

Newsletter of the Indian Academy of Sciences

TWENTY-SIXTH MID-YEAR MEETING

3–4 JULY 2015

The 26th Mid-Year Meeting of the Indian Academy of Sciences was held from 3rd to 4th July 2015 at the Indian Institute of Science, Bengaluru. The meeting began with a special lecture on ‘Strategies to counter resurgent tuberculosis’ by **V. Nagaraja** (IISc, Bengaluru). Tuberculosis (TB) is an epidemic disease that ravaged Europe and North America during the 18th and 19th centuries. Historical evidence of this disease can be found in Egyptian mummies and fossils. Nagaraja spoke of the menace of tuberculosis, which is a major global health problem – more than one-third of the world’s population is infected with *Mycobacterium tuberculosis*, and new



infections occur in about 1% of the population ever year. There are about 20 million chronic cases of active TB globally and 2 million associated deaths. It is the most formidable pathogen mankind has faced. *Mycobacterium tuberculosis* (Mtb) can stay dormant inside a healthy

Inside...

1. Twenty-Sixth Mid-Year Meeting	1
2. Eighty-First Annual Meeting	7
3. Associates	8
4. Special Issues of Journals	9
5. Discussion Meeting.....	11
6. Summer Research Fellowship Programme	13
7. Refresher Courses	15
8. Lecture Workshops	16
9. Repository of Scientific Publications of Academy Fellows	18
10. Workshop on “Emerging Trends in Journal Publishing”	18
11. Hindi Workshops	19
12. Obituaries	19
13. Science Minister's Visit to the Academy	27
14. Superannuated Academy Staff	28

EDITOR

R. Ramaswamy

Published by

Indian Academy of Sciences
Bengaluru 560 080, India
Phone: (080) 2266 1200, 2361 3922
email: office@ias.ernet.in

This Newsletter is available on the
Academy website at: www.ias.ac.in/patrika/

*To receive a regular copy of the
Newsletter, please write to the
Executive Secretary of the Academy
(execsec@ias.ernet.in)*

Forthcoming Events

Eighty-first Annual Meeting, Pune

6 – 7 November 2015

Refresher Courses

- Water
Field Marshal K M Cariappa College, Madikeri 16 – 29 November 2015
- Developmental biology
Sophia College, Mumbai 16 – 30 November 2015
- Refresher course in recent advances in chemistry
B.I.T., Mesra (Deoghar Campus), Deoghar 14 – 26 December 2015
- Physics training and talent search
Kuvempu University, Shankarghatta 17 – 30 December 2015
- Applications of quantum mechanics:
atoms, molecules and radiation
University of Mumbai, Mumbai 21 December 2015 – 4 January 2016

Lecture Workshops

- Recent advances in electrochemistry
NMKRV College for Women, Bangalore 28 – 29 October 2015
- Functional materials and their applications in devices
Sri Sathya Sai Institute of Higher Learning, Puttaparthi 26 – 28 November 2015
- Special functions and their applications
PSGR Krishnammal College for Women, Coimbatore 22 – 23 December 2015
- Modern chemistry and its applications
Guru Nanak Dev University, Amritsar 3 – 5 January 2016
- *Time and again: Challenging science*
Sophia College, Mumbai 8 – 9 January 2016
- Recent developments in chemistry
Madurai Kamaraj University, Madurai 8 – 9 January 2016
- Scope of medical biotechnology
Dr Hari Singh Gaur Central University, Sagar 21 – 22 January 2016
- Biotechnology – Present and future
Vijaya College, Bengaluru 29 – 30 January 2016

individual and become dormant and phenotypically drug resistant when it encounters multiple stresses within the host. Multiple, extensive and total-drug-resistant TBs have emerged. Various strategies used the world over to combat the emergence of resistant strains were discussed. The supercoiling and compaction of DNA within the cell and the catalytic activity of topoisomerases enzymes, which are responsible for gene duplication or gene expression, are attractive targets for lead molecule development. The molecular machines in mycobacteria and nucleoid-associated proteins (NAPs) of mycobacteria were the central theme. Genetic, molecular, cell biology and structural probing are essential to study the proteins in mycobacteria which can reveal hidden secrets of the pathogen's success. He argued that greater understanding of this could facilitate better intervention strategies.

Recently elected Fellows and Associates of the Academy presented their scientific research:

Tapas Chakraborty (IACS, Kolkata) in his talk titled 'Light-induced coupled proton-electron transfers in model chemical systems' spoke about the chemical reactions with coupled proton-electron transfers (PCET) which are essential for respiration, photosynthesis and even artificial solar energy devices, wherein acid-base and redox reactions take place with effective transfer of hydrogen atoms. A significant example in which PCET mechanism is highly relevant is the oxidation of a phenolic moiety to phenoxy radicals (PhO^*). The light-induced PCET processes of different dimeric molecular complexes involving phenol and analogous systems studied by his group was discussed, as well as the measurements performed under different physical conditions, and probed by means of electronic spectroscopy.

Avinash Khare (University of Delhi, Delhi) spoke on 'Gravitational equilibrium and the mass limit for dust clouds'. In dust clouds, the self-gravity of the dust is balanced by the force from shielded electric fields on the charged dust. If the total mass of the dust is less than the mass limit, equilibrium can be achieved. Khare derived an equation of state for such a cloud and compared the physics of this mass limit to Chandrasekhar's mass-limit for compact objects (neutron stars, white dwarfs). The answer to these questions will impact the role of dust in planet and star formation. Further studies should take into account the effect of magnetic fields collisions coupling between the plasma background and dust.

V. Mohan (Dr Mohan's Diabetes Specialities Centre, Chennai) spoke on 'The time has come to marry genomics with clinical diabetes'. The most significant clinical applications of genetics in the diagnosis of neonatal diabetes with single gene defect, occurring in the first 6 months of life, was presented. Type 2 diabetes is a polygenic disorder, whereas diabetes such as maturity onset diabetes of youth (MODY) and neonatal diabetes have single gene defects. He spoke of the different types of MODY, which are inherited and diagnosed before the age of 25, having predominantly beta cells dysfunction defects and with different gene mutations. An accurate genetic diagnosis of monogenic forms of diabetes helps to tailor the antidiabetic treatment and define the prognosis for the family. Genomics of monogenic forms of diabetes are easier to study and have direct clinical application as sulphonylurea treatment can be considered, he added. He mentioned that his group had discovered a new MODY gene and that novel mutations in neonatal diabetes have also been identified in India. He also mentioned that genetics of polygenic forms of diabetes did not have any clinical approach.

U. Kodandaramaiah (IISER, Thiruvananthapuram) spoke on 'Reading DNA to infer ancient flight'. He touched upon the importance of dispersal and vicariance in allopatric speciation, which is the process by which new species evolve from ancestral species in geographic isolation. He pointed out that historical biogeographers invoked dispersal to explain distributions, whereas the advent of phylogenetic systems and the acceptance of the plate tectonic theory made vicariance gain importance. However, with examples of the butterfly family Nymphalidae, he argued, on the basis of molecular phylogenetic data, that dispersal is fundamental to diversification and is more important than vicariance in many groups, as the data shows that speciation occurred after the continents had split.

Giridhar Madras (IISc, Bengaluru) spoke on 'Ionic catalysis for syngas production'. Syngas, a mixture of H_2 , CO and CO_2 in various proportions, is a prime petrochemical feedstock traditionally produced by reforming natural gas. The development of new catalysts for syngas production, unresolved problems in this area and water gas shift reactions were highlighted. Whether the noble metal ions and/or base metal ions substituted could serve as better active sites than the corresponding metal atoms (zero valent) was the novel idea of Madras' group.

Pulak Sengupta (Jadavpur University, Kolkata) gave a talk on 'Long-term climatic cycle – A petrologist's perspective'. The emission of anthropogenic CO₂ due to industrialization has led to global warming, a cause for serious concern. It is also important to understand the contribution of non-anthropogenic CO₂ and the variation in the earth's climate over the past several hundred million years, Sengupta stressed. He stated that the long-term climatic cycle was controlled by metamorphic de-carbonation-carbonation reactions that occur in deep-seated geological reservoirs. This requires comprehensive understanding of the chemical reactions in carbonate-silicated systems and the role of clinopyroxene on carbonation and decarbonation reactions. The reaction topology proposed by Sengupta and Raith shows how the metamorphosis of silicate-carbonate rocks can act as a source or sink of CO₂ at the convergent boundaries and hence control the climatic cycle over geological times.

Ravi A. Rao (TIFR, Mumbai) spoke on 'The theory of Suslin matrices'. Suslin's construction of the matrices and their properties were described. Some open questions and applications regarding these matrices were also discussed.

U. Mabalirajan (IGIB, Delhi) spoke on 'Airway epithelia: An overlooked borderline security force of the lung'. The airway is a lengthy air pipe that consists of larger and smaller bronchi. The airway epithelia of these bronchi in the form of continuous layers from the nose to the alveolus act as a borderline security force against air pollutants, bacteria, viruses, etc., through various physical, chemical and biological processes. Mabalirajan stated that sneezing and coughing are the primary barrier mechanisms to protect the lungs. He elaborated that the additional housekeeping phenomena of mitochondria (the power house of cells), autophagy and DNA repair determine the immune status of the lung. Airway epithelia have determining roles and therefore epithelial protecting agents are essential for lung diseases treatment.

Gautam Mandal (TIFR, Mumbai) spoke on 'Thermalisation in integrable models and conformal field theories'. Thermalisation could occur in integrable models, especially in 1+1 dimensions. Analytical and numerical evidences were provided to show that some universal results can be proved in integrable conformal models concerning thermalisation. The

results can be interpreted in terms of gravitational collapse to a certain class of black holes where they have infinite number of conserved charges.

Chandan Srivastava (IISc, Bengaluru) delivered a talk on 'Graphene oxide-Fe₃O₄ nanoparticle composite with high proton relaxivity value'. The investigation on the graphene oxide-Fe₃O₄ nanoparticle (GO-Fe₃O₄) composite as an image-contrast-enhancing material in the field of magnetic resonance imaging was presented. This technique is helpful in detecting cancer cells in the human body and to kill the affected cells as Fe₃O₄ particles have affinity to cancer cells. The results have shown that GO-Fe₃O₄ composites exhibited good biocompatibility with normal cell lines and considerable toxicity towards breast cancer cells.

K. Thangaraj (CCMB, Hyderabad) presented interesting data on 'The complex origin of Indian populations and its profound medical implications'. India, he said, is an ethnic museum with social stratification of castes, subcastes, religious groups, etc. India represents the largest sources of human diversity both genetically and phenotypically, with more than four and a half thousand anthropologically well-defined populations. India was inhabited by the descendants of modern humans who migrated Out-of-Africa about 60,000 years ago. Thangaraj's group established that there were only two founding populations: (1) Ancestral North Indian (ANI), distantly related to Middle East, Central Asia and Europe and (2) Ancestral South Indian (ASI), not related to groups outside India. Owing to endogamy marriages practiced for thousands of years, genetic mutations were introduced that were unique to each population. Their results showed that genetic patterns in Indian populations have been shaped by a long history of genetic isolation. The talk focussed on how Indian genetics is different from that of the rest of the world and its implications to health and disease. This complexity of diverse populations with higher genetic drift predicted can have tremendous implications on health and regional-specific diseases (such as Madras motor neuron disease deficiency, etc.).

Tanmaya Pathak (IIT, Kharagpur) gave a lecture on 'Small molecules, diversity and great expectations'. There is an ever-increasing demand for new chemical entities, which require synthetic strategies involving molecules of skeletal complexity and stereochemical diversity. Synthetic methodologies for generating

sugar-modified nucleosides were presented. These new compounds found applications as spacers for hybrid molecules, ligands for metal complexation, building blocks for gels, etc., and some were shown to possess biological activities. These modified nucleosides turned out to be inhibitors of enzymes belonging to ribonuclease family. He said his group was trying to develop the chemistry for designing small molecules having stereochemical and scaffold diversities.

The day's meeting was concluded with a public lecture in the evening by **Madhav Gadgil** from Goa University



on 'Sahyachala: A love story'. A fascinating study spanning five decades of the natural world of the Western Ghats was narrated. Some of the pertinent questions addressed by Gadgil over the years were the following: Why are the Western Ghats so rich in endemic species of frogs but so poor in birds? The answer lies in the geological history, he said, elaborating on the continental drift which brought about speciation. Why has the supposedly sustainable and scientific management of the forests so completely devastated the Western Ghat's biomass and biodiversity resources? He emphasized this by citing the Goa mining and bamboo forest case studies. Scientific management calls for reliable estimation of the stocks, sound understanding of the dynamics of stocks including mortality/regeneration, and knowledge of growth pattern of individual plants, all of which were missing in the case studies mentioned. Why are sacred groves the sole repositories of primeval patches of vegetation in many parts of the Western Ghats? In an impassioned talk he cited several examples of forests being treasured and guarded by the local people, such as the sacred grove of Gupta Bhima and Pachgaon, whereas many sensitive areas, such as the Bhimashankar Wildlife Sanctuary, have been misrepresented by forest officials and mining and windmill construction have

been allowed. He concluded by saying that conservation and development can go hand in hand, the benefits of development can reach out to all segments of society, and local communities can guide the course of development – conservation does not mean excluding people.

N Sathyamurthy (IISER, Mohali) began the second day of the meeting with a special lecture on 'Symmetry



and pattern formation in flowers'. Quoting Darwin, he said, observing the intricate functioning of nature is always a sheer pleasure but to understand the mechanism is a challenge. He explained with many examples different patterns and symmetries exhibited by flowers. The chemicals present in the flowers and fruits as well as the medicinal values of plants, flowers and seeds are of interest to the drug industry. The origin of the symmetry in flowers was also traced to prehistoric times. He explained about possible factors that could be responsible for the pattern formation in *Passiflora incarnata* (passion flower) by invoking the reaction diffusion theory of Turing and an activator – inhibitor model of Meinhardt. The video clip of the opening of passion flowers attracted the attention of the audience. One can study the radial opening, dynamics, pattern/structure, colour, pigments, etc., he said.

B. L. V. Prasad (NCL, Pune) spoke on 'New synthetic approaches for the preparation of metal nanoparticle dispersions and assemblies in different solvent media'. The efforts in preparing size-controlled nanoparticles in organic non-polar solvents using chemical molecules as controlling tools, the utility of sophorolipids as nanoparticle capping agents for the preparation of water-dispersible nanoparticles, and the self-assembling characteristics of sophorolipids were presented.

Rajan Jha (IIT, Bhubaneswar) gave a talk on 'Photonic crystal fibre modal interferometer-based

highly sensitive sensor'. Photonic crystal fibres (PCFs) are considered the new-generation fibre optics technology in the field of fibre optic sensing. A simple and compact modal interferometer for detection of volatile organic compounds, nano-displacement, and refractive index of a given medium was presented. Sensors based on PCF modal interferometer are economical, compact, user-friendly and easy to fabricate as they require just splicing and cleaving of the fibre. These can be used for accurate detection of physical, chemical and biological parameters. They can be used in harsh environments such as in high-temperature measurement for space applications and fire safety alarms. Food degradation analysis and structural health monitoring are other applications.

Parthanil Roy's (ISI, Kolkata) talk on 'Branching random walks with displacements coming from a power law' started with a definition of a branching random walk wherein a collection of particles that start from a single point, diffuse and branch independently of their positions and those of other particles. This model is very important in statistical physics, mathematics, and biology. Assuming that the underlying displacement distribution is a power law, Roy's group studied the limiting behaviour of such a system. Roy described their results and the contributions made so far.

Syamal Roy (IICB, Kolkata) spoke on 'History of leishmania research in India – then and now'. The history of leishmania in India, the discovery of the causative agent and preparation of pentavalent antimonial compound in a small laboratory in Calcutta were presented. Although this disease in the 1960s became a rare clinical entity with clinical success of the drug, it has again emerged in India. The evolution of drug-resistant cases is further compounding the problem. Over the years Roy's group

has been involved in studying the mechanism of immune suppression, resistance and vaccine development. So far there is no effective vaccine against leishmaniasis.

M. K. Bera (IIT, Kharagpur) gave a talk on 'Revisiting the linkage between Himalayan orogenesis and climate change'. Although Himalayan orogenesis is attributed to global climate change through increase in silicate weathering and consumption of atmospheric CO₂, field-based geological observations are missing. Two important questions are unanswered: When did Himalayan exhumation, erosion start? And when was the South Asian monsoon initiated? The results of his group's detailed study of sedimentology, sequence stratigraphy, stable oxygen and carbon isotopic studies were presented. The analysis, the clast composition, Sr and Nd isotopic data suggest that Himalayan weathering started at approximately 31 Ma. This raises questions about the tectonic-induced climate change at approximately 34 Ma.

R. S. Swathi (IISER, Thiruvananthapuram) spoke on 'Modelling the energetics of encapsulation of atoms and atomic clusters into carbon nanotubes: Insights from analytical approaches'. Carbon clusters are of great interest to astrophysicists and molecular spectroscopists. These clusters are highly reactive and difficult to prepare. Her group's studies on the energetics of encapsulation of noble gas atoms and monocyclic carbon rings into carbon nanotubes using analytical models were presented. Encapsulation of atoms and molecules into carbon nanotubes has an important role in sieving and separation of gases, drug delivery, etc. The analytical models employed by this study are computationally cheap and could provide insights into the encapsulation process.

* * * * *

EIGHTY-FIRST ANNUAL MEETING

Hosted by IISER – Pune in association with
CSIR–NCL and NCCS

6 – 8 NOVEMBER 2015

Programme

6 November 2015 (Friday)

- 0930 – 1100 **Inauguration & Presidential Address**
Dipankar Chatterji, IISc, Bengaluru
Social behaviour in bacteria
- 1200 – 1445 **Lectures by Fellows/Associates**
- 1200 – 1220 **Rama Kant**, University of Delhi, Delhi
Theories for anomalous response in disordered electrodes
- 1225 – 1245 **Arindam Ghosh**, IISc, Bengaluru
Multifunctional electronics with atomically thin membranes
- 1400 – 1420 **Susanta Roychoudhury**, Saroj Gupta Cancer Cell and Research Institute, Kolkata
Mitotic stress in cancer: Tipping the balance
- 1425 – 1445 **Kaushal Verma**, IISc, Bengaluru
Quadrature domains and potential theory
- 1530 – 1730 **Symposium on "Light and Matter" (International Year of Light)**
- 1530 **G. Ravindra Kumar**, TIFR, Mumbai
High-intensity lasers in physics
- 1600 **Anunay Samanta**, University of Hyderabad, Hyderabad
Employing light as an initiator and a probe
- 1630 **G. Krishnamoorthy**, Anna University, Chennai
Light in molecular biophysics
- 1700 **Deepak Nair**, IISc, Bengaluru
Super-resolution imaging and signal processing at synapse
- 1800 – 1900 **Public Lecture**
C.N.R. Rao, JNCASR, Bengaluru
Doing science in India

7 November 2015 (Saturday)

- 0900 – 0940 **Special Lecture**
Shubha Tole, TIFR, Mumbai
Sensational barrels in the brain: The circuitry of sensory resolution
- 0940 – 1025 **Lectures by Fellows/Associates**
- 0940 – 1000 **K.R. Prasad**, IISc, Bengaluru
Synthesis of natural products of therapeutic significance
- 1005 – 1025 **A. Chockalingam**, IISc, Bengaluru
Visible light communications: An emerging area in wireless
- 1050 – 1300 **Symposium on "General Relativity" (Centenary year of the discovery)**
- 1120 **R. Gopakumar**, ICTS, Bengaluru
The quantum dynamics of general relativity
- 1150 **Shiraz Minwalla**, TIFR, Mumbai
Applied gravity
- 1220 **T. Padmanabhan**, IUCAA, Pune
Gravity and/of Cosmos
- 1400 – 1535 **Lectures by Fellows/Associates**
- 1400 – 1420 **M. Ravikanth**, IIT, Mumbai
Boron-dipyrromethene dyes for ion recognition studies
- 1425 – 1445 **Sumantra Chattarji**, NCBS, Bengaluru
To be or not to be afraid
- 1450 – 1510 **A.C. Anil**, NIO, Dona Paula, Goa
Biological interactions in the sea
- 1515 – 1535 **Jyotishman Bhowmick**, ISI, Kolkata
Quantum isometry groups
- 1830 – 1930 **Public Lecture**
K. Srinath Reddy, Public Health Foundation of India, New Delhi
Pulse to planet: Human health in the era of sustainable development

8 November 2015 (Sunday)

- 0900 – 0940 **Special Lecture**
Kankan Bhattacharyya, IACS, Kolkata
Single molecule spectroscopy of a single live cell

0940 – 1300 **Lectures by Fellows/Associates**

0940 – 1000 **Arpita Patra**, IISc, Bengaluru
Secure multiparty computation

1005 – 1025 **Nita Bhandari**, Centre for Health Research and Development, New Delhi
A new approach to treating severe acute malnutrition in children

1100 – 1120 **Ranjani Viswanatha**, JNCASR, Bengaluru
Dilute magnetic semiconducting nanomaterials: Theory to reality

1125 – 1145 **Aswin Sai Narain Seshasayee**, NCBS, Bengaluru
Evolving chromosomes and their convergence with gene regulatory networks

1150 – 1210 **Sharmila A. Bapat**, NCCS, Pune
Cancer stem cells and stress induced evolution – Understanding the drug recalcitrance phenomenon

1215 – 1235 **Gautam Bhattacharyya**, SINP, Kolkata
The hierarchy problem and physics Beyond the Standard Model

1240 – 1300 **Mitali Mukerji**, IGIB, New Delhi
Ayurgenomics: Understanding human individuality through integration of Ayurveda and genomics for stratified medicine

1430 – 1530 **Special Open Lecture**

James Jackson, Cambridge University, Cambridge
Probing the continents: How variations in the structure and rheology of the lithosphere affect surface geology

* * * * *

ASSOCIATES – 2015

B. Anand

IIT, Guwahati
RNA Biology, Structural and Computational Biology, Genome Engineering



P. Anbarasan

IIT, Chennai
New Synthetic Methodologies, Natural Products, Carbon-dioxide Fixation



Abhishek Banerjee

IISc, Bengaluru
Noncommutative Geometry, Algebraic Geometry, Number Theory



Subhra Jana

S.N. Bose National Centre for Basic Sciences, Kolkata
Catalysis, Spectroscopy, Materials Science



Ankur A. Kulkarni

IIT, Mumbai
Game Theory and Optimisation, Stochastic Control, Information Theory



Chandan Mukherjee

IIT, Guwahati
Bioinorganic Chemistry, Biomedical Chemistry, Co-ordination Chemistry



Uma K. Narasimhan

VSSC, Thiruvananthapuram
Tropical Mesoscale Convective Systems, Stratosphere-Troposphere Exchange Processes, Ground and Space-Borne Remote Sensing



Narayanan T.N.

TIFR Centre for Interdisciplinary Sciences, Hyderabad
Materials Science, Nanomagnetism, Electrochemistry



Aseem Paranjape

IUCAA, Pune
*Cosmology, Large Scale Structure,
Gravitation*



Prabhu R

Harish-Chandra Research Institute,
Allahabad
*Quantum Information Theory, Many-Body
Physics, Quantum Optics*



Arpita Patra

IISc, Bengaluru
*Cryptography, Secure Distributed
Computing, Information Security*



Mahak Sharma

IISER, Mohali
Cell Biology, Molecular Biology



Prasad Perlekar

TIFR Centre for Interdisciplinary Sciences,
Hyderabad
*Fluid Dynamics, Nonlinear Dynamics,
Condensed Matter Physics*



Gyana Ranjan Tripathy

IISER, Pune
*Re-OS Geochronology, Weathering and
Erosion, Isotope Geochemistry*



* * * * *

SPECIAL ISSUES OF JOURNALS

Fluid Mechanics and Fluid Power (FMFP) and International Union of Theoretical and Applied Mechanics (IUTAM) Symposium: Deformable Tubes

**Editors: Amit Agrawal and K Muralidhar (FMFP);
V Shankar and V Kumaran (IUTAM)**

***Sādhanā*, Vol. 40, No. 3, May 2015, pp. 623–1048**

This special issue of *Sādhanā* contains selected papers from two conferences related to fluid mechanics held recently: Fluid Mechanics and Fluid Power conference at NIT, Hamirpur, and the International Union of Theoretical and Applied Mechanics (IUTAM) symposium at Jawaharlal Nehru Centre for Advanced Scientific Research, Bengaluru. The articles in this special issue exemplify the wide spectrum that fluid mechanics and its study represent.

Section 1 carries selected articles from the Fluid Mechanics and Fluid Power Conference held from

12 to 14 December 2013 at the National Institute of Technology, Hamirpur (HP), under the auspices of the National Society of Fluid Mechanics and Fluid Power. The section includes three review articles and nine original research articles. These were selected on the basis of their topicality and relevance, particularly in emerging areas of fluid mechanics and fluid power.

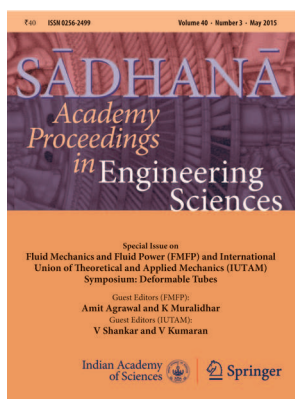
Section 2 is more focused, and contains articles related to flows in deformable tubes, which find application in biological systems. Research in bio-fluid mechanics has seen tremendous growth recently, partly to address important questions in biological systems, like clogging of arteries, and partly to see if new engineering systems mimicking natural ones can be developed. This section contains selected papers from the talks presented during the International Union of Theoretical and Applied Mechanics (IUTAM) Symposium held from 20 to 23 January 2014.

Theme Issue on Hot and Dense Matter

Editors: Bedangadas Mohanty and Sourendu Gupta

***Pramana – Journal of Physics*, Vol. 84, No. 5,
May 2015, pp. 669–942**

We are now at the beginning of the second decade after the discovery of quark matter at the RHIC in Brookhaven, and a little after the beginning of the



LHC heavy-ion programme. During this decade, questions about heavy-ion collisions have become more pointed. The earlier assumptions of early thermalization, long hydro-dynamic evolution, and abrupt freeze-out are being tested, probed, and improved.

Is matter thermally equilibrated, or does the initial condition influence even the late evolution of the fireball? A theoretical model for describing strongly coupled QCD-like theories (but not exactly QCD) has emerged and is being widely used. Can experiments be made precise enough that they test more than the generic features of strongly coupled systems? Lattice QCD gives a few quantitative predictions about the properties of thermally equilibrated matter. Can these be tested? These are some of the questions that become interesting in the modern context of heavy-ion collisions.

Lattice QCD also has predictions about the phase structure of QCD. Are they precise enough? Can the existence of a critical point be tested at colliders? Are there improved computational methods which may give quantitative answers to a wider variety of questions? Is local parity violation visible in experiments? These are new questions being asked, and the partial answers available are already extremely intriguing.

The classic questions now probe deeper: these are questions about photons and dileptons, about jets and heavy-quarkonia, and about the possible existence of quark matter in neutron stars.

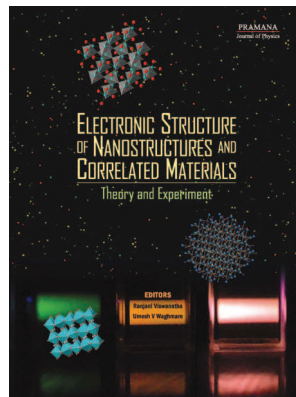
This special issue contains a collection of reviews on the state of the field, which gives context and longer answers to these questions, and poses others.

Theme Issue on Electronic Structure of Nanostructures and Correlated Nanomaterials: Theory and Experiment

Editors: Ranjani Viswanatha and Umesh V Waghmare

***Pramana – Journal of Physics*, Vol. 84, No. 6, June 2015, pp. 945–1128**

In this issue, invited reviews on the electronic structure of materials including strongly correlated electronic materials and nanoscale structures are included. Maiti's article provides a review of the experimental analysis



of electronic structure of superconductors coupled with a magnetic element like Fe. Paul and Raj discuss the metal–insulator transition in sodium tungsten bronzes using experimental methods like ARPES and first-principles calculations based on full potential LAPW methods. Stimulated by

many debates, efforts to understand the effects of the insulating tunnelling barrier on the magneto resistance of double perovskites are reviewed by Nag and Ray. The physics of magneto-caloric effect in materials with coupled electronic spins and lattice degrees of freedom, specifically in rare-earth intermetallics is reviewed by Nirmala *et al.* The correlation between a cation dopant site of perovskite SrTiO₃ and its dielectric properties is discussed by Choudhury using complementary analysis based on experimental and theoretical tools. Manju's article presents a review of the evolution of the correlation effects on the two-dimensional surface alloys. Mahantha and Menon review the effects of quantum confinement on the growth of Cu, Ag and Au on a graphite substrate using ARPES and LEED. Topwal's article provides an analysis of the effects of electron confinement in ultrathin films and nanowires on semiconductor and metallic substrates through band mapping. Das and Mahadevan's article presents first-principles calculations to determine the effect of strain on the electronic structure and possible metal-semiconductor transition in monolayer of MoSe₂. Various mechanisms of the deformation of nanoparticles are reviewed by Gerard and Pizzagalli. The growth of CdTe nanocrystals using digestive ripening is reviewed by Mittal and Srapa. Viswanatha reviews the effects of 3d transition metal dopant on the electronic structure of three-dimensionally confined nanocrystals. Mahadevu *et al.* discuss the progress made towards assembling nanoscale building blocks into functional materials. Following these reviews on the fundamental understanding of electronic behaviour, there are reviews dedicated to its applications. Nanda *et al.* discuss the role of size in revolutionizing the electrochemical energy storage in Li ion based batteries. Tandon *et al.* review the introduction of new transparent conducting oxide nanocrystals for plasmonic applications. The use of carbon-based nanostructures for electromagnetic shielding is reviewed by Joshi and Datar.

Proceedings of the Conference on 75 years of Nuclear Fission: Present Status and Future Perspectives, Parts I & II

Editors: D C Biswas, K Mahata and V M Datar

***Pramana – Journal of Physics*, Vol. 85, Nos 2 and 3, August and September 2015, pp. 187–566**

Nuclear fission was discovered 75 years ago and is considered to be one of the most important scientific discoveries in basic and applied nuclear research. It has played a key role in the understanding of statistical and dynamical properties of nuclei, in the production of nuclear power, development of nuclear instrumentation and evolution of other related fields. In order to commemorate this occasion, a conference was organized on “75 Years of Nuclear Fission: Present Status and Future Perspectives” by the Bhabha Atomic Research Centre, Mumbai, during 8–10 May

2014. The main goal of the conference was to review the progress in the understanding of nuclear fission during the past 75 years and also to indicate the direction of future research in fission. Nuclear fission occupies a prominent place in the context of global energy resources, and has given impetus to scientists and engineers to look for advanced reactors for the production of cost-effective nuclear power. The research work reported in the conference covered the topics in the field of fission process, fission fragment spectroscopy, radiochemical studies in fission, cluster radioactive decay, super heavy element studies and various applications of fission data. The role of nuclear fission in the design of advanced nuclear reactors, radioactive ion beam production and development of sophisticated experimental techniques were highlighted. This special issue contains the papers of the talks provided by the invited speakers.

* * * * *

DISCUSSION MEETING

Quantification and Reduction of Uncertainties in Hydrological Inferences

**Orange County, Coorg
26–28 February 2015**

Convener: V. K. Gaur (CSIR Fourth Paradigm Institute, Bengaluru) and P. P. Mujumdar (IISc, Bengaluru)

The meeting was attended by 20 participants including 5 distinguished scientists from abroad and eminent academics and creative researchers from various parts of the country. The focus of the meeting was to discuss and articulate science issues in the reduction of uncertainties in hydrological predictions which are finding increasing use in decision making by policy makers and managers. Discussions were structured through seven presentations that had been defined in advance to create an evocative perspective for identifying and debating potentially insightful approaches to the problem.

The discussion meeting was prefaced by Vinod Gaur, who traced the course of human endeavour in minimising epistemic uncertainty from the early Greeks through the classical era of determinism to our modern understanding of the behaviour of coupled systems which generate intrinsic uncertainties from simple deterministic systems. For the hydrological context, which is of increasingly greater concern, he emphasised the imperatives of researching issues that would take us to the limits of potential predictability as well as its representation in ways that could be easily assimilated in policy and management decisions.

The first subject of discussion was introduced by Witold Krajewsky, University of Iowa, who has investigated the characteristics of the rainfall-runoff model which has been generally found to exhibit a fractal distribution iconically expressed as a power law relation. His findings showed that the scaling slopes and intercepts of the graphs, while differing from event to event, incorporate all the pertinent physical processes that produce floods and hold a promise to yield in some way a generic model that would prove a boon to predict stream flows in the large number of ungauged basins, especially in less developed countries. Krajewsky also showed an example of the limits to predictive uncertainty as a

measure of the irreducible uncertainty in peak discharge.

The two subsequent presentations, made by Ashish Sharma of the University of New South Wales and Saman Razavi from the University of Saskatchewan, dealt with issues of factor analysis in attributing prediction uncertainties to various factors involved. Sharma showed the formulation of two new metrics of uncertainty: the Square Root Error Variance (SREV) and the Quantile Flow Deviance (QFD) to respectively investigate space-time distribution of uncertainties generated by a model, and to disaggregate prediction uncertainties arising from various sources such as model structure, and the likelihood function used in the analysis.

Saman Razavi raised the problem of defining uncertainty attribution to different factors which is essentially made through sensitivity analysis based on partial derivatives determined at localized points. He presented two approaches to globalize sensitivity analysis over the entire problem domain: the Derivative based MORRIS, and the Variance based SOBOL whose applications may, however, produce different ordinations of sensitivity parameters, thereby obviating the desirability of developing a unified framework to address this problem.

Two presentations at the meeting addressed the role of measurement accuracy in data and of data volume in determining uncertainties in hydrological prediction. These were made by Shivam Tripathi from IIT Kanpur and Sekhar Muddu from the Indian Institute of Science. Tripathi who had developed a set of algorithms based on Bayesian *a posteriori* estimations, showed some promising results by way of examples in Principal Component Analysis, Regression and trends analysis of hydrological extremes. Sekhar Muddu asked a more fundamental question of the limit to which uncertainty may be reduced by augmenting data sets. In particular, he addressed the question of estimating uncertainty in inferred hydrological storage and fluxes in the subsurface which is strongly controlled by the space time distribution of rainfall, evapo-transpiration, soil moisture and other variables, based on his studies in the Kabini experimental watershed.

A related issue of reducing prediction uncertainties through data assimilation was addressed by Harrie-Jan Hendricks Franssen from the Hydrology Institute in Aachen, Germany. Franssen highlighted the impracticality of multivariate data assimilation in the Bayesian framework which required the preservation and transport of large covariance matrices from one step to the next, obviating the high desirability of developing more efficient approaches to uncertainty reduction through data assimilation such as that offered by the Ensemble Kalman Filter. Franssen showed the results of the algorithms developed by his group to demonstrate the promise of this approach.

The last presentation, made by Dimtri Solomatine from the Institute of Water Education and Machine Learning of the Netherlands, dealt with the prospects of developing methods that would make uncertainty analysis amenable to machine learning opening the way to development of Expert Systems. In his presentation, Solomatine showed the methods developed by his group that allowed machine learning of and its performance in estimating model uncertainties.

This meeting, which resulted in intense thoroughgoing discussions on some seminal issues of uncertainty reduction, identified some important research issues for addressal, which included development of potentially quantifiable measures to represent uncertainty in hydrological inferences that would at once illuminate the course of possible future endeavours to reach potential predictability and also prove to be an effective communication for policy and managerial decisions; a comparative analysis of some of the currently used approaches to uncertainty analysis to show a possible way to a more overarching framework; better approaches and methodologies for isolating uncertainties in predictions according to influencing factors to obviate options in prioritization research targets; and scale being an important attribute of hydrological systems which inevitably encompasses a large varied domain of the earth system, a systems approach to uncertainty reduction.

* * * * *

SUMMER RESEARCH FELLOWSHIP PROGRAMME FOR STUDENTS AND TEACHERS

The summer research fellowship programme (SRFP) for students and teachers is a major activity of the Academy under its Science Education initiatives. Started in 1995, it has grown rapidly in size. This is particularly so after the Indian National Science Academy (New Delhi) and the National Academy of Sciences India (Allahabad) joined with this Academy in 2007 in conducting this programme.

The following table gives information on the number of applications received and the number of fellowships offered and availed in 2015.

Subjects	No. of applications received		No. of fellowships offered		No. of fellowships availed	
	Students	Teachers	Students	Teachers	Students	Teachers
Life Sciences (incl. Agri. Sci.)	4326	172	529	61	458	46
Engineering Sciences & Technology	12928	172	374	56	294	45
Chemistry	2221	117	246	26	223	17
Physics	2517	88	191	33	159	24
Earth & Planetary Sciences	933	11	131	00	114	00
Mathematics	998	33	94	05	73	04
TOTAL	23923	593	1565	181	1321	136
GRAND TOTAL	24516		1746		1457	

Many institutions in the country helped the programme by hosting summer fellows and providing them the necessary facilities such as laboratory support, accommodation, etc. The following tables give information on (a) the cities in which ten or more summer fellows were placed and (b) institutions which hosted ten or more summer fellows in 2015.

(a) Cities in which ten or more summer fellows were placed in 2015:

Sl. No.	Cities (as hosts)	No. of SRFs
1	Bengaluru	307
2	New Delhi	174
3	Mumbai	159
4	Hyderabad	150
5	Kolkata	79
6	Chennai	64
7	Pune	61
8	Thiruvananthapuram	46
9	Mohali	37
10	Bhubaneswar	33
11	Ropar	26
12	Guwahati	24
13	Dona Paula	15
14	Kanpur	15
15	Lucknow	15
16	Ahmedabad	14
17	Varanasi	14
18	Gandhinagar	12
19	Kharagpur	12
20	Manesar	11
21	Karaikudi	10
22	Puducherry	10

(b) Institutions which hosted ten or more summer fellows in 2015:

Sl. No.	Institutions (as hosts)	No. of SRFs
1	IISc, Bengaluru	202
2	IIT Bombay, Mumbai	81
3	BARC, Mumbai	52
4	UOH, Hyderabad	51
5	IIT Madras, Chennai	37
6	IISER, Mohali	35
7	IIT, Ropar	26
8	IIT, Guwahati	24
9	IIT, New Delhi	24
10	NCL, Pune	23
11	CDFD, Hyderabad	21
12	NCBS, Bengaluru	20
13	NCCS, Pune	20
14	NISER, Bhubaneswar	19
15	UOD(SC), New Delhi	18
16	ICGEB, New Delhi	17
17	IISER, Thiruvananthapuram	17
18	NGRI, Hyderabad	17
19	IIT, Kanpur	15
20	NIO, Dona Paula, Goa	15
21	BHU, Varanasi	14
22	JNCASR, Bengaluru	14
23	NII, New Delhi	14
24	CCMB, Hyderabad	13
25	JNU, New Delhi	13
26	UAS, Bengaluru	13
27	IICT, Hyderabad	12
28	IISER, Kolkata	12
29	IIT, Hyderabad	12
30	IIT, Kharagpur	12
31	AIIMS, New Delhi	11
32	Bose Institute, Kolkata	11
33	ICT, Mumbai	11
34	NBRC, Manesar	11
35	NPL, New Delhi	11
36	PRL, Ahmedabad	11
37	CECRI, Karaikudi	10
38	IIT, Gandhinagar	10
39	IMSc, Chennai	10
40	ISI, Bengaluru	10
41	ISI, Kolkata	10
42	Pondicherry University, Puducherry	10
43	RGCB, Thiruvananthapuram	10
44	UOD, Delhi	10

(c) Many institutions in the country were also benefited by the programme as several of their own students and teachers were selected under the programme and had the opportunity to work at institutions elsewhere. The following is a list of such institutions from where ten or more summer fellows were selected in 2015:

Sl. No.	Institutions benefitted by SRFP	No. of SRFs
1	UOD, New Delhi	46
2	NIT, Surat	35
3	NITK, Surathkal	33
4	NIT, Tiruchirappalli	26
5	IIT, Kharagpur	25
6	Presidency University, Kolkata	23
7	Pondicherry University	22
8	SASTRA University, Thanjavur	22
9	IIT, Roorkee	21
10	BHU, Varanasi	31
11	Bharathidasan Univ., Tiruchirappalli	20
12	VIT, Vellore	31
13	PESIT, Bengaluru	19
14	TNAU, Coimbatore	19
15	NIT, Calicut	18
16	IISER, Bhopal	18
17	UOH, Hyderabad	17
18	IIT – Madras, Chennai	17
19	RVCE, Bengaluru	17
20	ISM, Dhanbad	16
21	BITS – Pilani, Rajasthan	14
22	Anna University, Chennai	14
23	Jadavpur University, Kolkata	14
24	CUSAT, Cochin	14
25	IIT, Kanpur	14
26	SPP University, Pune	14
27	University of Calcutta, Kolkata	13
28	AV Vidyapeetham, Kollam	13
29	HIT, Kolkata	13
30	NIT, Rourkela	12
31	IISER, Kolkata	12
32	KIIT University, Bhubaneswar	12
33	SVNIT, Surat	11
34	SRM University, Chennai	11
35	Central Univ. of TN, Thiruvapur	11
36	NIT, Warangal	11
37	IISER, Mohali	11
38	IIT – Bombay, Mumbai	11
39	Ravenshaw University, Cuttack	11
40	IISER, Pune	10
41	MS University, Vadodara	10
42	Tezpur University, Tezpur	10
43	Stella Maris College, Chennai	10
44	AMU, Aligarh	10
45	IISER, Thiruvananthapuram	10
46	IIT, Guwahati	10

The mentor–summer fellow ratio for the year 2015 is provided in the following table.

Sl. No.	Subject	Number of Mentors	Summer Fellows		Total Candidates
			Students	Teachers	
1	Life Sciences (incl. Agri. Sci.)	351	458	46	504
2	Engineering Sciences & Technology	165	294	45	339
3	Chemistry	174	223	17	240
4	Physics	104	159	24	183
5	Earth & Planetary Sciences	82	114	00	114
6	Mathematics	38	73	04	77
TOTAL		914	1321	136	1457

This activity of the Academies has received enthusiastic response from both the faculty, who acted as guides, as well as the students and teachers, who availed the fellowship.

REFRESHER COURSES

Jointly sponsored by IASc (Bengaluru),
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 undergraduate syllabi followed in universities and institutions in the country. The following Courses were held from April to September 2015.

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 73 Courses in different parts of the country since 1999. These experiments are useful for laboratory programmes at BSc and MSc 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 M/s Ajay Sensors and Instruments, Bengaluru.

The following is the list of Experimental Physics Courses held from April to September 2015.

1. Experimental Physics – 69

Indian Academy of Sciences, Jalahalli, Bangalore
14–29 April 2015

Co-ordinator: T.D. Mahabaleswara

No. of Participants: 16

Resource Persons: T.G. Ramesh (NAL, Bangalore), Seeta Bharati (Bangalore), Sarmistha Sahu (Maharani Lakshmi Ammani College, Bangalore), A.V. Alex (U.C. College, Alwaye).

2. Experimental Physics – 70

Goa University, Goa
13–28 May 2015

Co-ordinator: Prof. K.R. Priolkar (Goa University, Goa)

No. of Participants: 16

Resource Persons: Dr Efrem Desa, Mr Manohar Naik, Prof. S.M. Sadique.

3. Experimental Physics – 71

NIT Mizoram, Aizawl
7–22 May 2015

Co-ordinator: Alok K. Shukla (NIT, Mizoram)

No. of Participants: 22

Resource Persons: Dr. R. K. Dwivedi, Dr. S. P. Singh (Christ Church PG College, Kanpur), Dr. Preeti Bhoje (IIT, Indore), Shri Manish Dev Sharma (Punjab University, Chandigarh).

4. Experimental Physics – 72

Punjab University, Chandigarh
16 June – 1 July 2015

Co-ordinator: Shahi J.S.

No. of Participants: 35

5. Experimental Physics – 73

Kurukshetra University, Kurukshetra
13–28 September 2015

Co-ordinator: R. K. Moudgil

No. of Participants: 35

B. Other Refresher Courses

6. Thin Films and Nanoscience

Tripura University, Suryamaninagar, Tripura
4–18 May 2015

Course Director: Tanusri Saha-Dasgupta

Co-ordinator: Syed Arshad Hussain (Tripura University, Suryamaninagar)

No. of Participants: 24

Resource Persons: Mushahid Husain, A. Rahman, Mrinal Pal, Gautam Buddha Talapatra, D. K. Aswal, Surajit Sengupta, Tanusri Saha-Dasgupta, Syed Arshad Hussain, D. Bhattacharjee, Barin Kumar De.

LECTURE WORKSHOPS

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

1. Advances in Chemistry Education and Research

University of Gour Banga, Malda
23–24 July 2015

Convener: Prof. Subrata Ghosh (IACS, Kolkata)

Co-ordinator: Prof. M. A. Mondal (University of Gour Banga, Malda)

No. of participants: 100

Topics Covered: Organic Synthesis-Why and How, Organic Synthesis in the Wellness of Mankind, Synergistic Participation of Redox Non-innocent Azo aromatic Ligand(s) and Metal in Transition Metal Complexes, Teaching is difficult: Teaching is simple, Development of potential strategies from traditional understandings, The importance of chirality in Drug Molecules. Nanocatalysis: Perspectives & Applications in chemical synthesis.

2. Advances in Wireless Communications and Networking

Amal Jyothi College of Engineering,
Kanjirapally
23–24 July 2015

Convener: A. Chockalingam (IISc, Bengaluru)

Co-ordinator: K.G. Satheesh Kumar (Amal Jyothi College of Engineering, Kanjirapally)

No. of participants: 100

7. Quantum Mechanics

Loyola College, Chennai
11–23 May 2015

Course Director: Mani H.S.

Co-ordinator: Joseph Prabagar (Loyola College, Chennai)

No. of Participants: 40

Resource Persons: Dr Govind Krishnaswami, H.S. Mani, G. Rajasekaran (CMI, Chennai), S.V. Satyanarayana (Pondicherry University, Puducherry).

Topics Covered: Introduction to Wireless Communications and Next Generation Wireless, Convex Optimization, Wireless Networking, Next Generation Wifi, Visible Light Wireless Communications.

3. Analysis and Topology

MS University of Baroda, Baroda
23–24 July 2015

Convener: Shah M.V.

Co-ordinator: Haribhai R. Kataria (MS University of Baroda, Baroda)

No. of participants: 110

Topics Covered: Influence of proofs of Weierstrass' theorem by Lebesgue and Bernstein on some recent trends in Mathematics II, role of definitions in the development of new areas in Mathematics, Some preliminaries on Riemann surfaces, proof of Riemann-Roch theorem for compact Riemann surfaces, weights on semigroups – I.

4. Integrated Research Approaches in Biology

Nirmala College for Women, Coimbatore
07–08 August 2015

Convener: T.J. Pandian

Co-ordinator: Pawlin Vasanthi Jose (Nirmala College for Women, Coimbatore)

No. of participants: 150

Topics Covered: Sleeping seeds, spores and cysts: voyage to celestial planets, Adaptive significance of circadian rhythm, Circadian consequence of social interactions, Ecosystem services of tropical forests with special reference to plant resource use by faunal

communities, Blue carbon sequestration, Sea grass ecosystem, Faunal interaction and conservation, Bio molecules against human disease: curcumin, a case study, Invertebrate immunity an overview, Not all the infected develop the disease lotus and cactus model, Arrival of first man and the genomic diversity of India.

5. Future Perspective and emerging technologies for sustainable energy resources

Tumkur University, Tumkur
18–19 August 2015

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

Co-ordinator: Ramesh T.N. (Tumkur University, Tumkur)

No. of participants: 150

6. Supramolecular Assemblies: Synthesis and Application

Guru Ghasidas Vishwavidyalaya, Bilaspur
20–21 August 2015

Convener: Partha Sarathi Mukherjee (IISc, Bangalore)

Co-ordinator: Gautam Kumar Patra (Guru Ghasidas Vishwavidyalaya, Bilaspur)

No. of participants: 150

Topics Covered: Self-assembled Discrete Structures, Supramolecular Chemistry: Concepts and Functions, The making of a new family of Trinuclear Ni(II) Single-Molecule Magnets: Strategy, Failure, Success and Serendipity, Supramolecular chemistry of coordination compounds, Supramolecular Chemistry of Metal-Oxo Clusters, Crystal Engineering: Design Principles and Functional Materials, Hetero-metallic complexes: facile synthesis, nuclearity, isomerization, catalytic activity and magnetic properties, Dithiolene Based Metal Coordination Complexes as Functional Materials: A Supramolecular Approach, Supramolecular Systems in Chemistry and Biology: A General Approach, Functional Molecular Architectures.

7. Green Revolution to Gene Revolution

Telangana University, Nizamabad
20–22 August 2015

Convener: Appa Rao Podile (UoH, Hyderabad)

Co-ordinator: Praveen Mamidala (Telangana University, Nizamabad)

No. of participants: 162

Topics Covered: Green revolution to Gene revolution, Molecular approach to develop disease resistant rice, Innate Immunity Responses in Plants, Language of four alphabets driving Biotechnology.

8. Spectroscopy and Perspectives

Sacred Heart College, Tirupattur
10–12 September 2015

Convener: P.K. Das (IISc, Bangalore)

Co-ordinator: S.A. Martin Britto Dhas (Sacred Heart College, Tirupattur)

No. of participants: 150

Topics Covered: Molecular spectroscopy, Quantum mechanics and spectroscopy of solids, why do molecules absorb/emit radiation, molecular beams in spectroscopy, some recent trends in fluorescence spectroscopy, analytical fluorimetry of multi-fluorophoric system, amorphous semiconductors and applications, Fibre Bragg Grating sensors and their applications, Non-linear optics, electronic states in molecules and solids and understanding electronic processes in molecules for devices applications, optical absorption and photoluminescence spectra of semiconductor Hetero structures and photo reflectance and spin-dependant absorption spectroscopy of semiconductors.

9. Recent Developments on the Theoretical and Experimental Aspects of Advanced Materials

North Bengal University, Darjeeling
18–19 September 2015

Convener: Swapan K. Ghosh

Co-ordinator: Amiya Kumar Panda (North Bengal University, Darjeeling)

No. of participants: 150

10. Recent Trends in Physics

Guru Nanak Dev University, Amritsar
18–19 September 2015

Convener: Arvind (IISER, Pune)

Co-ordinator: Ravi Chand Singh (Guru Nanak Dev University, Amritsar)

No. of participants: 150

* * * * *

REPOSITORY OF SCIENTIFIC PUBLICATIONS OF ACADEMY FELLOWS

Our Repository is in the news for quite the right reasons – the table below of the top ten repositories in India, is from <http://repositories.webometrics.info/en/Asia/India> (Ranking Web of Repositories). The full India list there has 43 entries. More information on the methodology used for ranking can be found in <http://repositories.webometrics.info/en/Methodology> and in <http://repositories.webometrics.info/en/node/29>. The ranks can, of course, change over time. Nevertheless, this is a good incentive to bring our Repository up-to-date – Please contribute what you can and help us to fill the gaps!

India rank	World rank	Repository
1	238	Open Access Repository Publications of Fellows of the Indian Academy of Sciences
2	271	Information and Library Network Centre Institutional Repository
3	343	Central Marine Fisheries Research Institute Institutional Repository
4	386	Indian Institute of Science Bangalore Institutional Repository
5	391	Inter-university Centre for Astronomy and Astrophysics Repository
6	395	National Institute of Technology Rourkela eThesis
7	455	National Institute of Oceanography India Digital Repository
8	487	International Crops Research Institute for the Semi-Arid Tropics Open Access Repository
9	547	Dyuthi Digital Repository Cochin University of Science and Technology
10	636	National Institute of Technology Rourkela Digital Archive

* * * * *

WORKSHOP ON “EMERGING TRENDS IN JOURNAL PUBLISHING”



A workshop on 'Standards, global practices and the emerging trends in journal publishing' was held for the editorial board members and the editorial staff of the Academy on 29th June 2015 at the Academy auditorium. Representatives from National Science Academies (INSA, NASI, IAS and NAAS) attended. The objective was to train and familiarize the publishing staff of the Academy with global standards and the emerging trends in publishing by providing insight into the present day practices in journals' publication across the world.

The workshop included talks by Harry Blom, Vice President, Publishing Development, Springer, on 'Latest developments in the publishing Industry'; Inga Schildmann, Journal Coordination Manager, Physical Sciences and Engineering, Springer, on 'Continuous Article Publishing (CAP) – The new buzz word in journal publishing'; and a Webinar by a team in Springer on the E-proofing tool. This was followed by an interactive session between the publishing staff and the Springer team on issues related to the production of the Academy journals.

HINDI WORKSHOPS

The Indian Academy of Sciences and Raman Research Institute jointly conducted a workshop titled “How to use Hindi on Computer” by Ananda, OL Officer, HAL Engine Division, Bengaluru, on 12th June 2015.

The Indian Academy of Sciences and Raman Research Institute jointly celebrated Hindi Fortnight from 14th to 28th September 2015. During this fortnight, various competitions were held, such as a quiz, singing competition, essay writing, dictation and administrative terminology. On 18th September, there was a talk on 'Bharatheye sahitheye nirman main Hindi' by Prof TG Prabhaskar (Retired Professor, Bangalore University). Hindi Day was celebrated on 28th September, with a talk by Dr Narayana Singh, Joint Director, Central Translation Bureau, Official Language Department, GOI, Bengaluru. The celebrations concluded with prize distribution to the winners of the various competitions.

* * * * *

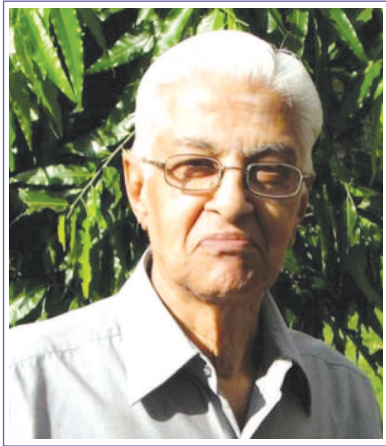
OBITUARIES



Govindaswamy Shanmugam
(elected 1991)

Govindaswamy Shanmugam (GS), pioneer cancer biologist of our country, died on 15 April 2015 in Madurai at the age of 77 years. He was born on 18 December 1938 at Vallampadugai, Tamil Nadu. He received his PhD from Osmania University in 1968 and served as an Assistant Professor at the Institute for Molecular Virology, St Louis, USA, from 1973 to 1978. GS worked on the synthesis and assembly of adenoviruses and moloney murine leukaemia virus in human cells. He discovered the subgenomic viral mRNAs and their function. In 1979, he moved to the School of Biological Sciences at Madurai Kamaraj University (MKU), first as Reader and as Professor in 1985. GS continued his work at Madurai as INSA Senior Scientist and Emeritus

Professor until 2008, when he became Director of the Oncophyta Labs. His contributions included the biosynthesis of viral components in murine leukaemia virus-infected cells. He had an abiding interest in understanding the molecular mechanisms of cell proliferation, oncogenes and tumour suppressor genes. Pioneering research on replication of DNA and DNA tumour viruses, he discovered a double-stranded RNA-specific nuclease involved in the processing of ribosomal and retroviral RNAs. These findings have been quoted in textbooks. Establishing a Cancer Biology Laboratory at the School of Biological Sciences, MKU, GS trained a large number of MPhil and PhD students. He pioneered work on characterizing DNA repair and various enzymatic activities in the placenta. He used mouse and chick embryonic cells and fibroblasts to study the carcinogenic and toxic features of various chemicals and plant-derived compounds. His group investigated the mutations of major tumour suppressor and oncogenes of oral, cervical and breast cancer patients from south India. His work in this area paved the way for the emergence of polymorphism and mutation data from cancer patients in India and eventually led to the establishment of several research groups. GS is known for his soft-spoken nature and friendly way of training and guidance, and has been a role model for many young researchers. He was also a renowned teacher of cell biology. GS also popularized the traditional Ayurvedic ginger treatment as an option for kidney failure. He was also Fellow of the Indian National Science Academy, New Delhi (1993), National Academy of Sciences, India (Allahabad), and International Union of Cancer. He is survived by his wife, two sons and a daughter.



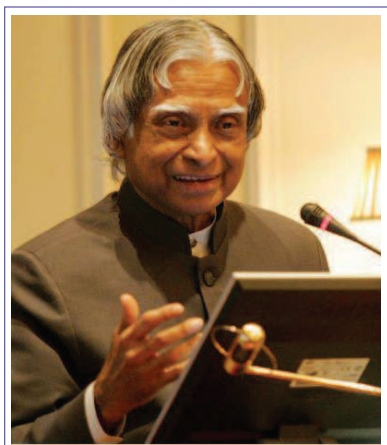
Taracad Narayanan Ananthakrishnan
(elected 1975)

Taracad Narayanan Ananthakrishnan (b. 15 December 1925), renowned Indian entomologist and insect ecologist, passed away in New Jersey, USA, on 7 August 2015. He is remembered for the light he shed on the systematics and diversity of thrips (Thysanoptera) in his earlier years and on the ecology of insect–plant interactions in later years. Influenced by M. S. Mani, master of Indian entomology of the 1940s, Ananthakrishnan made great strides studying Indian insects. T. V. Ramakrishna prompted Ananthakrishnan to study Thysanoptera. Further to Mani, Y. Ramachandra Rao – a contemporary of Ramakrishna in Madras Agricultural Service – also played a key role in shaping Ananthakrishnan’s passion for insects. Ananthakrishnan’s journey with thrips commenced in the mid-1940s. He first looked at the feeding behaviour, population dynamics and reproductive biology of *Arrhenothrips ramakrishnae*, which was a natural choice for Ananthakrishnan in getting an understanding of Thysanoptera, because the populations were readily and plentifully available to him in Loyola College, Chennai (Madras) campus, where he was teaching zoology. Nevertheless, his formal publications on *Rhipiphorothrips cruentatus* and a new species of *Ischyrothrips*, described as *menoni* by him, appeared earlier than his formal paper on the bionomics of *A. ramakrishnae*. Between 1950 and 1980, Ananthakrishnan unravelled 396 new nominal taxa of Thysanoptera, which include 76 new genera and 320 new species. With the experience of collecting and analysing hundreds of Indian Thysanoptera, he was impressed with the phenotypic variations he saw in their populations. His observations on wing variation (alary polymorphism) in thrips were first formally

presented at the First All-India Congress of Zoology, Jabalpur (Madhya Pradesh) in 1959. By the 1970s, Ananthakrishnan marshalled the concept of insect polymorphism, inspired by Ernst Mayr’s thoughts on organic evolution, using examples from the Thysanoptera he had studied. In the 1970s, when the University Grants Commission, New Delhi, launched a textbook-writing scheme, he wrote *General Animal Ecology* with T. R. Viswanathan. This was, and continues to be, one of those fine books on animal ecology that is highly suitable for use by undergraduate and postgraduate students of biology. The book uniquely incorporated ecological details of Indian animals. With the publication of *General Animal Ecology*, Ananthakrishnan’s interest shifted from the taxonomy of Indian Thysanoptera to the ecology of various insect groups. Much of the inspiration to redirect his research at this stage, from the taxonomy to the ecology of Thysanoptera, came from the works of Herbert G. Andrewartha on the Australian rose-thrips *Thrips imaginis* and the ecology volume by Herbert Andrewartha and Charles Birch. By the mid-1980s, Ananthakrishnan’s earlier passion for the taxonomy of thrips gradually tapered. He then directed his students to investigate the population dynamics and physiology of feeding by the hemipteroids (Thysanoptera and Hemiptera in particular), since he was keen to know more about their ecology and evolution. He studied and explained the bionomics of the Indian Thysanoptera, which ranged from free-living and polyphagous to gall-inducing, monophagous species, offering exciting insights into behavioural ecology. His investigations on the thrips that inhabited the weeds along the edges of crop vegetation and how the weeds enabled the movement of pestiferous thrips in and out of the crop ecosystem made extensive impact on the understanding of crop husbandry. Rene Feyerreisen, the editor of the *Annual Review of Entomology*, invited Ananthakrishnan to write the bionomics of thrips in the 1990s, which is now a major summary of the state-of-the-art knowledge of the Thysanoptera of the world. This paper is the jewel in his crown of academic achievements and recognition by the world with more than 100 cross-citations. He is one of the few in the world who has been invited twice by the *Annual Reviews* (Palo Alto, California) to contribute articles. The Entomology Research Institute in the 1980s in the Loyola College campus was established by Ananthakrishnan with the singular purpose of understanding and explaining the chemical and molecular ecology of insect–plant interactions.

Ananthkrishnan had a thorough and intimate knowledge of animals – from the Protozoa to Mammalia and from their classification to their physiology. He was a born teacher who had the innate skill to teach effectively and inspire students, be it in general zoology or entomology or the ecology of insect-plant interactions. He mentored over 50 students and was an extraordinary and prolific writer: he published over 400 journal papers between 1947 and 2005 and wrote textbooks as well.

* * * * *



Avul Pakir Jainulabdeen Abdul Kalam
(elected 1984)

Avul Pakir Jainulabdeen Abdul Kalam, a distinguished aerospace technologist who led the development of the country's first satellite launch vehicle as well as the first indigenous operational missiles, who then went on to become first the Scientific Adviser to the Defence Minister and later the Principal Scientific Adviser to the Government of India, and finally served as the 11th President of India, passed away on 27 July 2015 while addressing students at the Indian Institute of Management at Shillong. His death has taken away one of the most remarkable and charismatic figures, not only in Indian science and technology but also in Government, politics and public life.

Kalam was born in Rameswaram (Tamil Nadu) on 15 October 1931 to Jainulabdeen and Ashiamma, parents of modest means whose income Kalam supported by selling newspapers when he was a young boy. After schooling in the neighbourhood, he went to Tiruchirappalli in 1950, and obtained a B Sc in Physics

from St Joseph's College in 1954. During the next three years he studied aeronautical engineering at the Madras Institute of Technology, where he obtained a Diploma (equivalent to a Bachelor's degree, DMIT), and went to HAL Bangalore for shop-floor training. He wanted to be a pilot, but just missed being selected by IAF. However, he got a position at the Directorate of Technical Development and Production (DTD&P (Air)) at Delhi in 1955, and three years later was posted to the Aeronautical Development Establishment (ADE) at Bangalore. Here he designed and operated the country's first ground effect machine, or hovercraft, which attracted a great deal of technical and political attention as it could be a useful transport vehicle in difficult terrain. M. G. K. Menon (Director of TIFR at the time), visiting ADE, was quick to recognize Kalam's unusual abilities, drive and passion; this led to Vikram Sarabhai (who was then heading the Indian National Committee for Space Research) hiring Kalam in 1964 as a Rocket Engineer at the Thumba Equatorial Rocket Launching Station (TERLS) near Thiruvananthapuram. Here Kalam led a series of programmes including fibre-reinforced plastic technology development, and was Chief Designer for a Rocket-Assisted Take-Off system for aircraft.

In 1972, Kalam was appointed Project Manager of the Satellite Launch Vehicles mission. There were members of the scientific community who were skeptical about the project's chances of success, both within and outside ISRO, and the adequacy of Kalam for the task. However, Satish Dhawan had seen Kalam in operation, and concluded that he was one person who had delivered on what he had promised, because of his remarkable ability to work in teams and lead them. When the first launch failed in 1979 the fears of the pessimists seemed confirmed. However the second one launched a year later succeeded, and placed a 35 kg *Rohini* satellite in a 400 km orbit.

As SLV development was completed, Kalam went on to become Director of ISRO Launch Vehicles/Systems and moved to Headquarters in Bangalore. DRDO sought Kalam from ISRO to head the Defence Research and Development Laboratories (DRDL) at Hyderabad, to take forward a nascent missile development programme. This was an exciting prospect for Kalam, for he now had a whole programme of five missiles to implement as Chief Executive Officer of an Integrated Guided Missile Development project, which included *Prithvi*, *Akash*, *Trishul*, *Nag* and *Agni*.

With *Prithvi* entering production the missile programme was gradually maturing, and Kalam became ‘the Missile Man’ to the media. In 1992 Kalam was appointed Scientific Adviser to the Defence Minister and Director General of DRDO.

Kalam’s ‘India 2020’ project was done through the Technology Information Forecasting and Assessment Council (TIFAC), of which Kalam was the Chairman. Specific projects were formulated in 17 areas, and 25 reports were prepared by the Group. A summary of all this work appeared in the very readable book *India 2020: A Vision for the New Millennium*, written by Kalam along with Y. S. Rajan. He realized that such a national mission needs a change in the general mindset, and that can only happen with a new generation. It was therefore extremely important that young people today must be given the confidence to think that they *can* build a better future for themselves and their nation. Kalam was a phenomenally successful communicator, and spoke with equal ease to young and old, to rich and poor, to the weak and the powerful, to the illiterate and the scholarly, and to a peasant or a president. This Kalam charm was enhanced by an austere lifestyle, an enormous capacity for hard work and a strong commitment to use of technology for the benefit of man (e.g. using carbon fibre for polio calipers and designing and making inexpensive stents – he was a frugal innovator long before those words became popular). And there was his interest in the arts, in particular a fascination with the veena and Carnatic music, which gave his personality an almost universal appeal across the nation. And he had the classical Indic ability to condense a whole way of thinking or doing into some pithy sutra, sukta or maxim, even as he quoted from the *Thirukkural*, the *Gita*, the *Koran* and the *Bible*. Most leading scientists in India of the time – M. G. K. Menon, Vikram Sarabhai, Raja Ramanna and Satish Dhawan – often saw the spark in Kalam right from the time he had only just graduated with a DMIT from Madras. His later record fully justified the confidence that these perceptive leaders had reposed in him from the very beginning, in part because of his natural ability to work with and inspire small or large teams. The vast majority of the people of India, from every walk of life, have been mesmerized by the tangible achievements, charisma, simplicity, humanity and dedication that characterized Kalam, and they went on to shower their affection, love and respect on him, irrespective of caste, religion, gender or political

persuasion. His autobiography *Wings of Fire* (1999) became an inspiring national classic. He was honoured widely and received the *Bharat Ratna* in 1997 when he was still Scientific Adviser to the Defence Minister. He won the von Karman Wings Award of the Aerospace History Society in 2009 at the California Institute of Technology. The citation called him ‘an international leader and humanitarian who is honoured and admired by the next generation’. (Characteristically, the cash award he received at the time was donated by Kalam to Caltech, for a Kalam Prize to be awarded every year to the best student in the Master’s course.) He also won the Von Braun Award for excellence in management and leadership of space projects from the (US) National Space Society. In summary, he was an outstanding technological manager and leader, but he was also much more than that: a sensitive human being with a big and soft heart, a karma yogi with a desi genius for understanding his countrymen, a great Indian citizen and a true patriot – all in one.

* * * * *



Sethunathasarma Krishnaswami
(elected 1986)

S. Krishnaswami passed away on 20 July 2015. He was born on 21 May 1945 in Thiruvananthapuram. Swami, as he was popularly known, completed his BSc (chemistry) in 1963 from University College, Kerala University, Thiruvananthapuram. After attending the Atomic Energy Training School at BARC, Mumbai, Swami joined the Geophysics group of the Tata Institute of Fundamental Research (TIFR), Mumbai, in 1964 and worked as a Research Associate until 1972. He obtained his PhD from Bombay University in 1974. He later moved

to Physical Research Laboratory (PRL), Ahmedabad, in 1973 and served in various capacities. Swami was also a Visiting Scientist (1971–72) at the Scripps Institute of Oceanography, La Jolla, California, USA, and at the Department of Geology and Geophysics (1976–77, 1986–87), Yale University, USA. From 1987 to 1993, he served as a Dean at PRL and later as Acting Director (2004–05). After his superannuation in May 2005, Swami continued his research work at PRL as INSA Senior Scientist and Honorary Scientist. Swami's research work primarily focused on the application of environmental radioactive and radiogenic isotopes to study the surface processes on Earth. His initial research work at Scripps Institution of Oceanography was a benchmark study in the application of ^{210}Pb – ^{226}Ra radioactive disequilibrium to infer that particle-associated scavenging process is ubiquitous in the deep sea. His postdoctoral research with K.K. Turekian (Yale University) and subsequent visits to Yale led to new results on the application of U–Th series nuclides for investigating various processes in aquatic systems. The use of uranium decay series nuclides in the study of Mt. St. Helens eruption in May 1980, and waters of hydrothermal vents and groundwaters of Connecticut, set a new measure of the utility of these nuclides in solving problems other than those usually associated with dating of events. Swami's subsequent sustained contributions in isotope geochemistry provided new approaches in making use of environmental radioactive and radiogenic tracers to understand and quantify various natural processes, such as sedimentation and particle mixing in lakes and coastal waters; growth history of marine and freshwater ferromanganese deposits; particle dynamics and solute–particle interactions; transport of pollutants in sea water and subsurface aquifers and chemical weathering processes and erosion in the Himalaya and Deccan traps and their influence on global change. During the days when no radiometric method was available to date sediments deposited over the past one century, Swami had suggested and demonstrated the use of ^{210}Pb ($t_{1/2} = 22.3$ years) as a tracer to establish the chronology of lake and near-coastal sediments. In later years, realizing the effect of sedimentation and particle mixing that occur in coastal waters, he made use of cosmogenic ^7Be and bomb-produced $^{239,240}\text{Pu}$ along with ^{210}Pb to decouple the two effects and assign ages to various layers in the sediment column. Swami also documented that subsurface aqueous systems are best suited to study the reactivity of several important

radioisotopes of U–Th decay series, and along with his students, made detailed measurements of ^{238}U – ^{234}Th , ^{226}Ra – ^{222}Rn – ^{214}Pb – ^{210}Pb and ^{228}Ra – ^{224}Ra in groundwaters. These measurements showed that isotopes of Th, Ra and Pb are extremely reactive in subsurface aquifer environment and that nuclide removal onto particle surfaces is a reversible process and their rate constants for adsorption/desorption can be determined from the distribution of daughter–parent isotope pair. Swami's research group achieved a major breakthrough by developing special filter matrix for collection of small quantities of suspended matter from surface and deep waters to understand the role of particles in controlling the distribution of radionuclides and trace elements in the ocean. It was shown that the concentration of radionuclides ^{210}Pb and ^{230}Th increases with depth on particles, which enables the estimation of particle settling rates (meters/day) through the sea-water column. Radioisotopes of varying half-lives (^{210}Pb , ^{231}Pa and ^{230}Th) were also measured at several cross-sections in manganese nodules whose orientations were known on the seafloor. This study confirmed the slow growth rates of the nodules and showed that manganese nodules grow at different rates on the bottom side facing the sediments and on the top side exposed to sea water.

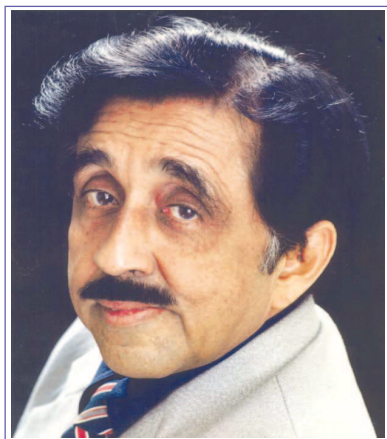
In later years, Swami was engaged in studies on chemical weathering processes in the Himalayas and the impact of Himalayan orogeny on the geochemical cycles of selected elements and isotopes in the ocean. His research work has shown that the Ganga and Brahmaputra rivers have considerably influenced the evolution of strontium isotopes and uranium concentration in the ocean since the Cenozoic era.

Post-superannuation, his main passion remained in discussing science with faculty members of the Geosciences Division at PRL and interacting with several graduate students of his own students. He had pioneered in several applications of radiogenic and cosmogenic radioisotopes. He published more than 100 research papers in peer-reviewed journals, contributed reviews in books/encyclopaedia, edited special volumes of journals and also a book on *U–Th Series Nuclides in Aquatic Systems* (Elsevier).

Swami was a Fellow of the Geological Society of India, Indian Academy of Sciences, Indian National Science Academy, The National Academy of Sciences, India,

The World Academy of Sciences, American Geophysical Union and Geochemical Society and European Association of Geochemistry. He was a recipient of the INSA Young Scientist Award (1975); Krishnan Medal (1981) and S.S. Bhatnagar Prize (1984). Swami was an Associate Editor of *Geochimica et Cosmochimica Acta*, and a Member of the Editorial Board of the *Journal of Earth Science*. He served as the Vice President of IAPSO (International Association for the Physical Sciences of the Oceans); Vice President of International SCOR (Scientific Committee on Oceanic Research); and Executive Member and Treasurer of IGBP (International Geosphere Biosphere Programme of ICSU). He was also INSA Council Member during 2002–04. He served as Chairman and Member of several National Committees of DST, CSIR and Ministry of Earth Sciences, Government of India. Swami is survived by his wife, daughter, son and their spouses.

* * * * *



Ravi Martanda Varma
(elected 1970)

Ravi Martanda Varma, who passed away in Bangalore on 10 March 2015, was one of the handful of pioneers who developed the speciality of neurosurgery in India. He was born on 7 September 1922 in Mavelikara. He was the great grandson of Raja Ravi Varma, who had married from the royal family in Mavelikara, known for its traditions in scholarship, literature and music. Varma was taken as a child by his parents to Thiruvananthapuram, where his aunt was the Queen Regent of Travancore. He had his early education in the SMV School and 'Inter-Science' in the University College, a prestigious institution in Travancore. He graduated in medicine from the Madras Medical College

in 1947 and was drawn to surgery even while serving as a house officer. This was no surprise because surgery attracts individuals whose interest in medicine is humanitarian rather than scientific and who love one's fellow beings. The fascination grew as he sensed the excitement of the operating room and toiled in the wards of the General Hospital, Chennai, because Varma was at heart a craftsman who loved using his hands and an artist whose mind worked on visual images. He moved to UK for surgical training which began in general surgery and culminated in the highly sought-after speciality of neurosurgery. Over a nine-year stay, Varma served in several hospitals in the UK but the Frenchay Hospital in Bristol was the pre-eminent centre which provided him intensive training in neurosurgery and the confidence to set up a centre on his own initiative. As a senior registrar at the Frenchay, he was responsible for running a large neurosurgical service including emergencies and supervising the training of younger surgeons under the guidance of a Senior Consultant. He became a Fellow of the Royal College of Surgeons of Edinburgh, and was ready and bursting with enthusiasm to set out on his own in India when an unexpected offer came from the All India Institute for Mental Health (AIIMH) in Bangalore of a Readership in Neurosurgery, which came with the implicit understanding that he would also build up the Department. Varma accepted the offer enthusiastically and looked on it as an opportunity to return to India where neurosurgery was in a state of infancy with no more than three or four centres devoted to the speciality exclusively. Varma's effort in the AIIMH soon blossomed into another noted centre for neurosurgery thanks to his technical panache, relentless effort and his natural goodness which made colleagues at all levels join hands with him. Even as the surgical and teaching activities grew and expanded, Varma became Professor and Head of Neurosurgery at AIIMH, a position he held for eight years. This was a surgical phase marked by innovation when he devised a topometer-guide scaled technique of percutaneous chemothalamotomy for relieving the tremor and rigidity in patients with Parkinson's disease. The technique was simple, safe and cheap, sans imported equipment and hospitalization. Varma's tenure at AIIMH climaxed in 1974 when his prolonged effort to amalgamate the Institute and the State Mental Hospital into a single institution succeeded despite much scepticism, and the National Institute of Mental Health and Neuro Sciences (NIMHANS) was born with Varma as the Director. While sceptics questioned the scientific basis of joining a Central Institute focussed on teaching and research in neurosciences with a state mental hospital, Varma's philosophic mind rebelled against the duality of brain and mind and saw instead a single

reality expressing in two interacting modes of existence. The pursuit of neuroscience and treatment of the mentally ill, according to him, were a vivid demonstration of complementarity. He rejoiced when NIMHANS grew in stature and became an institution of national importance in later years. He served briefly as the Deputy Director General of Health Services in Delhi prior to his retirement. Distinctions such as the Padma Shri, Fellowship of the Indian Academy of Sciences, Karnataka Rajyotsava Award, Visvesvaraya Award and Honorary Doctorate from Mysore University sat lightly on him. Varma was admired as a surgeon, institution builder, administrator, innovator, and patriarch of his family in Mavelikara. He was all this, yet he was more. He had a genius for friendship and for reaching out to the goodness in everyone, friends and strangers alike. No one saw him in a temper, and no harsh words ever escaped from his lips even under provocation.

He is survived by his wife Malathi and two sons, Ravigopal and Sashigopal. Ravi is a neurosurgeon.

* * * * *



Somenahalli Venkatesarao Subramanyam
(elected 1991)

Somenahalli Venkatesarao Subramanyam, a champion crusader for improving science education in schools and colleges in remote parts of Karnataka, passed away peacefully on 1 August 2015. He was born on 3 September 1943 in Somenahalli village, Kolar District, Karnataka. His early education was in Kolar and Bengaluru, where he received the gold medal of the Mysore University in his MSc programme. He was immediately appointed lecturer of physics in National College, Bengaluru, nurtured by H. Narasimhaiah, a Gandhian in principle and practice. A year later in 1965, Subramanyam joined the Department of Physics, Indian

Institute of Science (IISc), Bengaluru, for his PhD. He obtained his PhD in 1969 for his work on binary liquids, largely the hydrodynamic aspects in relation to emulsion formation. He was appointed a lecturer in the Department in 1970 to take part in the teaching activities associated with the new MTech programme. In 1972, he went to the Clarendon Laboratory, University of Oxford, UK, under a Commonwealth Academic Staff Fellowship for a year. He was promoted as Assistant Professor in 1976, Associate Professor in 1981 and to full Professor in 1986. He retired from IISc in July 2004. Gaining experience in liquid-helium-level low-temperature physics in the University of Oxford, Subramanyam started work on applying low-temperature measurements to the newly emerging class of materials, namely quasi-one-dimensional electrical conductors and electrically conducting polymers. Along with his students, he synthesized not only the TTF-TCNQ class of materials, but also a range of new organic crystals and doped polymers. In addition to measurements at low temperatures, he also applied high-pressure techniques using tungsten-carbide Bridgman anvils to reach 80,000 atmosphere pressure. This combination of two hard experimental techniques resulted in a number of outstanding publications. In those days of limited research funding, the apparatus was fabricated locally in the departmental workshop. Ready-made professional pieces of equipment were not available even internationally at that time in these areas of work. So this ability to prepare the materials, to make measurements (all with locally fabricated pieces of equipment) and to interpret the results in the light of the contemporary theoretical and experimental knowledge put him in a leading position. The same combination of skills was used in later studies on nonlinear behaviour, electrical switching phenomena, carbon materials, superconductors and super-hard materials. Twenty-two students got their PhD under his guidance. He authored over 100 scientific papers in various journals, and edited two books – one on high-pressure studies and the other on superconductors. Quite early in his career, Subramanyam felt that it was his duty to improve science teaching in schools and colleges, especially in the remote areas which did not have the advantage of access to the better institutions situated in urban areas. The University Grants Commission (UGC) had approved a small programme of UGC Extension Lectures in the early 1970s. Armed with a small portable domestic 35 mm slide projector, a cane as a pointer and white *dhoties* as screens, visits were regularly made to many schools in remote areas, most of the time by bus and, for the last leg of the journey, by cycle and horse-drawn carriage. In all, Subramanyam had given about a 1000 lectures in various

schools and colleges. In addition to students, teachers were also trained. The IISc team witnessed enthusiastic response and had to be diversified into physics, chemistry, biology and mathematics streams. Subramanyam wrote a dozen books for the students in Karnataka schools and also took part in the editorial work of the NCERT textbooks. He also authored a few popular science books in Kannada.

He served as the Chairman of the Cryogenics Facility, and Chairman of the Division of Physical Sciences besides his position in the Department of Physics. He worked with great dedication in the Materials Research Society of India in various capacities, being a regular participant in the annual meetings. Not surprisingly, Subramanyam was recognized in selected circles and awarded many distinctions. He held the IISc-MSIL chair for three years. In 1991, he was elected Fellow of the Indian Academy of Sciences. He was awarded the Gold Medal of the MRSI and honoured by the Karnataka State Council for Science and Technology. He was a member of many professional societies. He wished that institutions would give roughly equal importance to teaching, research and industrial activities. A little after superannuation from IISc, Subramanyam had a fall, which put an end to his travel across Karnataka for interacting with school children.

He is survived by his wife, a son, two daughters and grandchildren.

* * * * *



Kamal Nath Sharma
(elected 1972)

Kamal Nath Sharma, a renowned and internationally acclaimed physiologist of our country, passed away in Bengaluru on 21 June 2015. He was an icon in the field of Neurophysiology who had rendered more than

five decades of yeoman service to Indian science and technology through his outstanding and pathbreaking research and innovation. Sharma was born in Mussorie on 17 November 1929. After completing his MBBS and MD from the University of Lucknow, he became a faculty in the same university followed by stints at the All India Institute of Medical Sciences in Delhi and later the University College of Medical Sciences in Delhi. In 1962 he joined the University of Illinois as Professor of Physiology and Psychology (1962–64). Returning to India in 1964 he joined St John's Medical College in Bangalore as professor (1964–76) and Chairman of the Department of Physiology. In 1976 he rejoined the University College of Medical Sciences in Delhi and became its Principal in 1980, and Director of Centre for Brain Research and Human Development at the University in 1988. When Sharma moved to Delhi, where he built a great institution, viz. GTB Hospital, located on the campus of the University College of Medical Sciences at Sahadra, he brought in new academic and research programmes. He was a Visiting Consultant to the US Army Food Science Laboratory on three different occasions in 1967, 1970 and 1972 and the Chief coordinator of the Indo-USSR Plan of Cooperation in Neurophysiology in 1986. Sharma's original contributions have been in the field of neurophysiology, behaviour and nutrition and neural control systems in ingestive behaviour, ecology of hunger and other sensory systems, particularly nociception, olfaction and gustation. He undertook studies on the neurophysiology aspects of electroacupuncture and neuronal circuitry in cutaneous, muscular, joint and visceral pain. Nociception in stratified population samples of differing socio-economic and cultural background and ethnic groups was studied to see the relevance of animal models with human situations. These studies opened a new chapter in our understanding of the physiology of visceral functions with far-reaching implications. By applying systems analysis, he showed that nutrition dynamics – state of hunger, malnutrition and surfeit conditions – modulate differentially the alimentary signalization, possibly accounting for the variety of responses in different individuals. This has direct relevance to taste preferences, food acceptance and rejection and dietetic habits. He has published more than 180 original scientific papers in Indian and international journals and his work is extensively quoted in text books, monographs, etc. With Sushil Dua-Sharma, his wife, he published a research account of the stereotaxic atlas of the dog's brain. This was published by MIT

Press. He also contributed a chapter on alimentary receptors in the *Handbook of Physiology* series published by the American Physiological Society. He also contributed two other monographs in the area of alimentary receptor mechanisms. He received various honours and awards. He was elected Fellow of the Indian Academy of Sciences (1972), the Indian National Science Academy (1978) and the National Academy of Medical Sciences. He received the ICMR Award (1962), the Amrut Mody National Research Award (1975), the USSR Academy of Medical Science Anokhin Medal (1988) and the USSR Academy of Science Sechenov

Medal (1990). He served as President of the Biomedical Engineering Society of India (1976–1979) and the Indian Society for Pain Research and Therapy (1985–90). He was India's representative at the International Union of Physiological Sciences and a member of the Scientific Advisory Committee of the Defence Institute of Physiology and Allied Sciences, Government of India, the Biomedical Engineering Division at IIT Delhi, the Council of Scientific & Industrial Research and the Indian Council of Medical Research.

He is survived by his wife Sushil Dua-Sharma.

* * * * *

SCIENCE MINISTER'S VISIT TO THE ACADEMY



Dr Harsh Vardhan, Hon'ble Union Minister for Science & Technology and Earth Sciences, made a brief visit to the Academy on 21 August 2015 and interacted with the Office Bearers of the Academy.

Prof Dipankar Chatterji, President of the Academy, welcomed the Minister and gave a presentation of the Academy's programmes and activities.

Commending the work of the Academy, the Minister said that science should be made a 'People's Movement' and that the Academy should function as a facilitator in involving the scientific community in this endeavour. He also suggested that the Academy bring out publications of great inspiring leaders. He welcomed the suggestion that the Science Academies should be involved in planning science policies for the future of India.

SUPERANNUATED ACADEMY STAFF



C. Vedamurthy

Vedamurthy, who joined the Academy on 20 August 1983, superannuated on 30 June 2015 after completing 32 years of service in the Academy. He served in the Administration and Accounts Department of the Academy.



Peter Jairaj

Peter Jairaj, who joined the Academy on 1 December 1980, superannuated on 31 July 2015, after completing 34 years of service in the Academy. He served in the Accounts Department and the Circulation Department of the Academy.

* * * * *