No. 57

Patrika

March 2013

Newsletter of the Indian Academy of Sciences

Seventy-Eighth Annual Meeting, Dehra Dun
2 – 4 November 2012

The 78th Annual Meeting of the Academy, hosted by the Wadia Institute of Himalayan Geology in Dehra Dun over November 2–4, 2012, saw a return to this venue after nineteen years, the previous Annual Meeting in this city having been in 1993. Thanks to its location in the Himalayan foothills, and the proximity to many places of historic interest, the attendance was very good – 135 Fellows, 11 Associates and 47 invited teachers.

The packed three day programme included, apart from the opening Presidential address, two Special Lectures, two evening Public Lectures, two mini Symposia, and presentations by 19 Fellows and Associates. The Presidential address by **Professor A. K. Sood**, the concluding one for the triennium 2010-2012, carried forward the general themes of the two previous ones, being devoted this time to unusual behavior patterns of 'Driven Matter'. These come generally under the category of non-equilibrium statistical mechanics, a developing discipline largely within classical physics. The behaviors of gels and colloids under mechanical forces, shear, chemical gradients and electric fields were described based on recent experiments. We learnt that good quality chocolate taste needs shear property in an essential way, while in

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Forthcoming Events

Twenty-fourth Mid-Year Meeting
Bangalore — 5 – 6 July 2013

Refresher Courses

Quantum mechanics — 1 – 14 May 2013
St Berchman's College, Changanacherry

Statistical physics — 8 – 21 May 2013
Nehru Arts and Science College, Kanhangad

Experimental physics – XLVIII — 14 – 29 May 2013
Vidya Pratishtan's Arts, Science & Commerce College
Baramati

Modern biotechnology: Concepts and practice — 15 – 29 May 2013
Madurai Kamaraj University, Madurai

Experimental physics – XLIX — 6 – 21 June 2013
Jalahalli, Bangalore

Experimental physics – L — 6 – 22 August 2013
Jalahalli, Bangalore

Lecture Workshops

Frontiers in life science — 21 – 24 May 2013
NEHU, Shillong

Recent advances in materials science — 24 – 25 June 2013
Payyanur College, Payyanur

Galois theory, finite fields and cryptography — 24 – 26 June 2013
NASI and IIIT, Allahabad

Frontier areas in physics — 19 – 20 July 2013
St. Xavier's College, Kolkata

the case of margarine shear induced crystallization comes to the fore. Once again we saw the kinds of surprises that lurk beneath everyday often ignored materials and phenomena!

The Special Lecture by **Rohini Godbole** titled "We have found a new boson, what next?' was all about the Higgs discovery at the LHC at CERN in 2012 summer. Prior to this talk, the presentation by V. Ravindran – 'What is the Higgs boson?' – was a well illustrated account of the standard model of particle physics built up over several decades, based on concepts of continuous symmetry, its spontaneous breaking, and the reason for bringing in the Higgs boson. Godbole's talk took this story further, and showed how the detailed theoretical calculations and expectations played key roles in guiding and then interpreting the 'Higgs effort'. One could not help comparing and contrasting this discovery and situation with previous key experimental discoveries – of the muon, of parity violation, for instance – where the theoretical underpinnings of the search seem far less elaborate. One remembers also that the 'Higgs effort' was based on 3000 physicists from 38 countries!

The second Special Lecture by **V. S. Chauhan** on 'Current challenges in research of infectious diseases: Malaria and tuber-culosis' brought home the magnitudes of these problems and difficulties in making progress. With TB: India has 21% of the world's patients, China has 14%. Two million patients added every year, 1000 succumb each day. The poor are badly affected, and the public and private sectors are yet to join hands. Add to this the problem of irresponsible drug use. Fortunately one sees a very slow decline in incidence, and in India treatment is free. China has done very well in this field, while in India we do have several fine research centres tackling these diseases.

Of the two Public Lectures, **Mohan Agashe**'s on 'Cinema for Health' was a very well delivered analysis of the impact a well-made movie has on the viewer for long after it is seen. The speaker combined his skills as a psychiatrist and a film personality to wonderful effect. He reminded us that we are born with vision and hearing – so they are more intuitive, while words and language come later, along with analysis. The talk was embellished by two short films each with a powerful message.

Shyam Saran – a career diplomat and civil servant – spoke on 'The challenge of climate change and India's strategy in multilateral negotiations'. Both past problems and future policies were covered. Climate change and energy security are linked; and in the recent past there have been further complications due to economic crises. The hope expressed was that with our civilisational values, and non exploitative respect for nature, we may have important advantages.

The Symposium on 'Science of the Himalayas' gave a thrilling account of the emergence of this youngest and yet tallest mountain system in the world. The India-Asia collision of about 60 million years ago, the pictures of the moving land mass over the preceding 500 million years, covering 18 cm a year, initial collision in the North West followed by clockwise rotation, were conveyed in gripping fashion. Plus all that can be learnt from studies of river systems, glaciers, and earthquakes.

The second Symposium was a tribute to the life and work of Alan Turing, and was titled 'Computing legacy of Alan Turing'. His immensely fruitful conceptual advances in many directions, and their relevance today almost six decades after his passing – in biology, complexity theory, concepts of randomness and computability – were presented.

Inauguration of the 78th Annual Meeting, Dehra Dun.

From a wide spectrum of other presentations, here are selected highlights. A. K. Shukla told us that while today one in seven persons has a car (this is the world average, 7 billion people and 1 billion vehicles), this could become 1 in 4 by 2020; the world population is expected to reach 9 billion by 2050, 11 billion by 2100. Hence the need to move to electric vehicles. **Abhishek Dhar** addressed questions in non-equilibrium statistical physics, departures from Fourier's law of heat transport, the Levy distribution, random versus Levy walkers, and the like. Anuranjan Anand described studies of epileptic seizures provoked by sensory stimuli – touching hot water – and the way these patients occur in family clusters. Surprisingly, 80% of such cases worldwide are known to be in India, and here the number of such individuals is about 1000. What a 'small' yet intriguing problem to study at the genetic level!

The meeting as a whole was intellectually stimulating, and also well organized.

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TWENTY-FOURTH MID-YEAR MEETING

5 – 6 JULY 2013

Tentative Programme

5 July 2013 (Friday)

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

S Sivaram, NCL, Pune
Sustainable materials based on aliphatic polyesters: Teaching old chemistry some new tricks

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

1010 **H N Ghosh**, BARC, Mumbai
Harvesting solar energy through dye-sensitized and quantum dot solar cell

1030 **Amol Dighe**, TIFR, Mumbai
Particle astrophysics of neutrinos

1120 **A C Mishra**, NIV, Pune
Influenza viruses and public health in the first decade of twenty first century

1140 **Debasis Chattopadhyay**
NIPGR, New Delhi
Diverse role of CBL – interacting protein kinases in plant

1200 **B Sundar Rajan**, IISc, Bangalore
Wireless communication with multiple antennas

1220 **V K Sharma**, JNCASR, Bangalore
Understanding circadian entrainment of fruitfly drosophila melanogaster clocks under semi-natural conditions

1240 **Uday Bandyopadhyay**, IICB, Kolkata
Designing of a novel tryptamine-gallic acid hybrid to prevent non-steroidal anti-inflammatory drug-induced gastric ulcer/gastropathy

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

1430 **Bhaskar Saha**, NCCS, Pune
CD40 and anti-leishmanial immunity

1450 **S Baskaran**, IIT, Chennai
Domino reaction based approach for the synthesis of novel molecules

1510 **T K Nayak**, VECC, Kolkata
Exploring quantum chromodynamics phase transitions at RHIC and LHC

1600 **Soumya Swaminathan**, NIRT, Chennai
TB/HIV: A decade of research

1620 **K Ramamritham**, IIT, Mumbai
Smart electric grids – the vision, the opportunities, the challenges

1640 **Amiya Kumar Pani**, IIT, Mumbai
Scientific computing: A new way of looking at mathematics

1700 **Naseema Beegum**, NPL, New Delhi
Space-time variability of aerosols over Indian region: Implications in radiative forcing

1800 – 1900 **Session 1D – Public Lecture**
T Jacob John, Vellore
India's success story: Polio eradication

6 July 2013 (Saturday)

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

Deepak Pental, Univ., Delhi South Campus, New Delhi
Breeding of oilseed mustard: Tales from some marathon runners

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

0940 **S K Pati**, JNCASR, Bangalore
Structure and electronic properties of DNA and modified – DNA systems

1000 **S Shankaranarayanan**, IISER, Thiruvananthapuram
Higher derivative theories and quantum phase transition

1050 **K N Raghavan**, IMSc, Chennai
Invariant theory and standard monomial theory

1110 **B J Rao**, TIFR, Mumbai
Spatial movements of chromosomes that facilitate their repairs

1130 **Prahladh Harsha**, TIFR, Mumbai
Communication complexity: A treasure house of lower bounds

1150 **N V Chalapathi Rao**, BHU, Varanasi
Kimberlites: Keys for understanding the geodynamic evolution of ancient cratons

1210 **M Durga Prasad**, University of Hyderabad, Hyderabad
An electronic structure perspective of the promoter modes in proton transfer reactions

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2013 ELECTIONS

Nahid Ali
Indian Institute of Chemical Biology, Kolkata
Area: Biochemistry; immunology; parasitology

Uday Bandyopadhyay
Indian Institute of Chemical Biology, Kolkata
Area: Free radical biology and apoptosis; gastric pathophysiology; antimalarials

S Baskaran
Indian Institute of Technology, Chennai
Area: Development of new synthetic methods; green chemistry; synthesis of biologically active natural products

Debasis Chattopadhyay
National Institute of Plant Genome Research, New Delhi
Area: Abiotic stress of plant; plant virology; genome sequencing

Amol Dighe
Tata Institute of Fundamental Research, Mumbai
Area: Particle physics phenomenology; astroparticle physics

HN Ghosh
Bhabha Atomic Research Centre, Mumbai
Area: Radiation & photochemistry; quantum dot & nanomaterials; ultrafast spectroscopy in condense phase

B Gopal
Indian Institute of Science, Bangalore
Area: Structural biology; molecular microbiology; molecular biophysics

S Gopalakrishnan
Indian Institute of Science, Bangalore
Area: Wave propagation; structural health monitoring; computational mechanics

Jaya N Iyer
Institute of Mathematical Sciences, Chennai
Area: Algebraic geometry

BR Jagirdar
Indian Institute of Science, Bangalore
Area: Organometallic chemistry; materials chemistry; catalysis

Susanta Mahapatra
University of Hyderabad, Hyderabad
Area: Theoretical chemical dynamics; nonadiabatic chemistry

Souvik Maiti
Institute of Genomics and Integrative Biology, Delhi
Area: Biophysical chemistry; chemical biology

Debashis Mitra
National Centre for Cell Science, Pune
Area: Molecular virology; molecular immunology; HIV/AIDS and anti-viral drug discovery

Sangita Mukhopadhyay
Centre for DNA Fingerprinting and Diagnostics, Hyderabad
Area: Immunology; cell signalling; communicable diseases

TK Nayak
Variable Energy Cyclotron Centre, Kolkata
Area: Nuclear and high energy physics experiment; QCD phase transition and quark gluon plasma; phases of nuclear matter

Arun K Pati
Harish Chandra Research Institute, Allahabad
Area: Quantum information theory; quantum computing; foundations of quantum theory

B Jagadeeshwar Rao
Tata Institute of Fundamental Research, Mumbai
Area: Genome dynamics; biology of cellular adaptations; computational biology

NV Chalapathi Rao
Banaras Hindu University, Varanasi
Area: Igneous petrology; mantle geochemistry; geodynamics; mineral resources

G Narahari Sastry
Indian Institute of Chemical Technology, Hyderabad
Area: Computational chemistry; theoretical chemistry; computer-aided drug design

VB Shenoy
Indian Institute of Science, Bangalore
Area: Condensed matter theory; strongly-correlated systems; cold atom physics

Bhim Singh
Indian Institute of Technology, New Delhi
Area: Power electronics; renewable energy generation

Tarun Souradeep
Inter-University Centre for Astronomy and Astrophysics, Pune
Area: Cosmology; high energy physics; early universe

B Sundar Rajan
Indian Institute of Science, Bangalore
Area: Wireless communication; coding theory

Soumya Swaminathan
National Institute for Research in Tuberculosis, Chennai
Area: Paediatrics; tuberculosis; HIV co-infection; TB pathogenesis

Avesh K Tyagi
Bhabha Atomic Research Centre, Mumbai
Area: Chemistry of functional materials; nanomaterials; nuclear materials

Honorary Fellows

Thomas Kailath
Stanford University, Stanford, USA

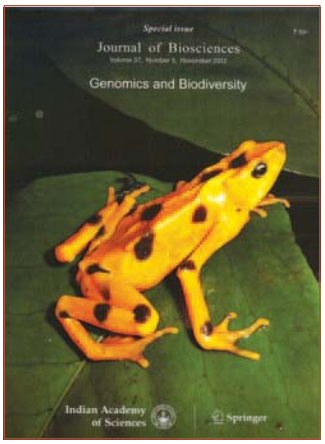
Daniel G. Nocera
Massachusetts Institute of Technology, Cambridge, USA

SPECIAL ISSUES OF JOURNALS

Special Issue on Genomics and Biodiversity

Editors: Ramesh K Aggarwal, Rajeev K Varshney and K Thangaraj

***Journal of Biosciences,* Volume 37, No. 5, November 2012, pp. 807 – 920**



A three-day international symposium on 'Genomics and Biodiversity' was held in Hyderabad, India, from 23 to 25 February 2011. The symposium was jointly organized by ADNAT (Association for Promotion of DNA Fingerprinting and other DNA technologies) and CCMB (Centre for Cellular and Molecular Biology), as part of the 15th Annual Convention of ADNAT at CCMB.

Justifying the theme of the symposium, the talks covered a rich diversity of research areas, organized into six sessions, namely, Genomics Platforms and Technologies, Characterization of Biodiversity, Genomics for Harnessing Biodiversity, Genomics for Diversity, Disease and Health, Conservation of biodiversity, and Biodiversity Studies in Challenging Scenarios. Overall, there were 23 invited talks by eminent scientists from India and eight other countries (Germany, UK, Australia, Singapore, Republic of Korea, USA, Colombia and Kenya); six short presentations by young researchers, and a panel discussion by scientists and social stakeholders on 'Genomics, Untapped Biodiversity, GMOs and Socio-Environmental Concerns'. The meeting was attended by a large number of researchers and students from across the country and also by the members of the ADNAT society.

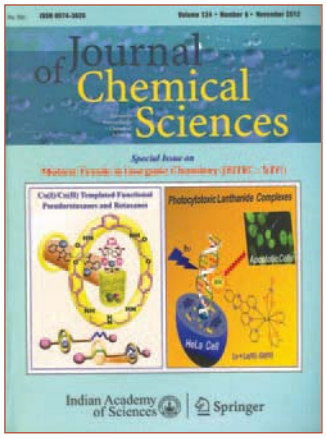
The presentations included in this special issue provide a broad glimpse of the variety of scientific enquiry into various facets of biodiversity exploration. The first three articles discuss the advancement in recent genomic platforms that aid in the discovery and development of molecular markers, which in turn are expected to dramatically shift the efficiency of molecular breeding to a higher level in plants. These should serve as simple primers for young researchers venturing into the field.

The article by Rajeev K. Varshney *et al*. provides the success story of the development of genetic resources (thousands of SSRs and SNPs) in legume crops through next-generation sequencing, and their use in developing comprehensive genetic maps and identification of candidate markers linked to agronomically important traits with the help of high-throughput genotyping methods. The next two articles (Martin W. Ganal *et al*. and Robert J. Henry *et al*.) provide simple but comprehensive reviews of the genomic approaches that have greatly accelerated the pace of 'molecular marker discovery' and the development of large genome-wide SNP arrays, followed by their potential applications in characterization of genetic resources, creation of high-density linkage maps and also in association studies. As a step forward, the next three articles inform us about how the genomics approaches/molecular markers can help us in understanding the origin/evolution of the vast germplasm resources, and also in their meaningful management, preservation and utilization. The article by B. M. Prasanna traces the centre of origin of maize and migratory routes of maize domestication using molecular markers on diverse germplasm, and emphatically brings out the need for high-throughout precision phenotyping as a prerequisite to exploit the genetic resources for desirable variability. In their article, M.Y. Kim *et al*. describe how whole genome sequencing of diverse germplasm can aid in identifying QTLs governing complex traits by comparative genomics approach, exemplifying it with their identification of 118 genes involved in flowering pathway in soybean. In the following article, Andreas Börner *et al.* discuss the fate of genetic integrity of long term stored germplasms that differ in their modes of reproduction, and highlight the need for integrating molecular markers in the management of large *ex situ* genebanks. In concert with crop plants, there is an equal need for healthy livestock for sustainable agriculture. In the following article, Emily L. Clark and Damer P. Blake review the genomics based population-level approaches that have accelerated the pace of mapping genomes of parasitic organisms, taking the example of coccidial protozoans that cause diseases of severe importance in both medical and veterinary fields (the genomic information of protozoans is expected to help in developing vaccines using reverse-genetic tools). The next two articles turn the focus from plant/agriculture biodiversity to faunal biodiversity. In the first of these articles, Andrea Paz and Andrew J. Crawford discuss the use of DNA-barcoding-based rapid inventories of sympatric diversity among frogs, and highlight the importance of sampling approach (from clade-based sampling to geographically focused sampling) to answer questions related to macro-ecology and community phylogenetics. Subsequently, Jan Janecka *et al.* throw light on the astonishing fact that the rates of molecular and morphological evolution is highly decoupled and suggest from their findings that insertions and deletions in the functional regions (that brings about phenotypic divergence) probably arise and fix faster than the rate of neutral substitution in the genome. In the end, the focus shifts to the most studied animal species, *Homo sapiens*, which diversified extensively since it originated in Africa about 200,000 years ago. In this last article, Rakesh Tamang *et al*. review the complex genetic origin of Indian populations and the driving forces that led to the current high-level diversity, as revealed by mitochondrial, Y-chromosomal and autosomal DNA marker analysis of around 20,000 individuals across India. The review highlights the fact that the contemporary Indian populations are the descendents of the very first modern humans who ventured the journey of Out-of-Africa about 60,000 years ago. It is hoped that this special issue will initiate many youngsters in the area of applied genomics to conserve/manage our natural biological resources/wealth.

Modern Trends in Inorganic Chemistry (MTIC-XIV)

Guest Editor: K C Kumara Swamy

***Journal of Chemical Sciences*, Volume 124, No. 6, November 2012, pp. 1137 – 1450**

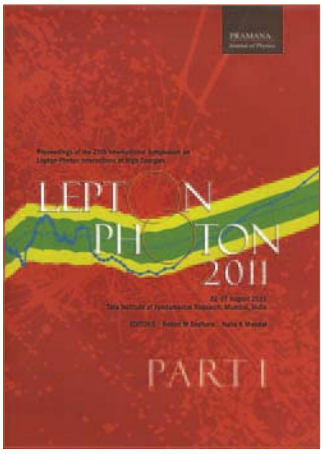


This special issue comprises contributions from invited speakers of the Fourteenth Symposium on Modern Trends in Inorganic Chemistry (MTIC-XIV) held at the University of Hyderabad during 10–13, December 2011. The MTIC series of biennial symposia have been an important forum for inorganic chemists of the country to focus on the current status as well as the future developments in the frontier areas of research in this discipline. The topics covered in this issue span a diverse range from bioinorganic chemistry to materials chemistry, encompassing the traditional areas of coordination chemistry, main group chemistry and organometallic chemistry.

Proceedings of the 25th International Symposium on 'Lepton–Photon Interactions at High Energies (Lepton – Photon 2011)' Parts I and II.

Editors: Rohini Godbole and Naba K Mondal

***Pramana*, Vol. 79, Nos. 4 & 5, October and November 2012, pp. 511 – 1364**



This special issue of *Pramana – Journal of Physics* comprises the Proceedings of the 25th International Symposium on 'Lepton – Photon Interactions at High Energies (Lepton – Photon 2011)'. This conference covered theoretical and experimental aspects of elementary particle physics with plenary talks covering the current results, developments and provided a vista of the future. The conference dealt with the latest results from accelerator experiments as well as space-bound and deep underground laboratories, studying neutrinos, dark matter and cosmic rays.

This was the first international meeting in which the results from Large Hadron Collider (LHC), obtained with the two detectors ATLAS and CMS, designed to search for the Higgs boson and for new particles beyond the Standard Model such as supersymmetric particles were announced for the first time by representatives of these collaborations. In addition, results from the Relativistic Heavy Ion Collider (RHIC) in the USA were presented on the 'quark-gluon plasma' formed at the extremely high pressures and temperatures, reached in the heavy-ion collisions, providing key insights into the behaviour of matter under conditions similar to those at the birth of the Universe. The conference gave a unique opportunity to compare the data from the Tevatron at Fermilab, USA, with those from the LHC.

Latest results from the T2K experiment from Japan, the OPERA experiment from Europe and the MINOS experiment from the USA, which had also detected the appearance of neutrinos through oscillations in terrestrial neutrino beams, were announced. The possible observation of a nonzero neutrino mixing angle θ_{13}, reported in the 'hot topic session' has now in fact been confirmed beyond any doubt.

The Planck Space Observatory had collected a large amount of data of the 'cosmic microwave background radiation' that pervades the Universe and is a relic from the very beginning of time. Irregularities, or 'anisotropies', in this radiation carry important information about the early Universe and the subsequent formation of stars and galaxies. The participants had the benefit of learning about the latest developments from the fascinating space probe.

DISCUSSION MEETINGS

Electronic, Optical and Magnetic Molecular Materials: Experiments and Modelling

Orange County, Coorg
25 – 28 November 2012

Convener: S Ramasesha (IISc, Bangalore)

The discussion meeting 'Electronic, Optical and Magnetic Molecular Materials: Experiments and Modelling' was held in Orange County, Coorg from 25 to 28 November, 2012. One of the speakers, Professor Alok Shukla from IIT, Bombay was unable to attend so there were, in all twenty-three participants of which fourteen participants made oral presentations and eight participants presented a total of nine posters. There were five scientist participants with affiliations outside India – two French, one Japanese, one Chinese and one American. The participants also included eight students/fresh post-doctoral researchers and five women scientists.

The oral presentations were for 45 minutes and often because of lively discussions, extended to a little under an hour. The interesting poster session was on the 26th and was very encouraging for young researchers. There were also many one-on-one discussions outside the scheduled lectures and posters.

The topics of the meeting ranged from organic molecular systems to inorganic molecular systems; from experiments to theory and modeling; and from pure research to device fabrications. There were four lectures on theoretical aspects of modeling electronic, optical and magnetic properties. These ranged from theoretical designs of molecular multiferroics, paradigms for obtaining large third order nonlinear responses, modeling molecules for solar energy storage and multiscale modeling for supramolecular assemblies. There were three talks on molecular magnetism, spanning spin state transition systems for device applications, design of high anisotropy molecular magnets and design of single chain magnets using phosphorous as linkers

between magnetic ions. There were three talks on the synthesis of organic molecular systems for device applications and enhanced nonlinear optical response. There were two talks on organic molecular devices for solar and display applications and two talks on nanomaterials and their optical responses in the presence of protein aggregation and transition metal dopants.

There were cultural programmes, bird watching, village and plantation tours organized for the participants.

Inositide signalling in health and disease

Orange County, Coorg
28 November – 2 December 2012

Convener: Gaity Hasan (NCBS, Bangalore)

An international workshop on "Inositide signalling in health and disease" was held between 28 November and 2 December 2012 at Orange County, Coorg sponsored by the Indian Academy of Sciences and

the National Centre for Biological Sciences. The workshop was organized by Gaiti Hasan and Raghu Padinjat (NCBS), Phillip Hawkins (Babraham Institute, Cambridge, UK) and John York (Vanderbilt University, USA). The meeting featured a cast of around twenty international speakers working at the leading edge of research in this field presenting new and mainly unpublished findings. The meeting was also attended by 30 PhD students and post-doctoral fellows mainly from India but also from other parts of the world. These participants presented their most recent research during interactive poster sessions. Finally, in addition to the formal sessions, substantial time was set aside for informal discussions and new collaborations were forged at this meeting.

This meeting discussed multiple aspects of inositide signalling. Several speakers presented new advances in understanding the biochemical reactions that underpin inositide signaling as well as the spatial organization of these with living cells. A notable highlight was exciting new insights into the regulation of phosphatidylinositol 3 kinase (PI3K) enzyme activity via RasGTPase family members. Fundamental mechanistic insights into the altered regulation of PI3K enzymes through structural studies using deuterium exchange were presented. These new structural insights offer a mechanistic explanation for understanding how mutations in PI3K enzymes result in enhanced activity that is now clearly linked to cell proliferation and cancer.

Also presented was an exciting new study into the localization and regulation on phosphatidylinositol 4 kinase (PI4K) in mammalian cells. Many cell signaling reactions that depend on inositides are triggered by the activity of enzymes that use $PI(4,5)P_2$ as a substrate. However there has been a long standing mystery surrounding the mechanism by which the levels of $PI(4,5)P_2$ are maintained within cells. Spatially regulated activity of PI4K is critical for this process.

Speakers presented multiple new data sets on the regulation and function of the most recently discovered and enigmatic member of the phosphinositide family, namely phosphatidylinositol 5 phosphate (PI5P). These included new insights into the function of enzymes that produce PI5P, novel role for PI5P in regulating Pin1 function in the mammalian nucleus and new roles for the regulation of cell growth through interactions with the TOR kinase.

Mechanical properties of small scale systems

Orange County, Coorg
24 – 28 February 2013

Convener: Vikram Jayaram (IISc, Bangalore)

This workshop, fourth in a series that began in 2004, was held at Orange County for the first time. In contrast to earlier versions, the participation was restricted to those actively working in the area of small scale deformation and included, in addition to 14 invited

lectures of 45 minutes from experts, 14 shorter oral and 8 poster contributions from young scientists in India, spread across three and a half days. Lead lectures from India, Germany, USA, and Hongkong set the tone for every session and covered different aspects of mechanical response including:

- the role of sample size and microstructural scale in plasticity and fracture
- fabrication and fracture of 3-d structures, such as nano-honeycombs and metamaterial architectures through a combination of lithography and electrochemistry
- void nucleation in metallic glasses
- the use of dynamic nanoindentation to obtain information on creep and adhesion at room and elevated temperatures
- shape memory alloys
- instrumentation used for small scale uniaxial and bend testing
- cyclic deformation effects when microstructural and sample length scales overlap
- thermal barrier coatings
- intrinsic stresses in thin films and their management in GaN based systems
- the coupling of electric fields and mechanical stresses in interconnects used in semiconductors
- micro mechanical systems based on superalloys for high temperatures
- topology optimisation and fabrication of micro systems
- fundamentals of interfacial fracture toughness.

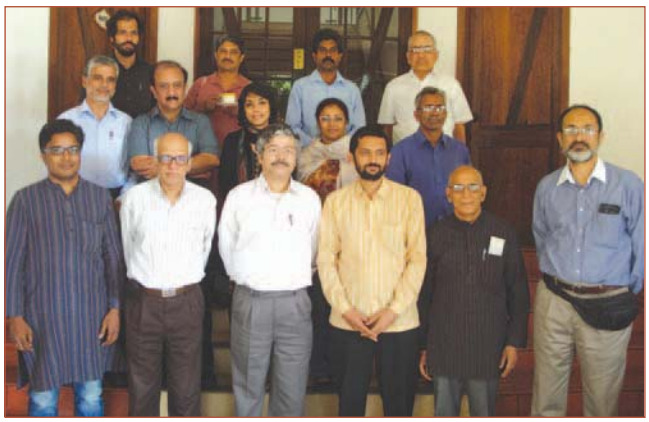
Contributed talks from scientists at IIT-B, IIT-K, IIT-M, Hysitron, ISRO, DMRL, CGCRI, University of Hyderabad, ARCI and IISc covered on-going research of scientists and young faculty in the above areas as well as in polymeric thin films and molecular dynamics simulations of deformation and indentation fracture of brittle materials and coatings. Talks were accompanied by extensive, lively discussion which continued informally into the ample free time that was made available.

School Mathematics

Orange County, Coorg
28 February – 2 March 2013

Convener: Phoolan Prasad (IISc, Bangalore)

The meeting was organised by the Ramanujan Mathematical Society (RMS) and was hosted by the Indian Academy of Sciences. This meeting was attended by Prof. M. S. Raghunathan, President of RMS, Prof. Phoolan Prasad, Editor-in-Chief of the RMS series of Little Mathematical Treasures (LMT); Editorial Board members of LMT and Prof. P. Shankaran as a representative of the Joint Science Education Panel of the three science academies. The other invitees to the meeting were some school/college teachers, a member of the Azim Premji University, a Research Officer of Kerala SCERT and a representative of the Association of Mathematics Teachers of India.



The agenda of the discussion meeting was (i) Creation of an all India cadre of school teachers (along the lines of services like IAS or IPS); (ii) Nurture programme for mathematics teachers; (iii) National level programme of quality mathematics education for bright students in schools.

Each item of the agenda was discussed in great detail. The recommendations of the meeting will be taken up with the Government of India, State Governments, K. V. Sangathan and groups of mathematicians interested in mathematics education. One important aspect of the meeting was the interest shown (and also confirmed later after the meeting) by the Azim Premji University in working jointly with this group of mathematicians on teachers training. It was also interesting to note the valuable work initiated by the Kerala SCERT on nurturing mathematics in schools from the 6th standard, which may be followed by other states.

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'WOMEN IN SCIENCE' PANEL PROGRAMMES

1. Careers in Science (9 March 2013)

The Indian Academy of Sciences, under the auspices of the Panel on 'Women in Science' organized a half-day session on 'Careers in Science' to commemorate International Women's Day and National Science Day. This lecture programme was held on 9th March at the Mount Carmel College, Bangalore.

Remembering the contributions made by women scientists to science, Rohini Godbole (IISc), the first speaker gave a brief introduction of the book 'Lilavati's Daughters: The women scientists of India', and recalled the contributions made by Janaki Ammal and Anandibai Joshi, the first lady doctor in India. She urged the young girls to read biographies of famous women scientists to learn and derive their inspiration from them. Godbole also gave a talk explaining the contribution of particle physics to other sciences and the significance of the recently discovered Higgs Boson. Her description of the discovery of the proton-proton collision to yield one Higgs boson particle that manifests in one in a billion collisions was very interestingly illustrated and explained.

The second speaker, T. N. C. Vidya (JNCASR) spoke on the social organisation in female Asian elephants. This talk showed how female Asian elephants interact, how their networking is structured and organised as compared to the African elephants. The talk revealed the marked differences between the social behaviour of Asian and African elephants in their group strategies, defence against predators and during crises such as food shortage.

The third speaker Attreyee Ghosh (IISc) gave an overview of ongoing research in the area of geophysics and enlightened the audience with various aspects of unknown facts of our planet Earth. The structure of the Earth was explained in a lucid manner emphasising the fact that ample research is necessary to cope with calamities such as earthquakes and tsunamis. For aspiring earth scientists, Ghosh listed a few necessary traits: (i) a person who loves being outdoors, (ii) is willing to explore nature and has love for science and (iii) a flair for coding and computing to design numerical models.

Following these lectures, an interactive session was also organized. Prabha Chatterji an industrial consultant interacted with the students. Some of the questions

discussed were — reservations for women in research institutes, post marriage social responsibilities for women and poor quality of science education at the school level.

The session concluded on an optimistic note with suggestions from the panel to the young gathering on the advantages of doing science, like flexible and independent working hours. Ten promising students were presented with a copy of the book 'Lilavati's Daughters – The Women Scientists of India'.

2. Women teaching and leading Sciences (16 February 2013)

As part of the programmes of the Academy Panel on 'Women in Science', a panel discussion on "Women teaching and leading sciences" was held on 16 February 2013 on the last day of the two-week "Refresher Course on Advances in Plant and Animal Biotechnology" at the Indian Women Scientists Association (ISWA), Vashi, Navi Mumbai. It was attended by nearly 90 persons consisting of the Course participants, the faculty, college students, teachers, scientists and IWSA members.

'Women in Science', has been receiving immense attention in India and abroad to assess why women are not as much in the forefront as men in science. Is it just a gender bias or are there other issues which need attention? This topic has been the focus of activities of the Academy Panel and it was therefore considered appropriate to discuss and see how far we have gone in our efforts to improve the space for women in science. A 2004 report by a committee chaired by Rohini Godbole and others, presented some of the prime factors as to why women scientists in India are where they are. These factors include environmental issues such as societal pressures, lack of amenities, which part of the country you reside, lack of support from the family, gender bias, science *vs* arts as appropriate for women, the glass ceiling and so on.

Surekha Zingde, (ACTREC, Kharghar, Navi Mumbai) moderated the proceedings of the panel of eminent women who had won laurels in their individual fields of activities. The panelists were Mythily Ramaswamy (TIFR-CAM, Bangalore), Shobhana Narasimhan (JNCASR, Bangalore) and Ranjini Bandyopadhyay (RRI, Bangalore) who represented the mathematical and physical sciences; Kamal Hazari (ex NIRRH, Mumbai), Anjali Kulkarni (BARC, Mumbai) the medical sciences; Rinti Banerjee (IIT-B), medical sciences among the engineers, and Sheela Dhonde (IISER, Pune) representing the teaching faculty from the colleges.

Three of the Refresher Course participants, (Liji Thayil, a college professor in Mumbai), Reshma Turbekar (from the Koli Community in Mumbai) and Sashidhara Rajaratnam (from an economically backward community in Tamilnadu) spoke on their efforts to overcome several different societal pressures to reach their goals as scientists and teachers. Tulsi Mukherjee (BARC) and Bakhtavar Mahajan (ex. HBCSE, TIFR), from the audience, shared their experiences and views on the topic.

All the senior scientists on the panel were from families wherein education was of prime importance, so the lack of support was not a factor. The discussion revealed how each member in the panel envisaged the topic, their personal experiences as professionals, their views and opinions of being women scientists, clinicians and educationists. The panelists expressed the importance of self-esteem, determination, persistence and decision on professional priorities, as the way forward for women scientists. They shared anecdotes that influenced their decisions and made it possible for them to reach their present positions. They also expressed how the immediate environment and that of society affects the path to development of a woman's career.

Key take home points were: a woman's self-esteem is essential to ensure that she reaches her goal (Shobhana Narasimhan); make your position clear to your male colleagues that you are scientifically at par, besides being a woman (Mythili Ramaswamy); equal participation with domestic activities from the spouse is a must for a woman to move ahead in her career (Ranjini Bandyopadhyay); a woman must understand her own body well to ensure that she can regulate her activities and move ahead in undertaking what she wants to do (Kamal Hazari); environment at home plays a major role in determining careers and family support is essential to excel (Anjali Kulkarni); good parenting, family encouragement, no discrimination between girl and boy child while growing up and the freedom of choice in the selection of a career and the importance given to "networking" to be considered as a Fellow of the Academies, are factors involved in the development of women as scientists (Rinti Banerjee); major attention is needed for educating the girl child in rural areas and small towns if they are to contribute effectively to society at large (Sheela Donde).

Zingde summarizing the proceedings mentioned the efforts made by the Academies towards identifying issues affecting women in science such as need for equal opportunities, gender neutrality, mentoring, flexi hours of work for women, opportunity to return after a break in career, efforts to provide jobs to both spouses in the same campus or at least in the same city and provision for child care on campus. She brought to attention the small percentage of women who get elected as Fellows of the Academies and that due importance should be given to their professional achievements rather than their "networking" capabilities which are most often affected by lack of family support and the view that a woman is solely responsible for the child and the home. She also informed that the Government of India has provided leave opportunities for working women to ensure that children below 18 years of age receive due attention from their mother. The points that now require attention and which constituted the recommendations of this panel were the need for:

1. child and elder care leave for both men and women so that they share their responsibilities for the family;
2. the importance for women to stand up for their rights, but not misuse privileges offered by the government;
3. concerted efforts for mentoring of men to participate in family responsibilities.

These recommendations will contribute to the efforts of the Academies towards ensuring that women have the same opportunities as men in science in India so that they excel professionally and are recognized at par with men.

The Indian Women Scientists' Association thanks all the three Science Academies for supporting IWSA to conduct the Panel Discussion. IWSA is also greatly indebted to the panelists. Of course our thanks are also due to the audience.

[Compiled by Surekha Zingde, Deputy Director, CRI-ACTREC and Rita Mukhopadhyaya, Secretary, IWSA].

STI POLICY – BRAINSTORMING SESSION

Indian Institute of Science, Bangalore
15 March 2013

Science, Technology and Innovation Policy – 2013

The Science, Technology and Innovation (STI) Policy 2013 was unveiled by the Prime Minister, Dr. Manmohan Singh on 3 January 2013 during the centenary session of the Indian Science Congress in Kolkata. A policy document on Science, Technology and Innovation Policy was made available in the public domain thereafter.

The Department of Science and Technology (DST) initiated a national consultation with different stakeholders to elicit inputs on implementation and

operationalisation of specific measures and mechanisms enunciated in the policy. The DST proposed to conduct ten brainstorming sessions across India.

One such session was held in Bangalore under the auspices of the Indian Academy of Sciences on 15 March 2013 at Indian Institute of Science, Bangalore. The speakers:

• Prof. Roddam Narasimha • Prof. D. Balasubramanian • Prof. K. Vijay Raghavan • Prof. T. V. Ramakrishnan and • Prof. K. N. Ganesh presented their views and perspectives on the policy document based on their rich experiences, accomplishments and contributions to science and technology activities in the country.

The session saw a large gathering of Fellows, senior scientists, academicians, students, and others. The speakers discussed recommendations in various areas including public health, public-private partnership, and reforms in education and innovation. The details of these recommendations will appear in a later issue of *Patrika*.

RAMAN PROFESSOR

Sauro Succi from the Istituto Applicazioni Calcolo "Mauro Picone", Rome (Italy) occupied the Raman Chair in three phases — during October 2011 and February 2012 (as reported in *Patrika*, March 2012 issue) and also during July 23 – 31, 2012 the last phase of his visit. During this phase he attended the 21st edition of the conference 'Discrete Simulation of Fluid Dynamics' held in Bangalore from July 23 to 27 and delivered a talk titled 'Lattice Boltzmann methods for fluid turbulence'. The talk was based on the joint work Succi did with Indian colleagues, particularly Santosh Ansumali and his coworkers, during his previous Raman visits.

In addition, he completed three papers jointly with Prof. Adhikhari in Chennai — a previous submission which has been accepted for publication in *J. Comp. Phys.* They also completed two new papers, on lattice discretizations of differential operators and turbulence simulations which have been submitted to *Phys. Rev. Letters* and *Proceedings of the National Academy of Sciences*, respectively.

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SUMMER RESEARCH FELLOWSHIP PROGRAMME FOR STUDENTS AND TEACHERS – 2013

This is the seventh year of the Summer Research Fellowship Programme jointly conducted by the three National Science Academies of the country.

The 2013 Programme was announced in October 2012 and the last date for receiving applications was 31 December 2012. Six Selection Committees consisting of about 25 experts in different areas met between 18 and 20 January 2013 to scrutinize and make the selections. The following table indicates, subject-wise, the numbers of applications received from students and teachers and the fellowships offered.

Subjects	Applications received		Fellowships offered	
	Students	Teachers	Students	Teachers
Life Sciences	4872	287	791	45
Engineering & Technology	11053	223	501	55
Chemistry	2314	165	422	78
Physics	2269	132	445	52
Earth & Planetary Sciences	916	25	227	25
Mathematics	865	52	192	16
TOTAL	**22289**	**884**	**2578**	**271**
GRAND TOTAL	**23173**		**2849**	

The next issue of Patrika will contain the number of fellowships availed and some analysis of the data.

REFRESHER COURSES

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

Two-week Refresher Courses are aimed 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 Courses were held during the last six months.

A. Refresher Courses in Experimental Physics

The Refresher Courses in Experimental Physics were held under the direction of R. Srinivasan who was instrumental in the conceptualization and designing of the experiments. He has so far held 46 Courses in different parts of the country since 1999. These experiments are useful for laboratory programmes at B.Sc and M.Sc levels and many universities in the country have adopted these experiments as part of their curricula. In order to conduct the Refresher Courses, a user-friendly kit containing several components has been developed and manufactured under licence by a company in Bangalore: M/s Ajay Sensors and Instruments. The experiments that can be done with the kit were listed in the earlier issues of *Patrika* including some of the new experiments that were added last year.

The following is a list of five Experimental Physics Courses held from October 2012 to March 2013.

1. XLII. Tuljaram Chaturchand College, Baramati (TCC)

8 – 23 October 2012

Co-ordinator: MK Kokare (TCC)

No. of Participants: 45 participants from Akluj, Baramati, Bhopal, Bhor, Hadapsar, Kopargaon, Shrirampur, Vita.

Resource Persons: R Srinivasan, JBC Efrem D'Sa, Manohar Naik, SM Sadique, Neelam Kapoor, RT Sakpal.

Special Lectures: CH Bhosale and Ray Bagkar.

2. XLIII. Indian Academy of Sciences Annexe, Jalahalli, Bangalore

15 – 30 November 2012

No. of Participants: 22 participants from Anantapur, Bangalore, Birbhum, Chennai, Jaipur, Kanpur, Katra, Latur, Malappuram, Patia, Santiniketan, Thiruvallur, Thrissur, Tuticorin, Vadodara, Vijayawada, Visakhapatnam.

Resource Persons: R Srinivasan, Sarbari Bhattacharya, BN Meera, Sarmishta Sahu, TG Ramesh, AV Alex.

Special Lectures: Aveek Bid and Andal Narayan.

3. XLIV. VIT University, Chennai

4 – 19 December 2012

Co-ordinator: G Vinitha

No. of Participants: 16 participants from Amravati, Aruppukottai, Chennai, Madurai, Mysore, Nagpur, Rajkot, Tiruchirapalli, Vellore.

Resource Persons: R Srinivasan, C Krishnamoorthi, G Vinitha and Caroline Ponraj.

Special Lectures: Fabrication and characterization of electrical micro-switch (Atanu Dutta); Wave nature

of recoiled electrons in the Compton Effect (Vinay Venugopal); Characterizations of interphases semi-conductor and conducting ceramics (N Manikandan); Telluride phase change materials and tellurite glass optical fibres (N Punithavelan).

4. XLV. Christ Church College, Kanpur (CCC)

1 – 16 February 2013

Co-ordinator: RK Dwivedi (CCC)

No. of Participants: 33 participants from Banda, Dehat, Etawah, Fatehpur, Hardoi, Jabalpur, Kanpur, Kumaracoil, Lucknow, Mathura, Muzaffarnagar, Pauri, Sambhal, Solan, Unnao.

Resource Persons: R Srinivasan, S Anantha Ramakrishna, HC Verma, YN Mohapatra, RK Thareja, RK Dwivedi, T Pramila, Manish Kapoor, SP Singh, VK Srivastava.

Special Lectures: Experiments in optics for enabling physical understanding (S Anantha Ramakrishna); importance of experiments in physics learning (HC Verma); my experiments in teaching physics (YN Mohapatra).

5. XLVI. Indian Academy of Sciences Annexe, Jalahalli, Bangalore

5 – 20 March 2013

No. of Participants: 17 participants from Alappuzha, Anand, Aurangabad, Bangalore, Birbhum, Chennai, Delhi, Jammu, Madurai, Malappuram, Mandya, Mysore, Udumalpet.

Resource Persons: R Srinivasan, TG Ramesh, Seeta Bharati, N Meenakshisundaram, AV Alex.

Special Lectures: Abhisek Dhar, N Kumar and ESR Gopal.

B. Other Refresher Courses

6. Traditional and Modern Approaches in Plant Taxonomy

University of Agricultural Sciences, Bangalore (UAS)

15 – 29 November 2012

Course Director: RR Rao (UAS)

Course Co-ordinator: M Sanjappa, MD Rajanna (UAS)

No. of participants: 26 participants from Allahabad, Anand, Bangalore, Chattisgarh, Coimbatore, Delhi, Ghaziabad, Hassan, Krishnagiri, Lucknow, Mumbai, Nanded, Rajouri, Ramanathapuram, Rohtak, Sangli, Shimoga, Srinagar.

Resource Persons: HY Mohan Ram, RR Rao, M Sanjappa, MD Rajanna, Ramakrishna, KN Ganeshaiah, R Uma Shaanker, V Bhaskar, MP Nayar, K Shankar Rao, SR Yadav, D Narasimhan, KG Bhat, Jagadish Chandra, YN Seetharam, K Shivanna, G Ravikanth, Senthil Kumar, Amit Agarwal, C Sathish Kumar, C Kameswara Rao.

Topics of Lectures: Problems of taxonomy teaching and research in India; endemism in Indian plants and taxonomy at crossroads; biogeography with special reference to India; photography and identification of plants; species and population concept and herbaria; cladistics and phylogeny; taxonomy of plants; cytotaxonomy; plant nomenclature; pollen morphology in relation to plant taxonomy; revision of genus *Impatiens L.*, trends in evolution of angiosperm flowers; taxonomic literature and other resources; taxonomy of Impatiens species complexes; patterns of species discovery in the Western Ghats and molecular phylogenetics; DNA barcoding of plants and phylogenetic analysis; role of chemistry in plant identification; role of botanic gardens in plant conservation; vegetative characters in identification of forest tree species; orchid taxonomy and biology; role of taxonomy and palynology in agri-biotechnological research; acts and conventions related to biodiversity; etnobotany, methods, techniques and its role in search of newer economic plant; role of anatomy in taxonomic researches and chemotaxonomy; history of taxonomic researches; botanical survey in India and its role in documentation and conservation flora and traditional knowledge of plants; reproductive biology and conservation and relevance of low tech science in modern days. The Course included practical sessions.

7. Plant Sciences

PSGR Krishnammal College for Women, Coimbatore (PSGRKCW)

19 November – 3 December 2012

Course Director: TJ Pandian (MKU, Madurai)

Course Co-ordinator: S Poornima (PSGRKCW)

No. of participants: 27 participants from Anantapur, Coimbatore, Mahe, Mangalore, Parangipettai, Solan, Tiruvannamalai.

Resource Persons: TJ Pandian, Jebasingh, Sri Priya, KN Ganeshaiah, RR Rao, DJ Bagyaraj, Victor Arokia Doss, K Mani, N Natarajan, KS Subramanian, D Sudhakar, SF Maleeka Begum, TS Lokeswari Sivaswamy, Narendar Sivaswamy, S. Paulsamy, V Narmathabai, Modhumita Dasgupta, M Ramanathan, S Poornima, NS Vasanthi, S Karuppusamy, TS Suryanarayanan.

Topics of lectures: Role of arbuscular mycorhhizal fungi in sustainable agriculture; microbial inoculants and crop productivity; bioinformatics; status of nano agriculture in India; engineering insect resistance in plants; safety of GM crops; an eco-friendly approach of essential oils as bio-pesticides; silencing RNAs in plants; gene regulation mechanism; bio-processing (fermentation-upstream and downstream processing); industrial enzymes (enzymes, applications and problems); plant-insect interaction; encounter with wasp; functional genomics; basic principles of pharmacological screening of drugs; screening for anti-inflammatory drugs; application of nanotechnology in seed science; joy of doing science; in search of sanjeevani; evolution of mutualism in plants; bio-informatics; cloning of biopesticide gene; antidepressant activity of plants; drug discovery; chemical genomics; ethics in research; Amazon – a naturalist pilgrimage; isolation of plant genomic DNA; RNA extraction; orchids – genetic resources, utilization and conservation, floristic diversity in India: inventorization, conservation and bioprospection; problems in taxonomy teaching and research in Indian Universities – a plea for urgent resurrection; biodiversity – an overview; molecular taxonomy and floristics; research opportunities in plant science; plants as source of nano particles – some vision to reality; biotechnology – a boon for diabetes treatment: from vision to reality; role of miRNA plant gene regulation; transgenic approaches to modify oils and fats in plants.

8. Experimental Chemistry

University of Pune, Pune

3 – 16 December 2012

Course Director: DD Dhavale (University of Pune)

Course Co-ordinator: Satish Pardeshi (University of Pune)

No. of participants: 12 participants from Amravati, Bhubaneswar, Dumka, Mumbai, Nashik, Pune, Rewa, Surat, Tirupati

Resource Persons: GS Grover, ND Singh, PD Lokhande, Vaishali Shinde, SB Waghmode, Dipalee Malkhede, Pragati Thakur, AS Kumbhar, SK Haram, AA Kumbhar, Satish Pardeshi, AK Nikumbh, Sunita Salunkhe, BG Ankamwar, Suvidya Ranade.

Course Content: Organic Chemistry: Preparation, purification and characterization of organic compounds; detection of functional groups and elements in organic compounds; synthesis of polystyrene; Physical Chemistry: spectrophotometric and spectrofluorometric determination of the ground and excited state acidity constants of 2-naphthol; conductometric titration of vinegar, various other acid base combinations, $AgNO_3$ and KCl, determination of CMC; study of clock reaction at two different temperatures; Inorganic/Analytical/ Environmental Chemistry: Round-trip of Cu; A pH-mediated synthesis of nitro and nitrite derivatives of a complex; photochemical degradation of a dye using Zno/TiO2 catalyst in the presence of sunlight, tungsten lamp and mercury lamp; environmental chemistry related experiment; various types of titration; Nano Chemistry: nanoparticle synthesis; characterization techniques used for nonmaterial; Biochemistry: separation; of DNA by Agarose gel electrophoresis; separation of nucleic acid bases by paper chromatography; determination of effect of increasing substrate concentration on enzyme.

9. Experimental Biology

Indian Institute of Science Education and Research, Kolkata (IISER)

19 – 31 December 2012

Course Director: Dhrubajyoti Chattopadhyay (University of Calcutta, Kolkata)

Course Co-ordinator: Partho Sarothi Ray (IISER, Kolkata)

No. of participants: 17 participants from Anand, Bangalore, Burdwan, Chikkasandra, Gajapati, Kolkata, Malkangiri, Mangalore, Manipal, Nadia, Pune, Puri, Rayagada, Sivaganga, Tiruchirapalli, Varanasi.

Resource Persons: Partho Sarothi Ray, Anindita Bhadra, Rupak Dutta, Mohit Prasad, Tapas Sengupta, Malancha Ta, Rituparna Sinha Roy and Partha Pratim Datta.

Course contents: Organismal biology – microscopic observations: plant cells/Drosophila/human cheek epithelial cell/mammalian cell lines; behaviour experiment: ant/zebrafish/Drosophila; Cellular biology – Drosophila polytene chromosome staining and observation; blood film staining and observation; isolation of DNA and RNA from goat liver/blood; protein extract preparation and isolation of plasmid DNA from bacteria; Molecular biology – spectrophotometric quantitation and electrophorsis of DNA/RNA/protein; enzyme assays from bacterial extract: constitutive–alkaline phosphatase inducible-b galactosidase; western blotting; PCR/restriction digestion. Several practical sessions were also held.

Special lectures were given by: Gene expression in prokaryotes (NC Mandal); DNA structure and function (HK Majumder); viral life cycle and regulation (Dhrubajyoti Chattopadhyay); utility of statistics in biology (Partha P Majumder); memory and learning (Kausik Si); behavioural biology of ants (Sumana Annagiri).

10. Foundation of Physics

Bengal Engineering and Science Univeristy, Shibpur (BESU)

24 – 31 December 2012

Course Director: Amitabha Ghosh (BESU)

Course Co-ordinator: BK Guha (BESU)

No. of participants: 56 from Hooghly, Howrah, Kolkata, 24 Parganas, Purba Midnapore, Purulia.

Resource Persons: Soumitra Sengupta, AK Mallik, Amitabha Ghosh, BK Guha, Swapan Datta, Manoj Harbola, Birendranath Das, Bhupati Chakrabarti, Surajit Chakraborty.

Topics covered: Newtonian mechanics and non-linear dynamics; theory of gravitation; thermodynamics and statistical mechanics; electricity, magnetism and special theory of relativity; quantum theory.

Special Lecture: Solar system and stellar evolution (DP Duari).

11. Advances in Plant and Animal Biotechnology

Karmaveer Bhaurao Patil College and other venues, Mumbai

3 – 16 February 2013

Course Director: Tarala D Nandedkar (NIRRH, Mumbai)

Course Co-ordinator: Susan Eapen (IWSA, Navi Mumbai)

No. of participants: 21 participants from Anand, Aurangabad, Burdwan, Hassan, Hyderabad, Mumbai, Nizamabad, Perambalur, Secunderabad.

Resource Persons: KB Sainis, Rakesh Tuli, Deepak Modi, Rajani Bhisey, SK Apte, Sulabha Pathak, Jayashree Sainis, Smita Mahale, SF D'Souza, Archana Joshi Saha, Sonia Chadha, Suman Bakshi, Rita Mukhopadhyaya, Paramjit Khurana, Shelly Bhattacharya, Robin Mukhopadhyaya, Sorab Dalal, Sanjeev Waghmare, Shubhada Chiplunkar, Rita Mulherkar, Sandipto Ghosh, D Bhattahcharyya, Pradnya Kowtal, Rukmini Govekar, Debjani Dasgupta, Neetin Desai, Mustansir B, Rajashri Navalakhe and many others.

Topics covered: Biotechnology: science, applications and concerns; biotechnology for designer plants and foods; cultivation of genetically modified food crops: prospects and challenges; reverse genetics: RNAi in research and therapeutics; application of tissue culture to basic research; microbes for eco-friendly environmental applications; malaria vaccine: one thing leads to another; artificial photosynthesis; protein purification techniques; harnessing biomaterials for bioprocess development and monitoring; vectors

for gene manipulations; genomic tools for fungal pathogens of plants and animals; microsatellite markers and their application in wheat breeding; SSR PCR; reporter gene assays; advent of genomics: implications in crop improvement; engineering plants for changing climatic conditions; generation and culture of adult rat; RNA extraction, cDNA synthesis plasmid extraction; staining and loading; hepatic stem cells: an alternate methodology for toxicological studies; silver staining; viral vectors for gene expression; generation of transgenic animals; in vivo molecular imaging; cancer immunotherapy; rodents in research; gene therapy; flow cytometry; mass spectrometry; advances in biotechnology; an overview of plant tissue culture; sugarcane biotechnology; next generation designer crops for better nutrition and stress tolerance; proteomics, functional genomics and new biology; ethics in science and technology; synthetic life: myth and reality; biotechnology and molecular biology of silk; future potential of stem cells. Several practical demonstrations were also conducted during this Course.

A Panel Discussion on 'Women in teaching and leading sciences' was also held on the last day of the Course. The panelists were Mythily Ramaswamy, Ranjini Bandyopadhyay, Shobhana Narasimhan, Rinti Banerjee, Kamal Hazari, Anjali Kulkarni, Sheela Dhonde.

12. Modern Genetics: Concepts and Practice

Manipal University, Manipal

4 – 16 February 2013

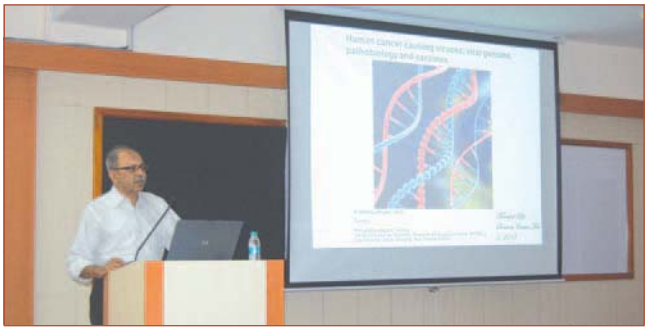
Course Director: V Nagaraja (IISc, Bangalore)

Course Co-ordinator: K Satyamoorthy (Manipal University)

No. of Participants: 21 participants from Arcot, Bangalore, Changa, Indore, Kasargod, Kolhapur, Kolkata, Mangalore, Puducherry, Padnekkad, Ranchi, Salem, Shankaraghatta, Shimoga, Sullia, Surat, Thiruppattur, Tiruvannamalai, Visakhapatnam.

Resource Persons: DN Rao, V Nagaraja, P Kondaiah, PN Rangarajan, KP Gopinathan, R Mukhopadhyaya, Jayaram S Kadandale, Mitesh Shetty, SP Thyagarajan, K Ramnarayan, Girisha Katta, Herman D'Souza.

Topics of lectures: At the Crossroads of chemistry and immunology: catalytic antibodies (catabs, abzymes); cancer causing viruses, viral genomes, pathobiology and vaccines; from basic biology to drug discovery



efforts – an ongoing journey; impact of molecular cytogenetics testing in clinical genetics; bacteriophages as models for molecular genetics; heavy metal toxicity; making sense out of expression profiling data: analysis and interpretation of breast cancer-micro arrays; re-combinant protein production in pichipastoris; Agarose gel electrophoresis and SDS-PAGE; theory behind HPLC and mass spectrometry; genetics in clinical practice; prenatal diagnostics for genetic diseases; advances in vaccinology.

Isolation of genomic DNA, primary culture; plasmid DNA isolation, lymphocyte culture; methods of DNA damage and repair assessment; techniques in genetic toxicology; absolute cell count by flow cytometry; cell viability assay; cell cycle analysis; atomic absorption spectrophotometer theory and practice; introduction to various aspects of PCR technique; polymerase chain reaction; bacterial cell count; DNA sequencing; real time PCR; principle procedure and guidance for performing microarray experiments; flagellar staining principle. The Course also consisted of over 6 hours of practicals/demonstrations/hands-on training.

13. Vision and Challenges of Pervasive Computing and Cloud Computing

GR Damodaran College of Science, Coimbatore (GRDCS)

25 February – 9 March 2013

Course Director: BL Deekshatulu, GR Gangadaran (Hyderabad)

Course Co-ordinator: Vanitha Sidambaranathan (GRDCS)

No. of Participants: 35 participants from Coimbatore, Duragapur, Pollachi, Puducherry, Rourkela, Surat.

Resource Persons: Ramalatha Marimuthu, GR Gangadharan, Thiagarasu, AS Syed Nazir Ahmed, R Kalpana, GR Karpagam, L Ashok Kumar, T Devi, Pavan Yara, Johny Kannan, BL Deekshatulu, Rajiv Wankar, Renuga, L Jagadeeshwaran, Mahesh U Patil,

Vannirajan Chellapan, Raveendhran, Krishnendu Mukhopadhyay.

Course Contents: Why research in cloud computing and pervasive computing? cloud computing – an introduction, applications, industry views; services discovery: composition; current landscape in cloud; services in computing; social computing; types of clouds; deployment types; cloud environment roles; CloudSim; pervasive computing – definitions: terms and standards; human computer interaction introduction to robotic science; robotics lab; pervasive middleware; wireless sensor networks; Castalia; mathematical challenges in pervasive computing research.

LECTURE WORKSHOPS

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

1. Ergodic theory and dynamical systems for post-graduates

School of Physical Sciences, Jawaharlal Nehru University, New Delhi (JNU)

1 October 2012

Convener: Ajit Iqbal Singh (ISI, New Delhi)

Co-ordinator: Amala Bhave/Riddhi Shah (JNU)

Participants: 138 participants (95 students and 43 teachers) from Delhi.

Topics Covered: Hyperbolic geometry and number theory; ergodic transformations; subadditive ergodic theorem and percolation theory; Kleinian groups: a tribute to Bill Thurston; dynamics of distal actions.

2. Photophysics of Molecular Materials for Electronic and Energy Applications

M. S. University, Baroda

3 – 5 October 2012

Convener: S Ramasesha (IISc, Bangalore)

Co-ordinator: Praveen Ghalsasi (MS University, Baroda)

Participants: 102 participants from different institutions in Baroda.

Topics Covered: Molecular materials; probing electron states; molecular devices; electron states in conjugated molecules; laser spectroscopy; electronic processes in organic devices; nonlinear optics of molecules.

3. History, Aspects and Prospects of Electronics in India

University of Delhi, New Delhi

12 – 13 October 2012

Convener: Manoj Saxena (Deen Dayal Upadhyaya College, New Delhi)

Co-ordinator: Poonam Kasturi (Deen Dayal Upadhyaya College, New Delhi)

Participants: 262 participants from institutions in Alwar, New Delhi, Gurgaon, Noida.

Topics Covered: From transistors to teraflop computing and beyond; teaching and research: which way to go? revolutionary ideas in microelectronics and their social impact; quantum dots based biosensors for cancer detection; steep subthreshold green transistors for low power CMOS integrated circuits; Indian

rockets and missiles; nanotechnology in semiconductor industry; the silent enables of electronics industry – silicon technology; system design opportunities in India; agilent, academia and the pursuit for employability.

A panel discussion on 'Need and role of industry in curriculum development and career opportunities for graduates' was held.

4. Mathematics

Jamia Millia Islamia, New Delhi (JMI)

18 October 2012

Convener: Ajit Iqbal Singh (ISI, New Delhi)

Co-ordinator: KK Dewan/Naseem Ahmad (JMI)

Participants: 150 participants from JMI and other institutions in Delhi.

Topics Covered: On the lifted temperature minimum; Ramanujan and pi; the Kobayashi metric on convex domains; how applied mathematics should be done?

5. Mapping, Utilization and Conservation of Bioresources

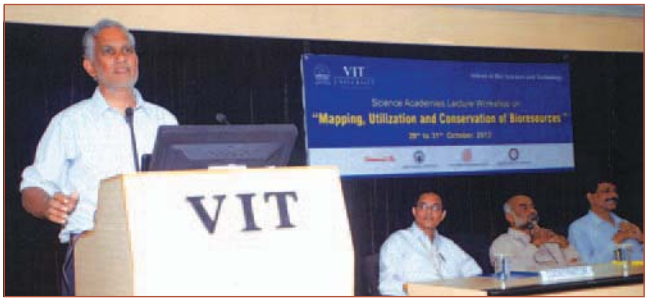
VIT University, Vellore

29 – 31 October 2012

Convener: R Uma Shaanker (UAS, Bangalore)

Co-ordinator: R Siva (VIT)

Participants: 150 participants from in and around Vellore district.



Topics Covered: Mapping, utilization and conservation of bioresources.

6. Tectonic Geomorphology

HNB Garhwal Univeristy, Srinagar Garhwal (HNBGU)

30 October – 2 November 2012

Convener: Nibir Mandal (Jadavpur University, Kolkata)

Co-ordinator: YP Sundriyal (HNBGU)

Participants: 100 participants

Topics Covered: Geomorphic processes and evolution of landforms; tectonic geomorphology; geomorphic markers; ascertain timing in landscape; methods of dating with special reference of OSL dating; fold, fault and stress; paleoseismology; rate of uplift and erosion.

7. Theoretical Physics Lectures

University of Mysore, Mysore

8 – 10 November, 2012

Convener: MVN Murthy (IMSc, Chennai)

Co-ordinator: C Ranganathiah (University of Mysore)

Participants: 140 participants from various colleges in Mysore.

Topics Covered: Point groups; time dilation; uncertainty relations in the classical realm; throwing polarized light on mathematics; three is company: the Efimov effect.

8. Conservation and use of natural resources for sustainable development

Dayalbagh Educational Institute, Agra (DEI)

17 – 18 November 2012

Convener: Anand Mohan (DEI)

Co-ordinator: Sahab Das Kaura (DEI)

Participants: 150 participants from 10 colleges in and around Agra.

Topics Covered: Natural resources, sustainable development and geopolitics; quest for water wisdom; hydrogen energy: the green future fuel; ocean circulation, marine biosphere, global change and Indian monsoon; soil as vital natural resource for sustainable development; overview of the oil and gas industry.

9. Emerging Paradigms in Life Sciences

Visva-Bharati, Santiniketan

19 – 20 November 2012

Convener: Shelly Bhattacharya (Visva-Bharati, Santiniketan)

Co-ordinator: Sudipta Maitra (Visva-Bharati, Santiniketan)

Participants: 77 participants including two teachers from Bolpur College and others were students of Visva-Bharati.

Topics Covered: Definition of normal science and its foundation in posterity; the mysteries behind the DNA topological structures in *Leishmania donovani*, a protozoan parasite, causing Kala Azar; Melatonin: a hormone that acts in harmony with environmental signal of darkness; molecular mechanism of invasion and metastasis in ovarian cancer; genetic basis of diseases: new knowledge we gained and the challenges we must confront; identification of biomarkers of heart diseases; cellular signaling defects: an ill understood area.

10. Modern Trends in Chemistry and Chemistry Education

University of North Bengal, Darjeeling (UNB)

22 – 23 November 2012

Convener: Uday Maitra (IISc, Bangalore)

Co-ordinator: Amiya Kumar Panda (UNB)

Participants: 200 participants from Assam, Maharashtra, Sikkim, Uttarakhand and institutions around Darjeeling.

Topics Covered: Green chemistry in teaching and research; molecular spectroscopy; chromatography; molecules that break the rules; medicinal chemistry; click chemistry; nanoscience and nanotechnology.

11. Neuroscience Research: Translation to care and cure

Sophia College for Women, Mumbai

23 – 24 November 2012

Convener: Tarala D Nandedkar (NIRRH, Mumbai)

Co-ordinator: Medha Rajadhyaksha (Sophia College, Mumbai)

Participants: 150 students from various colleges in Mumbai.

Topics Covered: Toxicology; neurological disorders – integrating research in imaging into clinical practice; behavioral, neural and cognitive studies of auditory, speech and phonological processing in development dyslexia; animal models for human diseases; glioblastoma and meduclloblastoma, malignant brain tumours with different strokes; neural stem cells: a battle of nerves.

12. Need of understanding the neglected tropical diseases

Chennai Medical College Hospital and Research Centre, Tiruchirapalli (CMCH&RC)

26 – 27 November 2012

Convener: Utpal S Tatu (IISc, Bangalore)

Co-ordinator: N Prabhu (CMCH&RC)

Participants: 147 participants (23 teachers and 124 students).

Topics Covered: Malaria; leprosy; filariasis; dengue; parasitic eye infections; leptospirosis.

Panel discussions on "Malaria – Issues and challenges"; "Is leprosy still in India"; "Issues on Dengue" were also held.

13. Recent Developments in Chemistry

Visva-Bharati, Santiniketan

29 November – 1 December 2012

Convener: BC Ranu (IACS, Kolkata)

Co-ordinator: Adinath Majee (Visva-Bharati, Santiniketan)

Participants: 133 participants from colleges and Universities in Kolkata.

Topics Covered: Green chemistry on education and research; green chemicals for UG and PG labs; basic thermodynamics; prediction of possible (molecule) materials for H_2 storage from DFT calculation; hydrogen-bonding in supramolecular assembly of pi-conjugated chromophores; stimuli-responsive amphiphilic polymer assembly: implications in drug delivery; cyclometallated complexes of the platinum metals; co-ordination chemistry of the thiosemicarbazone ligands; symmetry, orbitals and geometry.

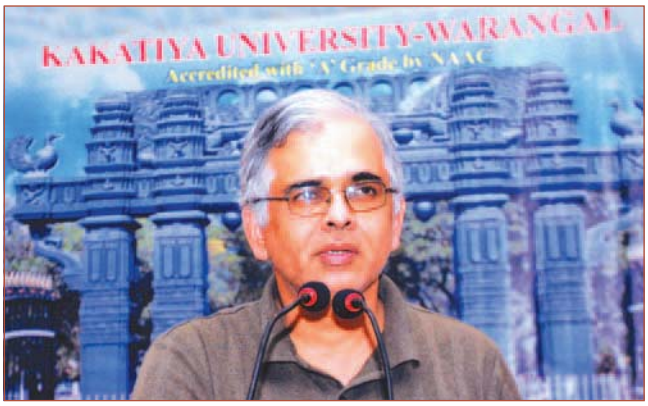
14. Uses of Recombinant DNA Technology in Modern Health Care

Kakatiya University, Warangal (KU)

30 November – 1 December 2012

Convener: Shekhar C Mande (NCCS, Pune)

Co-ordinator: G Shamitha (KU)



Participants: 479 participants from Kakatiya University, Narsampet, Waddepally and other colleges around Warangal.

Topics Covered: Uses of recombinant DNA technology in modern health care; epigenetics; virulence strategies of a human opportunisitic fungal pathogen *Candida glabrata*; recombinant DNA technology in the health care of tuberculosis and HIV infections; functional compartmentalization of the nucleus; drosophila: a model organism to study development and disease; development of body axis in animals and evolution of complexity.

15. Mathematics

St. Joseph's College, Bangalore

17 – 21 December 2012

Convener: Mythily Ramaswamy (TIFR-CAM, Bangalore)

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

Participants: 51 participants from seven colleges in Bangalore.

Topics Covered: Group theory; logic and set theory; calculus; linear algebra; differential equations and applications.

16. Introductory Astronomy

SDM College, Ujire

20 – 22 December 2012

Convener: CR Subrahmanya (RRI, Bangalore)

Co-ordinator: SG Bhargavi (PPISR, Bangalore) and Shiv Rao (SDM College, Ujire)

Participants: 133 participants from various institutions in and around Ujire.

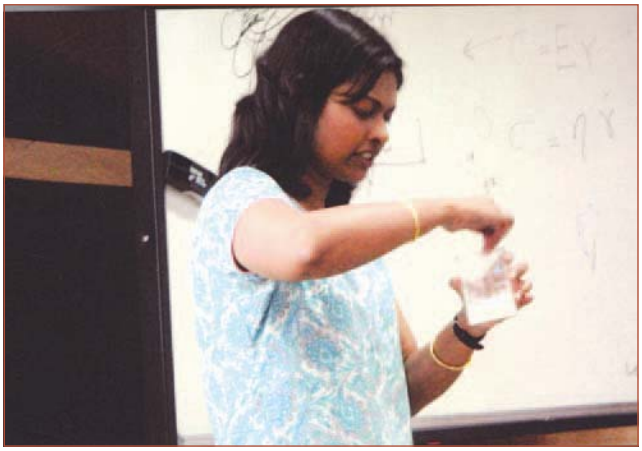
Topics Covered: Galaxies; radio astronomy; physics of astronomy; physics of Sun; cosmology; astronomical facilities in India across the electromagnetic spectrum.

17. Condensed Matter Physics

St. Joseph's College, Bangalore

10 – 12 January 2013

Convener: G Srinivasan (Bangalore)



Co-ordinator: RA Angiras (St. Joseph's College, Bangalore)

Participants: 75 participants from different colleges in Bangalore.

Topics Covered: Energy bands in solids; magnetism; liquid crystals; photonics.

18. Recent Trends in Synthetic Organic Chemistry

SNGS College, Pattambi

17 – 18 January 2013

Convener: D Ramaiah (NIIST, Thirvananthapuram)

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

Participants: 118 participants from Calicut, Coimbatore, Irinjalakuda, Malappuram, Mannarkkad, Palakkad, Pattambi, Shoranur, Thrissur, Valanchery.

Topics Covered: Design of sensitizers for photo-dynamic therapeutical applications; palladium-catalysed cross-couplings in organic synthesis; diversity-oriented synthesis of pharmaceutically important heterocycles and cyclopentanoids through palladium catalysed transformations; small molecules in drug discovery; therapeutically important quinolones and benzo-thiophenes through tandem reaction; synthesis of b-peptides with specific folding preferences for targeting protein-protein interactions.

19. Nanotechnology and its applications

MMM Engineering College, Gorakhpur (MMMEC)

18 – 20 January 2013

Convener: AK Ganguli (IIT, Delhi)

Co-ordinator: SP Singh (MMMEC)

Participants: 140 participants from various colleges in Gorakhpur.

Topics Covered: Nanomaterials by colloidal synthesis; quantum dots; nanotechnology and drug delivery; metal nanoparticles-doped dielectric films and their applications; magnetism at the nanoscale; micro-emulsions as nanoreactors; functional nanocomposite materials and coatings; magnetic materials for novel device applications; molecular simulations.

20. Emerging Trends in Development of Drugs and Devices

University of Delhi, Delhi

21 – 22 January 2013

Convener: K Misra (NASI, Allahabad)

Co-ordinator: SK Awasthi/Vibha Tandon (Univ. of Delhi)

Topics Covered: Medicinal chemistry and human welfare; nutraceuticals and their bio-comprehensive effects; targeted drug delivery; nucleic acids, peptide and protein chemistry.

21. Recent Advances in Chemistry

Manonmaniam Sundarnar University, Tirunelveli

23 – 24 January 2013

Convener: S Natarajan (IISc, Bangalore)

Co-ordinator: V Kumaresen (MSU, Tirunelveli)

22. Microbes, Minerals and Environment

VIT, Vellore

24 – 25 January 2013

Convener: KA Natarajan (IISc, Bangalore)

Co-ordinator: A Prem Rajan (VIT, Vellore)

Participants: 100 participants from different institutions in Vellore.

Topics Covered: Microbial aspects of environmental pollution and control with respect to mining; bacteria from cold habitats: biodiversity, survival and usefulness; impact of zoonotic diseases in environment; microbial diversity and its applications; bioleaching: mechanisms and processes; bioremediation of chromium contaminated soils and aquifers; adhesion of *acidithiobacillus ferrooxidans* to mineral surfaces; biomineralization: nature's footsteps.

23. Traditional, Modern and Futuristic Taxonomy

Jain University, Bangalore

29 – 31 January 2013

Convener: KN Ganeshaiah (UAS, Bangalore)

Co-ordinator: Ashwini N (Jain University, Bangalore)

Participants: 80 participants from various colleges in Bangalore.

Topics Covered: Floristic diversity of India; species concept in taxonomy, evolution, ecology and conservation; an island called India; phylogenetic patterns across multiple taxonomic groups reveal endemic radiations; DNA barcoding; hands-on training on molecular systematics; plant taxonomy; insect taxonomy; microbial taxonomy; do we need a new taxonomic species concept. Practical sessions were also held during this Workshop.

24. Recent Developments in Physics

Government Arts and Science College, Melur

30 – 31 January 2013

Convener: G Baskaran (IMSc, Chennai)

Co-ordinator: John Peter A (Government Arts and Science College, Melur)

Participants: 141 participants from several colleges in and around Melur.

Topics Covered: Richness of materials science; challenges and opportunities in computational materials science.

25. Thrust Areas in Life Science

Cauvery College, Tiruchirapalli

31 January – 2 February 2013

Convener: G Marimuthu (MKU, Madurai)

Co-ordinator: H Abirami (Cauvery College, Tiruchirapalli)

Participants: 150 participants from various colleges in Tiruchirapalli.

Topics Covered: Understanding evolution; evolution and human health; prey capture and detection by the Indian false vampire bat; biological clocks: connecting genes to behaviour; evolution of viviparity in vertebrates; understanding circadian entrainment in fruit flies *Drosophila melangaster*; biology and behaviour of bats; research begins with observation – Francis Galton; sex changing fish; microbial evolution; technique for conservation of fish genome; genetic switches; phytotherapy of fish diseases.

26. Frontiers in Astronomy

NITK, Surathkal

1 – 3 February 2013

Convener: G Srinivasan (Bangalore)

Co-ordinator: HS Nagaraja (NITK, Surathkal)

Participants: 125 participants from Mangalore and Surathkal.

Topics Covered: What are stars?; X-ray astronomy; quantum stars; gamma ray astronomy; black holes; radio universe.

27. Advanced Spectroscopic Techniques

HPT Arts and RYK Science College, Nashik (HPTRYKSC)

2 – 3 February 2013

Convener: Dilip D Dhavale (University of Pune)

Co-ordinator: VD Bobade (HPTRYKSC)

Participants: 170 participants from eight colleges in Nashik.

Topics Covered: ^{13}C NMR spectroscopy, 2D-NMR spectroscopy; mass spectrometry; IR and UV spectroscopy; ^{1}H NMR spectroscopy; XRD spectroscopy.

28. Basic and Interdisciplinary Topics in Physics

Midnapore College, Midnapore

4 – 6 February 2013

Joint Conveners: Indrani Bose (Bose Institute, Kolkata)/Bhupati Chakrabarti (City College, Kolkata)

Co-ordinator: BN Goswami (Midnapore College)

Participants: 128 participants from different colleges in and around Midnapore.

Topics Covered: Relaxation in disorder materials and nanocomposites; new particle at the large hadron collider; turbulent flow characteristics; the joy of small things; econophysics of income and wealth distributions in societies; self-organization in natural sciences; tipping point transitions in complex dynamical systems.

29. Current Developments in Atomic and Nuclear Physics

Christ University, Bangalore

6 – 7 February 2013

Convener: S Kailas (BARC, Mumbai)

Co-ordinators: Syed Azeez and SG Bubbly (Christ University, Bangalore)

Participants: 135 students from different colleges in Bangalore.

Topics Covered: Expanding nuclear landscape; applications of nuclear accelerators in basic and applied sciences; radiation effects and nuclear energy; current challenges in particle physics; physics of ion atom mixtures; laser spectroscopic applications from physics to medicine; nuclear magnetic resonance spectroscopy.

30. Recent Developments in Physics

Sri G. V. G. Visalakshi College for Women, Udumalpet (SGVGVCW)

6 – 7 February 2013

Convener: M Lakshmanan (Bharathidasan University, Tiruchirapalli)

Co-ordinator: TV Banumathi (SGVGVCW)

Participants: 245 students from various colleges in and around Udumalpet.

Topics Covered: Nonlinear dynamics: a science of complexity; understanding of the ultimate structure of matter; basics of quantum computation and quantum information; some exciting developments in condensed matter physics; nanotechnology; physics of living systems – biophysics, the novel subject for future.

31. Frontiers in Cell and Molecular Biology

Vidya Bhavan Rural Institute, Udaipur (VBRI)

14 – 15 February 2013

Convener: LS Shashidhara (IISER, Pune)

Co-ordinator: TP Sharma (VBRI)

Participants: 349 students from various colleges in Udaipur.

Topics Covered: Science and career opportunities in 21st century; evolution of human cognition; cells on the move: what is happening inside; science and researches in the field of genomics; are we more microbial than human; conventional and unconventional types of permeability; virosphere; green fluorescent proteins (GSP); how living organisms move: inter and intracellular movements within the body.

32. Progress and challenges in medical biotechnology

Christ University, Bangalore

15 – 16 February 2013

Convener: V Nagaraja (IISc, Bangalore)

Co-ordinator: S Suma (Christ University)

Topics Covered: Traditional, modern and futuristic vaccines; strategies to counter resurgent tuberculosis; gut bacteria and health; infection: lack of immunity or escape mechanism; multi-layered capsules as drug delivery systems; virus infection mechanisms; stem cell therapy.

33. Modern Trends in Chemistry

Vivekananda College, Tiruvekadam West

22 – 23 February 2013

Convener: R Ramaraj

Co-ordinators: VK Sivasubramanian/R Sevvel

Participants: 200 participants from various colleges in and around Madurai.

Topics Covered: Ionic liquids and organic synthesis; creating tissue phantoms: chemistry assisting ultrasound imaging; thiosulfate networks – synthesis, structure and properties; white light excitation fluorescence: novel concepts in analytical fluorimetry; inorganic-organic hybrid structure; principle and applications of molecular dynamics; molecular dynamics of collagen-like peptides; nanoparticles as sensors and catalysts.

34. Viral Vaccines and Diagnostics

Sri Venkateswara University, Tirupati

25 – 26 February 2013

Convener: HS Savithri (IISc, Bangalore)

Co-ordinator: M Hema (SVU, Tirupati)

Topics Covered: Virus structure, biology and purification; virus characterization; viral diagnostics; viral vector interactions; virus replication and virus cellular interactions; viral vaccines/therapeutics; control of emerging and re-emerging viruses.

35. Modern Chemistry and Biology

Aurora's Degree and PG College, Hyderabad

27 – 28 February 2013

Convener: Ahmed Kamal (IICT, Hyderabad)

Co-ordinator: KMR Nambiar (Aurora's College, Hyderabad)

Participants: 200 participants from various colleges in Hyderabad.

Topics Covered: Luminescence and applications; role of chemistry in the development of sensitizers in desensitized solar cells and biologically active compounds; revolution in evolutionary thoughts: Darwin and after; pathogenic bacteria and their survival mechanisms; coupling reactions and green chemistry; role of organic chemistry in drug discovery; transcription and formation of R-loops.

36. Chemistry and Physics of Advanced Materials

N.S.S. College of Engineering, Palakkad

1 – 2 March 2013

Convener: T Pradeep (IIT, Mumbai)

Co-ordinator: S Mayadevi (NSSCE, Palakkad)

Participants: 150 participants from different colleges in Palakkad.

Topics Covered: Hybrid materials; functionalized nanostructures; polymeric drug delivery systems; Green revolution in chemistry; nanochemistry; chemistry of ultra-thin molecular films; nanopore; biological motor – synthetic molecular motor.

37. Nanoscience and Nanotechnology

Jamia Millia Islamia, New Delhi

1 – 2 March 2013

Convener: AK Ganguli (IIT, Delhi)

Co-ordinator: Tokeer Ahmad (JMI, New Delhi)

Participants: 151 participants from various universities and colleges in and around Delhi.

Topics Covered: Nanostructures for applications in energy and environment; nano and nanoporous materials; thin film to organic nanowire and high performance organic field effect transistor; functional nano coatings by the wet chemical process; structural and magnetic phase transition in Pt based Nano-structured alloys; magnetic nanomaterials for GHz-frequency applications.

38. Recent Advances in Chemistry

AS College, Deoghar

16 – 17 March 2013

Convener: Anunay Samanta (University of Hyderabad, Hyderabad)

Co-ordinator: Bijoy K Choudhary (AS College, Deoghar)

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REPOSITORY OF SCIENTIFIC PUBLICATIONS OF ACADEMY FELLOWS

The initiative to maintain and make available a Repository of the publications of Fellows of the Indian Academy of Sciences has been a resounding success. Since the repository went online in late 2010, the total number of page views (lists, abstract views, full text file views) is *over* nine million (unfiltered for search engine crawlers and other robots, and repeat accesses; up from around six million in August 2012). The number of full text views/downloads by February 2013 exceeded 635,000 (filtered) and over two thirds of this number was from outside India.

The last update on repository information was published in the September 2012 issue of Patrika. Since then, the total number of records in the repository has crossed 90,000. However, the number of records with full text PDF files is only 20,000; the large difference being due to the fact that we are able to upload full text files *only* when publisher policy explicitly permits it.

The team constructing the repository at the Academy has essentially completed processing the lists of publications received from Fellows. Many journals in which Fellows' publications have appeared are *not* available online, and we have exhausted all avenues of finding online sources for many of the older publications. We therefore now are dependent on paper or soft copies of publications from Fellows in order to add publications to the Repository. The numbers clearly suggest that there is considerable value to the repository and this is when only a quarter of the records have full text files!

Collecting publications of past Fellows has been difficult. The Academy office is handicapped by not having access to a large library where one might find all the journals in which Fellows' publications have appeared, and this is one reason why some of the Repository lists are incomplete. Please let us know of sources for publications of past Fellows – we need your help in this regard.

For new publications, it would help us greatly if Fellows could send full publication metadata and full text files by email to the Repository team (eprints@ias.ernet.in) to enable them to upload the new data. When the team requests for paper or soft copies of the articles it does not mean that the full text file can be uploaded; this is primarily to get publication metadata (including the abstract where there is one) when an online source cannot be found.

In order to make the work itself openly available in the repository, we request Fellows to send us the essentially final versions of their papers, namely the publisher-accepted (and when allowed, copyedited) 'final author version' of their publications. If publisher policy allows hosting of the 'publisher version' of full text files, Fellows should send us those. Publisher policy for most major publishers and journals is available at SHERPA RoMEO (http://www.sherpa.ac.uk/romeo). This workaround may be applied to earlier publications also. In every case, the fulltext file should be correctly and clearly identified as 'publisher version' or 'author version' (and for author version, whether 'preprint' or 'postprint'; definitions at SHERPA RoMEO). Note that there may be publisher restrictions on hosting author versions also.

Do take a look, at http://repository.ias.ac.in, and let us know of additions and corrections. If you have suggestions, comments on Repository policy, or on the Repository itself, or have noticed inconsistencies, please send an email to the Repository team at eprints@ias.ernet.in.

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HINDI WORKSHOP

Two Hindi workshops were held in the last six months, one on 18 December 2012 and the other on 26 February 2013. These workshops were jointly organized by the Indian Academy of Sciences and the Raman Research Institute. The workshop sessions covered:

a) Official work in Hindi through computers: various methods to make routine correspondence easier through the computer were demonstrated by Shri A K Billure.

b) Official Noting and Drafting: some learning tips on noting and drafting were taught by Shri M G Savadatti.

Increased efforts were put on the implementation of the guidelines and targets fixed by the Official Language Implementation Committee and we are happy to report that the Academy has been able to meet most of these targets.

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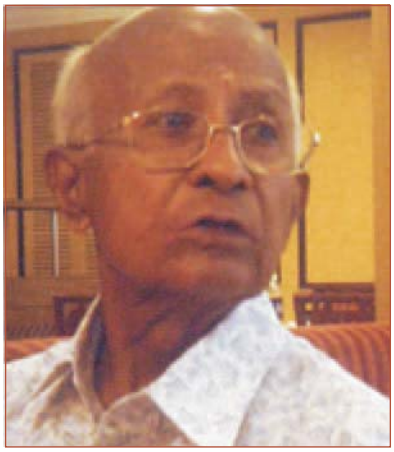
OBITUARIES



Bala Krishnan Nayar
(elected 1975)

After a distinguished and vibrant career, Bala Krishnan Nayar, one of the foremost pteridologists of the country passed away on 12 May 2012. Born on 19 September 1927 in the village Aymanam of Kottayam District, Kerala, he started his career as a lecturer in the University of Guwahati, Assam (1950 – 55). Between 1955 and 1970, he worked as a scientist at the National Botanical Research Institute (NBRI), Lucknow. He then became the first Professor of Botany in 1970 at the new University of Calicut when he was 43. He served as a faculty in the University until his formal retirement in 1987, but continued his research activities till the end.

It was during his field trips in Assam that Nayar developed a life-long attachment with ferns and fern allies. Shifting to Lucknow in 1955 as a research assistant, he served as a scientist in different capacities at NBRI, investigating diverse aspects of ferns such as anatomy, morphology, palynology and gametophyte development. A comparative study of the vascular organization in pteridophytes, clarifying the probable trends of evolution of stele in lower vascular plants was his special interest. An extensive study of the gametophytes of pteridophytes undertaken by him showed that the gametophyte morphology can be a significant tool in the study of phylogeny and classification of this group of plants.

The taxonomy and classification of ferns of tropical South India did not receive the attention they deserved till Nayar began studying the subject. Researches by him and his colleagues on the taxonomy of Indian ferns resulted in the discovery of several new species and new records for India. In appreciation of his efforts, a number of new species described such as *Pyrrosia nayariana* (Ching, P. and Chandra, S., *Am. Fern J.*) were named in his honour.

The only comprehensive work on the ferns of South India was by R. H. Beddome (1864), wherein he included 271 species recorded by him from South

India and Sri Lanka. As a supplement to Beddome's classic work of 1864, a book entitled *Companion to RH Beddome's Handbook to the Ferns of British India, Ceylon and Malay Peninsula* was published in 1974 by Nayar, updating the current situation of the fern flora of the region and their classification.

Nayar guided several research students in many universities in India. Over 150 research papers and books have been published by him on this subject. He was the founder of the pteridology laboratory at NBRI. In his honour, a collection of research papers on pteridology compiled in the form of a book entitled *Pteridology in the New Millennium* (edited by S. Chandra and M. Srivastava), was released on the eve of the Golden Jubilee Year of NBRI in October 2003.

Nayar was elected as a Fellow of the Indian Academy of Sciences, Bangalore (1975), the Linnaean Society of London and was a Distinguished Fellow of the Indian Fern Society (1992). He was honoured with the 2008 Lifetime Achievement Award.

Nayar leaves behind his wife Sharada Devi, two sons and a daughter.

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Laxmipuram Srinivasachar Srinath
(elected 1974)

Laxmipuram Srinivasachar Srinath, born on 15 March 1927, passed away in Bangalore on 13 September 2012. He was a celebrated teacher and an educationist par excellence.

Srinath started his career as a Fellow at the Confederation of British Industries in UK (1953–55), then moved to the Illinois Institute of Technology as Assistant Professor of Engineering Mechanics (1958–59). He returned to India to join the Aeronautical Development Establishment in Bangalore as Senior Scientific Officer (1959–60) before joining the Indian Institute of Technology (IIT) Kanpur, where he worked as a Professor between 1963 and 1971. In 1971, he joined the Indian Institute of Science (IISc), Bangalore as Senior Professor of Mechanical Science (1971–84) and continued after superannuation as Emeritus Professor until 1995. He was Director of IIT Madras from 1984 to 1989.

Srinath was elected Fellow of the Indian National Academy of Engineering, Indian Academy of Sciences, Society of Experimental Mechanics, Aeronautical Society of India and Fluid Power Society of India. He has made major fundamental research contributions in the areas of experimental mechanics photo-elasticity, photothermoelasticity, and stress wave propagation in solids and has over 160 publications to his credit.

He took keen interest in writing books in diverse areas and wrote 10 books in all ranging from linear programming, operations research and experimental stress analysis. His books *PERT and CPM–Principles and Applications* and *Advanced Mechanics of Solids* have become classics each running into 4 editions and more than 30 reprints!

Methods developed by Srinath in the areas of photoelasticity, holographic stress analysis and scattered light photoelasticity are standard reference books among practising engineers and have today formed the basis for many nondestructive analyses of stresses in solids. Several equations that are used are named after him. He was the first to demonstrate the potentialities of scattered light in the non-destructive analysis of stresses in solids. He was invited to deliver special lectures on his methods in photoelasticity, to practising engineers and professionals in India and abroad.

Srinath took keen interest in continuing education activities that span the domain of college teachers as well as serving professionals. Full credit should be given to him for his efforts to make the QIP schemes an effective instrument of change in transforming significantly the quality and standard of technical education in our country. He was the first to implement the scheme at IIT-Kanpur with the support of the then Ministry of Education.

Srinath was the first to set up a Centre for Continuing Education in India at IIT, Kanpur in 1969. One of

the major activities he initiated was curriculum development. A majority of curricula in technical institutions were of cut-and-paste type, comprising mostly outdated material. His three-pronged attack, namely (a) modernize the curricula reflecting newer developments; (b) train teachers to upgrade their subject competence through short-term summer programmes and (c) encourage Indian authors to write suitable textbooks in the newer areas, helped in raising the quality and standards of our teachers, and we also have a large number of good quality text/reference books written by Indian authors. The above activities of the Curriculum Development Centre at IIT Kanpur became a model for other institutions, and today a majority of activities of QIP Centres in IITs and NITs are in the above three areas.

At IISc, in addition to starting the Centre for Continuing Education, Srinath initiated the highly successful and reputed PROFISCIENCE programme in collaboration with 12 professional societies for working professionals in industries and R&D establishments. The evening courses which are offered under this programme are of the same standard and level as those given to regular students at IISc at the postgraduate level.

Since there was no forum available for teachers of technical institutions to mutually exchange and express their views on teaching methods, curricular contents, laboratory developments, etc., Srinath founded the *Indian Journal of Technical Education* in 1971 and was its editor for 13 long years. This was a much needed avenue and a channel of communication among the teaching community. Even today, this is the only journal in India dealing with technical education and is run by the Indian Society for Technical Education as an international journal under the Indo-Canadian programme.

Though design is the essence of engineering, the curricula of all our technical institutions were mostly analysis oriented without much design content. As a Jawaharlal Nehru Fellow, Srinath organized a series of seminars, workshops and national conferences in collaboration with COSTED to promote and inculcate design culture among the student and teaching community. Today, as a result of these efforts, a course on engineering design has become a common subject of study for all disciplines of engineering. To promote the teaching of design-oriented courses, Srinath authored several relevant books such as *PERT and CPM, Reliability Engineering, Mechanical Reliability, Design Essentials of Engineering Systems*, etc. These textbooks have greatly assisted the teachers to gain confidence in teaching design oriented courses. Srinath was the editor of *Engineering Design*, Journal of the Institution of Engineers from 1973 to 1977.

Srinath will be fondly remembered by his students for his clarity in presentation, and impeccable board work. He was considered a model teacher and one of the best in the profession. His teaching methods have also been unique. Many of his students today occupy important academic and administrative positions.

Srinath is survived by his wife, a son and a daughter.

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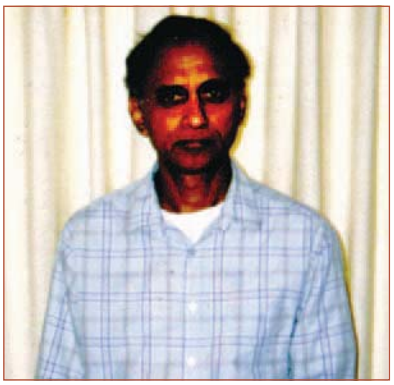

Edayathumangalam Venkatarama Krishnamurthy
(elected in 1972)

Edayathumangalam Venkatarama Krishnamurthy was born on 18 June 1934 in Ariyalur, Tamil Nadu. He obtained his B.Sc and M.Sc degrees from the University of Madras. He started his Ph.D under G. N. Ramachandran (then at the University of Madras) as a part-time doctoral student while he was working as an instrumentation technologist. As part of the thesis completed in 1959, he built an analogue computer for solving linear simultaneous equations and eigen value problems. The machine was named 'Lilavati' and was capable of solving 6 × 6 matrix equations. The work not only contributed to solving iterative matrix analysis problems, but also contributed towards novel circuit design using optimal (minimal) electronic components.

In 1960, Krishnamurthy took the position of Reader in Indian Statistical Institute (ISI), Kolkata and started working with the group that was designing and

developing a third-generation digital computer ISIJU (one of the two early efforts on building digital computers after ENIAC/EDVAC in India). One of his principal contributions was in the development of fast division algorithms that finds references in the monumental works of Donald E. Knuth (*The Art of Programming, Vol. I–II*). On lien from ISI, he worked for two years at the Institute of Computer Research, University of Chicago with N. Metropolis and contributed to the fast arithmetic unit design for Maniac III.

From computer arithmetic, Krishnamurthy moved on to numerical and statistical computational techniques at ISI and developed a curriculum for computer science. During 1969, he worked at the Weizmann Institute of Science, Rehovot, Israel, where he worked again on the design of the fourth-generation Computer Golem B. During 1970, he worked at the Department of Computer Science at Technion, Israel, during which period he contributed significantly towards the development of hardware – software algorithms and microprograming.

Krishnamurthy then moved to the Department of Applied Mathematics at the Indian Institute of Science (IISc), Bangalore in 1970. He worked on diverse areas such as numerical analysis, image processing, image reconstruction, chemical information system design, etc. Using finite field and *p*-adic arithmetic, he contributed to the development of error-free arithmetic using number theoretic transformations. Several papers as well as two books have been published on these topics. *Methods and Applications of Error-Free Computations* jointly with R. T. Gregory and *Error-Free Polynomial Matrix Computations* (both from Springer-Verlag) are widely referred books in numerical analysis. He was invited to work at ASTRA, Bangalore on sabbatical from IISc, where he contributed towards the design of chemical information system design.

In all his studies, one can see novelty, originality and depth with a common hallmark of algorithmic aspects of computing. His *Introduction to Theoretical Computer Science* was one of the earliest books that has been widely used in colleges and universities for teaching Computer Science. During his stay at IISc between 1970 and 1984, he guided 12 Ph.D and 18 MS students and served in various capacities like Chairman of the Department of Applied Mathematics, Dean of Faculty of Science, etc.

Krishnamurthy has contributed immensely to research and education worldwide. Under UNESCO programme, he was instrumental in setting up the Computer Science Department at the University of Lagos, Nigeria. From IISc, he moved to University of Waikato, New Zealand where he worked as Head of the Computer Science Department between 1984 and 1991. During this period, he wrote a book, *Parallel Processing: Principles and Practice* (Addison Wesley) and another on *Transaction Processing Systems* jointly with V. K. Murthy (Prentice-Hall). After his sojourn in New Zealand, he worked at the Australian National University, Canberra, Australia as a Professorial Fellow from 1991 to 1999 and thereafter as an Emeritus Fellow.

Krishnamurthy had won several awards and recognitions. He was elected a Fellow of the Indian Academy of Sciences in 1972 and was the recipient of the Shanti Swarup Bhatnagar Award in Mathematics in 1978.

Krishnamurthy was one of the most enthusiastic and passionate researchers who excited people on the algorithm aspects of computing in India. In his passing away the country has lost a doyen who was an acknowledged expert in computer science and who contributed immensely to areas such as computer arithmetic/organization, numerical analysis, image processing, chemical information system design and parallel computing.

He passed away in Canberra on 26 October 2012 and is survived by two sons.

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Shreeram Shankar Abhyankar
(elected 1988)

Shreeram Shankar Abhyankar passed away peacefully in his sleep at his home in USA on 2 November 2012. Just before he went to sleep that day, he was doing what had always given him the greatest happiness: mathematics.

Abhyankar was born in Ujjain on 22 July 1930. His father, Shankar Keshav Abhyankar, was a teacher of mathematics in Ujjain and Gwalior. Inspired by his father, Abhyankar developed a love for mathematics very early in his life. By the time he obtained his B.Sc at the Institute of Science (Mumbai) in 1951, his knowledge of mathematics, acquired on his own, was way ahead of what would normally be required for an M.Sc degree. He obtained his formal Master's degree in 1952 and a Ph.D in 1954, both at Harvard, working with the great mathematician Oscar Zariski. After brief stints at Columbia, Cornell and John Hopkins, Abhyankar joined Purdue University in 1963 to become the first Marshall Distinguished Professor of Mathematics there in 1967. This remained his regular position till the end, but he spent a fair amount of time as a visiting professor in eminent institutes all over the world, a major part of it in India.

His professional visits to India for brief periods, usually a month or two, were quite regular. But, apart from these short visits, he also spent long years in India in the decade starting 1976. This was when he set up Bhaskaracharya Prathishthana, a Research Institute for Mathematics in Pune and served as Head of the Department of Mathematics at the University of Pune.

Among the several international awards won by Abhyankar were the Alfred Sloan Research Fellowship, Herbert Newby McCoy Award, Lester Ford Prize, Chauvenet Prize and Vidnyan Sanstha Ratna. He was elected Fellow of the Indian Academy of Sciences in 1988 and of the Indian National Science Academy in 1987. Abhyankar wrote about 200 research papers and authored several books. He guided 28 students, including 11 from India, for Ph.D.

Abhyankar worked in several areas of mathematics, principal among them being algebraic geometry. The modern language of algebraic geometry has acquired a certain abstraction and most of the literature on the subject appears in this language. However, he preferred to use a classical and more concrete version in his work. His treatment was therefore more amenable to the derivation of constructive and algorithmic methods which engineers and computer scientists require and desire. As a result, he acquired a large following among this class of professionals and ended up writing a book *Algebraic Geometry for Scientists and Engineers*, which became phenomenally popular. These developments also led to his appointment as a Professor in the Department of Engineering as well as in the Department of Computer Science at Purdue, in addition to his position in the Department of Mathematics.

Some specific areas encompassed in his vast research work are resolution of singularities, tame coverings and algebraic fundamental groups, affine geometry, enumerative combinatorics of Young tableaux and Galois groups of equations. We discuss two of these areas, namely resolution of singularities and affine geometry in some detail.

In the 1940s, Zariski had obtained a rigorous proof of resolution of singularities of surfaces and three-folds in characteristic zero. The case of positive characteristic for surfaces was done by Abhyankar in his Ph.D thesis. An extension of the result to three-folds required, as a first step, the resolution of singularities of an embedded surface. This he studied over several years, developing in the process highly intricate and powerful algorithms in positive characteristic. Apart from positive characteristic, he also solved the equally difficult problem for the arithmetic case, i.e. for surfaces over the ring of integers. For a long time the only significant contributions in positive characteristic or in the arithmetic case were those due to Abhyankar.

In affine geometry, the themes of Abhyankar's work were embeddings and automorphisms. Two well-known terms here are the epimorphism theorem and the Jacobian conjecture. In fact, Abhyankar's focus was on the Jacobian conjecture and epimorphism theorem was just an outcome of his first attempt at solving the Jacobian conjecture. This was in the early 1970s. Soon after, he moved to other areas but then returned to the Jacobian conjecture in about 2002. Then this remained the area of his work in the last decade of his life. Abhyankar was very fond of 'algebraicising' results from other areas, notably analysis and topology, if he thought they were relevant to his current interest. He often succeeded in doing so and this was also one of his strengths. It is in this spirit that he developed the algebraic theory of diacritical divisors in the last few years, keeping in view their possible application to a solution of the Jacobian conjecture.

There was a notable contrast between the style of Abhyankar in writing mathematics and his style in speaking it. He wanted his writings to be perfect, logically and notationally, to the extent that perhaps even a computer could read it. This ensured elimination

of any errors but also made the reader's task quite hard. However, a few of his writings were exceptions to this rule, notably the book for scientists and engineers mentioned above.

On the other hand, listening to his lecture on mathematics was not only a relaxing experience and a pleasure, but the listener often came away with some rare insights into the subject which would almost never come from reading a book.

Two other passions of Abhyankar were Marathi and Sanskrit languages and Indian mythology. His long stay in India in the 1970s was partly influenced by his desire to have his children learn Marathi language and culture in a genuinely *desi* environment. His knowledge of Indian mythology was immense and it was not hard to detect his passion for it even during his conversations in mathematics. During a talk by him at Purdue on 'Relationships in *Mahabharata*' the audience was awestruck by his unmistakable and firm grasp on the intricate web of interrelationships among numerous characters in the epic.

Abhyankar is survived by his wife, son, daughter and four grandchildren. His absence will be deeply felt in the world of mathematics.

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Sri Niwas
(elected in 1995)

An abrupt end to the illustrious career of Sri Niwas, as teacher and researcher, came on 15 November 2012. He was born on 4 July 1946 in the village of Rakahat in Gorakhpur (Uttar Pradesh) to Smt Indrasana and Sri Ram Adhar Pandey.

Sri Niwas was closely associated with the Banaras Hindu University (BHU), having earned all his post-secondary degrees (B.Sc Hons. 1966, M.Sc Geophysics 1968 and Ph.D 1974) from the University. His Ph.D thesis was entitled 'Theoretical treatment of some problems on electrical behaviour of layered earth system'. After earning his doctorate from BHU, Sri Niwas joined the Indian Institute of Technology Roorkee (then, University of Roorkee) as a post-doctoral fellow in 1974. He worked at the institute in various capacities: a Pool Officer (1976–1977), Lecturer (1977–1979), Reader (1980–1991) and as Professor (1991–2011). He is credited with founding the Department of Geophysics at the University of Kurukshetra in 1989. Though he superannuated from IIT Roorkee in 2011, he continued his association with the institute as a Professor-Emeritus until his demise. He served as a Visiting Professor at the Federal University, Bahia, Brazil during 2000–01. He was an excellent teacher and always championed the cause of students which reflected in his continued and longlasting relationship with them.

Sri Niwas, along with Vinod K. Gaur (who was then at IIT Roorkee) and several other faculty members, designed a course curriculum in geophysics with an ideal blend of both theory and practice. This served as a model for a long time and motivated other geophysics departments in the country to modernize their course structures. Apart from his contribution to the growth of geophysics education in the country, Sri Niwas also profoundly impacted research in geophysical exploration that included inversion of geophysical data, geo-electromagnetism and geo-hydrology (exploration, development and management of groundwater). He was a strong advocate of hypothesis-driven research and argued for examining a physics-based relationship between input and observation.

Sri Niwas authored more than 100 research papers, in addition to editing and contributing chapters to several academic books. He mentored 12 Ph.D and 110 M.Tech students. For his pioneering research work, he was awarded the prestigious S. S. Bhatnagar Prize in 1991. He was elected to the fellowship of the Indian National Science Academy (Delhi), the Indian Academy of Sciences (Bangalore), the National Academy of Sciences, India (Allahabad), the Indian Geophysical Union (Hyderabad) and the Association of Exploration Geophysicists (Hyderabad). Sri Niwas served on several scientific committees of DST and CSIR.

Sri Niwas was a very valuable colleague and a very helpful, understanding and wise advisor to his students. He will be missed by several people, who mourn his sudden demise. He is survived by his wife (Shashi Kala) and two children, one of whom recently obtained a Ph.D in seismology from GFZ, Potsdam (Germany).

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Devendra Lal
(elected 1965)

'*For a physicist, the best chemist there is*', thus did, J. R. Arnold introduce the quintessential Lal to the Fellowship of the US National Academy of Sciences, on his election to that body, adding, how his deep insights into the interactions between high energy particles and the tenuous footprints etched in their passage through naturally occurring chemical systems led to a trail blazing approach to study planet Earth's evolutionary dynamic as well as that of early solar system processes. Devendra Lal's insatiable curiosity, imaginative mind and indefatigable zeal which health issues could never defeat, resulted in a rich repertoire of enduring science chronicled in over 200 scientific publications that he continued to contribute to human knowledge right up to his highly private extinction on the first day of the closing month of 2012, 10 weeks short of his 84th birthday.

Lal was the fifth child born to middle class parents in the ancient city of Varanasi. Here, he received all his education, cleaving his way through the various constraints of means and circumstance to a University degree in physics by dint of an urgent curiosity and the torch of an inventive mind. His inherent strength of overcoming an apparent limitation by an imaginative solution, manifest in his boyhood strategies to earn some pocket money by making and selling ordinary objects of everyday use such as fountain pen ink and toiletries, would appear again and again in various contexts of his later scientific career. An iconic example is his use of iron hydroxide impregnated sponges and fibres for *in-situ* concentration of key trace elements and isotopes from tonnes of sea water, to track the large scale circulation in the oceans. Lal's keen sensibility to scientific possibilities in solving societal problems such as availability of clean water, often urged the trial of such promising approaches to concentrate out unwanted contaminants such as arsenic from our water sources, by designing appropriate materials.

Lal, an amateur researcher since childhood, plunged into a serious study of the composition and energy spectrum of primary cosmic rays at balloon altitudes, using specially designed nuclear emulsion stacks, under the guidance of Homi Bhabha, at the Tata Institute of Fundamental Research which he joined in 1949. Here he and his colleagues also began studying the characteristics of nuclear interactions of high energy cosmic rays and were soon joined by Bernard Peters, the co-discoverer of the heavy nuclei component in primary cosmic rays. They followed the recent discovery of *K*-mesons, the rare insignia of the strange particle physics, by the Bristol Emulsion group under Powell, by studying their production characteristics. This resulted in the widely acclaimed discovery by the TIFR trio, Lal, Pal and Peters, of the associated production of *K*-mesons with the capture of negative *K*-mesons.

After 1959 when Lal spent a few months at the Scripps Institute in San Diego as a visiting researcher, he became a regular visitor and later a professor at Scripps, dividing his time between India and the US. Thus he continued even when persuaded to move to Ahmedabad as Director of the Physical Research Laboratory (PRL), uncompromisingly preserving a substantial research space in the midst of his administrative chores, whilst simultaneously seeding new dimensions to the science-scape of PRL.

Lal's enduring contributions to scientific knowledge have been widely recognized by world academies whose fellowship he adorned with rare distinction.

Many honours and awards too were showered on him, which he wore with characteristic humility and disinterestedness. A long time collaborator, P. B. Price, recounts how an undying curiosity and an adventure of ideas constantly possessed Lal. A letter that he received many years ago, whilst Lal was still in the throes of a delirious fever, expresses it eloquently, 'I have been thinking of all sorts of experiments and many in fact were a great success in my dreams. So, I thought I should write to you about several of these….'

No written account of Lal's work can capture the full range of his impassioned life and none would adequately describe the essence of its romance without the picture of his soulful companion and wife Aruna Lal who became an indistinguishable component of the colourful fabric of their life and work. Aruna's passing away in 1993 made Lal increasingly more remote even as he bore her absence stoically and plunged deeper in his work, which continued undiminished except for brief periods in and out of nursing homes. The Aruna Lal foundation that he established in her memory at PRL, Ahmedabad to support bright young students through college and to distinguish creative young minds engaged in researches of Earth and space environments, as well as endowments at TIFR and the University of California to support bright young scientists, expose another of Lal's understated passions for catalysing creativity and excellence. Many of his former students recall his persistent questioning about the novelty and originality of their work, constantly urging them by his own example to strain their scientific work towards the rigorous and the imaginative. They warmly recount how his expansive mind expressed itself in opening new vistas at every turn, explorations whose outcomes have shaped the lives of his students and colleagues, many of them carrying the torch forward to make notable scientific contributions themselves.

Devendra Lal finally departed this life in splendid isolation – his characteristic ethic winning to the end, leaving behind a host of friends and admirers whom the memory of a charismatic scientist, at once warm and remote, will forever haunt.

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Javaregowda Nagaraju
(elected 2003)

J. Nagaraju, staff scientist and chief of the Molecular Genetics Laboratory at the Centre for DNA Fingerprinting and Diagnostics (CDFD), Hyderabad, passed away on 31 December 2012. Death came rather unexpectedly and untimely while he was recuperating from a brief surgical procedure.

Born on 6 November 1954 in a small village (Agrahara bachahalli) in Mandya District near Mysore in Karnataka, Nagaraju had most of his education in and around Mysore. His Master's and Doctorate degrees were in zoology with genetics from Mysore University. He also underwent a three-year research training programme at the Centre for Genetics and Molecular Biology at the University of Lyon in France.

Nagaraju started his career in research at the Central Sericulture Research and Training Institute (CSB), Mysore. Later, he was instrumental in setting up the Seribiotech Research Laboratory under CSB in Bangalore, where he initiated several research projects on silkworm molecular genetics while serving as the Deputy Director. Subsequently he moved to CDFD to establish a vibrant research group working on the molecular genetics and genomics of silkworm. His intense efforts led to the establishment of a Centre of Excellence on Genomics and Genetics of Silkworms at CDFD.

Nagaraju embarked upon the analysis and mapping of differences in DNA between two geographically differentiated populations of tropical and temperate silkworm strains, which differ significantly in quantitative, qualitative, biochemical and physiological traits.

A number of DNA marker technologies such as single-locus and multi-locus RFLPs, RAPDs and SSR were extensively exploited for strain-specific DNA profiling and construction of molecular maps for use in marker-assisted selection in silkworm breeding. He extended these studies later to other insects such as wild silk moths and agricultural pest insects.

Nagaraju also developed and improved upon anchored-SSR PCR to generate robust markers to map the silkworm genome. He then extrapolated this technique to distinguish closely related but disputed chilli varieties, and in the detection of adulteration in Basmati rice. He has successfully developed SilkSat DB, a silkworm microsatellite database and InSat DB, an interactive interface applicable to all insect genomes. In 2007, Nagaraju received the Tata Innovation Fellowship of the Government of India in recognition of his scientific contributions and development of commercial technology.

Nagaraju's group, in collaboration with French and Japanese researchers, developed methods to deliver exogenous DNA into silkworm eggs. The generation of virus-resistant transgenic silkworms using transposable elements coupled with RNA interference approach was a successful outcome of these efforts. Baculovirus infection is a major cause of crop loss in sericulture and Nagaraju could transgress the desirable trait of virus resistance into commercial races of silkworm to combine with high silk productivity. Earlier his research team also worked on the defence mechanisms operative in silkworms to resist bacterial infections.

Nagaraju was a dynamic individual and established an extensive collaborative scientific network with many leading scientists from Japan, France, USA and elsewhere. He was a fellow of all the three national academies of science in India. He was also a Fellow of the Genetic Society of America and the Japanese Society of Sericultural Science. He was honoured with the Biotech Product and Process Development and Commercialization Award of the Department of Biotechnology, New Delhi and the Best Scientist Award of the Federation of Andhra Pradesh Chambers of Commerce.

Nagaraju is survived by his wife, daughter and son as well as a large group of researchers whom he had been mentoring. He had successfully inculcated leadership skills among his lab members. His research colleagues and peers remember him fondly. His sudden and untimely demise has left a big vacuum in the scientific community of India.

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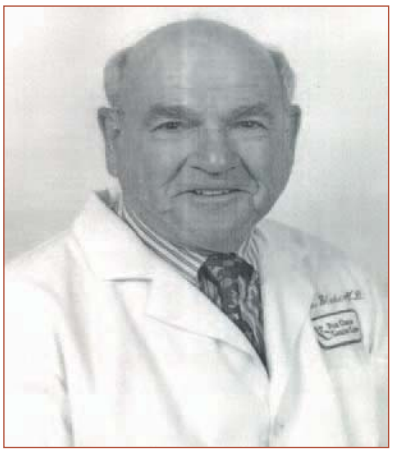

Baruch Samuel Blumberg
(elected 1987)

Baruch Samuel Blumberg, American physician and medical researcher born on 28 July 1925 in New York, passed away on 5 April 2011. Blumberg received the Nobel Prize in Medicine in 1976 for discovery of the hepatitis B virus (HBV) and for studies of variation in host response to the virus.

He attended Union College in Schenectady, New York where he received a Bachelor of Science degree in Physics in 1946. After a year of graduate training in mathematics at Columbia University, Blumberg entered Columbia University's College of Physicians and Surgeons and received a Medical Degree in 1951. Blumberg then became an intern and assistant resident at Bellevue Hospital in Manhattan. He worked for two years in the Arthritis Division at Columbia-Presbyterian Medical Center, where he researched the chemistry of hyaluronic acid, a major component of connective tissue, which holds together and supports structures in the body. From 1955 to 1957, Blumberg continued his study of hyaluronic acid, as a graduate student in biochemistry at Balliol College, Oxford. While there, he also began investigating human protein variation.

After receiving a Ph.D. in biochemistry from Oxford, Blumberg moved to the United States National Institutes of Health (NIH) in Bethesda, Maryland. There, as chief of the Section on Geographic Medicine and Genetics,

he studied protein polymorphisms in human populations from all over the world.

Blumberg shared the 1976 Nobel Prize for Physiology or Medicine with D. Carleton Gajdusek "for their discoveries concerning new mechanisms for the origin and dissemination of infectious diseases." In addition to his research on hepatitis carriers, Blumberg has gathered evidence that hepatitis B infection may lead to liver cancer. Blumberg's work drew on many disciplines, and he typified an era of biomedical science in which the fields of immunology, virology, genetics, biochemistry, and molecular biology overlapped to provide answers to research problems.

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Har Gobind Khorana
(elected 1976)

Har Gobind Khorana, who died on 9 November 2011 was born on 9 January 1922 into a Hindu family in the village of Raipur in Punjab, the youngest of five siblings. His father was the village's agricultural taxation official. In Khorana's own words: "Although poor, my father was dedicated to educating his children and we were practically the only literate family in the village inhabited by about 100 people." He attended the D. A. V. High School in Multan, then studied at the University of the Punjab in Lahore.

He received his bachelor's degree in 1943 and his master's degree in 1945; the same year he was awarded a Government of India fellowship which enabled him to go to England to undertake research for a PhD at the University of Liverpool. Between 1948 and 1949 he spent a postdoctoral year at the Eidgenössiche Technische Hochschule in Zurich. He returned to India briefly in 1949 and then came back to England, where he was awarded a fellowship to work at the University of Cambridge from 1950 until 1952. At Cambridge his great interest in proteins and nucleic acids flourished. In 1952 he accepted a post in Vancouver, British Columbia, working with a group conducting research on nucleic acids.

In 1960 he moved to the Institute for Enzyme Research at the University of Wisconsin-Madison, where he served as its co-director and conducted the research that led to his Nobel Prize. He became a naturalized US citizen in 1966. Four years later he was appointed Alfred Sloan Professor Biology and Chemistry at the Massachusetts Institute of Technology, where he worked until he retired in 2007.

Khorana received a number of honours and awards, among them the prestigious Lasker Award for basic medical research in 1968 and the US National Medal of Science in 1987 for "innovative contributions that significantly contributed to our understanding of gene structure, membrane function and vision".

A modest man who shunned publicity, Har Gobind Khorana was a world-class molecular biologist and biochemist best known for research that helped to demonstrate how the nucleotides in nucleic acids, which carry the genetic code of the cell, control the synthesis of proteins by the cell. For this work he shared the 1968 Nobel Prize in Physiology of Medicine with Marshall W. Nirenberg and Robert W. Holley; the three scientists worked independently. They won the prize "for their interpretation of the genetic code and its function in protein synthesis."

In another ground-breaking technical achievement, Khorana constructed the first completely artificial gene, an artificial copy of a yeast gene, using laboratory chemicals. He observed that an artificial gene could function in the cell of a bacterium. The synthesis of DNA led to key advances in genetic engineering and to the foundation of the biotechnology industry.

His later research investigated the cellular mechanisms involved in some aspects of vision in vertebrates. He was mainly interested in the structure and function of rhodopsin, a light-sensitive protein found in the retina of the vertebrate eye. He also investigated

the mutations in rhodopsin that are associated with retinitis pigmentosa, the cause of night blindness.

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Kadavil Poulose Abraham
(elected 1975)

Kadavil Poulose Abraham was born on 28 August 1920 in Trichur, Kerala. He passed away on 23 December 2011. He completed his MSc. in Chemistry in 1944 from the Lucknow University. He started his service as a Lecturer in the Maharaja's College, Ernakulam in 1945 and later on worked as a Lecturer in Jaffna College, Sri Lanka from 1947 to 1956. He then moved to the Imperial College, London in 1956. He received his PhD. in Extractive Metallurgy from the London University (Imperial College) in 1959. In 1969 he returned to India and started working in the Department of Metallurgy, Indian Institute of Science, Bangalore. He was also a visiting scientist in the Royal College of Technology, Stockholm, Sweden and University of Toronto, Canada.

His field of specialization was Extractive Metallurgy and his research interests were in thermodynamics of high temperature systems, kinetic aspects of high temperature metallurgical processes and electroslag refining of steels and nonferrous metals. Abraham was Principal Investigator of a research project on electroslag refining of aerospace alloys sanctioned and funded by the Aeronautical Research and Development Board. He was also an Investigator in the National Thermophysical Property Measurement Project in the Department of Metallurgy.

Abraham authored a chapter titled "Thermodynamic Properties of Oxide Systems" in the book entitled "Solid Electrolytes and their Applications" edited by Professor E. C. Subbarao and published by Plenum Press.

He was elected a Fellow of Indian Academy of Sciences in 1975. He was a member of the Indian Institute of Metals and the Metallurgical Society and also a Fellow of the Electrochemical Society of India. He has made important contributions to our knowledge of high temperature thermodynamic properties of metal oxide systems, and the kinetics of gas solid reactions of metallurgical interest. He has also contributed in the area of upgradation of low grade chromite and manganese ores of Karnataka.

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