

Young Indian Scientists Colloquium*

The first Young Indian Scientists Colloquium (YISC 2009), a Homi Bhabha Birth Centenary Commemoration initiative, was conceived and organized at the Tata Institute of Fundamental Research (TIFR). The colloquium was chaired by R. V. Gurjar (TIFR, Mumbai). Eighteen invited speakers delivered lectures at this meeting, which was attended among others, by about a 100 invited college and university teachers from all over India. G. Venkataraman (author of *Bhabha and his Magnificent Obsessions*) was the prominent speaker at the inaugural session. He joined TIFR as a graduate student in 1955 and has written extensively on various science topics including biographies of C. V. Raman and Homi Bhabha. Articulating the need for Indian universities to have a strong Ph D training programme with emphasis on problem-solving activity, he stressed the necessity for proactive encouragement of interdisciplinary research. He exhorted the researchers at universities to collectively take up large-scale experimental research activities, such as establishing a Linac-based coherent light source by 2016 as an alternative to the much sought-after push-button research. Saluting the achievements of Homi Bhabha, he brought out some subtle points of Bhabha as a person and a scientist.

A. Das (Institute for Plasma Research, Gandhinagar) in her talk titled 'Plasma: an interesting complex medium' highlighted the complex medium of plasma and how it can be triggered conveniently with current laser methods, and applications in this particular regime of plasma. In his presentation on 'The elusive neutrino', A. Dighe (TIFR, Mumbai) talked about the recent discoveries of neutrino masses and mixing. He also described the efforts involved in unravelling the nature of these elusive particles. M. Krishnamurthy (TIFR, Mumbai) delivered a talk on the properties of intense lasers that can produce hot dense plasmas and attempts to improve the intensity with

pre-pulses. He also explained the usefulness of infrared light in tiny systems.

K. Maiti (TIFR, Mumbai) dwelt on 'Precursor effect in magnetic and superconducting transitions' using methods such as high-resolution photoemission spectroscopy and extended X-ray absorption fine structure in an attempt to understand the origin of the temperature at which signatures of short-range order appear. R. Srikanth (Inter-University Centre for Astronomy and Astrophysics, Pune) focused on using high-quality absorption spectra of distant quasistellar objects to investigate possible time variations of fundamental physical quantities such as fine structure constant with observations made using the giant metre-wave radio telescope.

An overview of string theory and attempts to understanding spacetime in a rigorous framework was given by R. Gopakumar (Harish-Chandra Research Institute, Allahabad). S. Sastry (Jawaharlal Centre for Advanced Scientific Research, Bangalore) delivered a talk titled 'Liquid-liquid transition and anomalous properties of water, silicon and other "tetrahedral" liquids'. He described the transitions that have been proposed to understand various properties of water and the transition between amorphous solid silicon and liquid silicon arising from a liquid-liquid transition. J. Radhakrishnan (TIFR, Mumbai) talked about Shannon entropy and mutual information highlighting the notion of entropy as a measure of uncertainty in a random variable and application in combinatorics.

With his interesting talk on 'Molecular motors: the ultimate nanoscale machines designed by nature', R. Mallik (TIFR, Mumbai) discussed molecular motor proteins and studies to understand the mechanism of such systems. Molecular motors are 'nanoscale proteins that burn energy to move around inside the cells of the body and carry cargoes that are precisely delivered to specific locations in the cells'. M. Rao (Raman Research Institute, Bangalore) spoke on elucidation of active organization on cell surface using non-equilibrium thermodynamics principles and implications on both endocytosis and signalling. M. Puranik

(National Centre for Biological Sciences, Bangalore) dealt with the understanding of conformational changes in enzymes using a host of methods such as ultraviolet resonance Raman spectroscopy and density functional theory. S. Maiti (TIFR, Mumbai) talked about aggregation and fibrilization in amyloid beta proteins studied with single-molecule and time resolved fluorescence, optical microscopy, electron microscopy and NMR methods. These amyloid proteins are responsible for causing diseases like Alzheimer's and Parkinson's disease. S. Tole (TIFR, Mumbai) highlighted a genetic mechanism that acts to create the cerebral cortex in an attempt to understand how the brain is built and how brain structures are located at precise places. Her results revealed how brain structures are organized.

'Quantum mechanics, E -semigroups and product systems' was the theme of B. V. R. Bhat (Indian Statistical Institute, Bangalore). In his presentation, he talked about quantum mechanics of open systems through semigroups of contractive completely positive maps and attempts to understand the variety of product systems. While R. Sujatha (TIFR, Mumbai) outlined various aspects of number theory and elliptic curves, S. Gadgil (Indian Institute of Science, Bangalore) explained algebraic construction schemes to construct and describe manifolds, detect smooth structures on Euclidean space, and relation between topology and geometry in certain dimensions. V. Balaji (Chennai Mathematical Institute, Chennai) dealt with the understanding of stable bundles and geometry of bundles on projective varieties. M. Agrawal (Indian Institute of Technology, Kanpur) put forth the $P \neq NP$ hypothesis which essentially means that there are problems whose solutions are easy to verify but hard to compute, and attempts to prove this hypothesis.

A highlight of the YISC 2009 was a panel discussion chaired by R. Srinivasan (former Director, IUC, Indore), N. Mukunda (Indian Academy of Sciences, Bangalore) and Vijay Singh (Homi Bhabha Centre for Science Education, Mumbai). V. Singh outlined the various programmes of the Homi Bhabha

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Centre for Science Education. Mukunda expressed hope that in future editions of YISC, there would be speakers representing a wider cross-section of Indian universities. R. Srinivasan dwelt on his new venture of building kits for demonstrating various experiments for the benefit of colleges.

There was immense interaction between the audience and the panel chairs and this mainly dealt with the conditions in the university sector both in teaching and research, expectations from premier research institutes, and science academies. Also, there were discussions between various TIFR faculty members and the

invited college teachers. A formal laboratory visit programme was held, in which various TIFR groups actively participated, such as high energy physics group, gravitation group, NMR facility, pelletron, cryogenics, fluorescence correlation spectroscopy laboratories, astrophysics group, biology labs and supercomputer centre. These visits enabled the participants to witness the state-of-the-art in Indian science and interact with TIFR scientists, many of whom identified niche issues to explore using facilities in TIFR. M. Barma (Director, TIFR) also offered support to facilitate future individual interactions with college teachers.

N. Mukunda supported the proposal to host YISC-like venture every two years at different venues in India. It is hoped that YISC series will become a national event to disseminate scientific contributions by young researchers in India to the community of college teachers.

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MEETING REPORT

Earth system processes and disaster management*

A three-day National Conference on 'Earth system processes and disaster management' was conducted to understand earth processes and disaster management with special emphasis on climate change. There were seven highly interdisciplinary thematic sessions with 25 invited papers and 15 short presentations.

In the inaugural address, S. K. Tandon (Pro-Vice Chancellor, Delhi University) discussed natural climate variability from inter-annual to millennium scale emphasizing on the dynamics of the coupled climate system which is likely to be disturbed by anthropogenic factors. He gave special focus to the sustainability of the river systems of India which have been cradles of Indian civilization. N. K. Dutta (Director General, Geological Survey of India) emphasized the need for integration of multidisciplinary data to understand the processes which will be helpful in disaster mitigation.

The session on 'Atmospheric and surface processes' started with a lecture by D. R. Sikka by who elaborated on the development of early warning systems

for hydro-meteorological natural disasters. Giving an account of the march from climatology to dynamical weather prediction and climate prediction in the emerging climate change scenario, he emphasized that the mitigation of hydro-meteorological disaster rests with better monitoring, better modelling efforts and better communication of threat perception in a probabilistic manner for which public awareness is to be aggressively promoted. D. K. Pal (National Bureau of Soil Survey and Land Use Planning, Nagpur) focused on the soil resources of India and discussed the utility of clay minerals as a palaeoclimate proxy. Deepak Srivastava (Centre for Glaciological Studies, WIHG) pointed out that any imbalance in the glacier regime of Himalayas, triggered by natural as well as anthropogenic impacts of climate change, affects the water balance of the region. M. Baba (CESS) emphasized the role of multidisciplinary studies in earth sciences in disaster mitigation. Amit Dharwadkar (GSI) revealed that the recession of the Dakshin Gangotri glacier snout, Schirmacher Oasis, east Antarctica between 1983 and 2009 has varied from 0.57 to 0.78 m per year.

In the 'Subsurface processes and hydrology' session, K. R. Gupta highlighted the importance of shallow subsurface studies in India, and emphasized that shallow subsurface of earth down to a

maximum depth of 200 m is the critical layer on which, in which and with which we build and live. Motivated by a mix of scientific, environmental, economic, health and safety concerns, it is imperative to study and understand the shallow subsurface. S. Rajan (NCAOR) explored different aspects of the extended continental shelves beyond 200 nautical miles. Spread over nearly two years, over 31,000 line km of multichannel seismic reflection, gravity and magnetic data together with bathymetric information was acquired along 42 pre-determined profiles. Manohar Arora (NIH) elaborated upon the impact of climate change on stream flow volume as well as the temporal distribution throughout the year over the Asian region, imposing significant stress on the water resources in the region. J. K. Pati (Allahabad University) discussed progress and breakthroughs in studies on the Dhala impact structure, Central India.

The 'Natural disaster' session covered issues of earthquakes, floods, landslides and tsunami with particular reference to Indian scenario. R. K. Chadha (NGRI) presented an account of studies taken up in the Indo-Gangetic plains in general and Lucknow city in particular, to understand the tectonics and hazards where initial results on site response investigations have shown encouraging results. V. Bhanumurthy (NRSC) emphasized on the

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