riding on 10 years of intensive research, the CSIR-National Botanical Research Institute (NBRI) has developed 'transgenic rice' that will reduce arsenic accumulation and contamination in rice grains.

Arsenic contamination is most rampant in parts of Uttar Pradesh such as Ballia (most prone) followed by Bahraich, Rae Bareilly, Gorakhpur, Ghazipur, Meerut, and Chandoli. It is also a major problem in West Bengal, Bihar, Jharkhand and Odisha. Arsenic present in the groundwater percolates down into the soil during irrigation and

contaminates rice. Chronic arsenic exposure through groundwater contamination affects millions of people in the Ganga, Meghna and Brahmaputra areas. Rice is most susceptible to absorbing arsenic during cultivation. Cultivating rice varieties that accumulate less amount of arsenic can tackle the challenge of exposure to carcinogens (cancer causing elements).

The new variety of rice developed by scientists of the CSIR-NBRI has 'arsenic methyl transferase', a gene isolated from a fungus that accumulates less arsenic and would be less toxic. The variety is ready for field trials. The team that worked on the new rice variety published its findings recently in an international journal *Metalomics* published by the Royal Society of Chemistry.

## Dr. Harsh Vardhan Launches 'CSIR-NBRI Herbarium Online'

Union Minister for Science & Technology & Earth Sciences, Dr. Harsh Vardhan, launched the "CSIR-NBRI Herbarium Online" on the CSIR-NBRI website ([www.nbri.res.in](http://www.nbri.res.in)), thus making one lakh herbarium collections accessible worldwide. He also released a flyer "*CSIR-NBRI Herbarium Online*" on the occasion.



The Minister took keen interest in reviewing the detailed features of the new website like mechanism to enter specimen label data, taxonomic upgradation data, descriptors, GPS Data & Specimen Images &

Video Images, and Link to Genomics Data and GIS Maps. He applauded the efforts put in by the Bioinformatics group and advised that there should also be a provision for the availability of the data on uses, information useful to general public (especially students, teachers, researchers, environmentalists, etc.) like distribution, landscaping, geographical occurrences so that it becomes a unique knowledge resource of the country for every citizen.

It was also informed that digitization of one lakh specimens of higher plants has been completed thus making it a unique database of India in terms of Data Profile. In the future the database can also be linked to the other 95 Herbaria of India.

Addressing a gathering of Senior Scientists, Entrepreneurs, Industrialists, Officials and Farmers at NBRI, Lucknow, the Minister said that Scientists should think out of the box and work towards development on innovation-

driven research. He stressed upon the idea that CSIR sister labs should work together in synergy in networking mode by sharing of ideas, coordinated planning and carrying forward the initiatives of the Government of India. Encouraging each Scientist to have a dream to transform the lives of the common masses of India by developing plant based products, he emphasized on the need for optimal utilization of resources provided to the CSIR labs in terms of manpower and R&D infrastructure.

Director, CSIR-NBRI, Dr. C.S. Nautiyal, gave a brief presentation on the R&D activities, public interactions, and novel products developed by the Institute. He also presented a brief account of the national facilities of the Institute viz., National Herbarium and about three lakh holdings in the same; Botanical Garden and its theme gardens; and the recently created Bonsai House, Jurassic Gallery along with some plant varieties newly developed by the Institute. Apart from the national facilities, the Director's presentation also included three short-term deliverables – Anacardic acid, Thebaine rich Opium Poppy lines and Low grain arsenic rice variety – and Mission Mode Projects planned by CSIR-NBRI for the next few years to come. The Director also informed the Minister about an international project awarded by GEF/ UNIDO to CSIR-NBRI. This project involves development of Neem-based pesticides to eliminate the use of D.D.T. from India.

Dr. Harsh Vardhan specifically directed CSIR-NBRI to take up on an urgent basis the work of scaling up of 'Herbi Chew' as a potentially useful product to replace the cancer-causing

tobacco-based *gutka* currently available in the market. He was very happy to learn about the progress in the development of 'Muktashree', a low-arsenic uptake variety of rice, developed by CSIR-NBRI and Department of Agriculture, West Bengal and envisaged earliest release of this variety for the benefit of citizens living in arsenic-affected areas.

The Minister appreciated the effort of scaling up of CSIR-NBRI and CSIR-CIMAP (Central Institute of Medicinal and Aromatic Plants, Lucknow) joint product BGR-34, the country's first anti-diabetic ayurvedic drug designed for Type-2 diabetes mellitus. He noted that there is an overwhelming response to this drug among Diabetes Type-II patients throughout India.

The Minister was also apprised about the important contributions of CSIR-

NBRI in promoting Floriculture technology by a progressive farmer from Barabanki, who said that CSIR-NBRI technology has helped to increase his income by several folds.



Hon'ble Minister launching CSIR-NBRI Herbarium Online

### R&D Highlights

## Mercury-free Plasma UV-lamp (MFP UV-LAMP) for Water Purification Developed by CSIR-CEERI

Safe drinking water is the basic need of all human beings. Generally, water is contaminated with bacteria, viruses, salts and various organic compounds. This impure water causes many water-borne diseases, killing over 3 million people and causing serious illness in hundreds of millions each year worldwide (See WHO website, <http://www.who.int/>).

Existing technologies for water purification include mechanical filtration, reverse osmosis (RO), distillation, ultraviolet (UV) disinfection, chlorination and ozonation. Each of these technologies suffers from various limitations. Out of the existing water purification technologies, UV

disinfection has been known to be the most efficient method.

In the existing UV-lamps environmentally hazardous mercury is used for generation of UV light radiation at peak germicidal wavelength (254 nm). CSIR-CEERI has developed a mercury-free VUV/UV lamp with a novel structural design and an optimised gas mixture (Fig. 1) that produces strong spectral bands peaking at wavelengths

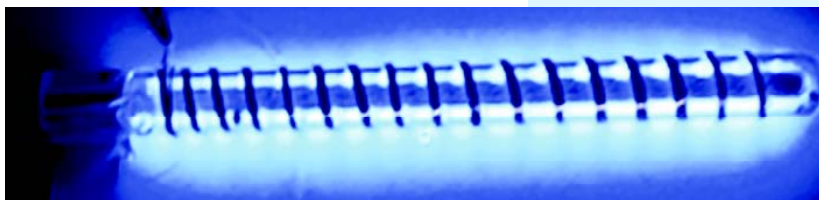


Fig. 1: MEP UV-Lamp developed at CSIR-CEERI

of 253 nm and 172 nm along with a weak band peaking at wavelength 265nm, which are highly useful for water sterilization (Fig. 2). This invention alleviates the problems of mercury lamps by virtue of its unique design and the composition of active discharge elements. As a result, it is able to produce the desired VUV/UV wavelengths for the deactivation of bacteria and viruses

most efficiently (without the use of mercury).

**Features**

- Mercury-free
- Medium pressure lamp
- Filamentless light source
- No end sleeves
- Negligible start-up time
- Scalable in dimensions
- Easily repairable
- Wide wavelength coverage due to dimer (or molecular) radiations
- Electrical to optical conversion efficiency as high as ~25 %
- Electrical input per unit arc length ~ 0.1 W/cm
- Operational time for complete deactivation with 5 log reduction of *E. coli* bacteria: ~ 10 seconds (under test conditions)

The lamp is a superior alternative for the present mercury-based UV lamps in water disinfection systems. The results of the *E. coli* bacteria deactivation in a household container (Fig. 3) are shown in Fig. 4 (a&b) and are tabulated in Table 1 and Table 2. On-time performance results of *E. coli* bacteria deactivation are shown in Table 3 at a fixed distance of 1 cm from the lamp surface for a commercial UV-lamp and MFP UV-Lamp developed at CSIR-CEERI.

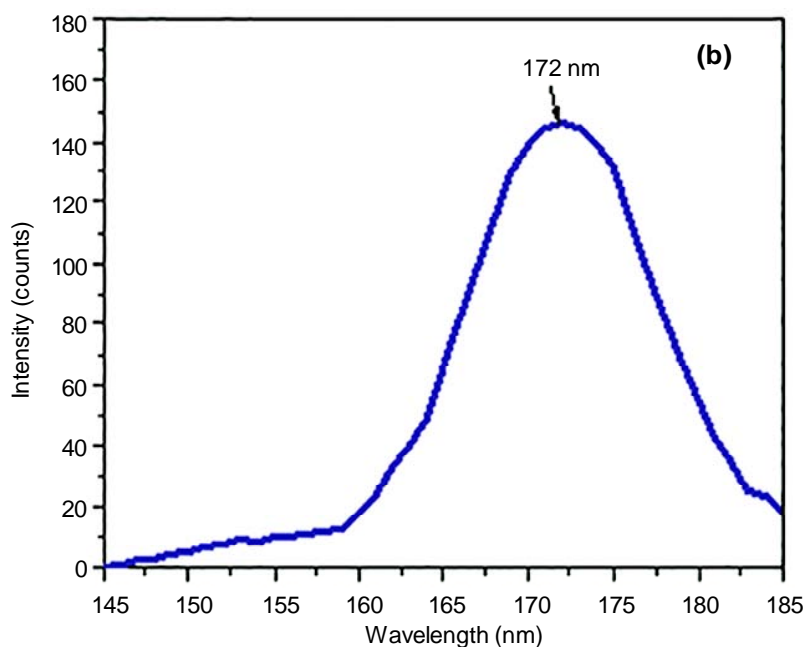
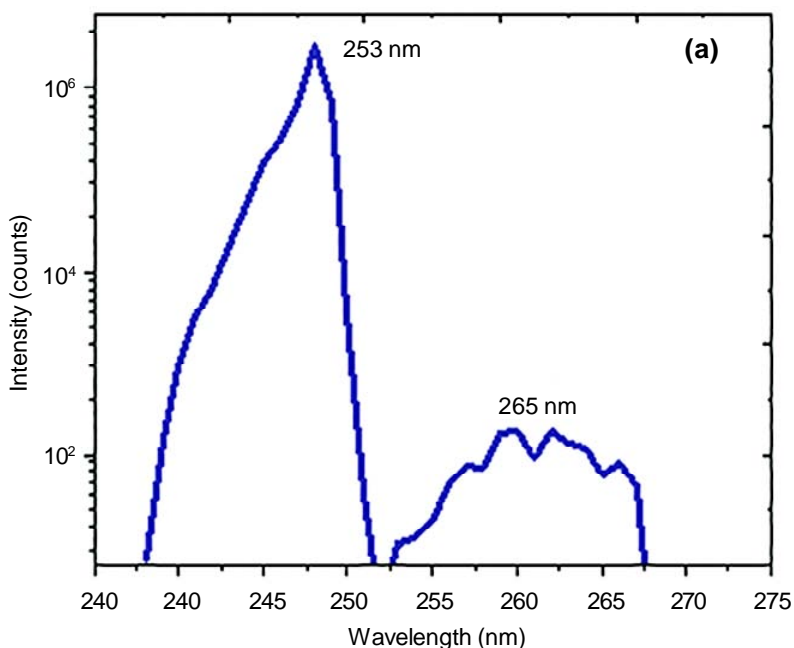


Fig. 2: Observed UV light from the MFP UV-LAMP (a) UV-C range (b) VUV range

**Table 1: *E. coli* deactivation results for control 3.75x10<sup>5</sup> CFU/ml**

Sample	Treat Time (sec)	CFU/ml ( <i>E. Coli</i> )
Control	NIL	3.75x10 <sup>5</sup>
E 1	5	No growth
E 2	10	No growth
E 3	20	No growth
E 4	60	No growth
E 5	600	No growth



Fig. 3: *E. coli* bacteria deactivation in a household container using MFP UV-LAMP



Fig. 4: (a) Control (without UV treatment) showing yellow coloured *E. coli* colonies on m-EC agar medium

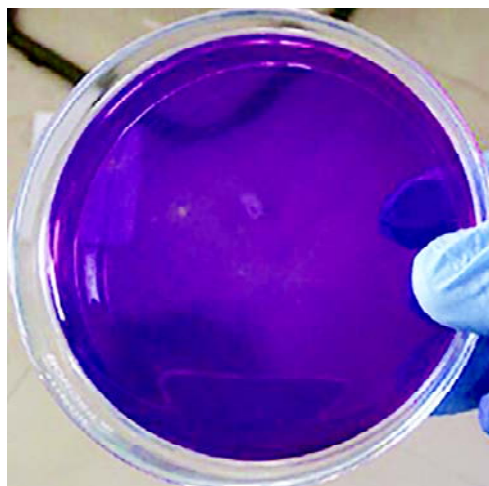


Fig. 4: (b) After UV treatment 100 % reduction in *E. coli* bacteria counts

**Table 2: *E. coli* deactivation results for control 1.6x10<sup>6</sup>CFU/ml**

Sample	Treat Time (sec)	CFU/ml ( <i>E. Coli</i> )
Control	NIL	1.6x10 <sup>6</sup>
E 1	4	1720
E 2	6	No growth
E 3	8	No growth
E 4	10	No growth

Bacteria deactivation testing was carried out at CSIR-NEERI, Nagpur and Birla Institute of Scientific Research (BISR), Jaipur under CSIR-Network and DST grant-in-aid projects. Technical features comparison of the MFP UV-Lamp with the existing UV-Lamp are given in Table 4.

**Table 3: On-time performance results of *E. coli* bacteria deactivation for a commercial UV-lamp and MFP UV-Lamp at a fixed distance of 1 cm from the lamp surface**

Turbidity (NTU) Kaoline Powder	Required on-time exposure time for deactivation of <i>E-coli</i> bacteria (Commercial tube)*	Required on-time exposure time for deactivation of <i>E-coli</i> bacteria (MFP UV-Lamp)
0.25	12.4 sec	6 sec
5.0	12.8 sec	6 sec
10.0	13.9 sec	8 sec
20.0	15.0 sec	8 sec

\*Steven H. Clarke, TIP, U.S. Army Public Health Command # 31-006-0211 (2011)

**Table 4: Comparative features of the MFP UV-Lamp with mercury-based UV-Lamps**

Parameters	Mercury based UV lamp		Mercury-Free Plasma UV-Lamp
	Monochromatic (LPHO)	Polychromatic (High Pressure)	Polychromatic (Medium Pressure)
Type	Monochromatic (LPHO)	Polychromatic (High Pressure)	Polychromatic (Medium Pressure)
Operating Pressure	~10 <sup>-3</sup> mbar	~400 mbar-1bar	100-400 mbar
Operating Temperature	100°C	600°C	~ Room Temperature
Electrical Input (minimum)	~0.5 W/cm	~25 W/cm	~0.1 W/cm
Electrical to UV efficiency	30-35%	10-20%	25 %
Start-up time	5-7 minutes	6-10 minutes	Instantaneous

MFP UV-Lamp technology can replace UV light sources used in:

- Household water purifier systems
- Storage/sewage/waste water treatment plants
- Municipality water treatment plants
- Portable water purifiers for soldiers, outdoorsmen, farmers, etc

Application-specific systems can be further developed for sterilisation of food, medical equipment, surfaces, ill skin conditions, air-conditioners and air-fresheners for hospitals, titanium coated toilet sterilisation in trains, water supply in trains and buses.

## Tumour-like Anomaly of Copepods—An Evaluation of the Possible Causes in Indian Marine Waters by CSIR-NIO Scientists

Globally, tumour-like anomalies (TLA) in copepods and the critical assessment of their possible causes are rare. The exact causative factor and ecological consequences of TLA in copepods are still unclear and there is no quantitative data available so far to prove conclusively the mechanism involved in developing TLA in copepods.

TLA in copepods are considered as a potential threat to the well-being of the aquatic food web, which prompted us to assess these abnormalities in Indian marine waters and assess the possible etiological agents. We carried out a focused study on copepods collected from 10 estuarine inlets and five coastal waters of India using a FlowCAM, advanced microscopes and

laboratory-incubated observations. The analysis confirmed the presence of TLA in copepods with varying percentage of incidence in different environments.

TLA was recorded in 24 species of copepods, which constituted ~1–15 % of the community in different environments. TLA was encountered more frequently in dominant copepods and exhibited diverse morphology; ~60 % was round, dark and granular, whereas ~20 % was round/oval, transparent and non-granular. TLA was mostly found in the dorsal and lateral regions of the prosome of copepods.

The three suggested reasons/assumptions about the causes of TLA such as ecto-parasitism (Ellobiopsis infection), endo-parasitism (Blasto-

dinium infection) and epibiont infections (Zoothamnium and Acineta) were assessed in the present study. We did find infections of endo-parasite Blastodinium, ecto-parasite Ellobiopsis and epibiont Zoothamnium and Acineta in copepods, but these infectious percentages were found <1.5 % to the total density and most of them are species specific.

Detailed microscopical observations of the samples collected and the results of the incubation experiments of infected

copepods revealed that ecto-parasitism, endo-parasitism and epibiont infections have less relevance to the formation of TLA in copepods. On the other hand, these studies corroborated the view that wounds on the exoskeleton caused by partial predation as the potential reason for the TLA of copepods in Indian waters.

**Jagadeesan, L.; Jyothibabu, R.**

Citation: *Environmental Monitoring and Assessment*, vol. 188(4); 2016; no. 244 doi.: 10.1007/s10661-016-5230-6.



## Intraseasonal Variability of Mixed Layer Depth in the Tropical Indian Ocean—A Study by CSIR-NIO Scientists

We used an observational dataset built from Argo *in situ* profiles to describe the main large-scale patterns of intraseasonal mixed layer depth (MLD) variations in the Indian Ocean. An eddy permitting (0.25°) regional ocean model that generally agrees well with those observed estimates was then used to investigate the mechanisms that drive MLD intraseasonal variations and to assess their potential impact on the related SST response.

During summer, intraseasonal MLD variations in the Bay of Bengal and eastern equatorial Indian Ocean primarily respond to active/break convective phases of the summer monsoon. In the southern Arabian Sea, summer MLD variations are largely driven by seemingly-independent intraseasonal fluctuations of the Findlater jet intensity.

During winter, the Madden-Julian Oscillation drives most of the intraseasonal MLD variability in the eastern equatorial Indian Ocean. Large winter MLD signals in northern Arabian

Sea can, on the other hand, be related to advection of continental temperature anomalies from the northern end of the basin. In all the aforementioned regions, peak-to-peak MLD variations usually reach 10 m, but can exceed 20 m for the largest events.

Buoyancy flux and wind stirring contribute to intraseasonal MLD fluctuations in roughly equal proportions, except for the Northern Arabian Sea in winter, where buoyancy fluxes dominate.

A simple slab ocean analysis finally suggested that the impact of these MLD fluctuations on intraseasonal sea surface temperature variability is probably rather weak, because of the compensating effects of thermal capacity and sunlight penetration: a thin mixed-layer is more efficiently warmed at the surface by heat fluxes but loses more solar flux through its lower base.

**Keerthi, M.G.; Lengaigne, M.; Drushka, K.; Vialard, J.; de Boyer, M.C.; Pous, S.; Levy, M.; Muraleedharan, P.M.**

Citation: *Climate Dynamics*, vol.46(7); 2016; 2633-2655.

## Fishing in Nature's Molecular Pools

Nature is a treasure trove of potential drugs. The human world is thriving with diseases and applications of every kind. How do we mix and match? Where do we begin our search? We could, for example, start with 100s of different cell lines and begin our test in a systematic manner, cataloging them as we go. Or we could take a bag full of tissues and expose them to the drugs all at once! And here the zebrafish screen lends a helping hand!

A whole organism screen with hundreds of transparent larvae, where the tissues are tagged with fluorescent proteins so you can visually inspect their size, shape, growth and death. Zebrafish embryos offer a first-stop-screening for many organ systems at once. Can we use zebrafish and go rummaging in the natural world for more and more drugs?

Let us take the example of the wonder-drug Taxol (now Paclitaxel), a highly successful treatment for various kinds of cancer. Taxol was discovered in the 1960s as part of a US government initiative to find treatments for cancer from the natural world. So, where was the problem? Taxol came from the bark of the Pacific yew tree, not a commonly found species; and 12 trees had to be killed to yield 1 gm of Taxol.

So, what is the alternative? What if we could synthesize compounds found in nature? Not as easy as it sounds though. The chemical space that is currently being explored by synthetic routes for drug discovery is but a tiny one. Natural products are complex, multi-ringed structures, very intractable to synthesis in the laboratory. But by bringing the possibility of synthesis to structures inspired by nature, we could find a middle

ground to play.

As part of efforts that started nine years ago at bringing together chemists and biologists, scientists at the CSIR-Institute of Genomics and Integrative Biology (IGIB), New Delhi recently embarked on this project with the synthetic chemist Dr. D. Srinivasa Reddy from CSIR-NCL. Dr Reddy's lab offered us a bag full, or rather box full of vials with synthetic products inspired from the natural world. CSIR-IGIB had its own multi-well plates full of zebrafish larvae, colour-coded for heart and liver and vasculature. When the fish met the compounds, many ended in tragedy. But a very small number showed very interesting and tantalizing phenotypes.

Of these, one had a very potent inhibitory affect on the sprouting of new blood vessels, a process called angiogenesis. Angiogenesis is a critical process for development of the organism, since blood vessels are important for the transport of nutrients and oxygen to the rapidly dividing embryonic cells. It is also critical for the other rapidly dividing cell type that wreaks havoc in our bodies, the cancer cells.

CSIR-IGIB scientists xenografted human cancer cells into the fish embryo to test if the inhibitor would impede their growth. Early fish embryos do not reject such grafts because their adaptive immunity is still developing. These grafted cells secrete growth factors that seduce blood vessels to abandon their straight and narrow path and steer towards the hungry cancer cells. Treatment with our nature-inspired synthetic molecule could stop them in their tracks, which could lead to tumour growth arrest eventually.

Perhaps, by using a combination of natural product resource, synthetic organic chemistry and zebrafish embryonic assays we may be able to dive into nature's treasure trove repeatedly and come up with powerful molecules for the drug cabinet.

Identification of noreremophilane-based inhibitors of angiogenesis using

zebrafish assays. Muthukumarasamy KM, Handore KL, Kakade DN, Shinde MV, Ranjan S, Kumar N, Sehwat S, Sachidanandan C, Reddy DS. *Org Biomol Chem.* 2016 Jan 27;14(5):1569-78. doi: 10.1039/C5OB01594D.

**By S. Ramachandran, Scientist, CSIR-IGIB (Courtesy: *Pulse CSIR-IGIB Digital Magazine*, March 2016)**



## Sensor Developed at CSIR-IGIB for Early Detection of Heart Attack in Humans

Heart disease is the leading cause of death in men and women. Early detection of heart attacks can help save many lives.

In a collaborative work, Deepika Bhatnagar and her colleagues at CSIR-Institute of Genomics and Integrative Biology (IGIB), New Delhi have developed a sensor to detect the antigen cardiac-Troponin I (cTnI). The technique uses Graphene quantum dots conjugated to antibody anti-cardiac Troponin I and fluorescence resonance energy transfer (FRET). The sensor is highly specific and shows negligible response to

non-specific antigens. The sensor displayed a linear response to cTnI from 0.001 to 1000 ng/mL with a limit of detection of 0.192 pg/mL.

Bhatnagar D, Kumar V, Kumar A, Kaur I. Graphene quantum dots FRET based sensor for early detection of heart attack in human. *Biosens Bioelectron.* 2016 May 15;79:495-9. doi: 10.1016/j.bios.2015.12.083. Epub 2015 Dec 25. PubMed PMID: 26748366.

**By S. Ramachandran, Scientist, CSIR-IGIB (Courtesy: *Pulse CSIR-IGIB Digital Magazine*, March 2016)**

## Morphotectonic and Petrological Variations Along the Southern Central Indian Ridge

In order to ascertain the effect of geomorphic and tectonic domains on the formation, enrichment and ascension of the ridge axis melt, structural and petrological data from a nearly 300 km long axial stretch along the slow to intermediate spreading (40-60 mm/yr) Southern Central Indian Ridge (SCIR) was studied. The stretch, approximately between 20°30'S and 23°07'S, was

disturbed by two major tectonic features- Egeria Transform Fault (ETF) in the north and the Gemino Fracture Zone (GFZ) in the south- besides eight other discontinuities of variable dimensions. This stretch was chosen to test the petrological variations and mechanisms of magma supply in four distinct geomorphic and tectonic regimes: a Ridge Crest-Flank-Valley (RCFV), a Neo-

Volcanic Zone (NVZ), a Large Transform Discontinuity (LTD), and an Overlapping Spreading Center (OSC). The major and trace element geochemistry of 44 glass and 47 whole rocks, extent and depth of melting ( $\text{Na}_8$  and  $\text{Fe}_8$ , respectively) and melt pristinity ( $\text{Mg}\#$ ) of the magma indicate that rocks along this stretch were probably sourced from a reasonably primitive melt generated at a relatively greater depth and later got accumulated in pockets at a shallower level before eruption. Petrochemical analysis and isotopic composition and ratios suggest that in

contrast to largely N-MORB type of rocks at RCFV and OSC areas, the rocks from LTD and NVZ locations show signatures of enrichment to transitional (T) and enriched (E) type basalts. A model explaining possible processes of enrichment and ascending framework of the melt at different tectonic regimes along SCIR are discussed in the paper.

**Mukhopadhyay, R.; Iyer, S.D.; Ray, Dwijesh; Karisiddaiah, S.M.; Drolia, R.K. CSIR-NIO**  
Citation: *International Journal of Earth Sciences (Geol. Rundsch)*, vol.105(3); 2016; 905-920

### MoUs

## CSIR-IICT Signs Agreements with Industries

The CSIR-Indian Institute of Chemical Technology (IICT), Hyderabad signed an agreement with Marico India Limited to transfer technology for refining rice bran wax. The Solvent Extractors Association of India too signed an MoU with the premier institute for making use of the facilities at the Centre for Lipid Research.

Director Incharge of CSIR-IICT, Dr. U.S.N. Murthy, informed that CSIR-IICT has state-of-the-art facilities and is opening its door to the industry to make use of the facilities at nominal rates. He informed that industries had started approaching CSIR-IICT for technology transfer. He said that at present, the crude rice bran wax is used in cosmetics, candle making and boot polishing industry. The wax is imported and the research at the centre will help in reducing the imports by almost 50 per cent. He has also complimented Solvent Extractors' Association of India for signing the MoU

with IICT for making use of the facilities of the Centre for Lipid Research at CSIR-IICT. The Centre for Lipid Research has developed technologies in the field of processing, value addition to by-products, nutraceuticals, bio-lubricants and surfactants.

Dr. B.L.A. Prabhavathy Devi, principal scientist at the Centre for Lipid Research said, "The centre has developed technologies related to vegetable oils for nutraceuticals and transferred the technology to 21 industries which help in refining and reducing consumption of water.

The IICT has been offering its services and facilities to the MSME sector at subsidised rates and during the past more than 10 years, the Institute has transferred at least 20 technologies to more than 50 industries all over the country.

## Climate Change Conference at CSIR-NIO



Prof. Bhalla releasing the abstract volume

The CSIR-National Institute of Oceanography, Dona Paula Goa, along with the Ministry of Earth Sciences (MoES) organised a three-day national conference on “Quaternary Climate: Recent Findings and Future Challenges” during 28–30 April 2016.

The conference was inaugurated by Prof. S.N. Bhalla, Professor (Retd.), Geology, Aligarh Muslim University and Prof. Talat Ahmad, Scientist and Professor at the Department of Geology, University of Delhi on 28<sup>th</sup> April at 9.30 am in Qasim Hall (NIO auditorium) along with Dr. SWA Naqvi, Director, CSIR-NIO. This was followed by an inaugural lecture by Dr. Rajiv Nigam, Chief Scientist, CSIR-NIO, on “Environmental implications of microfossils of the Indian Waters”.

Prof. Bhalla and Prof. Talat stressed upon the importance of climate changes in the Quaternary period on glaciation, sea level changes and human civilization. Earlier, Dr. Naqvi, welcomed the gathering and mentioned the importance of reconstruction of Quaternary climate, which is an

important area of research to understand the anthropogenic influence on earth's climate.

The conference included invited lectures by eminent scientists providing an in-depth review of the status of Quaternary climate reconstruction. There was also a poster session to provide insight into the recent understanding of the Quaternary climate and evaluation of proxies to reconstruct past climates. A special session was also dedicated to the role of climatic changes in shaping ancient civilizations. Prof. Bhalla also released an abstract volume containing all the papers that were presented during the three-day meet.

Prior to the lecture programme, Dr. Rajiv Nigam was felicitated at the hands of Prof. Bhalla, for his dedicated services rendered to the study of paleoceanography at CSIR-NIO. Dr. N. Khare, Scientist F, MoES and the co-convenor of the conference stressed on the objective of the conference and Dr. Rajeev Saraswat, Senior Scientist, CSIR NIO convener of the conference proposed the vote of thanks.

### Workshops

## Instructional Workshop on Computational Analysis of Genomes, Transcriptome & Metagenomes Organised by CSIR-IGIB

High-Throughput Next-Generation Sequencing (NGS) has become an integral part of modern biological research. A number of open source applications are available to the researchers to analyze such vast amounts of data. Use of appropriate pipeline and parameters therein is the key to success.

A three-and-a-half day workshop was conducted during 2-5 March 2016 to provide the participants a hands-on experience in Advanced data analysis

methodologies; Latest analytical approaches in the area of Next Generation Sequencing (NGS), and Visualization techniques for high throughput NGS data. Preconfigured laptops were provided for practical sessions during the workshop.

The topics covered were:

- Genome/Exome Sequence Analysis.
- Transcriptome Analysis (RNA seq/ sRNA seq).
- Metagenomics (Bacterial Community Analysis).

### Laboratory Celebrations

## CSIR-CBRI celebrates its Foundation Day



Dignitaries on the dais

The CSIR-Central Building Research Institute (CBRI), Roorkee celebrated its 70<sup>th</sup> Foundation Day on 10 February 2016. The function was organized in the Rabindra Nath Tagore Auditorium.

Dr Ashwini Kumar, Director

General, Indian Council of Forestry Research & Education (ICFRE), Dehradun and Vice-Chancellor, FRI & Colleges, Dehradun was the Chief Guest and Mr. Pramod Adlakha, Managing Director, M/S Adlakha Associates Private Limited, Delhi was the Guest of Honor. Mr. Yadvendra Pandey, Acting Director, CSIR-CBRI presided over the function.

Mr. Yadvendra Pandey, while addressing the gathering, highlighted the glorious past of CSIR-CBRI, which was established on 10 February 1947. Since then it has been contributing to the development of the country and carrying out R&D on all aspects of housing and assisting the building industry in solving problems of planning, designing, foundations, materials and construction including disaster mitigation in all kinds

of buildings, environment preservation and energy conservation.

Mr. Pandey informed that CBRI has provided assistance in rehabilitation after the Chamoli earthquake, damage assessment of education and health buildings in earthquake-affected Uttarkashi, landslide zonation of Garhwal districts, strong motion seismic instrumentation, development of solar timber seasoning kilns, building construction of Navodaya Vidyalaya complexes.

Mr. Pandey also informed that the institute has taken up projects for conservation of nationally important heritage structures such as the Taj Mahal, Konark Temple, Chittaurgarh Fort, Kashi Vishwanth Temple and Outub Minar. He also spoke about the CSIR-800 project and role of the institute in upliftment of the life of the bottom segment in the country. He talked about the major R&D projects, newer areas of research such as sustainability, nanotechnology, use of Kota stone dust, EPS door shutters, nano-concrete, bio-concrete, geopolymer, etc. and C&D waste utilization in the production of construction materials and products. He also informed about the involvement of CBRI in the "Housing for All" mission and in "Make in India".

Dr. Ashwini Kumar, Chief Guest, in his address complimented CBRI for its efforts and achievements, especially for its role in the country's economy by providing one of the life's three basic necessities. He spoke about the scientific importance of the day. He stated that CBRI is engaged in producing buildings while ICFRE produces building products. He shared his concern on the recent climatic changes in the environment and encouraged the efficient use of solar power. He dwelt

upon the need for developing energy-efficient building products.

Mr. Pramod Adlakhia, Managing Director, M/S Adlakhia Associates Private Limited, Delhi, who has been associated with the institute since 1975, requested CBRI staff to take the lead in the Prime Minister's Make in India movement. He informed that by using CBRI technologies, we have covered an area of about one crore sixty lakh square



meters. He said that CBRI's technology has been used in the construction of over twenty thousand houses in Bawana, Delhi.

On this occasion, the Diamond Jubilee Director's Best Paper Award of Rs 15000/- was awarded to Dr. Rajiv Kumar & Shri M.P. Singh for the paper "Correlations among Signature for detection of different types of fires". The Diamond Jubilee Director's Award for Development of Best Technology with the maximum impact on the society was awarded to Dr. B. Singh & Dr. Manorama Gupta for "Building Products from Pine Needles". A cash prize of

Rs. 20,000/- was given to them.

On this occasion, a publication on "State of the Art on Prefab Technologies for Housing" and two CDs containing short films on Innovative Building Materials and Confined Masonry were released. The occasion was also marked by inauguration of a Heritage Gallery having rare photographs of various dignitaries who visited the Institute. Winners of the inter school debate competition held on the occasion, were also awarded.

Dr. A.K. Minocha, Chief Scientist, conducted the proceedings and proposed a vote of thanks.



Inauguration of the Heritage Gallery

## CSIR-NGRI & CSIR-IICT Celebrate World Water Day 2016



March 22<sup>nd</sup> is marked by the United Nations to be observed as the World Water Day. A number of programmes are organized worldwide to dwell upon the importance of water resources and their best applications.

CSIR-NGRI and CSIR-IICT celebrated the day by coming out of their labs and interacting with the common public and also apprising them of the research findings of the two institutes related to quality and quantity of water



Prof. Valdiya delivering his lecture (left); a section of the audience (right)

with a slogan, "Lab to Land and Lab to People".

The staff as well as their families, research scholars and school children dressed in uniform took a Water Walk in the heart of the city, the Necklace Road, Hyderabad and walked about 3 km with banners apprising the common public of the important findings of the two institutions. The parade was flagged

off by Dr. S. Chandrasekhar, Director, IICT and Dr. Shakeel Ahmed, Senior most Chief Scientist, NGRI. The Deputy Mayor of the Greater Hyderabad Municipal Corporation also joined the procession and took part in the deliberations in a public meeting. The first phase of the walk was held during 07.30 hrs to 09.00 hrs.



Dr. S. Chandrasekhar, Director, IICT and Dr. Shakeel Ahmed, Senior most Chief Scientist, NGRI flagging off the parade





Inauguration of NGRI's Portal on Groundwater Solution

The second phase of the parade took place at Uppal Road from the CSIR-IICT main gate to CSIR-NGRI main gate.

The Water Walk was followed by a special talk on "Prehistoric river Saraswati, western India: Geological Aspects and Socio-cultural Fallouts" by an eminent personality, Prof. K.S. Valdiya, Honorary Professor of Geodynamics, Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bangalore. The lecture was followed by lively interactions with school children, NGO's and media persons.

CSIR - NGRI launched a portal on its website viz., *Groundwater Solutions*, which was inaugurated by Prof. Valdiya. The objectives of the portal are to apprise the public on the general aspects of groundwater, expertise at CSIR-NGRI, relevant research work carried out including a list

of do's and don'ts and finally a facility of submitting any query on groundwater. The query will be replied jointly by a team of experts in the field in the shortest possible time. This will be extremely effective as CSIR-NGRI receives a number of calls asking queries regarding groundwater conditions and quality, etc. With the water crisis at its peak, this medium will be a great service to the Nation.



## Honours & Awards

# Gandhian Young Technological Innovation (GYTI) Award 2016 for CSIO Scientist



The Gandhian Young Technological Innovation (GYTI) Award 2016 has gone to Mr. Manoj Kumar Patel for his work entitled "Air-Assisted Electrostatic Sprayer" awarded under More from Less for Many (MLM). He was awarded by Dr. R.A. Mashelkar, FRS, Chairperson, National Innovation Foundation (NIF)-India, at Rashtrapati Bhavan, New Delhi on 13 March 2016. GYTI is a Society for Research and Initiatives for Sustainable

Technologies and Institutions (SRISTI) initiative to foster youth-driven innovations.

The award was given to Mr. Manoj Kumar Patel in the presence of Krishnaswamy Vijay Raghavan, Secretary of Department of Biotechnology, Prof. Anil K. Gupta, Vice-Chairperson NIF & Founder Honey Bee Network, and Prof. Ashutosh Sharma, Secretary, Department of Science and Technology, Government of India.

## Dr. Srinivasa Reddy bags NASI-Reliance Industries Platinum Jubilee Award

Dr. D. Srinivasa Reddy, a senior scientist from CSIR-National Chemical Laboratory (CSIR-NCL), Pune has been chosen to receive NASI-Reliance Industries Platinum Jubilee Award for Application Oriented Innovations in the area of physical sciences.



Dr. Reddy's research group interests are in the field of total synthesis and drug discovery by applying medicinal chemistry. He has also been involved in the synthesis of agrochemicals like small molecules for crop protection. Synthesis of more than twenty natural products has been achieved in his lab including a sex pheromone that attracts the mealy bugs and has potential use in crop protection. On the medicinal chemistry front significant progress has been made by his

group using a new concept called "Silicon-switch approach" towards central nervous system drugs. Identification of New Chemical Entities for the potential treatment of diabetes and infectious diseases is being done in collaboration

with industry partners.

Dr. Reddy worked with pharmaceutical companies for seven years before joining CSIR-NCL in 2010. His efforts are evidenced by more than 60 publications and 30 patents. He recently received the CRSI bronze medal; in addition he is also a recipient of the Central Drug Research Institute award for excellence in drug research in chemical sciences and Scientist of the Year award by the NCL Research Foundation in the year 2013.

## CSIR-IICB Scientist Receives Swarnajayanti Fellowship and NASI-Scopus Award

Dr. Suvendra Nath Bhattacharyya, Principal Scientist, CSIR-Indian Institute of Chemical Biology, Kolkata has been selected for this year's Swarnajayanti Fellowship in Life Sciences.

The Government of India had instituted this prestigious Fellowship to commemorate India's fiftieth year of Independence. The Fellowship is given by the Department of Science and Technology, Govt. of India, to a select number of young scientists below the age of 40 and with excellent scientific track record. They are selected annually and are provided with special assistance and support to enable them to pursue research in frontier areas of science and technology. The support covers all the requirements for performing the research that include a fellowship of Rs. 25,000/- per month in addition to the salary they draw from their parent Institution for five years.

In addition to this prestigious fellowship, Dr. Bhattacharyya has also won the NASI-Scopus Young Scientist Award 2015 in Biological Sciences.

*Elsevier* partnered with the National Academy of Sciences to award researchers below the age of 40. Each year it is given to Scientists, one each from nine individual categories, after multiple screening rounds and winners are chosen by an empowered committee.

Dr. Bhattacharyya won this award for his outstanding contribution in the field of miRNA research and more specifically for the discovery of miRNA activity modulation mechanisms in mammalian immune and cancer cells.

For his scientific achievements, in the year 2015, Dr. Bhattacharyya was also selected as member of the Guha Research Conference and as the fellow of the West Bengal Academy of Science and Technology (WAST). He is also the recipient of Prof. B. K. Bachhawat Memorial Travel Award 2016 and he was voted as one of the "Young Achievers of Modern India" and was profiled in the 2016 Calendar published by Shoolini University.

Dr. Suvendra Nath Bhattacharyya joined CSIR-IICB in 2008 and currently is the head of Molecular Genetics division of CSIR-IICB. His research was primarily funded by the prestigious Career Development Award of International Human Frontiers Science Program Organization and International Senior Research Fellowship from The Wellcome Trust, London. Dr. Bhattacharyya was also a Young Researcher Award grant holder of the Lady Tata Memorial Trust during his tenure in CSIR-IICB.



## Dr. Rajiv Nigam selected for S.N. Bhalla Gold Medal



Dr. Rajiv Nigam, Chief Scientist, CSIR-NIO has won the S.N. Bhalla Gold Medal of the Paleontological Society of India in recognition of his outstanding contributions in the field of Micropalaeontology.

Dr. Rajiv Nigam has made outstanding contributions in the field of Marine Geology (Micropaleontology) using foraminifera as a tool to understand oceanographic processes and their role in environmental and paleo environmental assessments.

His main findings are pollution monitoring through relative sensitivity of the benthic foraminifera; development of novel techniques to decipher net sediment transport direction by comparisons of living and dead benthic foraminifera; postulating dimorphism as proxy for paleoclimate reconstructions; development of model for the paleodepth determination in the Arabian Sea and sea level curve for the Holocene; morphogroups of benthic foraminifera as a new tool for paleomonsoonal reconstruction; discovery of 77 years cyclicity in average monsoonal rainfall

which is modulated by Gleissberg solar cycle and application of Marine micropaleontology in the field of Marine Archaeology (e.g. settling the controversy of dockyard at Lothal and explanation of Neolithic human settlements in Gulf of Cambay through knowledge of sea level fluctuations).

He has pioneered the study of foraminifera in laboratory culture. These experiments provide new insights for some of the fundamental aspects of foraminiferal studies.

Dr. Nigam is recipient of several awards like the CSIR Young Scientist Award, Krishnan Gold Medal, National Mineral Awards, etc. Besides enhancing his own qualification to D.Sc. degree, Dr. Nigam has also taken keen interest in human resource development and successfully guided 11 students for PhD and 5 students are currently working under his supervision. He has published more than 125 research papers in National and International journals. At present he is heading the Geological Oceanography Division and Marine Archaeology Unit of NIO.

### **Book Shelf**

***RCS Estimation of Linear and Planar Dipole Arrays: Approximate Model, by Hema Singh, Chandini R., R.M. Jha (CSIR-National Aerospace Laboratories)***

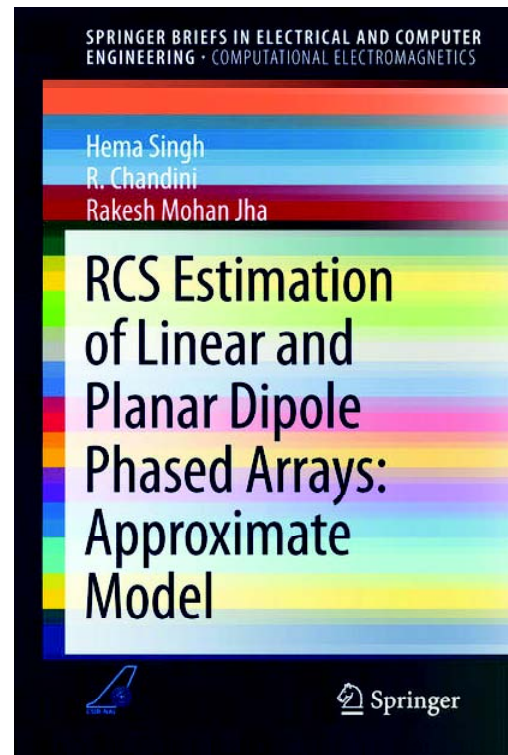
The signal propagation within the phased array system decides the radar cross section (RCS) of phased array. The reflection and transmission coefficients for a signal at different levels of the phased in scattering array system depend on the impedance mismatch and the design parameters. Moreover the mutual

coupling effect in between the antenna elements is an important factor. A phased array system comprises of radiating elements followed by phase shifters, couplers, and terminating load impedance. These components pose respective impedance towards the incoming signal that travels through them

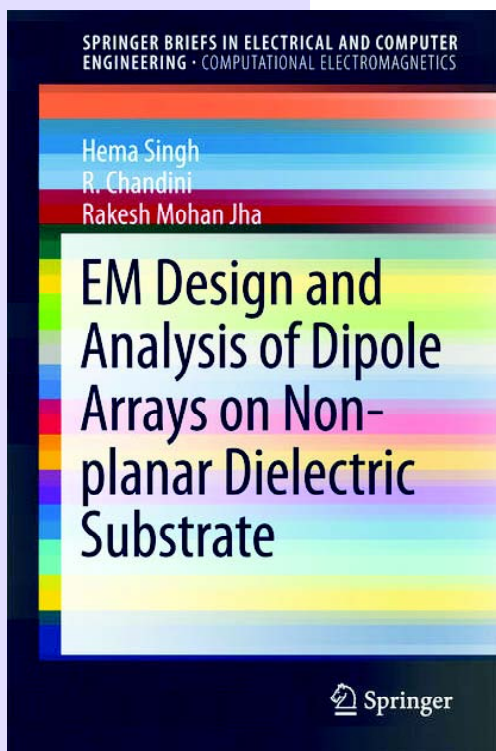
before reaching receive port of the array system.

In this book, the RCS of a parallel-fed linear and planar dipole array is derived using an approximate method. The RCS is approximated in terms of array factor, neglecting the phase terms. The mutual coupling effect is taken into account. The dependence of the RCS pattern on the design parameters is analyzed. The approximate model is established as an efficient method for RCS estimation of phased arrays.

This book presents a detailed formulation of approximate method to determine RCS of phased arrays, which is explained using schematics, and illustrations. This book should help the reader to understand the impinging signal path and its reflections/transmissions within the phased array system.



***EM Design and Analysis of Dipole Arrays on Non-planar Dielectric Substrate by Hema Singh, Chandini R., R.M. Jha (CSIR-National Aerospace Laboratories)***



Printed dipole antennas are known to be simple but more efficient than the wire antenna. The dielectric substrate and the presence of ground plane affect the antenna performance and the resonant frequency gets shifted. This book includes the electromagnetic (EM) design and performance analysis of printed dipole array on planar and cylindrical substrate. The antenna element is taken as half-wave centre-fed dipole. The substrate is taken as low-loss dielectric. The effect of substrate material, ground plane,

and the curvature effect is discussed. Results are presented for both linear and planar dipole array. The performance of dipole array is analyzed in terms of input impedance, return loss, and radiation pattern for different configurations. The effect of curved platform (substrate and ground plane) on the radiation behavior of dipole array is analyzed.

This book presents a simple and systematic description of EM design of antenna array. It explains fundamentals of EM design and analysis of dipole antenna array through numerous illustrations. This book focuses primarily on electromagnetic design and performance analysis to dipole antenna array on planar and cylindrical dielectric substrate. It is essentially a step-to-step guide for beginners in the field of antenna array design and engineering.

## Forthcoming Events

# 17<sup>th</sup> National Workshop on Challenges in Catalysis Science and Technology (CCST-2016)

The CSIR-Indian Institute of Chemical Technology, Hyderabad is organising on behalf of the Catalysis Society of India (CSI), the "17th National Workshop on Challenges in Catalysis Science and Technology (CCST-2016)" during June 23-25, 2016 at CSIR-IICT, Hyderabad.

Catalysis is one of the core areas of chemical sciences and plays a pivotal role in the production of large proportion of chemical products, which are useful for the well being of the humanity. However, the art of this practicing science is changing at a faster pace than changes in environmental regulations. One of the challenging tasks for the catalysis community is to develop chemical processes imbibing the green and sustainable principles. The primary objective of this three-day workshop is to bring together chemists from academia and industry with complementary strength and diverse expertise. This platform particularly provides an unique opportunity for the participants to discuss various aspects of catalysis in developing green and sustainable chemistry relevant to the industry.

### Topics to be covered

- Homogeneous and Hetero-geneous catalysis
- Synthesis and characterization of novel catalysts
- Hybrid materials
- Biomass conversion into useful products
- Green catalysis in organic synthesis
- Alternative feed stocks
- Clean and Alternative Energy

The delegates and participants are requested to register online on or before 16th May 2016 by logging on to <http://www.iictindia.org/ccst2016> by filling the online registration form.

### Registration Fee Details

CSI Members	Rs. 1500
Academic	Rs. 3000
Industry	Rs. 5000
Students	Rs. 2000

### Mode of Payment

The registration fee may be paid in the form of Demand Draft in favour of Director-IICT payable at State Bank of Hyderabad, CSIR-Indian Institute of Chemical Technology, Tarnaka, Uppal Road, Hyderabad - 500 007.

**Note:** Must indicate on the back side of the DD, for CCST-2016, your Registration No., Name and contact details

### Abstract Submission

The abstracts may be uploaded to the website [www.iictindia.org/ccst2016](http://www.iictindia.org/ccst2016) on or before May 16, 2016. Please prepare the abstracts as a single page word document in the format available on the website. Kindly make sure that your abstract is uploaded before the last date. List of accepted abstracts for poster presentation will be uploaded in the website in the last week of May 2016.

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Appointments

**Prof. (Dr.) Harish Hirani takes over as new Director of CSIR-CMERI**



Prof. (Dr.) Harish Hirani took over as the Director of the CSIR-Central Mechanical Engineering Research Institute (CMERI), Durgapur on 16 March 2016. Earlier, he was JEE (Advanced) Vice Chairman (2014-2016) and Professor in IIT Delhi.

Prof. Hirani did his B.E in Mechanical Engineering from Rajasthan Technical University (formerly known as Govt. College of Engineering) Kota in 1992 and M.E. in Machine Design from IIT Roorkee in 1994 and Ph.D. in 1999 from IIT Delhi.

For his research achievements, Prof. Harish Hirani had been accorded the prestigious "BOYSCAST fellowship". His three scientific papers have received the Best research paper award. He has also secured five patents.

His book *Fundamentals of Engineering Tribology with Applications*, published by Cambridge University Press has proven to be a success. He has organized and conducted more than 25 short-term training courses for learners from all walks of life.

With a robust 16 years of experience in teaching and research, Prof. Harish Hirani always aimed to inculcate the value of developing innovative products among Scientists/Researchers and learners for the benefit of the Indian masses. To achieve these goals, he initiated courses on "Design Methodology" and "Design of Machines" to outline and describe all the necessary steps required from generating an idea for the solution of a problem until its final physical realization.

**Nominations are invited for**

**G N Ramachandran Gold Medal for Excellence in Biological Sciences & Technology-2016**

The Council of Scientific & Industrial Research (CSIR) invites nominations for the **G N Ramachandran Gold Medal for Excellence in Biological Sciences & Technology for the year 2016**. The award is bestowed every year to an outstanding Indian scientist, who has made conspicuously important contributions, applied or fundamental, in the inter-disciplinary subject/field of Biological Sciences and Technology. The award would be given for the work done primarily in India during ten years preceding the year of the award.

Nominations addressed to Scientist Incharge, SSB YSA Unit, Human Resource Development Group, CSIR Complex, Library Avenue, Pusa, New Delhi 110 012 should be sent as per prescribed proforma (Original + one copy) along with reprints of five most significant publications of the last 10-year's period by **31 May 2016**.

The details of the award and the prescribed proforma for nomination may be downloaded from the website [www.csirhrdg.res.in](http://www.csirhrdg.res.in).

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