in-house using the garden waste generated in the campus; and vi) Use of plastic gifts and mementos has been discouraged in the school programmes.

Many public awareness programmes were also arranged to educate and motivate the community, like: i) Special exhibitions by students on various environmental themes as 'Stop using Plastic'; ii) Organization of seminar on waste management with focus on 'Reduce, Reuse, and Recycle' by eminent personalities; iii) Workshop for domestic maids on personal hygiene; iv) Felicitation of cosmetic workers; v) Display of attractive awareness posters on cleanliness at various locations; vi) Short-films highlighting the importance of cleanliness were shown to the school students, the public gathering during 'Durga Puja', cosmetic workers, and to the audience of cultural programmes conducted by HBNI scholars.

Earlier the solid wastes had to be land filled in the RRCAT campus which is now being sent to IMC for their proper disposal.

Some of the pictures from the public awareness events and the cleanliness campaigns held during year 2017.

The Construction and Services Division and Horticulture Cell have provided essential support for the implementation of cleanliness initiatives to make the campus a wonderful living place. The guiding light throughout all these cleanliness campaigns has been Dr. P. A. Naik, Director, RRCAT, who has been participating in almost every campaign. It is now our responsibility to inculcate good cleanliness practices and adopt newer technological means to take this work ahead.

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N.7: RRCAT Seminars during July-December 2017

National Nanofabrication Centre: facilities and collaboration oppotunities: *Dr Y. P. Prabhakar Rao, Chief Operating Officer, National Nanofabrication facility, CeNSE, IISc, Bangalore, July 11, 2017.*

National Nanofabrication facility (NNfC), is a state of the art Micro and Nano fabrication facility open to the nation. The facility is capable of realizing micro and nanoscale devices on various substrates that include Si, GaN, SiC, quartz, Glass, Graphene, and III-V. The facility houses industry standard tools geared to realize a wide variety of Semiconductor Devices, MEMS/NEMS, Photonics, Photovoltaics, Microfluidic and Biosensors. The national facility is open to public and private academic institutes, private industries, public sector undertaking and Indian strategic sector. The NNfC is a part of the Center for Nano Science and Engineering (CeNSE), which is an academic unit at Indian Institute of Science (IISc), Bangalore. CeNSE strive to support cutting-edge research as well as products of national relevance. To support this endeavor, in addition to NNfC, two unique state-of-the-art Micro and Nano Characterization Facility (MNCF) and Packaging facility render characterization and prototyping all under one roof. This is a unique facility not just in India but anywhere else in any academic institution. In this talk, an outline was given for the NNfC facility and capability, facility access model and mode of collaboration with strategic laboratories.

Structural and magnetic characterization of magnetic nanoparticles and thin films: *Dr. Durgamadhab Mishra, Professor, Ruhr University, Bochum, Germany, Aug 23, 2017.*

Magnetic nanomaterials, thin films and nanoparticles are at the forefront of research in nanoscience. They have proved their potentials in the field of nanoelectronics, spintronics, energy, catalysis, bio-medicine and many more, and continue to show a lot of promise for future novel applications. Therefore, it is necessary to develop advanced, cost effective and scalable synthesis processes and modern characterization tools to realize desired application. Synchrotron and neutron radiation play an important role during characterization process as they are routinely used for structural and magnetic characterization. Dr. Mishra explored

three different aspects of use of synchrotron radiation for various characterization. First, structural and magnetic characterization of self-assembled iron oxide nanoparticles using various techniques such as GIXRD, GISAXS, XRR and polarized neutron reflectivity (PNR). Second, soft x-ray magnetic scattering of various magnetic thin films and multilayers. Finally, coherent x-ray scattering and imaging performed at CXS chamber at Bessy II. All these aspects were shown during the talk and a future outlook was presented.

Extreme conditions research: from space to space elevators (RRCAT Colloquium): *Dr. Maddury S Somayazulu, Geophysical Laboratory, Carnegie Institution of Washington, Washington DC, USA, Aug 30, 2017.*

The study of matter at extreme conditions of pressure and temperature is central to many fundamental and exciting scientific challenges in the physical sciences. It provides the foundational research for addressing significant national security objectives related to both military (conventional and nuclear security) and energy (fusion, hydrogen economy) needs. The advances in extreme conditions research have reflected a very close synergy between synchrotron experimental techniques and high pressure-high temperature techniques to a point where both static and dynamic measurements seem to be converging. The underlying scientific quest in extreme conditions research is still trying to find out how things happened. Some of the questions being still asked are related to how was earth formed? What is the origin of life? At the same time, extreme conditions research is throwing up wonder materials like carbon nanothreads, silicon clathrates which could form the backbone to space elevators and new solar cells. The talk highlighted some of these discoveries and shared the excitement that drives this field of scientific research.

Solar powered PMBLDC motor pump: *Shri Jayakumar C, Construction and Services Division, RRCAT, Indore, September 12, 2017.*

A 5 HP solar powered PMBLDC motor pump set developed in BARC has been installed in RRCAT for demonstration purpose. The same was inaugurated by Chairman, AEC & Secretary, DAE on 29th July, 2017. The talk covered the advantages of solar pumps, PMBLDC motor, manual solar tracking system, sun trajectory etc.

Photons for food and medicine: *Prof. Chilakamarri Rangacharyulu, Suptd. Dept. of Physics and Engineering Physics at University of Saskatchewan, Saskatoon, Canada, November 13, 2017.*

Since their discoveries, x-rays and MeV photons have found applications in various technologies including food and medicine. With ever increasing global population, much attention is being paid to increase food production both in quantities and varieties. The treatment of food with photons is intended to help mitigate food security and safety issues by increasing the shelf life to reduce the waste and sterilize it to control pathogens. On health front, photons are used for diagnostic and therapeutic purposes both intravenously or as external radiations. The nuclear imaging heavily relies on 1 or 2 photon emission sources and back projection techniques for tumor detection. It is important to note that while radiation technologies have been in use for several decades, there is yet room to vastly improve their efficiencies and reduce the risks. In this talk, the essential considerations to minimize adverse side effects and increase efficiencies were pointed out. Talk briefly touched on the developments in radiation sources, specific isotopes for medical imaging and modes of their production. After a brief sketch of the history and current state of the art of these technologies, future prospects for better optimization of the food irradiation and medical imaging by photons were also suggested by the speaker.

Probing electronic excitations in real time: what is it good for? *Prof. Uwe Bovensiepen, Faculty of Physics, University of Duisburg-Essen, Duisburg, Germany, December 04, 2017.*

Thermodynamics provides excellent means to describe broken symmetry ground states of condensed matter in thermal equilibrium because the temperature determines the population of excited states and the resulting overall energy minimization leads to, e. g., structural transitions, magnetic order, or superconductivity. However, identification of the microscopic interactions, which generate such symmetry breaking, is far from trivial due to cooperation or competition of various interactions. Experiments in the time domain provide additional insights in this regard because they operate on the characteristic time scales of such interactions. In particular, femtosecond laser based pump-probe experiments address these time scales for elementary processes. Recent results from the fields of surface science, strongly correlated materials, and magnetism were discussed.

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