

build safeguards to stop flight of faculty, mentioning that factors like job security are also important. The foreign education providers will be Indian entities, the degrees will be Indian degrees and no equivalence with foreign degrees is guaranteed, but these universities will play an important role in enhancing the number of students in higher education⁶.

Supporters of the Bill believe that students who leave India will stay back to study in the branch campuses of foreign universities. But the ground reality is that a small section of Indian students go abroad in the hope of settling down there, or on the lookout for international campus atmosphere. To imagine that teleconferencing and foreign textbooks in branch campuses would provide a significant alternative to such students is incorrect. Hence branch campuses of foreign universities are for those students who stay back and not for those who want to leave.

According to M. Singaravel (Banaras Hindu University, Varanasi), 'foreign universities will certainly bring competition between public funded educational institutes and foreign universities while accommodating maximum number of students in higher education. Still before allowing the foreign universities on Indian soils some important points should be taken into account, like quali-

fications and pay scales of staff, student strength, course fees and curriculum. All these factors should be conducive to the Indian education system.'

Neither Harvard nor Columbia University or any other top-ranking institution would come to India, according to Madras University Vice-Chancellor, G. Thiruvassagam. 'Even the universities which come here would not offer a need-based curriculum. That's why even within the country and state we are opposed to a common curriculum under which the local needs are not addressed. In Coimbatore, for instance, a university could offer a course in textiles or in Tirunelveli one could teach courses on fisheries. This need-based approach would be missing in foreign universities.'

According to A. P. Nandini (M.N.M. Jain Engineering College of Anna University, Chennai), at present the appointments of teachers in public funded institutions are based on a set of eligibility criteria, whereas it may not be so in private institutions which compromise on the quality of teachers. Guidelines have to be set to avoid this in foreign institutions. The competition between public funded institutions and private/foreign institutions will compel every faculty member to perform. Faculty will move from Indian to foreign institutions not

only for the hefty salary packages, but also for recognition.

According to Devinder Sharma (Chairperson, Forum for Biotechnology and Food Security, New Delhi), 'The first two universities the world has ever known are Takshila and Nalanda. Their construction is considered to be one of the greatest achievements in the field of education. Isn't it a shame that the country that gave the world its first universities, is now feeling thrilled by the decision that some foreign universities are likely to open campuses in India to bring quality in Indian education system.'

1. India needs 800 more universities: Sibal. *Deccan Herald*, 14 April 2011.
2. Lok Sabha Starred Question No. 162, answered on 15 July 2009, Ministry of Overseas Indian Affairs, GoI.
3. Report to the Nation: 2006–2009, National Knowledge Commission, GoI, March 2009.
4. Unstarred Question No. 5332, answered on 28 April 2010, Ministry of Human Resource Development, GoI.
5. Mehta, P. B., Course correction, *Indian Express*, 8 May 2010.
6. Rahman, S., Foreign Universities: Degrees of Debate, *India Today*, 1 May 2010.

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MEETING REPORT

Seventy-seventh annual meeting of the Academy*

The 77th annual meeting of the Indian Academy of Sciences, Bangalore was held this year at the Physical Research Laboratory (PRL) in Ahmedabad for the fourth time (2011, 1992, 1968, 1953). PRL was founded by Vikram A. Sarabhai, the Father of Space Science in India. He also established the Indian Institute of Management Ahmedabad, Vikram A Sarabhai Community Science Centre and Ahmedabad Textile Industry's Research Asso-

ciation. The Space Applications Centre (SAC) was created by merging different experimental units started by Sarabhai.

The organizers had arranged a visit to SAC/Institute for Plasma Research (IPR) and Akshardham temple, an architectural marvel which hosted a light and water show portraying the scientific concepts of turbulence, hydraulics, lasers and projections. Another combination of art and science was the 'Dance of life', which featured Mallika Sarabhai and her team enacting the discovery of the place holder zero, the development of algebra and Ayurveda, and the first nose surgery.

The meeting began with the presidential address by A. K. Sood (Indian Institute of Science (IISc), Bangalore). He discussed shear thinning, shear thicken-

ing, instabilities and elastic turbulence in soft matter or condensed fluids. The salient features in these fluids are: (i) the constituents are large polyatomic structures, (ii) they have very low elastic constants, and (iii) they show strong response to modest external perturbations, which give them unusual flow properties. Sood indicated that these colloidal systems present a new paradigm for exploring non-equilibrium physics.

The rheology and segregation of granular mixtures in dense flows was explained by Devang V. Khakhar (Indian Institute of Technology (IIT) Bombay, Mumbai) in a special lecture. He concluded that simple continuum models give a good description of flow and segregation in the dense flow regime. The challenges

*A report on the seventy-seventh annual meeting of the Indian Academy of Sciences, Bangalore held during 18–20 November 2011 at the Physical Research Laboratory (PRL), Ahmedabad and jointly organized by PRL, Space Applications Centre and Institute for Plasma Research, Ahmedabad.



1968: Fellows of the Indian Academy of Sciences at its 34th annual meeting at the Physical Research Laboratory, Ahmedabad.

This photograph is displayed outside the K. R. Ramanathan auditorium in PRL where the 77th meeting was held this year.

arise in direct comparison of results to simulations, non-spherical particles, beyond shear flow and cohesive forces. In another special lecture, Samir K. Brahmachari (Council of Scientific and Industrial Research, New Delhi) explained the development of a web-based open innovation platform, involving a large number of students, for drug discovery for tuberculosis. The availability of genome sequences of a large number of pathogens will open up new opportunities to identify the Achilles heel in *Mycobacterium tuberculosis*.

The first symposium was on 'Chemical biology', which Siddhartha Roy (Indian Institute of Chemical Biology, Kolkata) termed as 'probing holistic biological structures with chemical tools' as compared to biological chemistry which also uses chemical tools, but is reductive in philosophy. His talk focused on the study of individual chemical modifications in regulatory networks in a cell, specifically whether peptide models could be used to understand the role of specific acetylations in the p53 network. He posed future questions: (i) what classes of p53 regulated genes are activated by the human transcriptional positive coactivator 4 (PC4)? (ii) are there other partners for PC4? Ram A. Vishwakarma (Indian Institute of Integrative Medicine, Jammu) spoke of his team's work on synthesis of full-length glycosylphos-

phatidylinositol (GPI) anchors and the questions sought to be answered through such synthesis, like the topology of GPI biosynthetic pathway in endoplasmic reticulum membrane. R. Nagaraj (Centre for Cellular and Molecular Biology, Hyderabad) described the study of aggregation behaviour of amyloid-forming peptides *in vitro*. His group found that structures with varying morphologies can be obtained depending on solvent of dissolution and surface of deposition, and they could be intermediates in the formation of mature amyloid fibrils. Studies done by N. Jayaraman (IISc) showed that synthetic glycolipids express a molecular mimicry function through which they inhibit mycobacterial growth, arrest sliding motility and impair biofilm formation.

The second symposium was on 'Recent trends in high energy physics/fundamental physics challenges in plasma physics'. The purpose of the Large Hadron Collider at CERN, Geneva, is to address unanswered questions in particle physics. India is a major participant and is involved in the Compact Muon Solenoid experiment. The recent findings from this experiment were discussed by Sunanda Banerjee (Saha Institute of Nuclear Physics, Kolkata). Saurabh D. Rindani (PRL) explained the shortcomings of the standard model of elementary particle physics and pointed out the attempts made to overcome them.

The standard model of hot big bang cosmology has to be changed to account for the larger-than-horizon perturbations in the cosmic microwave background observed by the COBE and WMAP experiments. A survey of the beyond-standard cosmological model scenarios and other related observations was described by S. Mohanty (PRL). The current understanding of turbulence-induced transports and the research related to Indian tokamaks like Aditya and SINP were presented by R. Jha (IPR). G. Ravindra Kumar (Tata Institute of Fundamental Research (TIFR), Mumbai) introduced the topic of high energy density science with laser light and then elaborated on how light couples to plasma and how to deal with the consequences of this coupling.

The lectures by Fellows and Associates ranged from climate change, cosmology, drug and vaccine development, neural mechanisms and superconductivity to morphism; some of them are presented below. S. K. Satheesh (IISc) indicated that recently there has been substantial increase in black carbon (BC) aerosols and its relation with climate change. There is a tendency to project mitigation of BC as an immediate solution to climate change, but studies have shown that this is not applicable everywhere and may even have the reverse effect.

Debajyoti Choudhury (University of Delhi, Delhi) spoke about the standard Friedmann–Robertson–Walker model of cosmological evolution and how introducing a delay in this model may obviate the need for a scalar field-driven inflation. J. N. Chengalur (National Centre for Radio Astrophysics–TIFR, Pune) elaborated on the study of dwarf galaxies, which could lead to insights into the formation and evolution of galaxies in the early universe. The records of short-lived, mantle-generated magmatic events and the dyke swarms of the Indian shield during the Precambrian era were explained by Rajesh K. Srivastava (Banaras Hindu University, Varanasi).

Using *in silico* tools, Balam Ghosh (Institute of Genomics and Integrative Biology, New Delhi) and his team have identified microRNAs which regulate the expression of IL-10 and IL-13. He discussed the relevance of their work in therapeutics development for immunological diseases. B. N. Mallick (Jawaharlal Nehru University (JNU), New Delhi) explained the development of selective

inhibitory process in the brain and inhibition of noradrenergic REM-OFF neurons by GABA, which determines rapid eye movement sleep (REMS) regulation.

Sandeep Verma (IIT Kanpur, Kanpur) spoke on metal–nucleobase interactions and the different structures synthesized by various modifications in the adenine molecule at the N9 position. The structural transformation of gold clusters has been investigated by Ayan Datta (Indian Institute of Science Education and Research, Thiruvananthapuram). He explained that adding a single heteroatom to a planar Au cluster can lead to the formation of stable bimetallic alloys.

A. K. Ganguli (IIT Delhi, New Delhi) focused on the pnictide superconductors

developed so far, their transport properties, and the commonalities and differences with other superconducting families. The phases and phase transitions obtained by trapping bosons in optical lattices were explained by Subroto Mukerjee (IISc). Basudeb Datta (IISc) discussed stacked spheres (*k*-stacked and *k*-stellated) and the combinatorial proof of the lower bound theorem. D. S. Nagaraj (The Institute of Mathematical Sciences, Chennai) described how given two varieties, one tries to describe all possibilities, the morphisms between them, and study the properties of these morphisms.

The first public lecture by Sudhir Kakar (a psychoanalyst and writer) on ‘A creative melancholy: the paintings of

Rabindranath Tagore’ dealt with the subconscious elements that wanted expression through his paintings. The crisis in the philosophical foundations of science and social science, due to intense commercialization and materialism, was described by Sudarshan Iyengar (Gujarat Vidyapith, Ahmedabad) in the second public lecture on ‘Science–social science interface’.

Overall, this meeting gave a historical, cultural, scientific and artistic flavour to the technical proceedings.

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MEETING REPORT

Revisiting the Shiva crater hypothesis*

The mass extinction that occurred at about 65 million years (m.y.) ago, at the Cretaceous–Tertiary (K/T) boundary was enormous, significant and very much debated. The bolide (asteroid) impact as the cause of mass extinction is bolstered with the discovery of the Chicxulub crater of 180 km diameter beneath the shore of the Yucatan Peninsula in Mexico¹. The detailed geochemical and petrological studies, radiometric age dating of impact-caused-melt rocks within this crater, and presence of tsunami deposits in the surrounding locations confirm the impact origin of the Chicxulub crater at 65 Ma and its contribution to global mass extinction. In contrast, the Deccan flood basalt volcanism at 65 Ma is considered by many others, as the possible reason for mass extinction at the K/T boundary². Rapid warming and cooling of global ocean water by about 3–4°C, emission of roughly 10,000 Gt of sulphur gas into the atmosphere and gigantic extension of the basalt province are considered to have played a pivotal role in this mass extinction.

In this contrasting scenario, an international meeting was held at the National Institute of Oceanography, Goa. The meeting discussed newer evidences for

multiple major meteoritic impacts on the Earth across the K/T boundary. This includes, besides Chicxulub, the Shiva crater (diameter ~ 500 km) off the shore

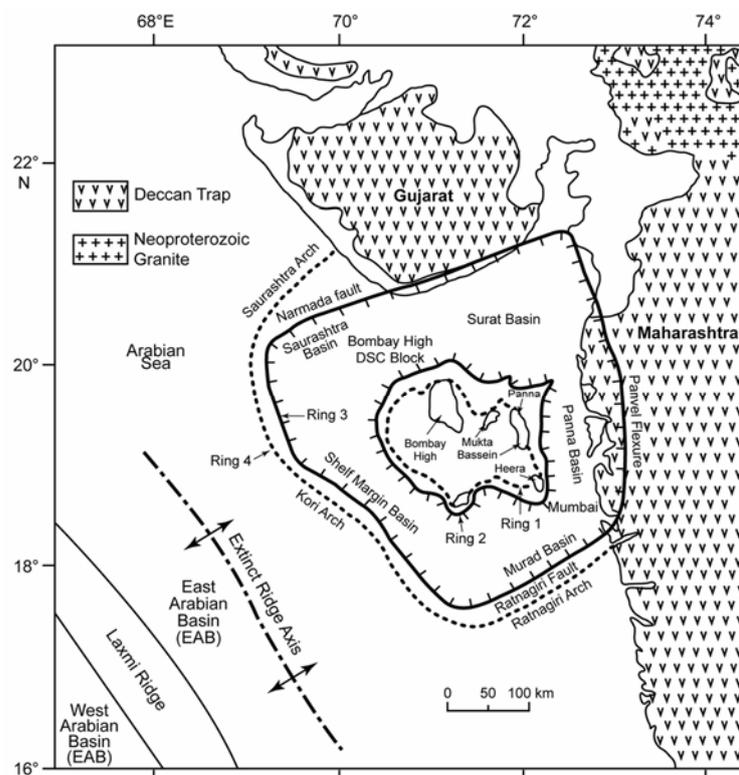


Figure 1. Oil-bearing multi-peak Shiva crater, offshore Mumbai, western shelf of India. Note four ring structures with annular trough and faulted outer rim (after Chatterjee *et al.*³).

*A report on the ‘Brainstorm meeting’, participated by scientists from USA and India, held at National Institute of Oceanography, Goa, on 5 and 6 July 2011 to examine the ‘K–T boundary status and associated geodynamics on the West Coast of India’.