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Newsletter of the Indian Academy of Sciences

SEVENTY-SIXTH ANNUAL MEETING

National Institute of Oceanography, Goa

12 – 14 November 2010

The Seventy-Sixth Annual Meeting of the Academy was held during 12–14 November 2010, hosted and organized by the National Institute of Oceanography at Dona Paula in Goa.

This was a return to this charming city a decade after the meeting in 2000 was held there. The attendance was particularly good, with over 250 Fellows and Associates (including spouses), and 28 teacher invitees present.

The opening address titled "Nano-tube dynamo and graphene" by the President **Prof. Ajay Kumar Sood** described in a lucid and extremely well-illustrated manner the work in his laboratory on various properties of nano forms of carbon. This was very timely as the 2010 Nobel Prize in Physics awarded to Geim and Novoselov recognized their 'ground breaking experiments regarding the two-dimensional material graphene'. In this context it was most interesting to remember that while coal, graphite and diamond have been known to mankind for millennia, the newer forms of this amazing chemical element – fullerenes, nano tubes and graphene – have been discovered by humans only over the past few decades. The address described studies which can lead to a wide variety of possible applications – drug delivery, liquid flow-induced voltages, vibration sensors, inter-connects, and materials combining flexibility with amazing strength, to name just a few.

The programme included two special scientific lectures, two public lectures, two mini symposia and 18 presentations by newly elected Fellows and Associates. The public

Inside....

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Forthcoming Events

D Twenty-second mid-year meeting, Bangalore : 8 – 9 July 2011

Refresher Courses

D Experimental physics XXIX
SICES Degree College of Arts, Science and Commerce
Ambernath (Maharashtra) : 7 – 22 June 2011

D Motivational bridge course in mathematical methods in physics and laboratory practices for I and II year B.Sc. students
Deogiri College, Aurangabad : 15 June – 8 July 2011

D Experimental physics XXX
Indian Institute of Technology Madras, Chennai : 11 – 27 July 2011

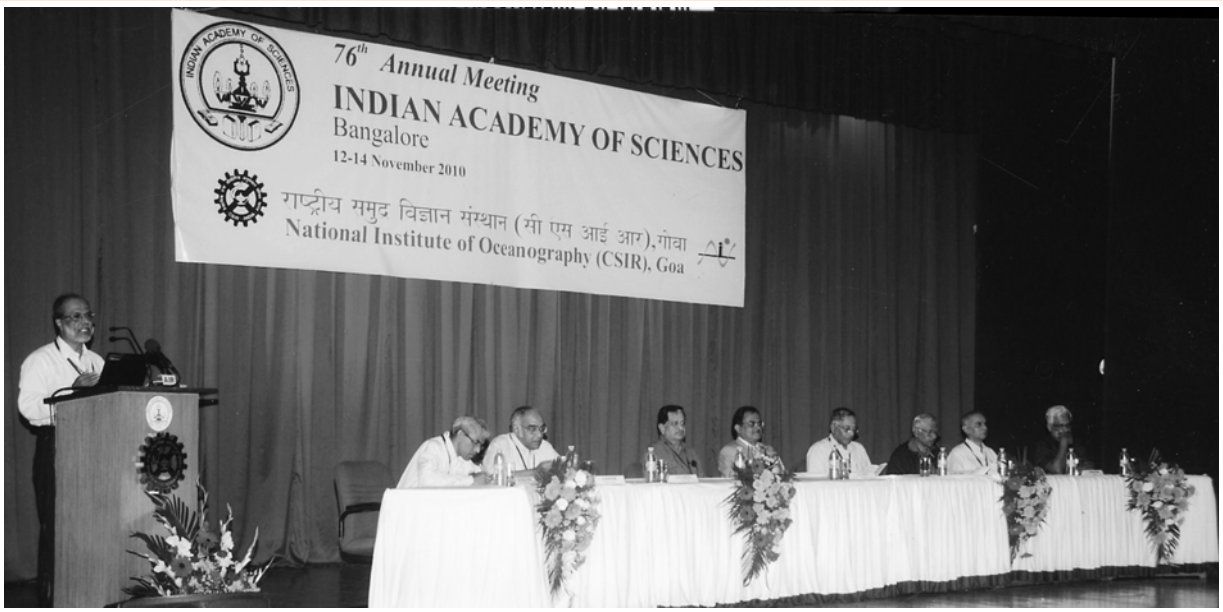
D Experimental physics XXXI
Don Bosco Institute of Technology, Bangalore : 8 – 23 August 2011

Lecture Workshops

D Mathematical analysis
Amrita School of Arts and Science, Kollam : 20 – 22 June 2011

D Statistical mechanics
Nehru Arts and Science College, Kanhangad : 15 – 17 July 2011

D Nano science and technology: A sustainable future
Mody Institute of Technology and Science, Sikar (Rajasthan) : 5 – 6 August 2011



Inauguration of the 76th Annual Meeting of the Indian Academy of Sciences at Goa in November 2010

lectures were both of outstanding interest and quality. The first one by **C. Raja Mohan** of *The Indian Express*, based in Delhi, titled "India and the Indian Ocean: In search of a strategic role" dwelt on the geopolitical importance of events in the Indian Ocean for the country. He pointed out that for many millennia the people in the subcontinent have always regarded land routes coming into the region – from the north west as well as north east – as the routes by which invaders could appear and threaten us. The realization that we are 'open to invasion' from the seas too is much more recent. Added to this is the fact that this 'our' ocean is ringed by failed or failing states. All this means that as a country we need to evolve newer ways of thinking and strategy to safeguard our security and future.

The second public lecture by **Kaushik Basu**, Chief Economic Adviser to the Government, was on "The Role of Higher Education in Economic Development". This talk too was marked by a freshness and candour which matched the earlier one. The speaker emphasized the importance of science for the Indian ethos, and stressed that research was important for society going beyond economic value. Pure research needs support, applications come later. In the past couple of decades, since 1994, the Indian growth rate has been on the rise, and sharply so since 2005. From a foreign exchange reserve of 5 billion dollars in 1991, we are now at 350 billion dollars. There had been an overproduction of engineers since the 1950s, but this turned to an advantage in recent times, combined with global opportunities and the knowledge of English. However we have to also realize that our literacy is shockingly low. For growth in economy we must invest in education, particularly in higher education; the connection between the two is immense. Basu stressed that higher education in all fields – sciences, humanities, economics – is important for us. Our Gross Enrolment Ratio, now at 12%, must increase; but most of our 460 odd universities are in a bad state. We need centres of excellence, the Government should support institutions in the basic fields, and leave the rest to private sources. There is need and space for both, we must bring the best to academics.

The two mini-symposia were devoted respectively to "Indian estuaries" and "Stem cells in development and regeneration". The former dwelt essentially on studies and phenomena in and around the west coast and the waters surrounding Goa, all seven speakers being from the host institution. The latter introduced the stem cell concept which is relatively recent, and its role and relevance in eye problems, brain development and psychiatry – an astonishing range!

A. K. Singhvi's special lecture on "Synergistic mutualism between geology and physics: The case of luminescence" described studies over the past three decades in developing and using a new and reliable dating mechanism suitable for going back a few million years. The technique is based on thermal and optical-stimulated luminescence, and the accuracy is about 3% to 5%. Its uses in geology, human impacts over a million years, intervals between earthquakes, river floods and the like were described.

K. V. S. Rao's special lecture on "The dynamics of host–pathogen interactions in TB infection" dealt with new ideas and approaches to tackle the re-emerging scare and burden of tuberculosis. That the pathogens have co-evolved with humans and thus successfully survive in them leads to the difficulties of treatment. The speaker dwelt on new chemo-therapeutic strategies that could disrupt the adaptive mechanisms which allow the pathogens to 'live happily' within the host, and in the progress, in experiments.

Among the other presentations, the great contrast between K. Subramanian's account of magnetic fields at the galactic and extra galactic scales and Kalobaran Maiti's description of puzzles in magnetism in 'everyday' materials was quite striking. Naba Mondal's talk on 'Neutrinos: A new window to the Universe' dealt with 'the most tiny quantity of reality ever imagined by a human being', and with the ambitious Indian Neutrino Observatory, and T.S.S.R.K Rao's mathematical talk titled 'An invitation to the geometry of higher dual spaces' left one wondering how a significant property could be seen up to the sixth duality operation, but not beyond.

The meeting as a whole was very well organized and coordinated in all respects, with all events (except the dinner on the boat ride!) taking place on the campus of the host institution.

Closing session of the Goa meeting

TWENTY-SECOND MID-YEAR MEETING

8 – 9 July 2011

Programme

8 July 2011 (Friday)

0930 – 1010 **Session 1A – Special Lecture**

J B Udgaonkar, NCBS, Bangalore

The self-packing protein puzzle: How do proteins fold?

1010 – 1300 **Session 1B – Lectures by Fellows/ Associates**

1010 **Shiraz Minwalla,** TIFR, Mumbai

Fluid dynamics from gravity

1030 **R. Murugavel,** IIT, Mumbai

Do discrete molecular clusters add up to porous structures?

1120 **Amitava Das**, CSMCRI, Bhavnagar

Designer molecule for molecular recognition and photoinduced energy/ electron transfer processes

1140 **Suvendra N Bhattacharyya,** IICB, Kolkata

miRNA: The powerful tiny regulator of gene expression

1200 **G. Beig,** IITM, Pune

Chemical weather

1220 **Vidya A Arankalle**, NIV, Pune

Success story of Hepatitis E and development of other viral vaccines

1240 **Surendra K Sharma,** AIIMS, New Delhi

Obstructive sleep apnea: Snoring and beyond

1430 – 1720 **Session 1C – Lectures by Fellows / Associates**

1430 **Amita Das,** IPR, Gandhinagar

The propagation of slow electro-magnetic disturbances in plasma

1450 **Jaywant H Arakeri,** IISc, Bangalore

Different regimes of turbulent natural convection

1510 **Rahul Roy,** ISI, New Delhi

Coverage of space by random sets

1600 **A. J. Parameswaran,** Kerala School of Mathematics, Kozhikode

Group theory: A modern perspective

1620 **Sujit Roy,** IIT, Bhubaneswar

Sustainable chemistry and cooperative catalysis: A win-win paradigm

1640 **V. V. Ranade,** NCL, Pune

Solid suspension in stirred tanks: Hysteresis and dynamic settling

1700 **Saumitra Das,** IISc, Bangalore

Ribosome–RNA Interaction: a potential target for developing antiviral against Hepatitis C virus

1800 – 1900 **Session 1D – Public Lecture**

Anil Sadgopal (All India Forum for Right to Education), Bhopal

Neo-liberal assault on education: Undoing freedom movement's aspirations and vision of the Constitution

9 July 2011 (Saturday)

0900 – 0940 **Session 2A – Special Lecture**

Mustansir Barma, TIFR, Mumbai

Entropy and order

0940 – 1230 **Session 2B – Lectures by Fellows/Associates**

0940 **Amlan J Pal,** IACS, Kolkata

Organic electronic devices: New directions

1000 **Mukesh Jain,** NIPGR, New Delhi

A next generation approach to the characterization of chickpea transcriptome

1050 **Tapas K Kundu,** JNCASR, Bangalore

Small molecule modulators of epigenetic modifications: Implications in therapeutics

1110 **Pulak Sengupta,** Jadavpur University, Kolkata

Jabalpur marble rock : A petrologist's perspective

1130 **Jayant R Haritsa,** IISc, Bangalore

Robust optimization of database queries

1150 **Mohammad Sami,** Jamia Millia Islamia, New Delhi

Understanding cosmic acceleration in a Newtonian way

1210 **J. S. Yadav,** IICT, Hyderabad

Excitement in natural product chemistry

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2011 ELECTIONS

Fellows

Anuranjan Anand
Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore
Area: Human genetics and genomics neurogenetics; developmental genetics

Jaywant H Arakeri
Indian Institute of Science, Bangalore
Area: Fluid mechanics; heat transfer; turbulence

S R Barman
UGC-DAE Consortium for Scientific Research, Indore
Area: Electron spectroscopy; surface science; materials studies

Rakesh Bhatnagar
Jawaharlal Nehru University, New Delhi
Area: Vaccine development; genetic engineering; molecular biology

S Chandrasekhar
Indian Institute of Chemical Technology, Hyderabad
Area: Natural product synthesis; green chemistry and combinatorial chemistry

Samit Chattopadhyay
National Centre for Cell Science, Pune
Area: Gene transcription and epigenetics; cancer biology; HIV and immunobiology

J N Chengalur
National Centre for Radio Astrophysics, Pune
Area: Radio-astronomy; galaxy evolution

Amita Das
Institute for Plasma Research, Gandhinagar
Area: Plasma; turbulence; electron-magnetohydrodynamics

K R Gopidas
National Institute for Interdisciplinary Science and Technology, Thiruvananthapuram
Area: Photochemistry; photoinduced electron transfer; supramolecular chemistry

C S Gopinath
National Chemical Laboratory, Pune
Area: Surface science; heterogeneous catalysis; spectroscopy

Sourendu Gupta
Tata Institute of Fundamental Research, Mumbai
Area: Particle physics; lattice field theory

Jayant R Haritsa
Indian Institute of Science, Bangalore
Area: Database systems; data mining; real-time systems

N Jayaraman
Indian Institute of Science, Bangalore
Area: Carbohydrate chemistry; dendrimer chemistry; synthetic organic chemistry

Gagandeep Kang
Christian Medical College, Vellore
Area: Enteric virology; vaccines

Shiraz Minwalla
Tata Institute of Fundamental Research, Mumbai
Area: String theory; gravity; quantum field theory

K N Raghavan
The Institute of Mathematical Sciences, Chennai
Area: Representation theory

V Rajshekhar
Christian Medical College, Vellore
Area: Neurosurgery; cysticercosis; cervical spine surgery

Vivek Vinayak Ranade
Tridiagonal Solutions Pvt. Ltd, Pune
Area: Multiphase flows & reactors; computational flow modelling; process intensification

Madan Rao
Raman Research Institute, Bangalore
Area: Non-equilibrium statistical mechanics; soft condensed matter physics; biological physics

Rahul Roy
Indian Statistical Institute, New Delhi
Area: Probability; stochastic processes

Pulak Sengupta
Jadavpur University, Kolkata
Area: Metamorphic petrology

Doraiswamy Shankar
National Institute of Oceanography, Goa
Area: Tropical ocean dynamics; ocean-atmosphere interaction; monsoons

S. Shivaji
Centre for Cellular & Molecular Biology, Hyderabad
Area: Reproductive biology; conservation biology; mammalian sperm function

Yogendra Singh
Institute of Genomics and Integrative Biology, Delhi
Area: Bacterial pathogenesis; biochemistry; cell biology

Rajesh K Srivastava
Banaras Hindu University, Varanasi
Area: Igneous petrology; geochemistry and precambrian geology

Shubha Tole
Tata Institute of Fundamental Research, Mumbai
Area: Neuroscience; developmental biology

Sandeep Verma
Indian Institute of Technology, Kanpur
Area: Bio-organic chemistry; metal nucleobase interactions; peptide-based soft structures

Honorary Fellows

Richard H Friend
Cavendish Laboratory
Cambridge, UK

Daniel L Hartl
Harvard University
The Biological Laboratories
Cambridge, Massachusetts, USA

Tobin J Marks
Northwestern University
Evanston, Illinois, USA

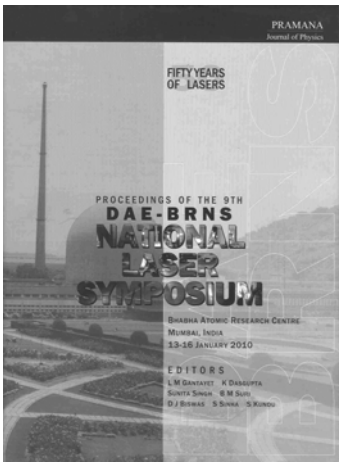
SPECIAL ISSUES OF JOURNALS

Proceedings of the IX DAE-BRNS National Laser Symposium on Physics & Technology of Lasers, Materials & Optics and Laser Applications

Guest Editors: L M Gantayet, K Dasgupta, Sunita Singh, B M Suri, D J Biswas, S Sinha and S Kundu

***Pramana,* Vol. 75, Nos 5 & 6, November & December 2010, 552 pages.**

These special issues have emerged out of papers and invited talks presented at the National Laser Symposium held at BARC in January, 2010. The year 2010 was the 50th year of laser, a cause for celebrations worldwide commemorating the invention of laser in 1960. It has therefore, been our special endeavour to substantially strengthen the scientific content of National Laser Symposium encouraging wider international and national participation of the scientific fraternity involved in the field of lasers and laser applications. Besides making the contents of the symposium available to a wider audience, these two special issues are also intended to serve as a reference for future research, which the symposium hopes to have stimulated.



The National Laser Symposium is an annual event sponsored by the Department of Atomic Energy, Board of Research in Nuclear Sciences. The symposium is organized in collaboration with Indian Laser Association and is held at different locations in India, each year. The ninth DAE-BRNS National Laser Symposium was held during January 2010, at Bhabha Atomic Research Centre, Mumbai. The symposium provides a dedicated platform for young researchers in laser physics and technology to interact with eminent scientists from India and abroad, and to present their latest work.

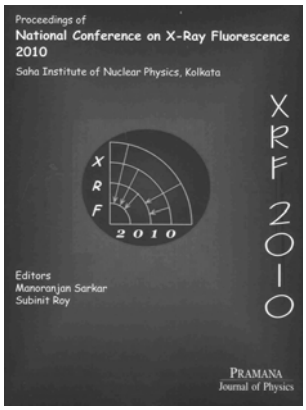
As in previous years, the National Laser Symposium covered frontline research in basic laser physics as well as significant advances in development and applications of laser technology. Srikumar Banerjee, Chairman, Atomic Energy Commission and Secretary, Department of Atomic Energy, Govt. of India, inaugurated the symposium. The keynote address at the symposium was delivered by Swapan Chattopadhyay, Sir John Cockroft Chair of Physics, Universities of Lancaster, Liverpool & Manchester, and Director, The Cockroft Institute, UK. The four-day symposium included 22 invited talks by leading experts and young researchers from India and abroad, 212 contributory papers presented as posters, and 10 oral thesis presentations. The papers were painstakingly peer-reviewed by a team of experts.

Proceedings of the National Conference on X-Ray Fluorescence

Guest Editors: Manoranjan Sarkar and Subinit Roy

***Pramana,* Vol. 76, No. 2, February 2011, 184 pages.**

Wilhelm Conrad Roentgen discovered the existence of X-rays in 1895 through the shadow cast by the unknown rays. The seed for the evolution of X-rays as a technique in the field of applied scientific research was sown that very day. In the late 1920s, a number of research workers, led by von Hevesy, clearly demonstrated the potential of X-ray spectroscopy for



chemical analysis. Since then, slowly but steadily, X-ray spectroscopy has grown into an irreplaceable analytical tool with applications in diverse fields including material science, biological and medical sciences, archaeological, geological and environmental sciences.

In recent years, the development of powerful X-ray sources, advent of new generation detectors with sophisticated electronics and introduction of new techniques in X-ray focusing have ushered in a new era for X-ray fluorescence spectroscopy. It was beyond one's imagination even a decade ago. Based on recent advancements, industries are also coming up with state-of-the-art XRF instruments to be utilized in various fields.

The National Conference held at the Saha Institute of Nuclear Physics, Kolkata in January 2010, was organized to present the latest developments in X-ray fluorescence and to stimulate fruitful discussions amongst researchers in our country.

The structure of the conference was based on invited talks, posters, short oral presentations and an interaction session. With three of the invited speakers from abroad, a panel was formed to judge the posters presented and to select four contributions for short oral presentations. During the interaction session, scientists from the Centre of Archaeological Studies and Training, Kolkata and the West Bengal Pollution Control Board highlighted the nature of synergy with the X-ray spectrometrists required to know what is criticial for the problem they are working on. The proceedings consisted of thirteen invited talks and four refereed contributed papers.

The conference was organized by the erstwhile Nuclear and Atomic Physics Division of Saha Institute of Nuclear Physics, Kolkata with the active collaboration of Centre of Archaeological Studies and Training, Kolkata, UGC-DAE Consortium for Scientific Research, Kolkata and West Bengal Pollution Control Board.

DISCUSSION MEETINGS

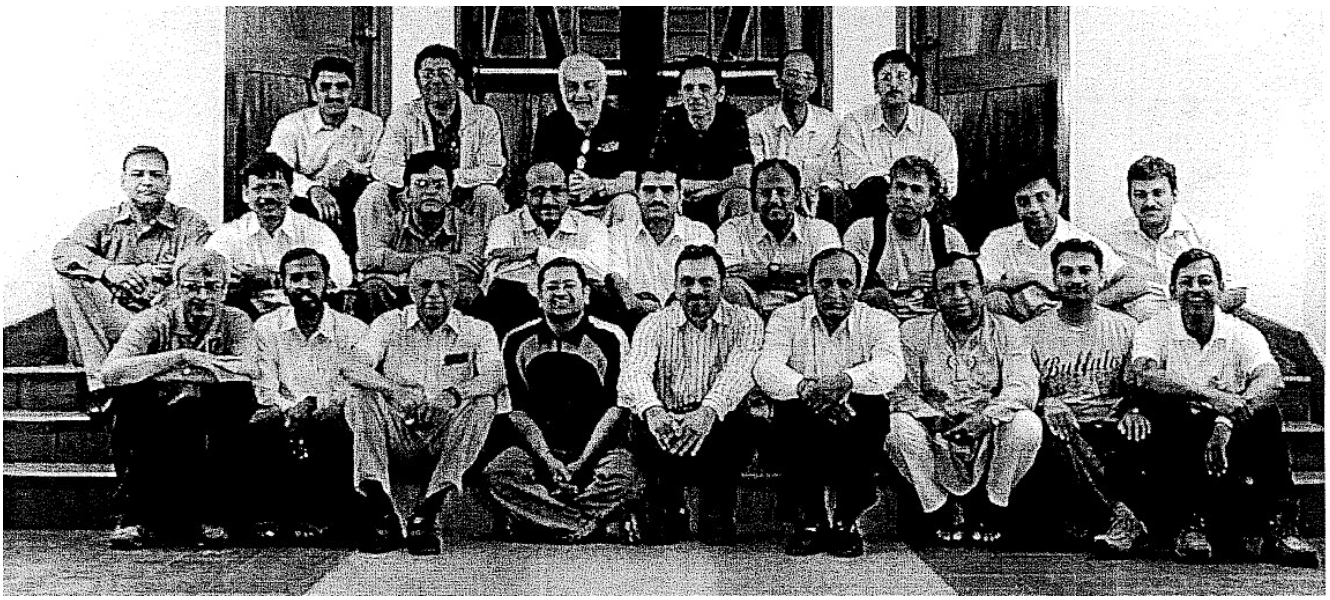
Microstructural evolution and phase transformation at different length scales

Orange County, Coorg
21 -– 24 February 2010

Convener: K. Chattopadhyay (IISc, Bangalore)

This discussion meeting on 'Microstructural evolution and phase transformation at different length scales' held at Orange County, Coorg was attended by 24 participants. The meeting on the 21 February began with a presentation by D. Banerjee (DRDO) on the importance of microtexture in controlling the microstructure of the titanium alloys and their subsequent properties followed by a presentation by Vikram Jayaram (IISc, Bangalore) on the nature of ductile glass in ceramic systems and the issue of co-existence of two glasses of different densities. Dey (BARC, Mumbai) spoke on the variety of metastable microstructures that form during the micropyretic synthesis.

On the 22 February, the first talk was by K. Chattopadhyay (IISc, Bangalore) on issues related to the co-existence and transformations of multiscale features in multiphase microstructures. This was followed by a talk by M. P. Gururajan (IIT, Bombay) on the effects of misorientation and anisotropy on the grain growth in poly crystalline materials. S. Lele (BHU, Varanasi) discussed the cluster expansion method (for configurational enthalpy of mixing) and cluster variation method (for configurational entropy of mixing) (CE-CVM) for calculation of the free energy of a materials system. N. Ravishankar (IISc, Bangalore) discussed the role of interfaces in controlling various properties in advanced functional materials. Kallol Mondal (IIT, Kanpur's talk was on the thermo-dynamic modeling of nucleation of crystalline phase in glasses. Bhaskar Majumdar (DMRL, Hyderabad) discussed the microstructures of melt spun and annealed Fe-Si-B-Nb-Cu, Fe-Zr-B-Cu and Fe-Co-Zr-B-Cu alloys processed under different conditions and their corresponding soft magnetic properties. D. Prabhu's presentation was on the effect of Cu clustering in engineering the microstructure of HITPERM type alloys with emphasis on using advanced technique like 3-dimensional atom probe tomography to understand the mechanism of crystallization in these materials. K. Biswas (IIT, Kanpur) spoke on issues related to the sintering of nanometric size particles followed by G. Phanikumar's (IIT, Madras) talk involved discussion on various issues related to micro-structural evolution during rapid solidification using



melt spinning, solidification of undercooled melts using electromagnetic levitation and flux undercooling, solidification of weldments and alloy casting.

On the 23 february, the first talk was by B. S. Murthy (IIT, Madras) on the various issues related to the microstructural evolution in a driven system followed by the presentation on the evolution and characterization of structures of three phases of titanium alloys, namely martensitic, Ti3Al(2) and B2 phases by A. K. Singh (DMRL, Hyderabad). D. Santosh Hosmani (IIT, Delhi) discussed the issues related to the science of phase transformations at metal/gas interfaces followed by Debalay Chakrabarti (IIT, Kharagpur) spoke on the challenges in the development of bimodal grain structures in low carbon steel. Anirudha Biswas (BARC, Mumbai) spoke on the various aspects of the application of atom probe tomography technique for characterization of materials. R. Balamuralikrishnan (DMRL, Hyderabad) discussed the role of nanoscale characterization in identifying and optimizing avenues for microstructure control during processing towards realization of desired properties in engineering (an engineered) materials. The meeting concluded with the talk by Chandan Srivastava (IISc, Bangalore) on the particle size dependent microstructural evolution in isolated bi-metallic nanoparticles.

Molecular Interactions

Orange County, Coorg
28 November – 1 December 2010

Convenor: E. Arunan (IISc, Bangalore)

The meeting started with a brief introduction given by Arunan, convener of the meeting. He pointed out that there have been several key advances over the last decade that challenged the conventional wisdom about hydrogen bonding. The stunning difference between the crystal structure close to the freezing point at ambient conditions, for ice (H_2O) at 0°C and H_2S at – 60°C has led to the common perception of 'hydrogen bonding' and 'van der Waals interaction' as two distinguishable physical forces among chemists. The advent of molecular beam spectroscopy and scattering studies have showed that $(H_2O)_2$ and $(H_2S)_2$ have similar structures. Moreover, molecular beam electric resonance spectroscopy showed that the complex formed between HF and ClF had a structure ClF•••HF, rather than the expected hydrogen bonded ClF•••HF. Though it was originally called 'anti-hydrogen bond' now it is well recognized as a halogen bonded complex. IUPAC recognized the importance of these phenomena and formed task groups to summarize our understanding of these phenomena and define hydrogen bonding and halogen bonding. Among the participants were E. Arunan and J. Sadlej (Chair and core-group member of the task group to define hydrogen bond) and P. Metrangelo (Chair of the task group to define halogen bonding). G. R. Desiraju, who is a member of both these task groups, could not attend the meeting due to unforeseen circumstances.

The meeting had sixteen invited lectures with topics ranging from the interaction between two rare gas atoms such as argon and neon to the interaction between the domains in multi-domain and multi-functional proteins. The first talk was given by Tapas Chakraborty from the Indian Association for Cultivation of Science. He presented experimental results on these diketones in the gas phase, liquid phase and in a rare-gas matrix. While keto-enol tautomerism is well known in chemistry, he pointed out that

γ–cyclohexanedione existed only in the keto form in the matrix and formed dimers exhibiting C-H•••O hydrogen bonds. Ashoka Samuelson (IISc) spoke next about weak interactions in drug design and asymmetric catalysis. He presented some experimental results which suggested that π•••π interactions occurring far away from a chiral centre could still influence enantio-selectivity. He suspected that such interactions having π•••π distance of even 4-5 Å could be influential. This raised some discussions among participants about what would be the maximum distance between two π centers up to which they could have attractive interactions that are still influential. The first session ended with a talk by Ayan Datta (IISER) spoke about understanding intermolecular interactions in complex systems through computations. Magnetic interactions through multi-centered π-stacked molecules and the interaction of one water molecule in calixarene (water in the smallest cup) were addressed in his talk.

Judith Howard from University of Durham spoke in the second session and compared neutron and X-ray diffraction techniques to investigate molecular interactions. She pointed out that neutron diffraction is good for locating H atoms but X-ray diffraction can give electron density topology in the crystal which is crucial in understanding bonding. C. Pulla Rao (IIT, Mumbai) spoke on manifestations of weak interactions in complex molecules. He discussed lectin-carbohydrate interaction and also Hg^{2+}•••π interaction which results in fluorescence enhancement in anthracenyl-glyco derivatives.

Pierangelo Metrangolo, Politenico de Milano, spoke about halogen versus hydrogen bonding in crystal engineering. He showed that Br as acceptor could interact with partially positive Cl/Br/I in molecular complexes which are now described as halogen bonding but not F. After the talk, Guru Row mentioned that his group has looked at cases where the electron cloud in F could be distorted leading to a 'halogen bond' with F as the positive end. G. Mugesh (IISc) discussed the role of intermolecular interactions in the synthesis and recognition of thyroid harmones. He emphasized the role $^{\delta-}$Se•••$^{\delta+}$I and $^{\delta+}$Se•••$^{\delta-}$N interactions in these systems and showed their importance in the treatment of hyperthyroidism. Arunan spoke next about hydrogen, halogen and lithium bonding and presented microwave spectroscopic results on unusual complexes formed between benzene and ethylene and also methane and hydrogen sulphide. He also cautioned against the blind extension of the hydrogen bond definition proposed by the IUPAC task group chaired by him for defining the halogen bond. He particularly showed that X-F stretching frequency in Y•••X-F halogen bond is not a useful criterion for halogen bond as opposed to the H-F stretching frequency in Y•••H-F.

Mrinalini Puranik (NCBS) spoke about aromatic amino acids and substrates as probes of local environment and dynamics in proteins. She highlighted the importance of dynamics in addition to the steady state structures in determining the protein functions and how simulation of Raman intensities can help in these studies. T. N. Guru Row (IISc) demystified the 'pharmaceutical cocrystals' and showed that there is no difference between cocrystals and salts. He also presented the crystal structure of adenine without water, characterized for the first time. He also summarized the extensive work his group has carried out on 'halogen bonding'. G. Krishnamoorthy (TIFR)

talked about site-specific dynamics in an RNA thermometer. He showed that a single mismatch in base pairing can lead to significant differences in the fluorescence anisotropy lifetime.

David Capelletti from Perugia, Italy described how one can get intermolecular potentials from crossed beam experiments. Coupled with state-of-the-art theoretical methods, he showed that charge transfer plays an important role in weakly hydrogen-bonded complexes formed between rare gas and H_2O and also H2 and H_2O. Sanjay Wategaonkar (TIFR) discussed experimental results obtained from his molecular beam laboratory using spectroscopic techniques. Through a comprehensive study he showed that sulphur atom can be as good an acceptor for hydrogen bonds as are F, O and N. He also showed that in many of these 'hydrogen bonded systems' dispersion plays a crucial role.

Joanna Sadlej from University of Warsaw showed how vibrational circular dichroism (VCD) spectroscopy can be useful in probing chirality transfer in molecular interactions. As the VCD intensity depends both on the electric and magnetic dipoles and particularly the angle between them, it offers a unique tool for studying intermolecular interactions. Hanudatta Atreya (IISc) convinced the participants about the importance of NMR in elucidating inter-domain interactions in proteins. He presented results from both NMR spectroscopy and molecular dynamics simulation. V. Subramanian (CLRI) made the last presentation for the meeting. He discussed the interaction between peptides and carbon nanotubes investigated by classical dynamics simulation. He presented new results on adamentane-benzene interaction.

The last session was dedicated to discussing the IUPAC provisional recommendation on the definition of the hydrogen bond.

Operator theory and applications

Orange County, Coorg
23 – 26 February 2011

Convener: K. B. Sinha (JNCASR, Bangalore)

The topics covered in the lectures and discussions were: Random Schrödinger operator, estimates of eigenerators of non-selfadjoint operators, Berg's theorem and finite-dimensional approximation, holomorphic cocycles on fock space, Hilbert C*–modules and disc-algebras.

There were seventeen participants including one each from UK and Germany and five young researchers.

ACADEMY PUBLIC LECTURES

The challenges and opportunities of nanotechnology in China

Chunli Bai
(Honorary Fellow, Indian Academy of Sciences; Executive Vice-President, Chinese Academy of Sciences, Beijing, China)

25 October 2010
Indian Institute of Science, Bangalore

His research areas involve the structure and properties of polymer catalysts, X-ray crystallography of organic compounds, molecular mechanics and EXAFS research on electro-conducting polymers. Prof. Bai, one of the pioneers in the field of scanning probe microscopy and nanotechnology in China, has been instrumental in furthering China's nanoscience and nanotechnology research both as a scientist and a policy-maker. As chief scientist of the National Steering Committee for Nanoscience and Related Technology, he initiated and coordinated a number of national key projects about nano S&T. He is the Founding Director and Council Chairman of the National Centre for Nanoscience and Technology, China.

Dharmanand Kosambi: The life and contribution of a Buddhist sociopolitical thinker

Meera Kosambi
(Former Professor and Director, Research Centre for Women's Studies, S.N.D.T. Women's University, Mumbai)

18 November 2010
National Institute of Advanced Studies, Bangalore

Dharmanand Kosambi (1876–1947) was a pioneering Buddhist scholar of Buddhism in India, whose quest for spiritual solace through Buddha's doctrine had led him to monkhood for some years in Sri Lanka and Burma. But the most fascinating part of his life was his

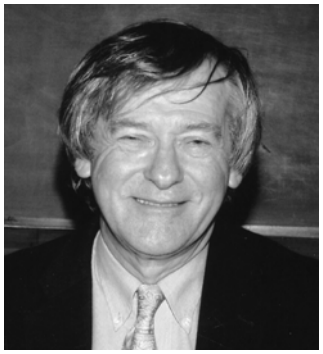
journey from the rural Goa of his birth to Harvard University, USA, as a visiting research scholar. Exposure to socialist ideology in the USA made a deep impact on him because he could relate it to the working of the Buddhist Sangha or monastic order. Also, his deep faith in Buddhism attracted him to Gandhiji's freedom struggle based on truth and non-violence.

Chandra: Gentleman, scholar and telescope

Roger Blandford

(Kavli Institute for Particle Astrophysics and Cosmology, Stanford, USA)

8 December 2010
Indian Institute of Science, Bangalore



Professor Subrahmanyan Chandrasekhar, or "Chandra" as he was widely known, was a singular scientist and intellectual. Blessed with formidable mathematical ability and legendary powers of concentration he was a scientific leader over an unequalled suite of the most challenging astro-physical disciplines. Although he may be most famous for his youthful discovery of a mass limit for white dwarfs and its famous corollary that black holes must exist, for which he was awarded the 1983 Nobel Prize, his lifetime contributions to mathematical physics, astrophysics and even the humanities, are even greater. The range and durability of his scholarship was memorialised in the naming of the finest imaging X-ray telescope ever launched. Vignettes from his life were interspersed with a description of some of the amazing discoveries made by Chandra X-ray Observatory.

Never reaching a stable steady state: Highly dynamic patterning mechanisms and their application to chemotaxis

Hans Meinhardt

(Max Planck Institute for Developmental Biology, Tübingen, Germany)

1 February 2011
Indian Institute of Science, Bangalore

Spontaneous pattern formation in biology requires a local self-enhancing reaction that is antagonised by components that act on a longer range. Some patterns, for example pseudopod formation during chemotaxis and the pole-to-pole oscillation of MinD in *E. coli*, involve highly dynamic behaviour. They can be explained by assuming two antagonistic reactions, one with a long range (for spatial patterning) and one with a short range but a long time constant (for quenching local maxima

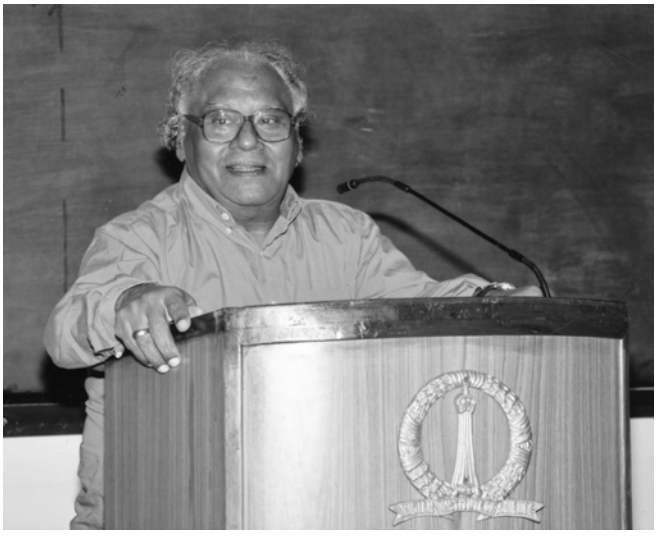
soon after generation). Such a mechanism enables minute external asymmetries to be detected. Reactions of this type are also involved in many developmental processes including pigmentation patterns on shells of molluscs, barb formation in avian feathers and phyllotaxis in plants.

Evolution of physical chemistry

C. N. R. Rao

(Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore)

20 January 2011
Indian Institute of Science, Bangalore



SUMMER RESEARCH FELLOWSHIPS PROGRAMME – 2011

This is the fifth year of the Summer Research Fellowships Programme which is jointly conducted by the three National Science Academies of the country.

The 2011 programme was announced in October 2010 and the last date for receiving applications was 31 December 2010. Selection committees consisting of experts in different areas met during the second/third week of January 2011 to scrutinize and make the selections. The following table indicates subjectwise, the numbers of applications received from students and teachers and the fellowships offered.

	Applications received		Fellowships offered	
	Students	Teachers	Students	Teachers
1. Engineering	5155	151	218	7
2. Life Sciences (including Agriculture)	4318	264	492	92
3. Chemistry	1701	152	251	37
4. Physics	1436	126	198	37
5. Earth and Planetary Sciences	687	13	108	5
6. Mathematics	443	38	84	11
	13740	**744**	**1351**	**189**

We hope to include in the next issue of *Patrika*, the number of fellowships actually availed and some analysis of the data.

REFRESHER COURSES

Jointly sponsored by IASc (Bangalore) INSA (New Delhi) and NASI (Allahabad)

The two-week Refresher Courses are an important segment of the activities of the Science Academies' programmes. The primary focus is to enhance the quality of science education at the undergraduate and graduate levels. Refresher Courses aim at helping teachers to add value to their teaching and are designed to have direct relevance to the study materials covered in the graduate and under-graduate syllabi followed in universities and institutions in the country. The following are the courses held during the last six months.

1. Experimental Physics – XXIII

Shivaji University, Kolhapur
5 – 20 October 2010

No. of participants: 25

Course Director: R. Srinivasan (Mysore)

Course Co-ordinator: C. H. Bhosale, Shivaji University, Kolhapur

Resource Persons: J. B. C. Efrem D'Sa (Carmel College for Women, Goa), S. M. Sadiq and Manohar Naik (Goa), K. R. S. Priolkar (Goa University, Goa), A. K. Sharma, C. H. Bhosale and K. Y. Rajpure (all of Shivaji University, Kolhapur), R. Srinivasan (Mysore).

Topics of lectures: Constant current source and load regulation, Young's modulus by flexural vibrations, thermal diffusivity; capacitance circuit, dielectric constant of benzene and dipole moment of acetone, verification of Curie Weiss Law; phase-sensitive

detection, calibration of lock-in amplifier, measurement of mutual inductance and low resistance with a lock-in amplifier; signal generator, passive filters, high resistance by leakage; A.C. experiments, A.C. bridges; Stefan's constant, thermal and electrical conductivity of copper and thermal conductivity of a poor conductor; calibration of an Si diode and a thermocouple, TCR of copper and energy band gap of a semiconductor; error analysis, B-H curve, calibration of a search coil and Feigenbaum apparatus.

The course also involved 20 laboratory experiments. There were special talks by V. R. Puri and P. S. Patil. University authorities assured the department of physics that a few experiments will be included in the curriculum of M.Sc (physics). An excursion tour to fort Panhala and Kaneri math was arranged.

The teacher participants were from Amaravati, Arjunnagar, Aundh, Baramati, Chandgad, Gagdhinglaj, Jabalpur, Karad, Kolhapur, Kurukali, Rayaguda, and Sangli.

2. Contemporary non-equilibrium thermodynamics and statistical mechanics

RTM Nagpur University, Nagpur
20 October – 2 November 2010

No. of participants: 31 teachers from Chandigarh, Dehradun, Goa, Gondia, Hassan, Karaikal, Kolkata, Mohali, Mouda, Mumbai, Nagpur, New Delhi, Ratnagiri, Vijayawada, Wardha.

Course Director: D. S. Ray (IACS, Kolkata)

Course Co-ordinators: Anil A. Bhalekar and L. J. Paliwal (RTM Nagpur University, Nagpur)

Resource Persons: David Jou (Autonomous University of Barcelona, Bellaterra, Spain), Ingo Müller (Technical University, Berlin, Germany), R. S. Johal (IISER, Mohali), B. L. Tembe (IIT, Mumbai), Sunil Nath (IIT, Delhi), C. Dasgupta (IISc, Bangalore), D. Chowdhury (IIT, Kanpur), M. V. Sangaranarayanan (IIT, Chennai), R. Venkatesh (BHU, Varanasi), P. M. Gade and A. A. Bhalekar (RTMNU, Nagpur) and S. S. Dhondge (SKP College, Nagpur).

This course focussed on nonequilibrium thermodynamics and statistical mechanics. Nonequilibrium thermodynamics comprised of extended irreversible thermodynamics, rational thermodynamics, classical irreversible thermodynamics, foundations of non-equilibrium thermodynamics, electrochemical processes, quantum heat engines and finitetime thermodynamics.

The statistical mechanical topic comprised of Bayesian statistical kinetic theory of non-uniform systems, Chandrasekhar equation in chemical dynamics, ordered disordered systems, percolation problems of dilute magnetic systems, spin glasses, structural glasses, random field systems, stochastic kinetics and enzymology, stochastic of molecular motors, nonequilibrium statistical mechanics of liquids and dynamics of phase transitions in spatially extended systems.

The participants were given books on 'Elements of nonequilibrium statistical mechanics' by Balakrishnan and 'Statistical mechanics' by K. Huang. The participants were also taken for a half day excursion tour to Ramtek.

3. Experimental Physics – XXIV

Mahatma Gandhi University, Kottayam
18 November – 3 December 2010

No. of participants: 38

Course Director: R. Srinivasan (Mysore)

Course Co-ordinator: C. Sudarsanakumar, Mahatma Gandhi University, Kottayam

Resource Persons: R. Srinivasan (Mysore), Rajini Ashrita (Osmania University, Hyderabad), Syamala Thampi (M. G. College, Thiruvananthapuram) and A. Gnanaprakash (University of Mysore).

The schedule of the course included 23 lectures, and 25 experiments. The participants were divided into 16 batches. Each batch of three members was allotted 19 laboratory sections of 3 hour duration. The lectures covered the theory, experimental set-up and procedures for doing the experiments efficiently.

Topics of lectures: Regulated power supply, temperature controller and furnace, calibration of secondary thermometers, TCR of copper and band gap of silicon, high resistance by leakage; constant current source-load regulation, DC differential amplifier, and Stefan's constant, thermal and electrical conductivity of copper and thermal conductivity of a poor conductor, thermal diffusivity; signal generator, AC experiments, passive filters, AC bridges; capacitance circuit and comparison of capacities, dielectric constant of benzene and dipole moment of acetone, verification of Curie-Weiss law from temperature dependence of capacitors, Young's modulus by flexural vibrations; error analysis, B-H curve with integrator, calibration of a search coil, phase-sensitive detection-calibration of a lock-in-amplifier, mutual inductance and low resistance with a lock-in amplifier, nonlinear dynamics with Feigenbaum apparatus.

Experiments covered: Calibration of an Si diode and a copper constantan thermocouple as temperature sensors; temperature coefficient of resistance of copper – energy band gap of silicon, load regulation of constant current source; temperature variation of capacitance of a ceramic and a polymeric capacitor; Stefan's constant – high resistance by leakage; thermal and electrical conductivity of copper – thermal conductivity of a poor conductor; thermal diffusivity of brass; comparison of capacitances – dielectric constant of benzene, dipole moment of acetone; AC experiments – measurement of impedance of an inductance as a function of frequency, measurement of impedance of capacitance as a function of frequency, series and parallel resonant circuits; passive filters; AC Bridges-Maxwell's, De Sauty's and Anderson's; thermal relaxation of a light bulb; Young's modulus by flexural vibrations of a bar; calibration of a lock-in amplifier; measurement of mutual inductance with a lock-in amplifier – measurement of resistance below 1 ohm with a lock-in amplifier; B-H curve; calibration of a search coil, magnetic field along the axis of a solenoid.

There were three special lectures on current research topics by N. V. Unnikrishnan, C. Sudarsanakumar and K. Indulekha. During the feedback session, the participants felt that it was an excellent course with very simple and effective set-up for BH curve and the lock-in amplifier experiments and wanted to implement these experiments in their institutions. The participants also expressed that this Course is unique, very essential to revamp the age-old experiments used in the BSc and MSc programmes and decided to form a group for coordinating the activities and exchanging new developments in experimental physics.

The participants were taken for a one day trip to Vagamon and other places in Idukki district.

The teacher participants represented institutions from Aluva, Chungathura, Ernakulam, Idukki, Kalady, Kolenchery, Kothamangalam, Kottayam, Melukavu-mattom, Pala, Parumala, Pathanamthitta, Ranny and Thiruvananthapuram.

4. Recent advances in chemical science and its technological applications

Sikkim Manipal Institute of Technology (SMIT), Sikkim
8 – 21 December 2010

No. of participants: 27

Course Director: M. K. Chaudhuri, Tezpur University, Tezpur

Course Co-ordinator: Amlan Kumar Das, (SMIT)

Resource Persons: Ghanashyam Bez, R. K. Poddar (NEHU, Shillong), B. C. Ranu, Subrata Ghosh (IACS, Kolkata), Arun Chattopadhyaya (IIT, Guwahati), S. C. Bhattacharyya, Kaushik Das, Pratik Sen, Chittaranjan Sinha and B. C. Roy (Jadavpur University, Kolkata), A. Anil Bhalekar (RTM Nagpur University), N. Homendra (Manipur University, Imphal), Sanjib Bagchi (IISER, Kolkata), A. Chatterjee (Himalayan Pharmacy Institute, Sikkim), Anirban Misra (North Bengal University, Darjeeling) and Sanjay Dahal (SMIT, Sikkim).

Topics covered: The course covered all important topics in chemistry such as thermodynamics, electro-chemistry, surface chemistry, green chemistry, nano-chemistry, photochemistry, spectroscopy, quantum chemistry, chemical kinetics and catalysis, supramolecular chemistry, bioinorganic chemistry, polymer and colloid chemistry, organic reaction mechanism, symmetry, group theory and applications.

The teacher participants were from Adipur, Bhopal, Chennai, Deoghar, Dhanbad, Gangtok, Hyderabad, Jharkhand, Kolkata, Madurai, New Delhi, Pudukkottai, Ranchi, Sikkim, Sonitpur, Thalassery, and Thiruvananthapuram.

5. Experimental physics – XXV

Bangalore (IASc facility)
15 – 31 December 2010

No. of participants: 25

Course Director: R. Srinivasan (Mysore)

Course Co-ordinator: G. Madhavan (IASc, Bangalore)

Resource Persons: J. B. C. Efrem D'Sa (Carmel College of Women, Goa), S. M. Sadique and Manohar Naik (Goa), K. R. S. Priolkar (Goa University, Goa), K. Rukmani, B. N. Meera, Sarbari Bhattacharya (all of Bangalore University, Bangalore), S. B. Gudennavar (Christ University, Bangalore).

The President of the Academy, Prof. A. K. Sood, inaugurated the course. The first four days were devoted to lectures on the experiments. On the fourth day the participants were divided into groups of two to conduct the twenty seven experiments spread over seventeen work stations.

There were 18 laboratory sessions of three hours each in which the participants conducted the experiments.

Topics of lectures: Constant current source and load regulation, signal generator, thermal relaxation of a light bulb, high resistance by leakage, calibration of Si diode and thermocouple, TCR of copper and band gap of silicon, Stefan's constant, capacitance circuit and comparison of capacitances, temperature dependence of capacitance verification of Curie-Weiss Law, dielectric constant and dipole moment of acetone, DC differential amplifier, thermal and electrical conductivity of copper and thermal conductivity of poor conductor, thermal diffusivity of brass, AC experiments, passive filters, AC bridges.

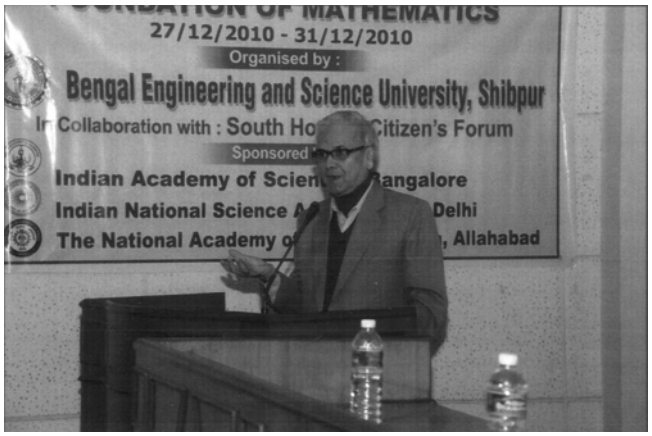
There were special talks on discovery of super-conductivity in ternary boro-carbides by R. Nagarajan; soft condensed matter covering the behaviour of liquid crystals, polymers and colloids by V. S. Raghunathan; H. L. Bhat traced the history of the development of lasers and mentioned their various applications; T. G. Ramesh demonstrated the shape memory effect and spoke about thermoelectricity. During the feedback session, the participants suggested some experiments to be added. R. Srinivasan suggested some projects that can be taken up by the students.

The participants were from Adipur, Alipur, Bangalore, Bilaspur, Chennai, Chitradurga, Coimbatore, Hassan, Jalandhar, Kannur, Kothamangalam, Kottayam, Mukhed, Mysore, New Bombay, New Delhi, Ranchi, Talcher, Udupi.

6. Foundations of mathematics

Bengal Engineering and Science University, Shibpur (BESU), Howrah
27 – 31 December, 2010

No. of participants: 38



Course Director: Amitabha Ghosh (BESU)

Course Co-ordinator: Bichitra Kumar Guha (BESU)

Resource Persons: J. K. Bhattacharya (S. N. Bose National Centre for Basic Sciences, Kolkata), Ashok Kumar Mallick, B. K. Guha, Basudeb Mukhopadhyay, Tapan Kumar Roy and Murari Mitra (BESU).

Mathematics is supposed to be the mother of all sciences. It forms the basic tool and language of physical sciences. Unfortunately in the regular school curriculum students are taught only a set of formulae and are asked to solve problems on the basis of these formulae. The approach followed in the schools does not create interest in the subject. The present course was aimed at complementing the school curriculum with historical development of mathematical ideas and their practical applications to the world of modern physical sciences.

There were twenty-two lectures and three special lectures on rough set, fuzzy set and set theory by M. Chakrabarty, differential equations and their applications by J. Das and scaling theory by Amitabha Ghosh.

The participants felt that the duration of the session should be extended and more time should be devoted to discuss different topics. They mentioned that they have never studied a course on mathematics in such a manner and that it was a novel experience for them. A book on "What is Mathematics?" by Richard Courant and Herbert Robbins (Oxford University Press) was presented to all the participants.

Topics of lectures: Maxima and minima, Fermat's principle, brachistochrone's problem, iteration on integers, real numbers, complex numbers and non-linear dynamics, geometry in the context of theory of relativity, matrices and their applications, theory of numbers and fuzzy set, and theory of probability and its applications.

7. Modern biotechnological techniques

Manipal University, Manipal
10 – 22 January 2011

No. of participants: 19

Course Director: V. Nagaraja (IISc, Bangalore)

Course Co-ordinator: K. Satyamoorthy (Manipal University)

Resource Persons: V. Nagaraja, K. P. Gopinathan, Umesh Varshney, K. Somasundaram, P. Kondiah (IISc, Bangalore), Kemparaj, P.M. Gopinath, Murali, Padmalatha Rai, Saadi Abdul Vahab (MLSC, Manipal), Shree Dhawale (Purdue University, Indiana), L. S. Shashidhara (IISER, Pune), Girish Katta (Kasturba Medical College, Manipal),

Topics of lectures: Genomic diversity and evolution; mind, body and soul; protein-DNA and protein-protein interactions; restriction endonucleases, topoisomerases; transcription activation and termination; cytogenetics and its various applications in biotechnology, expression systems, for recombinant DNA cloning, synthetic life: diagnosis of bacterial cell cultures; stem cells and cloning, behavioural adaptations and evolution; PCR techniques, applications of classical genetics in modern biology, regulatory RNAs, human genetic diseases, cancer diagnostics, DNA sequencing, microarrays and applications: breast and brain cancers.

The teacher participants represented institutions from Aizawl, Bangalore, Burdwan, Coimbatore, Gulbarga, Hyderabad, Indore, Jhunjhunu, Mahe, Malappuram, Mangalagangothri, Manipal, Moodbidri, Narsapur, Pune, Thanjavur.

8. Condensed matter and statistical physics

St Thomas College, Pala
28 February – 13 March 2011

No. of participants: 27

Course Directors: Srikanth Sastry (JNCASR, Bangalore), G. Baskaran (IMSc, Chennai)

Course Co-ordinator: Ison V Vanchipurackal, (St Thomas College, Pala)

Resource Persons: G. Baskaran, R. Shankar, Gautam Menon (all of IMSc, Chennai), Srikanth Sastry (JNCASR,

Bangalore), Subodh Shenoy (University of Hyderabad, Hyderabad), V. Venkataraman, Vijay Shenoy (IISc, Bangalore).

Topics of lectures: Quantum mechanics, statistical mechanics, phase transitions, biological matter, solid state physics, optoelectronics and device physics, superconductivity.

The participants were from Kanyakumari, Karaikal, Kasargod, Kottayam, New Delhi, Pala, Pune, Srikakulam, Vizianagaram, Wayanad.

9. Advances in biotechnology

National Institute for Research in Reproductive Health (NIRRH), Mumbai
1 – 11 March 2011

No. of participants: 19

Course Director: Tarala Nandedkar (NIRRH, Mumbai)

Course Co-ordinator: Srabani Mukherjee (NIRRH, Mumbai)

Resource Persons: Aditi Ambekar, Amare-Kadam (TMH, Mumbai), Balasinor, N., Deepak Modi, Deepa Bhartiya, S., Kadam, Khatkhatay, Madan, T., Maitra, A., Mania, J., Mukherjee, S., Sachdev, G., Smita Mahale, Susan Thomas (NIRRH, Mumbai), Bandivdekar, A., Bhagat, S., Bhakti Pathak, Bhisey, Rajani A. (Mumbai), D'Sousa, S., Dhumal, R., Dighe, Rajan (IISc, Bangalore), Gadkar Sable, S., Ganeshan, S., Gaonkar, R., Geeta Vanage, Ghosh, K.

(NIIH, Mumbai), Gokhale, P., Harsh, G., Jacob, Khavale, S., Majumdar, S. (NII, New Delhi), Mandal, Chitra (IICB, Kolkata), Mandar, A., Manjramkar, D., Meena Desai, Nanda, U., Natu, A. A. (IISER, Pune), Nuzhat, S., Panda Dulal (IIT, Bombay), Roshan, D., Saravanan, C., Shinde, G., Sonawane, S., Sumit Bhutada, Sushma, K., Tole, Shubha (TIFR, Mumbai), Varsha Vrushali, S.

Topics of Lectures/demonstrations and experiments: Secrets of biology as revealed through molecular biology and exploited through biotechnology, chemistry in health care Indian scenario, genomic DNA extraction agarose – Gel electrophoresis, animal model to access carcinogenesis of drug, PCR technology, PCR amplification RFLP, DNA sequencing, epigenetic, blotting of biomolecules and its application, RNA silencing, RNA extraction real time PCR, ELISA, RNA interference by a rapid method of transgenesis, SDS-PAGE and immunohistochemistry, pluripotent stem cell, 2D gel electrophoresis, western blotting, cancer cytogenetic, microtubules with special reference to confocal microscopy, cytogenetics and FISH, electron microscopy, expression, characterization and purification of recombinant therapeutic proteins, protein purification techniques, chromatography and amino acid analysis facility, applications of flow cytometery, cell cycle analysis flow cytometery, HLA and disease susceptibility, micro array, cloning, cell signaling and cancer, how the brain is built, bioinformatics: basic tools, aspects of genetic toxicology.

LECTURE WORKSHOPS

Jointly sponsored by IASc (Bangalore) INSA (New Delhi) and NASI (Allahabad)

1. Modern biology

Aurora College, Hyderabad
28 – 29 September 2010

Convener: Shekhar C Mande (CDFD, Hyderabad)

Speakers: Sanjeev Kholsa, M. S. Reddy (CDFD, Hyderabad), Sharmistha Banerjee (University of Hyderabad), Tapas K. Kundu (JNCASR, Bangalore), D. Kasbekar (CCMB, Hyderabad), Sharmila Mande (Advanced Technology Centre, TCS, Hyderabad), V. Nagaraja (IISc, Bangalore).

Participants: 200 students and faculty from various colleges and universities in Hyderabad.

Topics of Lectures: Reprogramming of genetic information; tuberculosis: challenges ahead; genes and cancer; shy study neurospora; metagenomics: understanding how microbes rule the world; meta-genomics: A fascinating area of microbiology; apoptosis.

2. Biodiversity biome – the web of life

NGM Institute of Health Sciences, Navi Mumbai
6 – 7 October 2010

Convener: Tarala Nandedkar (NIRRH, Mumbai)

Co-ordinator: D. S. Joshi (NGM Institute of Research)

Speakers: R. D. Lele (Lilavati Hospital, Mumbai); P. B. Seshgiri (IISc, Bangalore) S. K. Apte (BARC, Mumbai); S. D. Kholkute (NIRRH, Mumbai); J. Bellare (IIT, Mumbai); Rajani Bhisey (University of Pune).

Participants: 350 students and teachers

Topics covered: Diversity in human disease/disorder; comparative biology and biodiversity in blastocyst development and implantation in mammals; microbial bioremediation; plant biodiversity in Western Ghats; macro, micro and nano technology; diversity in cancer genetics.

3. Advances in chemistry

PSGR Krishnammal College for Women, Coimbatore
7 – 8 October 2010

Convener: R. Ramaraj (MKU, Madurai)

Co-ordinator: A. Shamitha Begum (PSGR Krishnammal College for Women)

Speakers: D. Ramaiah (NIIST, Thiruvananthapuram); G. Mugesh, S. Natarajan (IISc, Bangalore); C. Namasivayam (Bharathiar University, Coimbatore); A. K. Mishra (IIT, Chennai).

Participants: 290 students and faculty from colleges in Coimbatore

Topics covered: Photodynamic therapy: basic aspects and applications; heme proteins – from oxygen transport to enzyme catalysis; bio and medicinal inorganic chemistry; development of activated carbons from agricultural solid wastes and applications to removal of organics and inorganics from water; principles and applications of X-ray diffraction technique, polymorphism in solids and fluorescence.

4. Recent trends in physics

Lady Doak College, Madurai
11 – 13 October 2010

Convener: M. Lakshmanan (Bharathidasan University, Tiruchirappalli)

Co-ordinator: B. J. M. Rajkumar (Lady Doak College, Madurai)

Speakers: M. Lakshmanan (Bharathidasan University), K. Iyakutti (MKU, Madurai), K. Jeganathan (Centre for Nano-Science and Nano-Technology, Trichy), Sibasish Ghosh (IMSc, Chennai), V. P. N. Nampoori (CUSAT, Cochin), K. Murali (Anna University, Chennai), K. P. N Murthy (University of Hyderabad), C. S. Sundar (IGCAR, Kalpakkam).

Participants: 120 students and faculty from colleges in and around Madurai.

Topics covered: Basic concepts of nonlinear dynamics; properties and applications of carbon nanotubes; semiconductor 1D nanowires and its applications; quantum computation and quantum algorithms; laser and its applications; nonlinear electronics: applications of chaos; the fundamentals of thermodynamics; three facets of materials research.

5. Probing electronic states in molecules and molecular materials

Marathwada University, Aurangabad
21 – 25 October 2010

Convener: S. Ramasesha (IISc, Bangalore)

Co-ordinator: Ramarao Mane (Marathwada University)

Speakers: S. Ramasesha, P. K. Das, Satish Patil (IISc, Bangalore), K. L. Narasimhan (TIFR, Mumbai).

Participants: 170

Topics covered: Introduction to molecular materials; molecular devices; probing electron states; organic electronics; laser spectroscopy; electron states in molecules; electron states in solids; nonlinear optics; electron states in polymers.

6. Animal behaviour

IISER, Kolkata
30 – 31 October 2010

Convener: R. Gadagkar (IISc, Bangalore)

Co-ordinator: Anindita Bhadra

Speakers: R. Gadagkar (IISc, Bangalore), Mewa Singh (Mysore University), Annagiri Sumana, Anuradha Bhat, Punyasloke Bhaduri, Anindita Bhadra (IISER, Kolkata), V. K. Sharma (JNCASR, Bangalore), Suhel Quader (NCBS, Bangalore).

Participants: 148

Topics covered: Why are humans nice to each other?; animal behaviour and wildlife management; colony emigration as influenced by key individuals: case study of an Indian ant; variations in behavioural responses to environmental manipulation in zebra fish populations; nocturnal sex drive in Drosophila; marine phytoplankton diversity – what do functional genes tell us?; co-evolutionary conflict: strategies and counter-strategies of brood parasites and their hosts; a study on urban feral dogs.

7. Vistas of science

Aurora College, Hyderabad
26 – 27 November 2010

Convener: S Chaturvedi (University of Hyderabad)

Co-ordinator: Savitha Ramesh (Aurora College)

Speakers: Rajaram Nityananda (NCRA, Pune), Ghanashyam Krishna, K. P. N. Murthy, V. Kannan (University of Hyderabad), A. L. N. Murthy (ISI, Hyderabad), Srinathan Kannan (IIIT, Hyderabad).

Participants: 275

Topics covered: Astronomy with radio waves; nano-science; thermodynamics; fractional dimensions; statistics and its relevance to society; cryptography and network security.

8. Spectroscopy

NIT, Tiruchirappalli
3 – 4 December 2010

Convener: S. Umapathy (IISc, Bangalore)

Co-ordinator: R. Karvembu (NIT, Tiruchirappalli).

Speakers: S. Umapathy, Uday Maitra, E. Arunan, S. Ramakrishnan (IISc, Bangalore); R. Ramaraj (MKU) and A. Sreekanth (NIT, Tiruchirappalli).

Participants: 200

Topics covered: Elecronic absorption spectro-scopy; fluorescence spectroscopy; rotational spectroscopy; basics of nuclear magnetic resonance spectroscopy and its applications; Raman spectroscopy; NMR spectroscopy; spectroelectro-chemistry; ESR spectroscopy.

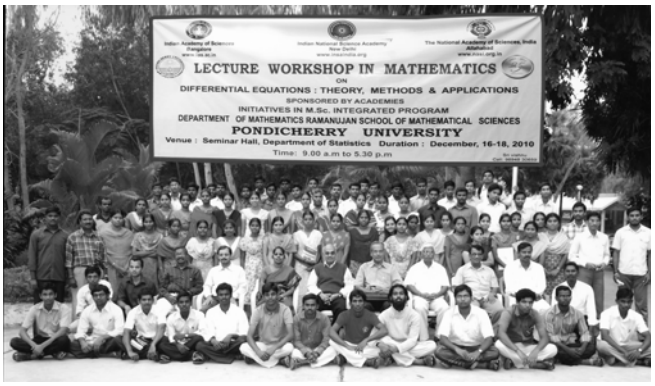
9. Differential equations: Theory, methods and applications

Pondicherry University, Puducherry
16 – 18 December 2010

Convener: K. M. Tamizhmani (Pondicherry University)

Co-ordinator: Rajeswari Seshadri (Pondicherry University)

Speakers: A. Chakrabarti (IISc, Bangalore), S. Kandaswamy (Bharathiar University, Coimbatore), M. Vanninathan (TIFR-CAM, Bangalore), M. Lakshmanan (Bharathidasan University, Tiruchirappalli), K. M. Tamizhmani, Rajeswari Seshadri (Pondicherry University).



Participants: 150 students and faculty from Pondicherry University

Topics covered: Singular integral equations; perturbation techniques; basics of differential equations, superposition principle, linear and nonlinear equations, types of symmetries; partial differential equations; basics of PDE and methods of solutions for solving PDE, homogenization and practical applications in industry.

10. Some topics in functional analysis and several complex variables

St. Josephs College, Irinjalakuda
4 – 6 January 2011

Convener: S. Thangavelu (IISc, Bangalore)

Co-ordinator: N. R. Mangalambal (St. Josephs College, Irinjalakuda)

Speakers: E. K. Narayanan, S. Thangavelu, K. Verma, G. Bharali (IISc, Bangalore).

Participants: 81 students and faculty from St. Josephs and other colleges in Karnataka and Kerala.

Topics Covered: Topological vector spaces and theory of distributions; analyticity, holomorphicity, Cauchy integral formula and related properties; Fourier transform theory.

11. Interdisciplinary physics – some basic aspects

Ramananda College, Bishnupur
6 – 7 January 2011

Conveners: Indrani Bose (Bose Institute, Kolkata) and B. K. Chakrabarti (SINP, Kolkata)

Co-ordinator: Goutam Biswas (Ramananda College)

Speakers: J. K. Bhattacharjee (S. N. Bose Centre, Kolkata), Soumitra Sengupta, D. S. Ray (IACS, Kolkata), B. K. Chakrabarti (SINP, Kolkata), Indrani Bose (Bose Institute, Kolkata), Arghya Taraphder (IIT, Kharagpur).

Participants: 86 students and faculty from various colleges in Bankura

Topics covered: Statistical physics; quantum physics; nonlinear dynamics; econo physics; biological physics; physics of nanomaterials.

12. Cognitive neuroscience and interdisciplinary approach to understanding behaviour

Sophia College, Mumbai
10 – 11 January 2011

Convener: Vijayalakshmi Ravindranath (IISc, Bangalore)

Co-ordinator: Hema Ramachandran (Sophia College, Mumbai)

Speakers: Aditya Murthy (IISc, Bangalore), Anindya Sinha (NIAS, Bangalore), N. Srinivasan, Bhoomika Kar (CBCS, Allahabad), R. Manchanda (IIT, Mumbai)

Participants: 140 students and teachers from various colleges in Mumbai

Topics covered: Cognitive neuroscience of sensory motor control; an introduction to EEG and ERP; analysis of EEG and design of ERP experiments; functional MRI; obtaining computational insights into neuronal biophysics. Why and how?; social cognition in primates: from mental representation to distributed cognition.

13. Protein engineering and its applications

Gitam University, Visakhapatnam
20 – 21 January 2011

Convener: Shekhar C. Mande (CDFD, Hyderabad)

Co-ordinator: M. Anitha (Gitam University)

Speakers: Shekhar C. Mande (CDFD, Bangalore), T M Radhakrishnan (Andhra University, Visakhapatnam),

Sharmistha Banerjee (University of Hyderabad), Rajan Sankaranarayanan (CCMB, Hyderabad), T Srinivasan, S. Talluri (Gitam University).

Participants: 260 students from various colleges in Visakhapatnam.

Topics covered: Networks in biology: interface of physics and biology; protein (enzyme) engineering; tuberculosis: the challenges ahead; evolution of virulence properties from common folds in pathogenic bacteria; protein engineering in plants; protein engineering and thermal stability.

14. Advances in biological sciences

Poornaprajna Institute of Scientific Research (PPISR), Bidalur
20 – 22 January 2011

Convener: A. J. Rao (IISc, Bangalore)

Co-ordinator: A. B. Halgeri (PPISR)

Speakers: G. Padmanaban, P. Kondaiah, M. R. N. Murthy, Utpal Tatu, R. Annapoorni, Rajan Dighe, Dipshika Chakravarthy, A. J. Rao (IISc, Bangalore), M. R. S. Rao (JNCASR, Bangalore), N. J. Shetty, V. V. S. Suryanarayana (IVRI, Bangalore), K. R. Sridhar (Mangalore University), Jayarama Bhat (Goa University), N. S. Raviraja.

Participants: 50 students and faculty from all colleges in Bangalore

Topics covered: Recombinant products; new direction in research in cell biology; biomarkers for cancer diagnosis; significance of the unstructured proteins in viral survival; conventional approach to proteomics; clonal theory of cancer, basis of genetic control of mosquitoes complexity involved and significance of rf gene, problems of developing suitable and ideal vaccines, role of endophytic fungi in various plants, importance of infectious diseases, metabolites from filamentous fungi, production of mesenchymal stem cells and their therapeutic application, need for population control.

15. Exploring recent horizons in chemical sciences

Marathwada University, Osmanabad
21 – 22 January 2011

Convener: Anunay Samanta (University of Hyderabad, Hyderabad)

Co-ordinator: S. D. Delekar (Marathwada University, Osmanabad)

Speakers: S. Vasudevan (IISc, Bangalore), Anunay Samanta, S. K. Das, T. P. Radhakrishnan, M. J. Swamy (University of Hyderabad), N. P. Argade, B. L. V. Prasad (NCL, Pune).

Participants: 200 students and teachers from various colleges of Marathwada University.

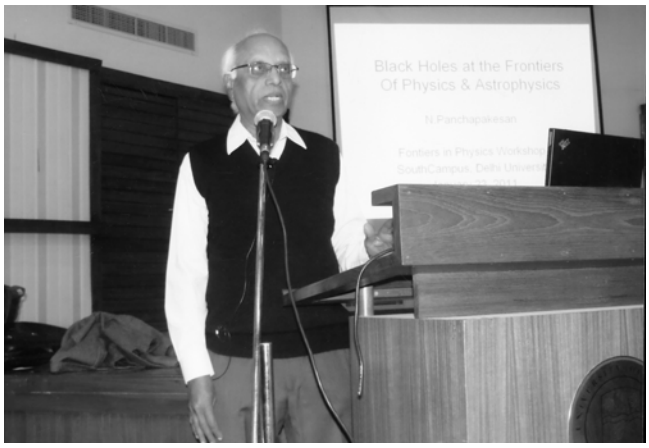
Topics covered: Intercalation in layered solids; short lived species; polyoxometalates: fluorescence studies on ionic liquids, sol to gel transformation in dispersions of layered solids; co-ordination chemistry of dithiolene and ortho-phenylenediammine ligands; importance of nanotechnology; polymer thin films with *in situ* generated metal nanoparticles; biomembranes: cyclic anhydrides and derivatives: synthesis of bioactive natural and unnatural products; monodispersity, superlattices, nanomachining: interesting manifestations of digestive ripening in nanoparticle synthesis.

16. Frontiers in physics

Deen Dayal Upadhyaya College, New Delhi
21 – 23 January 2011

Convener: Manoj Saxena (Deen Dayal Upadhyaya College)

Speakers: Ajoy Ghatak, Anurag Sharma (IIT, Delhi), Patrick Das Gupta, Sanjay Jain, D. Choudhury,



N. Panchapakesan (University of Delhi), R. Ramaswamy, Debashis Ghoshal, Sanjay Puri (JNU, New Delhi), Sudhendu Rai Chowdhury (IISER, Bhopal), S. M. Roy (TIFR, Mumbai).

Participants: 314 students and faculty from various colleges in Delhi.

Topics covered: Measurements in quantum theory: EPR paradox and Bell's inequality; accelerating universe; repulsive gravity and dark energy; nonlinear science; instabilities in string theory; the origin of life problem: some mathematical insights; fundamental particles and interactions; large hadron collider; quantum paradoxes, causal quantum mechanics and experimental tests; black holes at the frontiers of physics and astrophysics; fibre optics; pattern formation in granular materials.

17. Foundation of analysis in mathematics

Indian Institute of Science Education and Research, Thiruvananthapuram
21 – 23 January 2011

Convener: Mythily Ramaswamy (TIFR-CAM, Bangalore).

Co-ordinators: M. P. Rajan and Utpal Manna (IISER, Thiruvananthapuram).

Speakers: E. K. Narayanan (IISc, Bangalore), M. P. Rajan, Utpal Manna, R. Prakash (IISER, Thiruvananthapuram), K. S. S. Moosath (NIIST, Thiruvananthapuram), Mythily Ramaswamy, K. Sandeep (TIFR-CAM, Bangalore).

Participants: 39 students from IISER and other colleges in Thiruvananthapuram.

Topics covered: Single variable calculus; fourier series, linear algebra; multivariable calculus; integration in R^n; volume and surface integrals.

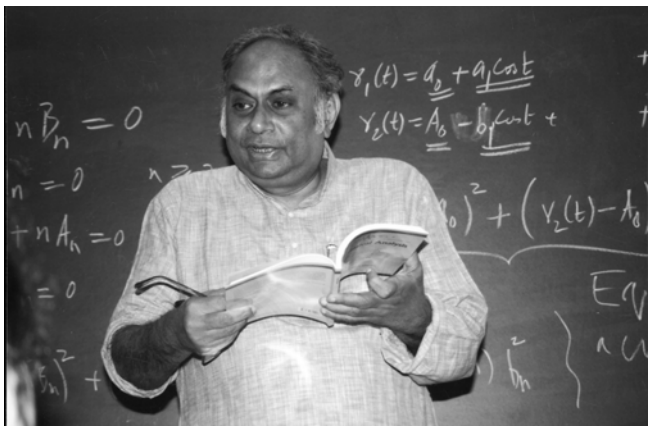
18. Mathematics

St. Joseph's College, Bangalore
28 – 29 January 2011

Convener: Mythily Ramaswamy (TIFR-CAM, Bangalore)

Co-ordinator: Renee D'Souza (St. Joseph's College, Bangalore)

Speakers: Mythily Ramaswamy, K. Sandeep (TIFR-CAM, Bangalore), Sujatha Ramdorai (TIFR, Mumbai), Alladi Sitaram, Kaushal Verma (IISc, Bangalore).



Participants: 70 students and teachers from various colleges in Bangalore

Topics covered: An introduction to real analysis; prime numbers; Fourier series; some examples in multi-variate calculus; interplay between linear algebra and analysis.

19. Genes, genomics and proteomics

St. Aloysius College, Mangalore
28 – 29 January 2011

Convener: V. Nagaraja (IISc, Bangalore)

Co-ordinator: Avila D'Silva (St. Aloysius College)

Speakers: Umesh Varshney, Saumitra Das, Usha Vijayraghavan, Utpal Tatu, V. Nagaraja (IISc, Bangalore).

Participants: 250 students and faculty from 11 colleges in and around Mangalore

Topics covered: Analysis of gene structure and function; biochemistry of protein synthesis in a nutshell; miRNA and siRNA; viruses hijack host biochemical machinery; RNA splicing; molecular genetics and genomics of flower development; understanding proteomics and its applications; use of mass spectrometry in biological research; biochemistry of DNA replication; meta-genomics – a fascinating new area of biology.

20. Current trends in novel materials

Christ University, Bangalore
4 – 5 February 2011

Convener: S. V. Bhat (IISc, Bangalore)

Co-ordinator: S. B. Gudennavar (Christ University)

Speakers: S. V. Bhat, Arindam Ghosh, V. Venkataraman, T. N. Guru Row, S. A. Shivashankar, A. K. Shukla, P. S. Anilkumar (IISc, Bangalore) K. S. Narayan (JNCASR, Bangalore)

Participants: 115 students and teachers from various universities/colleges in Bangalore

Topics covered: Superconductivity and superconducting materials; graphene – from physics to devices; semi-conductor heterostructures, new approaches in structure determination of complex inorganic materials; device physics of polymer based photovoltaics; chemical approaches to nanomaterials with specific examples; magnetic random access memory – fundamentals and applications, building better batteries: challenges and opportunities.

21. Biotechnology

Sri Kaliswari College, Sivakasi
4 – 5 February 2011

Convener: G Marimuthu (MKU)

Co-ordinator: S. Saravanan (Sri Kaliswari College)

Speakers: T. J. Pandian (Annamalai University, Chidambaram), Arun Kumar, V. S. Arun and Shyama, Hussain Munavar, K. Veluthambi, S. Krishnaswamy, G. Marimuthu, Hussain Munavar, K. Veluthambi, S. Krishnaswamy (MKU), S. Sudhagar (Manonmanium Sundaranar University, Tirunelveli) S. Kannan (Bharathiar University, Coimbatore).

Participants: 166 students and faculty from 17 colleges in Sivakasi.

Topics covered: Primordial germ cells and spermato-gonial stem cells; the genographic and the migration of Man-40 and genomic technologies of genographic-40; aging; biology and behaviour of bats, cancer proteomics; novel regulatory network controlling transcription in *E. coli*; selectable marker elimination in transgenic rice, structural biology of porins of salmonella, typhi.

22. Modern trends in chemistry

Lady Doak College, Madurai
7 – 8 February 2011

Convener: M. Periasamy (University of Hyderabad, Hyderabad)

Co-ordinator: S. Vasantha (Lady Doak College)

Speakers: M. Periasamy (University of Hyderabad), K. R. Prasad, A. G. Samuelson, S. Chandrasekaran, S. Natarajan (IISc, Bangalore), S. Sankararaman (IIT Chennai).

Participants: 120 post-graduate students and teachers from various colleges and universities in Madurai

Topics covered: Stereochemical concepts in organic reaction mechanisms and synthesis; recent advances in organic synthesis; reaction mechanisms in organo-metallic chemistry; organotitanium reagents for use in the synthesis of bioactive and energy harvesting molecules; weak interactions in inorganic chemistry; click chemistry and beyond; organic reactions "in water, on water and in the presence of water"; principles and applications of X-ray diffraction; pericyclic reactions; metal-mediated C-C coupling reactions.

23. Current trends in biology

MES College, Bangalore
9 – 10 February 2011

Convener: H. A. Ranganath (NAAC, Bangalore).

Co-ordinator: Ravindra Reshme (MES College).

Speakers: R. Gadagkar, V. Nagaraja, Usha Vijayraghavan (IISc, Bangalore), K. N. Ganeshaiah, V. S. Acharya, Amitabh Joshi (JNCASR, Bangalore), Mewa Singh (University of Mysore), H. A. Ranganath (NAAC, Bangalore).

Participants: 170

Topics covered: Are insects smart?; metagenomics – a fascinating new area in biology; insect plant interactions and evolution of mutualism; experimental evolution; making of flowering stem; doing science and having fun; epigenetics.

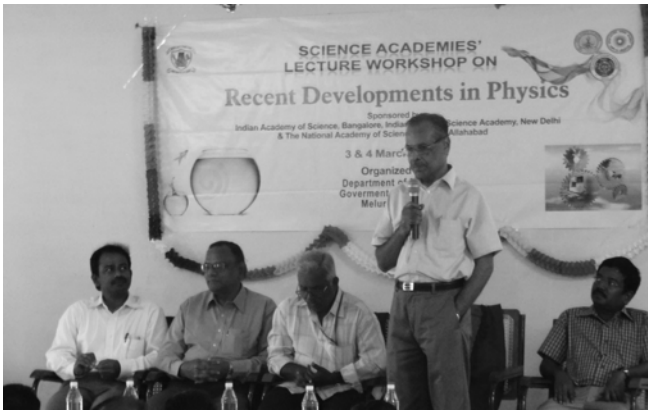
24. Recent developments in physics

Govt. Arts College, Melur
3 – 4 March 2011

Convener: M. Lakshmanan (Bharathidasan University, Tiruchirappalli)

Co-ordinator: A. John Peter (Govt. Arts College)

Speakers: J. Sethuraman (Kirupananda Variyar Engineering College, Salem), M. Lakshmanan (Bharathidasan University), G. Baskaran (IMSc, Chennai), C. S. Shastry (Amrita University, Coimbatore), M. Mangalraj (Bharathiar University, Coimbatore), V. Yegnaraman (CECRI, Karaikudi).



Participants: 89

Topics covered: Nonlinear dynamics – a science of complexity: superconductivity: 100 years young; lab view software; analytical *s*-matrix approach for the study of alpha decay of super heavy elements; development of nanostructured materials; electro-chemical sensor, ultramicroelectrodes and microarrays, chemically modified electrodes – polymer-nano-composites as modifiers microfluidics and lab-on-a-chip EC detection of biomolecules.

25. Partial differential equations

IIT, Patna
3 – 5 March 2011

Convener: Phoolan Prasad (IISc, Bangalore)

Co-ordinator: A. K. Upadhyay (IIT, Patna)

Speakers: D. Bahuguna, M. K. Kadalbajoo, V. Raghavendra (IIT, Kanpur), Phoolan Prasad (IISc, Bangalore).

Participants: 93

Topics covered: Classification of second order PDEs; normal forms; pure IVP for the wave equation of one dimension; IBVP for the wave equation of one dimension; non-homogeneous wave equation; the wave equation in a rectangular domain; the wave equation in a circular domain; heat equation; Laplace's equation; first-order linear, quasilinear and nonlinear partial differential equations based on the method of characteristics; theoretical aspects of Laplace, wave and heat equations.

26. Emerging trends in digital image processing

GR Damodaran College of Science, Coimbatore
4 – 5 March 2011

Convener: B. B. Chaudhuri (ISI, Kolkata)

Co-ordinator: S. Umamaheswari (GR Damodaran College)

Speakers: P. K. Yalvarthy (IISc, Bangalore), P.V.S.S.R. Chandra Mouli (Vellore Institute of Technology, Vellore), P. Nagabhushan (Bangalore Technological Institute, Bangalore), B. L. Deekshatulu (University of Hyderabad), T. Senthilkumar (Amrita School of Engineering, Coimbatore)

Participants: 108 students and faculty from colleges in Coimbatore

Topics covered: Recent trends in medical imaging; image segmentation and edge detection; futuristic research issues in image processing and vision computing; content-based image retrieval; application of genetic concepts in matlab for image processing; research model development issues in video processing.

27. Advances in molecular spectroscopy

SNGS College, Pattambi
4 – 5 March 2011

Convener: K. George Thomas (IISER, Thiruvananthapuram)

Co-ordinator: P. Venugopalan (SNGS College, Pattambi)

Speakers: K. L. Sebastian (IISc, Bangalore), R. S. Swathi, Vinesh Vijayan, K. M. Sureshan, K. George Thomas, Mahesh Hariharan, Reji Varghese (IISER, Thiruvananthapuram), Suresh Das (NIIST, Thiruvananthapuram).

Participants: 253

Topics covered: Fundamental aspects of quantum mechanics; fundamentals of molecular spectroscopy; nuclear magnetic spectroscopy in biochemistry; biological applications of solid state NMR; is the boundary between chemistry and biology disappearing?; stimulii responsive materials; light-matter interactions in the nanoscale; structure of natural and non-natural DNA; DNA nanotechnology.

28. Graduate engineering curriculum development for biomass related subjects

IISc, Bangalore and Jain University, Bangalore
10 – 11 March 2011

Convener: H. S. Mukunda (IISc, Bangalore)

Co-ordinator: C. S. Bhaskar Dixit (Jain University)

Speakers: H. S. Mukunda, S. Dasappa, P. J. Paul, N.K.S. Rajan (IISc, Bangalore), Bhaskar Dixit, R. N. Iyengar (Jain University), B. V. Umesh, T. R. Anil, Shamsundar, T.S. Prahlad, Sripathi, A. Ramachandra, Milton, C.K. Umesh, N. R. Banapurmath, Purushottam.

Participants: 19 students and faculty from various engineering colleges.

Topics covered: Introduction to bio-energy, biomass combustion devices, combustion/engine aspects/new research, carbon foot prints: CDM, JU.

29. Approaches to biodiversity conservation and utilization – North-East example

Regional Centre of Institute of Bioresources and Sustainable Development, Gangtok, Sikkim
14 – 15 March 2011

Convener: J. Nagaraju (CDFD, Hyderabad)

Co-ordinator: N.C. Talukdar (Institute of Bioresources and Sustainable Development, Imphal)

Speakers: M. Sanjappa (Howrah), B. G. Unni (NEIST, Jorhat), J. P. Tamang, N. C. Talukdar (IBSD, Imphal), Usha Lachungpa (Sikkim), Syamali Chakrabarti (National Research Centre for Orchids, Pakyong).

Participants: 118

Topics of lectures: Conservation and utilization of biodiversity; biodiversity and bioresources of Sikkim Himalayas; molecular diversity of non-mulberry silkworms; diversity of the fermented foods and beverages in Sikkim; rich diversity of flora and fauna of Sikkim Himalayas; rich diversity of orchids of Sikkim Himalayas; role of IBSD in conservation and sustainable use of rich bioresources in North-East region of India.

30. Contemporary biology

Jain University, Bangalore
15 – 16 March 2011

Convener: Sandhya S. Visweswariah (IISc, Bangalore)

Co-ordinator: Vijayalakshmi Pradeep (Jain University)

Speakers: Renee Borges, Arun Sripati, Deepak K. Saini, Dipshika Chakravorty, Arun Kumar, P. B. Seshagiri, Nagasuma Chandra (IISc, Bangalore).

Participants: 125 students and faculty from various institutions in Bangalore

Topics covered: Nothing in biology makes sense; looking into the brain; looking into cells; infection biology; introduction to human molecular genetics; recent advances in stem cells; bioinformatics.

31. Advances in chemistry

PSN College of Engineering and Technology, Melathediyoor, Tirunelveli
17 – 18 March 2011

Convener: R. Ramaraj (Madurai Kamaraj University).

Co-ordinator: S. Balakumar (PSN College).

Speakers: S. Umapathy, E. Arunan, S. Natarajan (IISc, Bangalore), Anunay Samanta (University of Hyderabad), S. Muthusamy (Bharathidasan University, Tiruchirappalli).

Participants: Postgraduate students and faculty from various colleges in Tirunelveli.

Topics covered: Fluorescence signalling of the transition metal ions; fluorescence probing of the ionic liquids; laser spectroscopy and X-ray diffractions; laser spectroscopy; molecular beam microwave spectroscopy; hydrogen bonding; studies on cyclo additions; synthesis of macrocyclic compounds.

32. Brainwave: Inspiring young minds

SGTB Khalsa College, New Delhi
17 – 18 March 2011

Convener: J Nagaraju (CDFD, Hyderabad)

Co-ordinator: Komal Kamra (SGTB Khalsa College)

Speakers: Akhilesh Tyagi (National Institute of Plant Genome Research, New Delhi), Anil Aggrawal (Maulana Azad Medical College, New Delhi), O. P. Jasuja (Punjabi University, Patiala), Balram Bhargava (AIIMS, New Delhi), S. Natesh (DBT, New Delhi), H. Y. Mohan Ram (Delhi), Ram Ramaswamy (JNU, New Delhi), K. N. Ganeshaiah (UAS, Bangalore), J. Nagaraju (CDFD, Hyderabad), Navin Khanna (ICGEB, New Delhi), S. D. Biju (University of Delhi).

Participants: 700 students and faculty from various colleges in Delhi.

Topics covered: Plant genomics; current perspectives in forensic biotechnology; biometrics; health care innovation in India; biotechnology in India: the changing scenario; plants in Indian tradition; a few things that physics can learn from biology; mining the past for shaping the future; silk – key to evolutionary success of silkmoths and spiders; dengue vaccine: mirage or a reality; life: understanding with uncertain knowledge – halting human-induced amphibian extinction.

33. Prospects and future challenges in plant biotechnology

GR Damodaran College of Science, Coimbatore
18 – 19 March 2011

Convener: K. Veluthambi (MKU, Madurai)

Co-ordinators: A. Malarvizhi/K. Pavithra (GR Damodaran College)

Speakers: K. Veluthambi, R. Usha, (MKU), M. Ramesh (Alagappa University, Karaikudi), R. Jayanthi (Sugarcane

Breeding Institute, Coimbatore), A. S. Raghavendra (University of Hyderabad), P. R. Padma (Avinashilingam University for Women, Coimbatore), N. Tuteja (ICGEB, New Delhi), H. S. Savithri (IISc, Bangalore), R. Uma Shaanker (UAS, Bangalore).

Participants: 141 students and faculty from GRD College and other institutions in Coimbatore

Topics covered: Generation of selectable marker-free, transgene stacked rice plants with sheath blight resistance; applications of plant virus research in biotechnology; ex situ conservation of bacopa monnieri (L) through biotechnological approaches; biotechnological approaches in pest management; C4 photosynthesis: recent advances and exploitation of our knowledge to improve C3 plants; anticancer drugs in plants; MCM6 single subunit from pea functions as DNA helicase and promotes salinity stress tolerance without affecting yield; viruses as nano particles; bioprospecting in the Western Ghats.

34. Recent trends in physics

Amrita School of Arts and Sciences, Amrita Viswa Vidyapeetham, (AVV) Kollam
23 – 25 March 2011

Convener: M. Lakshmanan (Bharathidasan University, Tiruchirappalli)

Co-ordinator: V. M. Nandakumaran (AVV, Kollam)

Speakers: M. Lakshmanan (Bharathidasan University, Tiruchirappalli), E. S. Raja Gopal (IISc, Bangalore), K. A. Suresh (Centre for Soft Matter Research, Bangalore), V. P. N. Nampoori, M. R. Anantharaman (CUSAT), Anil Shaji (IISER, Thiruvananthapuram), V. M. Nandakumaran (AVV, Kollam)

Participants: 103 postgraduate students from AVV and nearby colleges

Topics covered: Nonlinear dynamics; liquid crystals; nonlinear optics; quantum computing; nano science and nano technology; measurement techniques; Bose-Einstein condensation of photons.

35. Statistical applications in industry, business, agriculture and ecology

St. Thomas College, Pala
26 – 28 March 2011

Convener: A. P. Gore (Pune)

Co-ordinator: K. M. Kurian (St. Thomas College)

Speakers: Vijay Nair (University of Michigan, USA), A. P. Gore, T. V. Ramanathan, (Pune), E. V. Gijo (ISI, Bangalore), K. K. Jose (St. Thomas College), N. Balakrishna (CUSAT, Cochin).

Participants: 103 students and faculty from St. Thomas College and other institutions in Kerala.

Topics of Lectures: Statistics in industry: a review of past developments and new directions; tiger and elephant counting; measurement of biodiversity using cycle sampling; statistics and information-intensive agriculture; process improvement using design of experiments and Taguchi methods, applications of forecasting in business and industry; six sigma implementation in Indian industry.

OBITUARIES

KRISHNA RAJARAM SURANGE (elected 1976)

During the early part of the twentieth century, pre-partition India produced some famous botanists who took a world view of their subject in its various avatars. Professionally, they were equally at ease with the subject's basic and applied aspects as well as its living and extant taxa. Surange was one of those rare persons who combined his academic interests with considerable administrative skills and still had time to be a lover of the arts. He was born on **7 February 1920** in Ujjain, Maharasthra on Mahashivaratri day to Rajaram Dhontopant Surange and Sita Bai and was the second child amongst five brothers and sisters. His father was in the service of a princely state and soon moved to Gwalior to make his home there. Young Surange studied at Victoria College, Gwalior and obtained his High School and Intermediate degrees in 1937 and 1939 respectively. At an early age of his academic career, tragedy struck the family in the form of severe and untimely accidents, and the care of the family fell on the frail shoulders of Surange. He decided to move to Lucknow to complete his undergraduate studies. It was while he was a student at Lucknow University that he came in contact with Birbal Sahni, then Professor and Head of the Botany Department, and was soon impressed not only by his professor's personality but also with the subject that he taught!! He took to botany with all the fervour at his command passing his MSc in botany from Lucknow University with a first division in 1943. Within a year in 1944, he had published a paper in *Nature* and later completed his PhD under the guidance of Birbal Sahni on the "Morphology of Living and Fossil Cyclanthaceae" in 1947. This work is of great significance even today as it documents the presence of South American plants in the Deccan Intertrappean volcano-sedimentary sequences during a brief interval of the late Cretaceous

and early Palaeocene at a time when India was a northwardly drifting island subcontinent.

In 1946, he married Shushila Joshi and shortly afterwards, he was admitted to the Cambridge School of Botany under Henry H. Thomas, FRS completing his second PhD in 1949. Very few scientists have had the privilege of being guided by two Fellows of the Royal Society for their respective doctoral dissertations! His second topic of research focussed on Lower Carboniferous ceonopterid fern taxa from England, namely Botryopteris and Stauropteris. This work is his seminal contribution to palaeobotany and finds place in many text books as it sheds light on rooting and seed reproductive systems in the early evolution of land plants. His love for Palaeozoic plants continued and on his return to India he was one of the pioneers on the Lower Gondwana genus, Glossopteris. His work on this enigmatic taxon added invaluable knowledge to the subject and was a passion with him which he pursued to the very last trying to combine data from Australia and other southern hemisphere landmasses. His monograph on Indian Fossil Pteridophytes published by CSIR is still considered a monumental piece of work. Together with his able student Shaila Chandra, herself a distinguished senior scientist of the Institute, he published what is probably the most complete account of the Indian species of Glossopteris. Needless to say that though Surange published several other very significant papers, only a few are highlighted in this brief biography.

Surange was first appointed Reader in the fledgling Palaeobotany Institute in 1949 and after the sudden and unexpected demise of his Guru, the visionary Birbal Sahni, he was appointed Assistant Director in the Birbal Sahni Institute of Palaeobotany at Lucknow in 1952. He served the Institute in various capacities and as Director from 1959 to 1980. It would be no exaggeration to state that under his leadership the Institute attained great acclaim as one of the few research centres of palaeobotany in the world mainly because of his own personal initiatives and the band of dedicated research workers that he had nurtured to constantly strive for excellence. He led by example and was a Fellow of all the three Indian Science Academies as well as a Founder Member of the Palaeobotanical Society which had played a key role in the establishment of the Institute itself. The framework of the Institute that exists today owes its existence to Surange as does the establishment of a world class museum and repository where scientists from all over the globe can examine material published by the scientists of the Institute.

In 1980 he was given charge of the Directorship of the Agharkar Research Institute at Pune. He put all his energy and experience into his new assignment for five years and again succeeded in making the Institute an international centre of learning and research in many scientific disciplines.

His own involvement in scientific issues at the international level is attested by the fact that he was an active member of the working Group of the International Union of the Geological Science (IUGS) Sub-commission on Gondwana Stratigraphy and had visited various centres of palaeobotanical research in the UK, France, Belgium, Germany and Sweden during 1947–1948 and in the USA during 1952.

Surange was a friendly person who enjoyed the simple joys of gardening, photography and music. His love for painting ripened at the age of 65 years and he continued with this passion till the very end. His death on **6 January 2010,** is a great loss to the scientific community and to his family, friends and colleagues.

K S VENKATARAMANI (elected 1968)

In the demise of K S Venkataramani on **29 December 2010** at Chennai, science has lost a distinguished horticulturist who devoted a lifetime to varied aspects of the cultivation of tea in our country, notably in the Nilgiris in southern India. It is indeed sad to know that he had been ill with colon rectal cancer for the past three years.

Son of K. S. Sundaram Iyer and Lakshmi Ammal, he was born on the **17 January 1924** at Madras (now Chennai). Venkataramani was educated at the Besant Theosophical School, Madanapalle, and graduated with a B.Sc. degree in Botany from the Madras Christian College (MCC) in 1942. Working on Indian vegetables and fruits, he earned his M.Sc. degree with guidance from K. C. Naik, and the Ph.D. degree of the Madras University with guidance from

T. S. Sadasivan. In 1948 he found his rightful place when he was appointed Botanist to the United Planters' Association of South India (UPASI) where he rose to the position of Director of Research in 1965. The shifting of the Tea Research Station, originally located at Devarshola in the Nilgiris, to Cinchona in the Annamalais was an onerous operation which he completed successfully. He sought voluntary retirement in 1975, but continued to be a Consultant to the Tamil Nadu Tea Plantation Corporation and several plantations until about 1992. His opinion and advice was valued by many organizations such as CSIR and ICAR and he served on many state-level and national committees. For a short spell in 1959 he taught as Reader in Horticulture in the Post Graduate School of the Agricultural Research Institute at Coimbatore.

As the first Botanist at the UPASI Tea Research Station, Venkataramani had a challenging agenda which he worked on with conviction, confidence and courage. Problems arose in plantations and required solutions in the field. Quite clearly, he had to embrace all aspects of cultivation of tea which is what horticulture is about. Though his special focus was on clonal selection, other related aspects such as plant protection received his close attention. His excursions into the horticulture of other crops such as banana, rubber and coffee enriched his experience in meeting the challenges of tea cultivation with imagination and innovation. He was a pioneer in tea clonal selection and vegetative propagation. His most significant contribution to the tea industry is a set of outstanding tea clones combining high yields with quality and resistance to drought and diseases. Many of these clones such as Sundaram, Athrey, Pandian, Golconda, Swarna, Jayaram and others are extensively planted in southern India. His analysis of the taxonomy of tea and the tea clones in general cultivation in southern India is a significant contribution. As Venkataramani noted, we see in the field a wide spectrum of tea populations showing variations in leaf form and other morphological features relevant in taxonomy. The populations range from the small-leaved *Camellia sinensis* to the long-leaved *C. assamica*. From analysis of populations in the field, the cultivated tea populations were held to be complex species hybrids. Venkataramani also contributed notably to elucidation of plant nutrition in control of the vexed blister blight of tea caused by the fungus *Exobasidium vexans*, the response of tea bushes to foliar application of fertilizers, laboratory evaluation of copper fungicides, besides the chemical control of weeds. His manifold duties and commitment to development of tea took him to almost all tea-growing areas in the country enabling him to comprehend the practices, principles and problems of development of tea in the broadest perspective. A list of his important publications on tea can be found in Paul Hockings,1996, *Bibliographie generale sur les monts Nilgiri de l'Inde du sud, Espaces Tropicaux No. 14*.

In his early career he contributed to our knowledge of the banana complex, hybrid vigour in brinjal (*Solanum melongena*), blossom biology of vegetables such as Hibiscus esculentus, and vitamin C content of vegetables such as Trigonella foenum-graecum, reflecting his varied interests and versatility.

He was a Fellow of the Indian Academy of Horticultural Science and of the Indian Botanical Society. He was a recipient of the 'For the Sake of Honour Award' from the Rotary Club of Nilgiris. The scroll given to him said: "his high sense of duty, integrity and honesty both as a scientist and as a man, are widely known and respected. Highly principled, he is uncompromising where ethics, good conduct and standards of performance are concerned. Venkataramani believes in the religion of hard work. He has never cared or worried about rewards. He has put into practice the Rotary motto Service above Self. In 1998 the Tea Board of India presented Venkataramani with its "Tea Research Award for Lifetime Achievement" in the field of tea research and development.

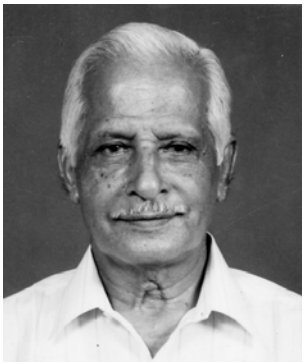
I* knew Venkataramani from the time he joined the University Botany Laboratory at Madras in 1945 or 1946 where I had been doing research in soil mycology and soil-borne diseases of cotton. His simplicity, quietude, utter dedication to work, and self-effacing nature were obvious to me even then. Unobtrusive, he moved on with his work on blossom biology or vitamin C content of vegetables, as if nothing is happening around him. Such was his complete involvement and concentration in his work. He admired his teachers, notably A. J. Boyd, the distinguished and much respected Principal of MCC at that time. He would tell me about his association with Cherian Jacob, the banana specialist in Coimbatore and his respect for S. N. Chandrasekhara Iyer, the botanist at the Institute in Coimbatore from whom he said he learnt a great deal. As far as I could note, he had few interests other than horticulture in its broadest sense. Such was his intense passion for science. To a question about his other interests or hobbies, Mrs Venkataramani told me he

* Obituary written by **C. V. Subramanian**, Chennai.

was interested in the Ramakrishna Math and used to attend the lectures of Swami Ranganathanandaji Maharaj and he had a collection of Ramakrishna literature.

Venkataramani is survived by his wife, Kanthamani whom he married in 1966. Kanthamani is an organic chemist in her own right, having obtained her doctorate working with K. Venkataraman at the National Chemical Laboratory, Pune. In the years following their marriage, she continued her work on flavanoids, but now, on those involved in the flavour of tea.

Pondering over Venkataramani's lifetime that was devoted with passion and resolve to development of tea I rejoice in the conviction that development of tea cannot just be mere science, but more pragmatically an art. There was in him the spark to combine both.



KOLLIYIL HAMEED ALIKUNHI (elected 1969)

K. H. Alikunhi was born in Azhicode, Kodungallur, Kerala on **27 May, 1918.** He obtained his B.Sc (zoology) in 1938 and M.Sc in 1941 by research both from Madras University. He was conferred D.Sc. by Central Institute of Fisheries Education (Deemed University) in 2000. He served as Research Assistant in Zoology Research Laboratory, Madras University during 1941–43; Assistant Professor (zoology) in Maharajas College, Ernakulam during 1943–45, Assistant Director (fresh-water research) in Department of Fisheries, Madras during 1945–48, Research Officer (pond culture) in Central Inland Fisheries Research Institute, Barrackpore during 1948–64 and Director, Central Institute of Fisheries Education, Bombay during 1964–72.

His contribution to fisheries was recognized by the Food and Agriculture Organization in 1972, and since then, he was assigned different positions by the FAO. During 1972–78, he served as Inland Fisheries Development Adviser, Government of Jordan, Amman; Project Manager, FAO/UNDP Brackishwater Shrimp and Milkfish Culture Research & Training Project, Jepara, Indonesia; and as FAO Consultant in Sri Lanka and Vietnam. Later, he served as Fisheries Development Adviser, Government of Kerala and as Director in shrimp hatcheries.

Alikunhi's career turned from that of an academician to that of a fisheries scientist after he joined the Department of Fisheries, Madras. Since then, his contribution to fisheries research, production, development and management was immense. In the late 1940s, he studied the breeding habits of carps and reared the high-altitude stocks of Cyprinus carpio in the plains of Madras. These initial, but important, headstart researches demonstrated the potential of a breakthrough in freshwater aquaculture in India. After a decade, in the late 1950s, the breakthrough followed. Alikunhi, along with Hiralal Chaudhury, achieved the induced breeding of Indian carps for the first time. The team followed up this success with production of zooplankton for the newly-hatched larvae of carps and pond management. The rest is history. The success in induced breeding was published in *Current Science* in 1958 and paved the way for a revolution in carp production in the country, in what is termed as "aquaplosion". During the last 50 years, carp production from farming has been consistently increasing and in 2009–2010 had reached more than 3 million tonnes, valued at more than Rs. 10,000 crores. Interestingly, a note published by Chaudhury and Alikunhi may not be a "citation classic" but the technique described by them in that publication is being practised by every fish farmer in India and South East Asia. Hence in terms of 'economic impact', their *Current Science* publication has been far reaching.

Other achievements of Alikunhi and his team include extensive trials showing superior growth potential of exotic carps in Indian waters and demonstration of the potential for 10 t of carp production per hectare per year. He also played a major role in the establishment of Aquaculture Station in Orissa, which later fructified as the Central Institute of Freshwater Research at Kausalyaganga, Bhubaneswar.

As Director, Central Institute of Fisheries Education, Mumbai, Alikunhi was instrumental in locating the Institute in its permanent location at Versova, establishing training sub-centres for freshwater and brackishwater aquaculture, and equipping the Institute as one of the foremost educational institutions in the region with FAO/UNDP assistance. Later, as Chairman of Quniquennial Review Team of CIFE, he recommended its upgradation as a Deemed University, which was accepted by the Government of India. India's first fisheries university was thus born.

As Fisheries Development Adviser, Government of Kerala, he set up and operated the first commercial penaeid shrimp hatchery for the tiger shrimp 'Penaeus monodon' and the Indian white shrimp 'Penaeus indicus' at Azhicode, Kodungallur in 1978–79 and demonstrated the use of hatchery-produced seed for raising commercial crops in brackishwater ponds at Narakkal. Again, for the first time, he demonstrated large-scale rearing of freshwater giant prawn 'Macrobrachium rosenbergii' to juvenile stage at Azhicode.

The contributions of Alikunhi attracted several awards which he received including Chandrakala Hora Memorial Gold Medal of the Indian National Science Academy, New Delhi and Sunderlal Hora Gold Medal of the Ichthyological Society of India, Madras. He published more than 200 papers on fisheries development, freshwater and brackishwater aquaculture, marine fisheries and marine biology. His contributions have left indelible footprints in fisheries education and research. His demise on **September 26, 2010** is an irreplaceable loss to the fisheries science and development in India.

BASAVA SRI RAMAKRISHNA (elected 1975)

The doyen of acoustics in India passed away on **12 February 2011**. He was born in Vizianagaram, Andhra Pradesh on **17 October 1921,** and received his B.Sc degree from Andhra University and MSc degree in physics from the Banaras Hindu University. After two brief teaching stints, he received a government scholarship to specialize in acoustics at the Illinois Institute of Technology in Chicago where he obtained his PhD degree in 1949. Soon thereafter he joined the Indian Institute of Science, Bangalore as a lecturer in the Department of Electrical Communication Engineering. He served this institution in various capacities and with great distinction for over three decades.

One of the first tasks undertaken by Ramakrishna at IISc was the development of an acoustics laboratory and introduction of a course in acoustics in the curriculum for students in electrical communication engineering. The laboratory contained acoustic test and research facilities including an anechoic chamber, a reverberation chamber, a recording studio with adjustable acoustic characteristics, and a water tank with anechoic walls, all of which were built in India for the first time through his efforts. He also devised several simple experiments for the instruction of students and kept augmenting this set over the years. A striking example was the development of a simple laboratory set-up for obtaining spectrograms of speech suitable for instruction. He taught under-graduate and graduate level courses in acoustics, vibrations, wave propagation, information theory, probability theory and random processes, and these subjects acquired a less intimidating and more interesting hue in his classroom.

Research in acoustics and linguistics thrived in IISc under the guidance of Ramakrishna. His passion for research and the joy he derived from its pursuit were infectious. His research contributions covered practically all aspects of acoustics, from vibrations and electroacoustics, to speech and hearing, noise and vibration control, architectural acoustics, and ocean acoustics. One of his earliest works was a theoretical and experimental analysis of vibrations of Indian musical drums (mridangam and thabala) which explained the unique property of the harmonic character of their overtones. This was indeed a remarkable piece of 'pure research' which attracted the attention of C. V. Raman who had been the first to observe the above-mentioned property. Ramakrishna next turned his attention to the problems of nonlinear vibrations of strings and active control of string vibrations. He and his students made substantive contributions to literature in these fields. His abiding interest in the 'open window' problem (study of sound propagation through an open window) led to a seminal study of non-exponential decay of sound in rooms. He also developed a statistical theory of audience sound absorption in concert halls that enables a better prediction of expected sound absorption from the audience. Another piece of pioneering research by Ramakrishna and his associates was the development of information theoretic models of linguistic communication and language transcription, and studies of relative efficiencies of English, German, and several Indian languages, and relative efficiencies of Devanagari, Tamil and Roman scripts. This was followed by an investigation of prose styles in literature from the point of view of communication theory, and a linguistic

analysis of stuttering patterns among monolinguals and bilinguals. A hallmark of all his work was the balance between theory and experiment, and his talent for devising simple experiments to demonstrate key theoretical concepts and results. Some of the most acclaimed and visible contributions of Ramakrishna are towards the design of the acoustics and sound reinforcement systems of several auditoria, concert halls, theatres, conference rooms, etc. He provided the acoustical designs for some of the earliest and finest multipurpose auditoria in the country, including the 3500 seater Centenary Auditorium of Madras University. He was acutely aware of the fact that visual cues enhanced the auditory experience, and attention to aesthetics was one of the highlights of his designs. He strove hard and succeeded in creating awareness of the need for a scientific approach to acoustical design of buildings in the community of architects and builders in India.

Ramakrishna became the Chairman of the Department of Electrical Communication Engineering of IISc in 1969. Soon thereafter, he led a team of IISc faculty members to the National Conference of Electronics organized by the Government of India to review the status of the field of electronics in the country. This culminated in the establishment of Centre for Information Processing (CIP) in 1971 at the ECE Department of IISc under his chairmanship, with a substantial grant from the Defence Research and Development Organisation (DRDO). He nurtured the growth of several emerging areas of research such as acoustical/optical information processing, surface acoustic wave devices, and microwave materials/technology under the aegis of CIP, and also ensured the merger of these activities into the parent ECE Department at the end of the 8-year grant period. In 1979, he initiated research in ocean acoustics, again with a major grant from DRDO. Introduction of these new areas of research during the decade of seventies led to the emergence of a stronger and more vibrant ECE Department.

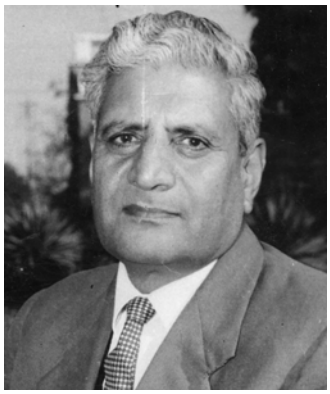
In 1974, Ramakrishna was appointed Chairman of the Division of Electrical Sciences of IISc, and also the Chairman of the Indo-Swiss Joint Committee constituted by IISc as per the provisions of an Indo-Swiss Agreement for setting up a Centre for Electronics Design and Technology (CEDT) in collaboration with Swiss Federal Institute of Technology (ETH-Zurich). The role of the proposed centre was to provide specialized education and training in electronics design and technology to engineering graduates in Indian industry through a one-year post-graduate diploma course. The committee headed by Ramakrishna completed, within a span of two years, several tasks including obtaining sanctions for grants, construction of laboratories and other facilities, planning and procurement of equipment, recruitment and training of faculty/technical staff, design of curriculum, and procurement of academic approval for the one-year PG diploma programme, and CEDT became operational in February 1976. CEDT has now grown into a highly regarded centre of excellence in electronics design and technology.

Ramakrishna was the architect of a major reform of academic programmes in IISc. The reforms included introduction of a credit system based on unitization of courses, introduction of the semester scheme, examination reforms such as continuous internal evaluation followed by semester-end examination, awarding of numerical grade points, grade point averages, and letter grades, and fixing of norms for passing and for awarding of class/distinction. Other concurrent and related tasks included preparation of user-friendly documents/manuals, gradation of courses into 100/200/300 levels for UG/PG/Research programmes, and designing of IISc-wide Scheme of Instruction, syllabi, and time-tables. Ramakrishna conceived and formulated the entire package, held extensive consultations with other faculty members, and piloted the scheme through the academic and administrative bodies of IISc for approval and implementation. The new scheme, introduced in 1971, has proved to be beneficial to teachers and students alike, offering flexibility in academic work and enhancing the quality of academic programmes. All leading universities/academic institutions in India have adopted similar schemes following the reforms introduced by IISc.

Ramakrishna was a founder Fellow and former President of the Acoustical Society of India. He was a Fellow of the Acoustical Society of America and the Institution of Electronics and Telecommunication Engineers, India, and a member of the International Commission of Acoustics from 1976 to 1981. He was the recipient of the Bhagavantham Award for 1984 for his contributions to acoustics, and the Raman Centenary Gold Medal for 1988.

Prior to his retirement from IISc in 1981, Ramakrishna went on deputation to Hyderabad in September 1980 as Vice-Chancellor of the University of Hyderabad. He

was responsible for the planning, design and construction of the Science Complex, the administrative building and other buildings of the then nascent university. On completion of this assignment in January 1986, he returned to Bangalore and immersed himself once again in the pursuit of his scientific interests, offering advice and consultancy in acoustical design of auditoria and other buildings, and reading voraciously. He was a regular invitee and an active participant in several scientific gatherings, enjoyed discussions with his students and former colleagues, and often quizzed them about current developments in their areas of expertise. His students and younger associates remember with warmth and gratitude his role as a teacher, mentor, guide and philosopher. His passing is a great loss not only to his family and friends but also to the large community of his students and to the country as there is no one who can match his contributions to the field of acoustics.



LACHMAN DAS KAPOOR (elected 1963)

Son of the late Bhagwandas Kapoor and Jankidevi, Kapoor was born on **27 September 1916**. Since 1946 Kapoor had been engaged in the survey and study of medicinal plants of Western Himalayas and made valuable contribution to their utilization and pharmacognosy. His work on the biosynthesis of alkaloids was an important contribution. A retired scientist from the National Botanical Research Institute, Lucknow, Kapoor passed away on **16 April 2002**.

Kapoor received his B.Sc from Punjab University, MSc from Banaras Hindu University, Varanasi, and his Ph.D. degree from London University.

He was selected to work in the drug research laboratory of Jammu and the Kashmir government, and was later appointed as botanist-in-charge of the botany division. He initiated research on pharmacognostic studies, and the techno-economic survey and cultivation of medicinal and aromatic plants, some of which were grown on a semi-commercial scale. He was the recipient of a research grant from the Indian Council of Agricultural Research for cultural studies on exotic medicinal plants. In 1955, he was deputed to the London School of Pharmacy for advanced studies and training in pharmacognosy, where he worked for his Ph.D. degree under J. W. Fairbain.

After his return from London in 1958, he joined the Regional Research Laboratory, Jammu. In addition to his research activities in botanical sciences, he was editor-in-chief of the RRL Bulletin, Jammu. For the first time in the temperate Himalayas, he successfully initiated the culture of ergot on rye, now grown on a commercial scale.

In 1964, he was transferred to the National Botanical Garden of Lucknow, where he introduced the cultivation of some aromatic plants on the alkaline, saline soils. He reorganized the research activities of the pharmacognosy division of NBRI, and was the recipient of three research schemes on various aspects of ayurvedic medicinal plants, financed by the Indian Council of Medical Research. He was also the recipient of a PL 480 grant (U.S.) for "Studies on water soluble seed mucilages".

He was invited by His Majesty's Government, Nepal, to advise on the establishment of herbal farms for commercial production. He visited Sri Lanka and Bhutan to advise on the commercial production of ayurvedic drugs for pharmaceutical preparations. He was the recipient of an award by the President of India for his invention of a new distillation apparatus. He was a consultant to a number of pharmaceutical concerns working on natural products.

Kapoor was a fellow of the American Society of Pharmacognosy and the Linnean Society of London and a member of the Institute of Biology, London.

Kapoor was the co-author of four books and had published more than 200 research papers.

Kapoor is survived by his wife, Prakash Kapoor, his daughter, Suman Virmani, his two sons, Anil Kapoor and daughter-in-law, Kusum and Ashish Kapoor and daughter-in-law, Sita and his five grand children and two great-grand children.

RAMAVARAPU VENU GOPALA RAO (elected 1977)

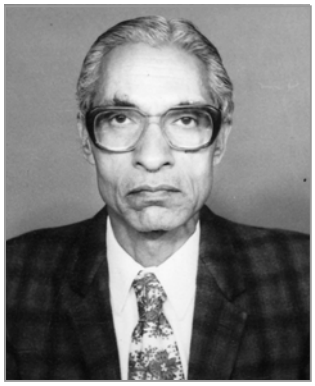
Born on **3 December 1927** in Andhra Pradesh, Gopala Rao was an INSA senior scientist in the Department of Chemistry, Jadavpur University, Calcutta. He passed away on **3 September 2010**.

Gopala Rao obtained his BSc degree in 1948 (Andhra), his MSc degree in 1951 (Banaras) and his Ph.D in 1957 (Berkeley). His area of interest included physics and chemistry of liquids, solids and molecular acoustics. He was an outstanding theoretical/physical chemistry scientist. His contributions to the chemistry of liquid state, ultrasonics, various models in support of equations of state etc., had attracted worldwide attention. He is the author of several research publications in reputed journals.

Several equations developed by Gopala Rao have been used to compute important physical properties of liquids and to understand the nature of liquid state in a comprehensive way. Some of his methods, especially the application of square well potential to liquid metals and alloys forms an important discovery. Further, his recent work on fused salts is an important contribution. More generally, his work reveals that the structure function can be used as a unified property to evaluate all the properties of liquids. Recently, new equations for the pressure derivatives of elastic constants which in turn are related to third order elastic constants and acoustic Gruneisen's constants have been derived. New equations have been derived for diffusion coefficient and its pressure derivatives.

Gopala Rao was a fellow of the Indian Physical Society, Indian Chemical Society, Indian Society of Surface Science and Technology, West Bengal Academy of Science and Technology, Foundation Fellow, Acoustic Society of India and Fellow of the Indian National Science Academy.

His family consists of his wife Jaya Lakshmi, one son and two daughters.



PANDURANG GANPATRAO ADYALKAR (elected 1974)

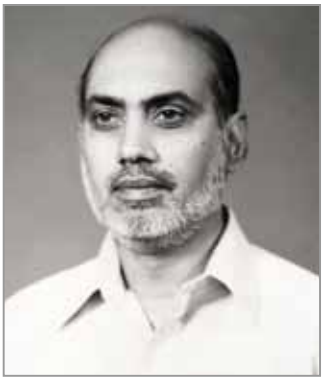
After his MSc degree in geology, Adyalkar who was born on **3 December 1927** obtained his Ph.D degree from Nagpur University on the 'Hydrogeology of Upland Alluvial Valleys of India'. He obtained a certificate in 'hydrogeology' and training in 'aerial photography' from the Government of France in 1968–69. He was also a member of the Indian delegation to Algeria in 1975 representing 'Ground Water'.

After discovering lead-antimony-sulphide ore near Bhiwapur in Nagpur district of Maharashtra, he joined the Geological Survey of India in October, 1953 as Assistant Geologist, serving that organization till November, 1959 in the field of economic geology of manganese, copper and lead-zinc in Madhya Pradesh and Rajasthan followed by his work on groundwater from June, 1957, when he was promoted to the post of Geologist at Geological Survey of India (GSI).

From November 1959 to November 1966 he was on deputation to the Exploratory Tubewells Organisation in the Ministry of Agriculture, where he worked in a senior capacity, guiding all hydrogeological work in relation to exploratory drilling and assessment of groundwater potential in the whole country. On returning to GSI in early 1967, he continued to work as Officer-in-Charge, Ground Water Division and from January 1969 as Director of the GSI in the central region upto March 1979. From 1979 he worked as Director, Central Ground Water Board and was in-charge of all hydrogeological work in West Bengal, Bihar, Orissa, Sikkim and Andaman and Nicobar Islands.

His areas of interest were geology, hydrogeology, mining and environment. He was a permanent member of the sectional committee of geology and a council member for the years 1971–73 of the Indian Science Congress Association.

He passed away on **13 November 2007**. His family consisted of his wife Usharani, two sons and two daughters.



MADHAVA RAO DHANVADA (elected 1974)

Born in Allahabad, D. M. Rao had a childhood passion for flight and airplanes. He received his undergraduate degree in physics from Allahabad University and worked as a scientist and later as Deputy Director at the National Aeronautical Laboratory (NAL) in Bangalore. He was an adjunct professor at the Indian Institute of Science, Bangalore. Rao received his postgraduate degree in engineering at the Imperial College of Science and Technology in London, England. Later, he and his family moved to England, where he received a Ph.D. in aeronautics from Imperial College. Upon completing Ph.D., he and his family moved to Norfolk when an opportunity to work at the NASA Langley Research Center through the National Science Foundation was presented.

Rao excelled in the aerospace field as his interests were in high angle of attack aerodynamics, active and passive vortex generation, vortex abatement, and boundary layer control. He received six U.S. Patents for aerodynamic devices that he had designed and tested for vortex generation and high angle of attack maneuverability. He was the author of over 75 technical publications. He was elected Associate Fellow of American Institute of Aeronautics and Astronautics. He was a mentor to several Master's students.

Rao further enhanced his career when he co-founded Vigyan Research Associates, Inc., located at Langley Research Park in Hampton. Vigyan specialized in all aspects of aerospace, computer and environmental engineering services to Federal agencies including NASA Langley Research Center. Rao was able to continue wind tunnel research projects in the low speed and boundary layer wind tunnels he designed and built at Vigyan. After retiring from Vigyan in 1998, he enjoyed staying current with technical advances in Aerospace Engineering. He was an avid reader and internet explorer and became very proficient with all aspects of information technology.

D. M. Rao passed away on **December 29, 2010** in Hyderabad, while travelling with his wife to visit family and friends. He was 78.

Rao is survived by his wife Padma, his second son Ravi and wife Diana, daughter-in-law Patricia and grand daughter Emily.

VERONICA RODRIGUES (elected 1995)

Born in 1953, Veronica was Senior Professor at the Tata Institute of Fundamental Research (TIFR) at its Department of Biological Sciences, Mumbai and its National Centre for Biological Sciences (NCBS), Bangalore. She passed away on **November 10, 2010**.

Veronica was a leading developmental neurobiologist who, in a career of 34 years in research, made major contributions and influenced the scientific directions of many. Her research started with the study of chemo-sensory behaviour in the fruitfly *Drosophila*. Her group pioneered in contributions to the understanding of how the network of nerve cells that constitute the chemosensory detection and coding system of the fly is put in place and functions in the mature animal. Her recent work contributed to examining the ways in which activity of nerve cells sculpt their form, function and survival. Her collaborators have gone on to establish and occupy positions in research and teaching all over their world. The culture of excellence that they strive to establish is a testimony to her training and influence. Through her research accomplishments, collegiality and mentorship, Veronica leaves a legacy and a void.

In the 1970s a band of accomplished phage and bacterial geneticists, in the hubris of their successes in unravelling the secrets of the strands of life, turned to understanding how the brain works. Seymour Benzer led one such tendency and was arguably the founder of neurogenetics, the study of how genes put in place animal behaviour. Each of Benzer's stellar collaborators took a behavioural trait and began its genetic analysis in the animal that has become the test-tube for studying animal

development and behaviour: the fruitfly *Drosophila melanogaster*. Obaid Siddiqi, the founder and head of the Molecular Biology Unit at TIFR worked with Benzer at Caltech and returned from his sabbatical to work on two projects, the genetics of nerve conduction and that of chemosensation.

Siddiqi rapidly established facilities for fly genetics and electrophysiology at TIFR and began exploring the new frontier of research in neurobiology. His new directions attracted a few brave collaborators and many puzzled watchers from the side. Veronica had completed her BA in microbiology at the Trinity College in Dublin and applied to work at TIFR on bacterial conjugation. Arriving in Bombay in 1976, she discovered that Siddiqi's research priorities had shifted. Sniffing out various possibilities for research, her instinct and Siddiqi's sophisticated nudge led her into the 'smell and taste' project.

Veronica was a 'natural' in this uncharted terrain. Siddiqi and she made a dream team. The best of intellectual debates in the world of neurogenetics and *Drosophila* permeated the laboratory through Siddiqi's influence and, later, through P. Babu's. Satpal Singh, followed by K. S. Krishnan and Tadmiri Venkatesh led in fermenting the pot of this debate. She quietly, and fully, imbibed this heady brew and participated in its making. Drunk with the satisfaction of debate, many students and faculty, naturally, could not distinguish discussion with doing. Veronica, ever one to hold her intellectual drink, always linked thought and action to make excellent science. This ability to get things done, no matter what else was going on, was a quality which would be her imprimatur all her life.

Success and recognition came early, but there were major conceptual and experimental barriers that had been overcome. The first was the standardization of olfactory and gustatory behavioural tests in the fly. The idea behind the tests was usually deceptively simple, indeed that was their strength: Given a choice of odour or contact chemical stimulus, how does the fly behave? Veronica and Siddiqi endlessly discussed and devised tests and went down to the workshop or glassblowing section with their designs. The next challenge was to use the fly's choice to screen for mutants defective in response to smell and taste cues. This required large-scale isolation of mutants and their amplification to generate hundreds of strains, each with all the animals carrying one genetic defect. The final challenge was the genetic mapping of the mutations onto the chromosomes of the fly. The isolation and characterization of olfactory mutants in *Drosophila* was completed in only a little over a year of Veronica's joining as a student and the consequent paper is a classic.

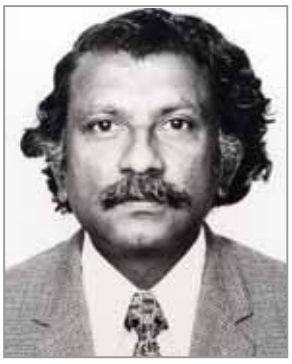
In 1979, Siddiqi and Babu organized an international meeting in Bombay that brought rising stars and future leaders of Drosophila developmental biology to TIFR. Veronica, the only student to speak, was a hit. Trained by Siddiqi, Veronica had a style all her own. Her restrained elegance, the sophisticated unwrapping of meticulous data and the refusal to unduly speculate was an early example of her scientific communication at its best. This ability to communicate only became better with time.

Veronica left Bombay in 1982 to the Max-Planck Institute for Biologische Kybernetik in Tübingen, Germany. She was welcomed readily by her mentors Karl Götz and Erich Buchner. In the Mecca of quantitative fly behaviour, she again trod new territory when she used uptake of a radioactively labelled glucose analog to determine the areas of the fly brain that were active upon odour stimulation of the antennal sense organs. This important work was prescient of later molecular approaches that allowed mapping of odour coding in the antennal lobe.

Returning to TIFR in 1984, Veronica and her fledgling lab began to examine the neural basis of chemosensation using behavioural assays. She realized that relying solely on this approach would result in interesting, speculative, but not a cellular understanding. This was a time when the typhoon of molecular approaches was sweeping biology followed by another, that of genetic and cellular methods, which allowed the rapid isolation of mutants, mapping of genes, the isolation of their DNA and the cellular localization of their products. As always happens when hit by the onslaught of transforming techniques, religious wars erupt. Ex-revolutionaries, formerly champions of new approaches in their own time, dismiss 'mere techniques' as no substitute for thinking. Opposing the old, the iconoclasts scream evangelically about how solutions to long-standing problems will miraculously appear by adopting the new methods. Silent in the din, Veronica realized that a thoughtful but more mechanistic approach to developmental neurobiology was now possible and took this direction without trumpeting it. On one front Veronica built a close scientific collaboration with Bill Chia at the Institute of Molecular and Cell Biology in Singapore. This made her an expert and productive molecular biologist in record time. On another front, in Bombay, she used newly emerging

genetic and molecular approaches to chart out the development of the chemosensory organs of the fly. Her international reputation as a developmental neurobiologist was soon secure. The next phase of her laboratory's research delved into the principles underlying the organization of the brain and its handling of olfactory information. Over the past decade, research from her group also made substantive contributions to our understanding as to how regional specialization in the olfactory lobe of the brain takes place. Her range of approaches moved from anatomy, at cellular levels of resolution, all the way to behaviour in groups of animals. Her range of collaborators spanned from the novice who had never been in a laboratory to some of the leading maestros in the field.

Stitching together a lifetime of science, her final composition is seen when the composer is gone. Veronica's research assembles, note by note, page by page, into a simple but beautiful symphony in developmental neurobiology. Her scientific journey which deserves far more than this brief and superficial account can and will be documented in detail soon. However, the spirit of the principled, caring, fun-loving, elegant Goan from Nairobi, who imbibed the soul of the TIFR in the days when it had it in plenty, amplified it and gave it back many times over, whenever it was in danger of losing it, is hard to capture. Except, perhaps, when the merry meet in the bars of Bombay, Bangalore, Singapore and Dublin and her friends across the world celebrate her rich life.



VENKATARAMAN RADHAKRISHNAN (elected 1968)

Radhakrishnan, who was a major figure in the world of radio astronomy and headed the Raman Research Institute in Bangalore as its Director from 1972 to 1994, passed away early in the morning of **3 March 2011.**

Rad, as he was widely known, grew up in Bangalore, taking a BSc. in physics at the Central College of the Mysore University – his only degree till an honorary doctorate from the University of Amsterdam in 1996. His early fascination for radios and motorcycles grew into a lifelong love and deep understanding of all kinds of gadgets and machines, not just electronics which was a forte. His other great love was travel. Setting forth from India in his early twenties to seek his destiny, he found it in the very young field of radio astronomy, joining the Onsala Observatory of the Chalmers Institute of Technology in Sweden in 1955 on the strength of his technical skills. He worked with the the 21cm line, then a new tool for exploring neutral atomic hydrogen in interstellar space. This spectral line and fluent Swedish stayed with him all his life.

The next move was in 1958, to the Owens Valley Observatory of Caltech, where he took part in basic work on the study of polarization of radio waves, and radio interferometry. He and his collaborators were able to view the magnetic field of Jupiter and the rotation of its interior to which the field is anchored. He took part in early work at Owens Valley on combining emission and absorption of the 21cm line to deduce the physical conditions in clouds of atomic hydrogen in our galaxy.

Rad next moved to the CSIRO Division of Radiophysics in Australia by sailing across the Atlantic and Pacific in 1964–65. At the Parkes Observatory, a major programme of studying emission and absorption of the 21cm line was launched, providing a strong observational underpinning for the concept of a multiphase interstellar medium. The detailed account of this work filled an entire volume of the *Astrophysical Journal* Supplement. A classic observation of the polarization swing of the Vela pulsar formed the basis for the widely accepted magnetic pole model for pulsar radio emission. In all this work, he was particular to ensure full credit to his many collaborators, including the people who joined him in building the instruments that made the science possible. He became widely known for his original approach to astronomy and instrumentation which was exacting and closely thought out, but entirely devoid of mathematics – this was greatly valued even by colleagues who thought in more conventional modes.

In 1972, Rad accepted an invitation from the Raman Research Institute Trust to return to India and head the RRI which was undergoing a revival after C. V. Raman's death in 1970, with funding from the Department of Science and Technology. Under his overall leadership, the institute grew from essentially zero strength to establish successful programmes in radio astronomy and liquid crystals, the latter spearheaded by S. Chandrasekhar who moved along with colleagues and students from the University of Mysore. Rad himself assembled, trained, and inspired

a group which built sophisticated instrumentation and undertook many projects over more than three decades. There was a major collaboration with the Indian Institute of Astrophysics, Ch. V. Sastry in particular, in building and using two low-frequency radio observatories at Gauribidanur and Mauritius. A 10.4 millimeter-wave dish and receivers, working up to the carbon monoxide line at 115 GHz was a major achievement of the laboratory, headed by N.V.G. Sarma. Rad enjoyed a special relationship with Govind Swarup who founded the radio astronomy group of the Tata Institute of Fundamental Research. He worked with the Ooty Radio Telescope, and strongly supported TIFR's Giant Metrewave Radio Telescope project in kind, with some critical front ends and back ends being built at RRI in the 1990s.

With his students and colleagues, he worked on many aspects of pulsars and the interstellar medium. A survey of low-frequency recombination lines with Anantharamaiah, the proposal of recycled pulsars, with Srinivasan, and a model for the Vela pulsar X-ray emission with Deshpande, are some examples. Rad enjoyed the respect of astronomers from all over the world, who responded readily to his invitation to visit the Raman Institute. He delivered the invited discourse on pulsars at the General Assembly of the International Astronomical Union in 1985, the Milne lecture of the Oxford University (1987), and the Jansky lecture of the NRAO (2000). He was elected a foreign fellow of the US National Academy of Sciences and the Royal Swedish Academy, and was a member of advisory bodies of major observatories in Australia, the Netherlands, and the US. He served as the President of the URSI Commission on Radio Astronomy, and a Vice-President of the International Astronomical Union, and served the Indian Academy of Sciences in many capacities for two decades.

A few words on his style of leadership would not be out of place. He strove to build a unique working atmosphere at RRI, in which theory, experiment, instrumentation and observation were not separate compartments, and the staff members were not divided by classification into academic or technical. He worked towards this goal by searching, questioning, intense discussion, and setting a strong personal example, characterized by close attention to detail and concern for members of the institute as individuals. This necessarily called for extensive talking and listening to many people, about science and other things, which he always seemed to find the time for. In important matters, he took all calls himself, viewing committees and consensus as ways of evading individual judgment and responsibility. Though this is not the place to dwell on details, some of his decisions in the early nineties raised widespread controversy in the institute and the wider community. What is relevant is that the episode and its aftermath did affect him deeply, and must have influenced the course he set for himself after he stepped down from the directorship of RRI in 1994.

Starting from the 1990s, he took up building and flying microlight aircraft. In his last decade, he went back to the sea, building a twin-hulled sailboat of his own novel design. Well after his eightieth birthday, he sailed it to Oman, then back westwards to Malaysia, with a clearly stated intention of going all the way round the globe. This period involved working with a completely different group of people, all far younger than him. He immersed himself enthusiastically in these new worlds, keeping his scientific interactions very selective. Those who had seen his meticulous planning and design in earlier years were surprised and even alarmed at some of the risks he took while sailing, though always with a manner of relaxed confidence. This was surely not out of ignorance of the possible consequences but seemed more like readiness to accept them – he often said he would love to be lost at sea. But death finally came to him at home in Bangalore, after a conference dinner during which he was completely his usual self.

Rad leaves behind his wife Dominique and son Vivek who is married to Namrata, with two daughters.

HOMI NUSSERWANJI SETHNA (elected 1968)

A doyen among nuclear scientists, Sethna passed away on **5 September 2010**. Sethna, born in Mumbai on **24 August 1923**, obtained his B.Sc. (Tech) degree from the University Department of Chemical Technology (UDCT) in 1944 and Master of Science in Engineering (M.S.E) degree in 1946 from the University of Michigan,

Ann Arbor, USA. In 1947, he joined the Imperial Chemical Industries as a trainee under the TATA–ICI scheme.

Sethna's first encounter with Homi Bhabha changed the course of his career. It started with a discussion on how to make absolute alcohol. They were then at the Wellington club swimming pool. Bhabha was not convinced and Sethna gave him a book which described the process. In 1949, Bhabha appointed him as works manager at the Indian Rare Earths (IRE), Alwaye. Sethna's first contact with nuclear materials thus started at Alwaye and he never looked back.

He presented a paper titled "Uranium and thorium extraction and purification' at the Conference on "Development of Atomic Energy for Peaceful Purposes in India" in November 1954 in New Delhi. Jawaharlal Nehru himself presided over almost the entire conference except for a brief period when K D Malaviya chaired the session. The conference was in response to the widespread criticism that nothing much had happened over the five years since 1948, when the Atomic Energy Commission was set up. Sethna's paper described the complete technical details. IRE was then processing 1500 tons monazite annually with a provision to double the capacity. The delegates including several outstanding scientists, industrialists, MPs and cabinet ministers realized that it was a curtain raiser for future technological and scientific developments in the nascent field of atomic energy.

Sethna attended the First Geneva Conference on the Peaceful Uses of Atomic Energy in 1955. He was the Deputy Secretary General of the Second Geneva Conference in 1958. The conference was attended among others, by John Cockcroft, W B Lewis, H J Bhabha, V S Emelyanov, Francis Perrin and Sigward Eklund, virtually a who's who in the world of atoms, Bhabha chaired the session on controlled fusion. Sethna was its scientific Secretary.

Sethna joined the Atomic Energy Establishment (now BARC) in 1959 as the chief scientific officer and was the Director of BARC from 1966 until 1972 when he became the Chairman of the Atomic Energy Commission and Secretary to the Government of India, Department of Atomic Energy. He continued in this position till his formal retirement in 1983. Subsequently he worked as the Chairman and Managing Director of Andhra Valley Power Corporation and Chancellor of the North-Eastern University.

Sethna was a member of the committee which designed the *Apsara* reactor, the first of its kind in India. He was instrumental in setting up the thorium plant and the uranium metal plant at Trombay. He was the project manager of CIRUS, the 40 MW research reactor at Trombay from 1956–58. He was responsible for designing and constructing India's first plutonium plant at a time when only a handful of nations had this technology. In 1967, Sethna supervised the erection of the Uranium Mill at Jaduguda.

His contribution to the peaceful nuclear explosion project in 1974 was legendary. He played a significant role in India's nuclear power programme. He was awarded the Padma Vibhushan in 1975. Sethna fulfilled his mentor's wishes by creating the facilities to produce nuclear materials such as uranium, zirconium, thorium, heavy water, and plutonium for the first time in the country, mostly using know-how developed indigenously.

After his retirement between 1984 and 2000 he was on the board of various industrial institutions.

He was one among the handful of the last of the titans of our atomic energy programme.

BALU VENKATARAMAN (elected 1975)

One of the most distinguished chemical physicists of India passed away on **28 October 2010** removing from the scientific scene an excellent scientist and fabulous human being. Venkataraman was born on **17 December 1929** in Chennai to N. S. Balu and Krishnammal**.** He graduated from the University of Madras in 1949, followed by an M.Sc degree in Chemistry at Banaras Hindu University, both with distinction. Immediately thereafter he went to the Columbia University for his doctoral programme under G. K. Fraenkel, one of the pioneers of earlier-day electron

spin resonance practitioners and specially on the creation and detection of organic free radicals and interpretation. Thus Venkataraman took to EPR spectroscopy within six to seven years after its discovery in 1945 by Zavoisky. He is one of the few who worked under Fraenkel and took up the construction of an X-band ESR spectrometer along with a facility to produce radicals under anaerobic conditions for his classic work with the radicals of semiquinones not only looking at the proton hyperfine interactions but also proton-deuteron hyperfine structure in similar organic free radicals. After obtaining his PhD from Columbia University he returned to India to serve Indian Science and Education.

While at Columbia University (New York) he was both a teaching and research assistant during 1951 to 1955 followed by a research fellowship and lecturership. His urge to do science in India brought him initially to the Department of Physics of Aligarh Muslim University; though he is basically a chemist he had to enter the department of physics since EPR was virtually unknown to chemists at that time. The progressive recruitment policies of Homi Bhabha to bring youngsters working in the modern 'niche' areas of science brought him initially to the atomic energy establishments followed by his shift to the Tata Institute of Fundamental Research (TIFR) Bombay where he stayed until his retirement as a Senior Professor and beyond. He also served as the Dean of the Physics faculty at TIFR. He held visiting appointments at Columbia University, University of Notre dame and University of Copenhagen.

Though he was under the affectionate leadership of S. S. Dharmatti in the early days of the development of magnetic resonance in India, he formed an excellent team with C.R Kanekar both taking care of EPR and NMR respectively at TIFR. His scientific contributions revolve around electron spin resonance and at later stages time-resolved spectroscopy inclusive of fluorescence. He shifted from his earlier ESR studies mainly contributing to the unravelling of hyperfine interactions of Pi electron with ring protons as well as satellites attributed to the low abundance C13 hyperfine interaction. He was instrumental in constructing an X-Band EPR instrument including the magnet. He also developed instrumentation to measure T1 (spin-lattice relaxation time of free radicals in solution) probably for the first time by saturation recovery technique. He radically shifted his interest from measuring hyperfine interactions to unravelling the relaxation mechanisms in semiquinone-related radicals. Other important contributions include T1 measurements of hydrogen deuterium in water, study of T1's of radicals with near degenerate energy, Heisenberg and chemical change effects on T1's, and development of electron-electron double resonance for understanding cross relaxation effects. His other fabrication expertise included time domain ESR spectrometer for flash photolysis. Later he employed a picosecond time-resolved fluorescence spectrometer to study diffusion controlled reactions and other dynamics related molecular motions.

Venkataraman was passionate about the study of fast chemical reactions by non-ESR techniques. He initiated and encouraged research programmes using pulsed lasers from the seventies in TIFR and elsewhere. The three-week Workshop organized on study of fast chemical processes in 1987 at Lonavala was well known for the depth and extent of coverage of the then frontline topics and served as a forerunner for many laser spectroscopy programmes in the country. His active and enthusiastic involvement in ISRAPS and biennial TSRP conferences will be remembered by the community of photochemists.

His other contributions to science include membership of editorial boards of many scientific journals, co-authoring NCERT chemistry textbook, and preparing science video programmes. In the later part of his life he shifted to science education particularly at school level by giving several lecture demonstrations in many cities in India.

He attracted brilliant students to carry out their doctoral degrees in various areas mentioned above; his work brought him pride in the committee of Indian Science and thus played a vital role in developing substantial manpower in the field of chemical physics and in particular electron paramagnetic resonance as an important theme.

The demise of Balu Venkataraman, a gentleman with a constant smile on his face is a serious loss to the field of chemical physics and science education in India as also to a large family of his students and admiring colleagues. He is survived by his wife (Savitri), a son (Arun) and two daughters (Bhawani and Chitra), daughter-in-law (Anu), sons-in-law (Jay and Markus) and of course, loving grand children.

RUSTOM ROY

A scientist of international repute, a doyen of materials science and Founder Director of the Materials Research Laboratory (MRL) at Penn State, one of the first of its kind in USA, passed away on **26 August 2010**. He was elected an Honorary Fellow of the Academy in 1990.

Considered as one of the top five Indian scientists in USA, a member of President Nixon's Science Advisory Council, Roy was the first Indian to be elected Fellow of the US National Academy of Engineering and Foreign Member of the Royal Swedish Academy of Engineering Science. He was the third Indian after Rabindranath Tagore and S. Radhakrishnan to be invited to deliver the Hibbert Lectures at the University of Oxford in 1979, for which he chose the title 'Experimenting with Truth'. This was also published by Pergamon Press. Roy also authored a monograph 'Ternary Oxides' with O. Muller.

Born in India in 1924, Roy went to St Paul's School, Darjeeling and obtained his BSc and MSc degrees in Geology from Patna University, before joining the Pennsylvania State University, State College for his doctoral studies in geochemistry where he quickly rose to become one of the youngest professors. As a renowned geochemist, his pioneering research was in the study of glasses and ceramics, one of his discoveries being glass-ceramics which can withstand high temperatures. His group carried out path-breaking research in hydrothermal crystal growth and plasma deposition of diamond thin films.

I* had the opportunity of working in his laboratory as a Research Associate between 1966 and 1970, first with H. K. Henisch and then with L. E. Cross, both of whom he recruited from the UK. I also edited his immensely popular lectures on 'Crystal Chemistry' which many US graduate students termed as the single most influential course they had ever attended. This was the time the laboratory moved into its new building constructed partly with Federal and partly with State funds. Roy was always concerned about the state of science and technology in India and was connected with the Central Glass and Ceramic Research Institute (CGCRI), Kolkata in its initial stages. MRL, Penn State had a number of Indian faculty and trained a large number of students from India.

Roy was one of the founding editors of the *Materials Research Bulletin* first published in 1966 and later of the journal *Science and Society*, concerned with science education and the application of science and technology to societal needs. He was critical of science teaching as well as the downgrading of industrial research in USA and was not averse to courting controversy. The most well-known example was his strong criticism of the huge funds being spent on the superconducting supercollider to be located in Texas. Senate disapproval followed and led to its cancellation. This made Roy highly unpopular with the high energy and particle physics community.

His education and career in the US encompassed a life-long synthesis of disciplines and of science and religion. He served as Chairman of the US National Council of Churches Committee on Science, Technology and the Church. He was also involved with the activist avant-garde Christian community for 30 years, speaking and writing on contemporary religious issues. His wife Della Roy is a Distinguished Professor in Solid State at Penn State. Between them they discovered two minerals which are now called 'Rustomite' and 'Dellite'!

He leaves behind his wife and three sons.

* Obituary written by **Dwaraka Bose,** Kolkata