The 80th Annual Meeting of the Indian Academy of Sciences was held in Chennai. The meeting was attended by over 200 Fellows and Associates of the Academy, as well as teachers from several colleges. Thirty scientific presentations were made, which included two symposia and two special lectures by the Fellows and Associates of the Academy. Public lectures of general interest were held.

The meeting began with the Inauguration and Presidential address, titled ‘Inhibition of bacterial transcription: action of antibiotics’, delivered by Dipankar Chatterji (IISc, Bengaluru). He emphasized the dangers humanity will encounter as microbes become increasingly resistant to antibiotics. While this is currently a global problem, it is more serious in India, where antibiotics are dispensed without a registered medical practitioner’s prescription over-the-counter and most people do not complete the course. Due to an antibiotic, the infection drops and asymptotically approaches zero, implying that some bacteria can survive
Forthcoming Events

Twenty-sixth Mid-Year Meeting, Bengaluru 3 – 4 July 2015

Refresher Courses

- Experimental Physics – 69
  Indian Academy of Sciences, Jalahalli, Bengaluru 14 – 29 April 2015
- Thin Films and Nanoscience
  Tripura University, Suryamaninagar 04 – 18 May 2015
- Experimental Physics – 71
  NIT Mizoram, Aizawl 07 – 22 May 2015
- Quantum Mechanics
  Loyola College, Chennai 11 – 23 May 2015
- Experimental Physics – 70
  Goa University, Goa 13 – 28 May 2015
- Refresher Course in Mathematics
  Shri Mata Vaishno Devi University, Katra 01 – 14 June 2015
- Materials Preparation and Measurement of Properties – 75
  Indian Academy of Sciences, Jalahalli, Bengaluru 09 – 24 June 2015
- Experimental Physics – 72
  Panjab University, Chandigarh 16 June – 01 July 2015
and acquire resistance to the drug. Antibiotic resistance has been found to develop within 5–10 years and newer drugs will have to be developed. To come up with more effective antibiotics, it is essential to understand the action of drugs and the mechanisms by which bacteria develop resistance. Resistance is acquired mainly by mutations, whereby the RNA polymerase of the bacteria gets modified and leads to reduced affinity of the drug; biofilms, whereby microbes form a layer that cannot be penetrated by drugs; and defending RNA polymerase through protein–protein interactions.

Chatterji cautioned that we are imbibing antibiotics through foods as well, especially meat. This he said is a ticking time bomb, as it will only inhibit the bacteria and not kill them, consequently rendering them more resistant to the drug. He advised against indiscriminate use of antibiotics and non-completion of the course. Work in his laboratory aims to identify these mutations and develop drugs that can overcome these barriers.

To commemorate the International Year of Crystallography (2014), a symposium on ‘X-ray crystallography’ was held. This year marks the centenary of the beginning of modern X-ray crystallography and its identification as the most powerful tool for structure determination of matter. Max von Laue in 1914, and W. H. Bragg and W. L. Bragg in 1915, were awarded Nobel Prizes in Physics for their pioneering work in this field. The following four talks were part of this symposium.

**T. N. Guru Row** (IISc, Bengaluru) began the symposium by presenting a stamp released earlier by the Indian Postal Department to commemorate the International Year of Crystallography, to the President and the Academy. In his talk titled ‘The nature of a chemical bond involving elements in group 14–17 from experimental charge density studies’, he discussed some of the recent advances by his group to study weak intermolecular interactions.

**Dhananjai Pandey** (IIT (BHU), Varanasi), in his talk ‘Complementary role of X-ray, neutron and electron diffraction in materials research’, emphasized the complementary roles of X-ray, neutron and electron diffraction techniques. He gave an overview of the historical and conceptual milestones in crystallography before elaborating on his group’s work on two functional materials: PZTs and multiferroics.

**Shekhar C. Mande** (NCCS, Pune) gave an informative talk on ‘Early Indian contributions to crystallography’. He highlighted the Indian contribution to this field, especially those of Bhagavantham, Kedarweshwar Banerjee and G. N. Ramachandran. Towards the end of his talk, Mande emphasized the need for a synchrotron in India.

**T. P. Singh** (AIIMS, New Delhi) concluded the symposium with his talk on ‘Structural basis for therapeutic applications of innate immunity proteins as protein antibiotics’. The proteins of the innate immune system provide the first line of defence against infecting microbes. These proteins recognize the conserved motifs that are present on the cell walls of microorganisms but absent on human cells. His group has carried out extensive binding studies and determined the structures of several complexes of these proteins.

The next symposium was on the India-based Neutrino Observatory (INO) being built in Theni, Madurai, which is a state-of-the-art, inter-institutional neutrino detector facility expected to begin soon. In order to garner attention and support of the Indian scientific community towards this grand project, this symposium was organized.

**Amol Dighe** (TIFR, Mumbai) introduced the audience to the intriguing world of neutrinos. He described the sources (solar, atmosphere and cosmic), types ($\nu_e$, $\nu_\mu$, $\nu_\tau$) and their strange property of weak interaction, emphasizing why their detection is difficult. He also mentioned the current open questions in the field such as the mass hierarchy problem, CP violation, etc., and spoke of finding solutions with the new INO for many of the puzzles.

In continuation of Dighe’s talk, **Vivek Datar** (BARC, Mumbai) expounded on the current status and future prospects of neutrino mass measurement.

**D. Indumathi** (IMSc, Chennai) spoke of the global status of neutrino oscillations and the role of INO in understanding them. She mentioned that the INO is being built to mainly detect the atmospheric neutrinos. Also, the ICAL detector designed for the INO will allow us to resolve the mass hierarchy problem and make sensitive CP phase measurements.

**N. K. Mondal** (TIFR, Mumbai) presented an extensive report on the development and current status of INO. He mentioned that 2015 marks 50 years of the first Indian attempt to detect neutrinos in the Kolar Gold Fields. He described the salient features of the INO facility: a huge underground tunnel with a 50 k tonne magnetized iron calorimeter (ICAL detector) and a dark matter laboratory unit. These detectors,
he mentioned, are highly sensitive for CP phase measurement and can be used to solve the mass hierarchy problem as well. ICHEP is coming up at Madurai and students are already being trained for the same. He urged the timely implementation of this project, as any further delay will only make us fall behind in the world competition.

Each day began with a special lecture. The first one was by **R. L. Karandikar** (CMI, Chennai) on ‘Power and limitations of opinion polls’. How can obtaining opinion of, say, 20,000 voters be sufficient to predict the outcome of an election in a country with over 71 crore voters? Do the opinion polls conducted, say, a month before the elections accurately predict what will happen on voting day? Using simple examples, Karandikar showed that accuracy is determined by sample size and does not depend upon population size: by choosing a large random sample, one can ensure that in most samples (99%), the winner in the sample is also the winner in the constituency. Failure to select a random sample can lead to wrong conclusions, he said. Any prediction based on pre-election polls does not have predictive power as far as final results are concerned because of volatility of opinion and unreliability of responses. Exit polls were devised to correct both these effects, he added. He elaborated on the methods used by his group (multi-stage systematic sampling based on various socio-economic parameters that match profiles obtained from the census data at the state level) and highlighted their track record.

The second special lecture was delivered by **Ashok Jhunjhunwala** (IIT-M, Chennai) on how decentralized 24x7 solar power supply to India can mitigate power-cut problems. All over the country, AC power is being supplied to houses, while most electronic appliances run on DC. So, conventionally every appliance is fitted with an AC/DC convertor, which leads to power loss. A novel approach of additionally supplying parallel uninterrupted DC to houses from solar panels installed on home rooftops can reduce the demand-supply gap. Jhunjhunwala’s team has succeeded in providing decentralized solar-powered systems to his laboratory and to an entire village near Chennai. He urged that we take the first innovative steps to develop such green power and hence set an example to the world. He also added that the use of indigenous electric cars will eventually become inexpensive in future.

The first public lecture was delivered by **Gopalkrishna Gandhi**, former Governor of West Bengal. India is a land of diverse cultures, tribes and traditions and it is almost impossible to find one unifying answer to ‘Who owns India?’ he said. Gandhi categorized India as North, South, East and West based on the population count. With apt examples he voiced the dominance of North Indians over the South in almost all fields. He mentioned that, however, the North, very much like Hindustani music, has brought the gifts and taxes of emotion, impulse and feeling to the Indian political imagination, while the South, more like Carnatic music, has brought the boons of
analysis, reason and cogitation. ‘Who owns India’, he said, is ‘not a rhetorical question, but a self-inquiry by the people about themselves in times when blind acceptance is obscuring thought’. He further emphasized that ownership is not of land or people or culture, but is of thought, the software of human lives. He concluded that ideologies based on cultural antiquity, moral infallibility and political superiority make India self-obsessed, self-advertising and self-certifying. So, such ideologies must not be allowed to root in the broad-minded, deep and assimilative India (for more details, see Gandhi, G., *Curr. Sci.*, 2014, 107(11), 1775–1776).

The second public lecture was by **D. Subbarao**, former Governor, RBI, on ‘India – mega trends’. Much of our worldview is shaped by our daily experiences and exposure to mass and social media. One needs to step back from daily experiences and discern the mega trends in order to understand the big, albeit gradual, changes that are going to transform our collective and individual futures. In an information-packed lecture, Subbarao spoke of five mega trends, the evidence for these trends, how they came about and their implications, as well as their challenges.

The first mega trend is the shift in terms of trade towards the rural economy, as evidenced in prices that have shifted in favour of the rural economy, implying improved lifestyles of the rural sector.

The second mega trend he mentioned was contrarian demographic dynamics. India’s increasing demography will now start paying dividends as we will provide labour for the rest of the world. But this can happen only if we create jobs, which leads us to the third mega trend – a manufacturing revolution. The only way of creating employment opportunities is through manufacturing with high productivity. There are many challenges to engineering a manufacturing revolution: skill shortage, government labour policies, lack of infrastructure and insufficient exports.

The fourth mega trend is decentralization, which has kept India together, where states improve by sharing resources. In the future there may be protests regarding this as richer states may not like poorer ones piggybacking on them.

The fifth mega trend is globalization. Subbarao mentioned that globalization comes with costs and benefits. The benefit is that we integrate with the world. The cost is when we are adversely affected by the global financial crisis. We must maximize the benefits and minimize costs, he added.

The lectures of Fellows/Associates of the Academy were as follows:

**Balaji R. Jagirdar** (IISc, Bengaluru) spoke on ‘Activation of unreactive chemical bonds in small molecules’. Many small alkane molecules are unreactive due to strong sigma bonds. In order to induce reactivity, these strong sigma bonds must be activated. Towards achieving this challenging goal, he described his group’s work on the heterolytic activation of these strong yet inert sigma bonds, their binding to transition metal centres, their subsequent activation pathways and unusual reactivity patterns relevant to activation and functionalization.

**K. V. Adarsh** (IISER, Bhopal), in a talk titled ‘Ultrafast light-induced effects in amorphous chalcogenide thin films’, described his group’s studies on chalcogenide glasses, an important class of amorphous semiconductors that exhibit remarkable photo-induced changes. He also proposed a new method to synthesize gold nanoparticles on the surface of amorphous chalcogenides and demonstrated ultrafast all-optical switching.

**C. V. Ramana** (NCL, Pune) spoke about ‘Inspirations from natural products: new catalytic methods by metal complexes’. His group focuses on the development of transition metal-catalysed reactions and their application to the total synthesis of natural products of biological relevance.

The human body is homochiral, while many drugs are chiral. Both enantiomers of the drug must be tested as one could be toxic. Obtaining a single enantiomer in pure form is therefore necessary. For this, chirality must be introduced into a reaction, preferably through catalysts. In his lecture titled ‘Controlling stereochemistry at the quaternary center through olefin functionalization and desymmetrization’. 
Santanu Mukherjee (IISc, Bengaluru) described his work on electrophilic halogen-induced heterodifunctionalization of unactivated olefins and desymmetrization of prochiral compounds. With the help of bifunctional catalysts, his team could set stereochemistry at quaternary stereogenic centres with high selectivity.

Visceral leishmaniasis, popularly known as kala-azar, is a fatal disease if left undiagnosed and untreated. Nahid Ali (IICB, Kolkata) explained her work on developing easy diagnostic tools for kala-azar and also suggested novel strategies to combat the disease.

In the talk ‘Cold-loving microbes: biodiversity, genes and genomes’, S. Shivaji (L. V. Prasad Eye Institute, Hyderabad) spoke of his team’s discovery of 74 new species of bacteria living in extreme cold habitats of the Antarctic, Arctic, Himalaya and stratosphere. He also mentioned that they had successfully identified and extracted the gene that allows these bacteria to live in extreme cold conditions.

B. Gopal (IISc, Bengaluru), in his talk ‘Studies on sigma factor/antisigma complexes reveal a molecular rationale for Mycobacterium tuberculosis persistence’, mentioned that M. tuberculosis σ factors are regulated by transcriptional, translational and post-translational mechanisms. Studying these regulatory mechanisms is important to understand the expression profile, the latent phase and persistors in M. tuberculosis. Information on the conditional expression profile of M. tuberculosis could substantially influence TB diagnosis and therapy. Structural studies on σ/anti-σ complexes provide a basis to rationalize these observations.

The number of people suffering from diabetes has been rising over the years. There is desperate need to quell the spread of this disorder. Nikhil Tandon (AIIMS, New Delhi) researches the possible reasons behind this sudden surge and mines patient data for patterns and clues. In his talk on ‘Epidemiology of non-communicable diseases in India – across the life course’, he mentioned that four decades of data have revealed unexpected results, such as low-BMI (body mass index) infants are likely to gain fat mass at a later stage and are prone to diabetes, while high-BMI infants are likely to pick up lean mass and grow to be healthy individuals. Studies have also revealed that a good lifestyle in early life can do wonders later in life.

Thomas Pucadyil (IISER, Pune) spoke on ‘Membrane fission: analyses using novel assay systems’. Membrane compartments within a cell are constantly changing in shape and composition. Nuclear hydrolysis is said to be the energy provider for membrane compartment creation and consumption. There are various mechanisms to understand the process that is taking place in nonequilibrium conditions within the cell. He spoke about the insights his group had gained from monitoring the dynamics of the dynamin-catalysed membrane fission reaction, which is an extreme membrane remodelling event.

Membrane proteins are vital constituents of the proteome of an organism, and are critical for cell recognition, signaling and homeostasis. Outer membrane proteins of mitochondria and bacteria possess the unique commonality of displaying β-barrel structures. It is therefore of interest to address similarities and differences in the folding pathways of these barrels. R. Mahalakshmi (IISER, Bhopal) spoke on ‘Membrane protein folding and stability: Underlying similarities in bacteria and humans’. The findings of her group indicate the key contributions of barrel–micelle interactions and interface aromatics to the scaffold stability of this family of proteins.

The ubiquitin pathway has been implicated in the pathogenesis of several diseases and genetic disorders. M. Subba Reddy (CDFD, Hyderabad) spoke about his work on several new functions mediated by canonical and non-canonical ubiquitination in his talk titled ‘Canonical versus non-canonical ubiquitination: control of protein fate’.

Abha Misra (IISc, Bengaluru) introduced the nonlinear behaviour of carbon nanotube arrays in her talk ‘Carbon nanomaterials and engineering applications’. Many properties of these arrays have promising applications in the electronics industries, she said.

While the observations of the Cosmic Microwave Background are largely consistent with the Standard Model of cosmology, there are certain observations that need theories beyond the Standard Model; for instance, the primordial power spectrum which shows deficit of power. Tarun Souradeep (IUCAA, Pune) shared the results of a decade-long research that has led his group to develop new formalisms and methods to probe the fundamental assumptions of cosmology.
There are many unanswered questions related to the formation and evolution of galaxies. Looking deep into space reveals the formation of early galaxies. Annapurni Subramaniam (IIA, Bengaluru) emphasized the importance of studying Megallanic cloud interactions, star formation in Megallanic clouds and their implications in understanding many aspects related to galaxy formation. She also spoke of upcoming major projects in astronomy.

Colloidal inorganic nanocrystals are generally capped with organic ligands which are typically insulting in nature and thus not suitable for integration in electronic and opto-electronic devices. Angshuman Nag (IISER, Pune) introduced his group’s work on colloidal semiconductor nanocrystals with magneto- and opto-electronic properties, a novel approach to achieve organic-free colloidal nanocrystals that are electronically coupled to each other.

Infections by pathogens carrying the New Delhi Metallo \( \beta \)-lactamase (NDM-1) are a major concern for public healthcare today, especially in the Indian subcontinent, as these pathogens show resistance to all the beta-lactam antibiotics. Molecular mechanism and kinetics of antibiotic resistance by \( \beta \)-lactamases are vital for the development of novel antibiotics and \( \beta \)-lactamase inhibitors. Nisanth N. Nair (IIT, Kanpur), in his talk titled ‘Supercomputers against superbugs’, discussed the results and details of computer simulations that unravelled the molecular mechanism and kinetics based on free energy surfaces. The findings of his group agree well with those from X-ray crystallography.

Many problems that arise in the real world (such as facility location, routing, scheduling, etc.) are difficult to solve because they would require enormous computational resources to find exact solutions. Naveen Garg (IIT, New Delhi), in his talk titled ‘Approximation algorithms for hard optimization problems’, discussed algorithms that are quick to compute solutions that are close to the optimum.

Pradeep P. Mujumdar (IISc, Bengaluru) delivered a talk on ‘hydrologic impacts of climate change and quantification of uncertainties’. He explained how several global models of hydrology need to be downscaled in order to be able to predict the impacts of climate change. Specifically, he described the results on the Mahanadi streamflow and the urban floods in Bengaluru.

C. Vineeth (VSSC, Thiruvananthapuram) delivered a talk on the importance of optical remote sensing of the terrestrial upper atmosphere based on airglow radiation. These optical emissions from different regions of the upper atmosphere are perfect tracers of many physical, chemical and dynamical processes prevailing therein.

K. Manjunath (IISc, Bengaluru) began his talk titled ‘Collisions between random walks’ with the simple question Polya had raised on random walks: if there are two random walkers, what is the probability that they will meet? He derived counter-intuitive results for questions related to the collisions between random walkers in lattices of more than two dimensions. Although the results are purely mathematical, they can have deep implications for various areas of science, he said.

Eknath Ghate (TIFR, Mumbai) spoke on ‘Number theory via representation theory’, in which he introduced the Galois group and its representations. He mentioned how some of Ramanujan’s famous congruences can be explained using Galois representations. He also connected the number theoretic problem of understanding the reductions of local modular Galois representations to a representation theoretic problem using the local Langlands correspondence.
TWENTY-SIXTH MID-YEAR MEETING

3 – 4 JULY 2015

Tentative Programme

3 July 2015 (Friday)

0930 – 1010  Session 1A – Special Lecture
V Nagaraja, IISc, Bengaluru
Our strategies to counter resurgent tuberculosis

1010 – 1300  Session 1B – Lectures by Fellows/Associates
Tapas Chakraborty, IACS, Kolkata
Light-induced coupled proton-electron transfers in model chemical systems

Gautam Mandal, TIFR, Mumbai
Thermalization in integrable models and conformal field theories

V Mohan, Dr Mohan’s Diabetes Specialities Centre, Chennai
The time has come to marry genomics with clinical diabetes

U Kodandaramaiah, IISER, Thiruvananthapuram
Reading DNA to infer ancient flight

Giridhar Madras, IISc, Bengaluru
Ionic catalysts for syngas production

V V S S Sarma, NIO, Visakhapatnam
Biogeochemistry of Indian estuaries

1120 – 1400  Session 1C – Lectures by Fellows/Associates
Ravi A Rao, TIFR, Mumbai
The theory of Suslin matrices

U Mabalirajan, IGIB, Delhi
Airway epithelia: An overlooked borderline security force of lung

Avinash Khare, University of Delhi, Delhi
Gravitational equilibrium and the mass limit for dust clouds

1430 – 1720  Session 1D – Public Lecture
Madhav D Gadgil, Goa University, Goa
Sahyachala: A love story

4 July 2015 (Saturday)

0900 – 0940  Session 2A – Special Lecture
N Sathyamurthy, IISER, Mohali
Symmetry and pattern formation in flowers

B L V Prasad, NCL, Pune
New synthetic approaches for the preparation of metal nanoparticle dispersions and assemblies in different solvent media

Rajan Jha, IIT, Bhubaneswar
Photonic crystal fiber modal interferometer based highly sensitive sensor

Parthanil Roy, ISI, Kolkata
Branching random walks with displacements coming from a power law

Syamal Roy, IICB, Kolkata
History of Leishmania research in India – then and now

1150 – 1210  M K Bera, IIT, Kharagpur
Revisiting the linkage between Himalayan orogenesis and climate change

1215 – 1235  R S Swathi, IISER, Thiruvananthapuram
Modelling the energetics of encapsulation of atoms and atomic clusters into carbon nanotubes: Insights from analytical approaches
ELECTIONS – 2015

Javed N. Agrewala
CSIR – Institute of Microbial Technology, Chandigarh
Area: Immunology, vaccine, drug discovery

A. C. Anil
CSIR – National Institute of Oceanography, Goa
Area: Biological oceanography, marine ecology, marine biology

Siva R. Athreya
Indian Statistical Institute, Bengaluru
Area: Probability theory

Arindam Banerjee
Indian Association for the Cultivation of Science, Kolkata
Area: Molecular assembly, soft materials and hybrid nanomaterials, bio-organic chemistry

Sharmila A. Bapat
National Centre for Cell Science, Pune
Area: Cancer stem cells, epithelial–mesenchymal transitions

Nita Bhandari
Society for Applied Studies, New Delhi
Area: Nutrition-infection interaction, child health, nutritional interventions, clinical evaluation of vaccine

Alok Bhattacharyya
Jawaharlal Nehru University, New Delhi
Area: Molecular parasitology, computational genomics

Gautam Bhattacharyya
Saha Institute of Nuclear Physics, Kolkata
Area: Particle physics phenomenology

Soumen Chakrabarti
Indian Institute of Technology, Mumbai
Area: Web search and mining, graph information retrieval

Tapas Chakraborty
Indian Association for the Cultivation of Science, Kolkata
Area: Vibrational and electronic spectroscopy, cold molecules and clusters, mass spectroscopy

A. Chockalingam
Indian Institute of Science, Bengaluru
Area: Wireless communications, wireless networking

Shantanu Chowdhury
CSIR – Institute of Genomics and Integrative Biology, Delhi
Area: Structural and molecular biology, genomics

Pallab Dasgupta
Indian Institute of Technology, Kharagpur
Area: Electronic design automation, artificial intelligence, formal methods

Debabrata Dash
Banaras Hindu University, Varanasi
Area: Cell biology, signal transduction, nanobiotechnology

Anuradha Dube
CSIR – Central Drug Research Institute, Lucknow
Area: Parasite (Leishmania), immunobiology, drug discovery, model development

Arindam Ghosh
Indian Institute of Science, Bengaluru
Area: Experimental condensed matter physics, semiconductor physics, nano-device technology
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<tr>
<th>Name</th>
<th>Institution</th>
<th>Area</th>
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<tbody>
<tr>
<td>Debashish Goswami</td>
<td>Indian Statistical Institute, Kolkata</td>
<td>Area: Noncommutative geometry, quantum groups, operator algebra</td>
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<tr>
<td>Rama Kant</td>
<td>University of Delhi, Delhi</td>
<td>Area: Complex systems in electrochemistry and polymers, theoretical chemistry, nanoelectrochemistry</td>
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<tr>
<td>Avinash Khare</td>
<td>University of Delhi, Delhi</td>
<td>Area: Plasma physics, statistical mechanics, critical phenomena, plasma astrophysics</td>
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<tr>
<td>Anjan Kundu</td>
<td>Saha Institute of Nuclear Physics, Kolkata</td>
<td>Area: Theoretical and mathematical physics, nonlinear classical and quantum integrable systems, field models with topological charges</td>
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<tr>
<td>Gobinda Majumder</td>
<td>Tata Institute of Fundamental Research, Mumbai</td>
<td>Area: Calorimeter, B-physics and CP-violation, electroweak physics at collider</td>
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<td>D. K. Ojha</td>
<td>Tata Institute of Fundamental Research, Mumbai</td>
<td>Area: Star formation and interstellar medium, infrared astronomy, astronomical instrumentation</td>
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<td>Tanmaya Pathak</td>
<td>Indian Institute of Technology, Kharagpur</td>
<td>Area: Synthetic organic chemistry, nucleoside and carbohydrate modification, enzyme inhibition</td>
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<td>A. R. Podile</td>
<td>University of Hyderabad, Hyderabad</td>
<td>Area: Molecular plant microbe interactions, microbial biotechnology</td>
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<td>B. L. V. Prasad</td>
<td>CSIR – National Chemical Laboratory, Pune</td>
<td>Area: Materials chemistry, self-assembly, nanoparticle synthesis</td>
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<tr>
<td>K. R. Prasad</td>
<td>Indian Institute of Science, Bengaluru</td>
<td>Area: Organic synthesis, total synthesis of natural products</td>
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<td>M. Ravikanth</td>
<td>Indian Institute of Technology, Mumbai</td>
<td>Area: Supramolecular chemistry, co-ordination chemistry, photochemistry</td>
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<tr>
<td>N. Ravishankar</td>
<td>Indian Institute of Science, Bengaluru</td>
<td>Area: Nanomaterials, electron microscopy, energy applications</td>
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<tr>
<td>V. V. S. S. Sarma</td>
<td>CSIR – National Institute of Oceanography, Visakhapatnam</td>
<td>Area: Biogeochemistry, stable isotopes, remote sensing</td>
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<tr>
<td>K. Thangaraj</td>
<td>CSIR – Centre for Cellular and Molecular Biology, Hyderabad</td>
<td>Area: Population genetics, evolutionary biology, clinical and medical genetics, ancient DNA and forensic genetics</td>
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<tr>
<td>Kaushal Verma</td>
<td>Indian Institute of Science, Bengaluru</td>
<td>Area: Complex analysis</td>
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<td>Honorary Fellow</td>
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<td>Andre K. Geim</td>
<td>University of Manchester, Manchester, UK</td>
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SPECIAL ISSUES OF JOURNALS

Proceedings of the International Symposium on Nuclear Physics
Editors: Sudhir R Jain, Renju G Thomas and Vivek M Datar


The 58th DAE Symposium on Nuclear Physics was held as an international event at Mumbai during 2–6 December 2013. This annual event has been instrumental in setting up a tradition for research in nuclear physics in particular, and basic sciences in general, in our country. Over the years, the symposium has given birth to various other symposia and conferences in different subjects like solid-state physics, accelerator physics, etc. Research in nuclear physics gained enormously when the Pelletron accelerator was set up by Bhabha Atomic Research Centre (BARC) and Tata Institute of Fundamental Research (TIFR). The year 2013 also marked the Silver Jubilee of this accelerator. A session was put together to celebrate this event. In all, the participants were from 11 countries and 17 states of India, a total equalling 500, which was the largest participation ever. The symposium consisted of 32 invited plenary talks, 480 contributed papers, and 16 Ph.D. theses. The plenary speakers were chosen after detailed deliberations by the members of the Organizing and Advisory Committees. The topics included nuclear structure and reactions, radioactive ion beams, hadron physics, relativistic nuclear collisions and quark gluon plasma, intersections of nuclear physics with particle and astrophysics, and nuclear instrumentation. This Special Issue of Pramana – Journal of Physics consists of articles based on plenary talks. All the articles have been refereed by some of the leading experts in the field.

Proceedings of the Conference on Perspectives in Nonlinear Dynamics 2013 (PNLD 2013)
Editors: Sudeshna Sinha, Somdatta Sinha, Neelima Gupte and Ram Ramaswamy


PNLD 2013, the fourth of the Perspectives in Nonlinear Dynamics conferences, was held in Hyderabad, India from July 15 to July 18, 2013. Like previous editions of this meeting, it was a satellite to STATPHYS 25 (held in Seoul, South Korea).

The scientific programme for the meeting consisted of about 25 invited talks and an equal number of contributed talks, and about 60 poster presentations. The conference attracted over 120 participants from about 10 countries.

The diversity of talks captured the breadth and interdisciplinarity of the field of nonlinear dynamics and complex systems, and therefore complex networks and coupled nonlinear systems formed a large component of the conference programme, as can be seen from this special issue.

Special issue on Chemical Crystallography
Editors: Murugavel Ramaswamy and Jarugu Narasimha Moorthy

Journal of Chemical Sciences, Vol. 126, No. 5, September 2014

It was in 1912 that Max von Laue discovered the fact that solid materials deflect X-rays. This phenomenal finding heralded the dawn of X-ray crystallography, which allowed solids to be seen and interpreted in terms of regularly ordered atoms/molecules and the connectivity between the atoms. Laue was awarded the Nobel Prize in 1914. The very next year’s Nobel Prize in physics was shared by the father–son duo, William Henry Bragg and William Lawrence Bragg, for analysis of crystal structures using X-rays. X-ray crystallography has since become a subject that is deeply distributed in several disciplines. Its importance may be gauged by the fact that at least 25 Nobel Prizes in the last 100 years have gone to the discoveries that depend to a large degree on X-ray crystallography. UNESCO declared 2014 as International Year of Crystallography (IYCr) to recognize the importance of the subject and commemorate the first Nobel Prize in this quintessential area. It turns out that 2014 also marks 50th anniversary of the Nobel Prize to Dorothy Hodgkin for her Himalayan contributions to
determination of the structures of prominent biomolecules such as penicillin, vitamin B12 and insulin.

One of the major objectives of the UNESCO in the current year has been to popularize – with the help of IYCr – the subject and create awareness of how crystallography is pivotal to the advancement of science. The Indian Academy of Sciences, Bengaluru, took early note of the distinction for X-ray crystallography this year and planned to bring out a special issue on “Chemical Crystallography” with articles that exemplify the use of crystallography in different hues of chemical research in India. Prof. T. N. Guru Row, Solid State and Structural Chemistry Unit (SSCU), IISc, Bengaluru, offers his perspective of this discipline today and how it holds for the scientific research in India in future. His article, ‘X-ray crystallography: Past, present and future’, is included in this issue so that one may appreciate how a subject that is so indispensable in today’s research has evolved in our country. It allows us to recognize and also pay respect to the peers who have made possible the way that crystallography is practised today with their sheer commitment, passion and dedication.

For this Special Issue of the Journal of Chemical Sciences, ‘Chemical Crystallography’, we invited contributions from active researchers who utilize X-ray crystallography not merely to determine structures, but are concerned with structural insights to probe a phenomenon, uncover new modes of assembly, correlate structure with some function, develop new materials with a particular ordering, exemplify host-guest recognition, etc. In other words, the articles were envisaged to emphasize the importance of X-ray crystallography in different aspects of chemical research. We sincerely believe and wish that the collection of articles in this issue sufficiently showcases the panorama of chemical science involving X-ray crystallography in India.

Special issue on Modern Trends in Inorganic Chemistry (MTIC-XV)
Editors: Udai P Singh and K Ghosh

This Special Issue of Journal of Chemical Sciences is based on the contributions from the invited speakers of the Fifteenth Symposium on Modern Trends in Inorganic Chemistry (MTIC-XV) held at the Indian Institute of Technology, Roorkee, during 13–16 December 2013. The MTIC series of biennial symposia has been an important forum for the inorganic chemists of the country to focus on the current status as well as the future developments in the frontier areas of research in this discipline. The topics covered in this issue span a diverse range from bio-inorganic chemistry to materials chemistry, encompassing the traditional areas of computational chemistry, main group chemistry, supramolecular chemistry and metal cluster, organo-metallics and catalysis.

Proceedings of the International Conference on Variability of Blazars: From Jansky to Fermi (VBJF)
Editors: J. H. Fan, Y. Liu, A. C. Gupta and Z. Q. Shen

Blazars represent a small subset of the most enigmatic class of radio-loud active galactic nuclei (AGN), which exhibit strong variability at all wavelengths of the electromagnetic (EM) spectrum, strong polarization from radio to optical wavelengths, and usually core-dominated radio structures. Blazars are among the most suitable objects for simultaneous multi-wavelength observations in order to comprehend the most puzzling issue of blazar emission mechanism through its spectral energy distribution. During the last decade, ground-based (HESS, MAGIC, VERITAS, etc.) and space-based (Fermi, Swift, etc.) observing facilities in gamma rays have revolutionized research in the field of blazars and consequently a large number of new, very-high-energy (GeV to TeV) gamma-ray-emitting blazars have been discovered. As both blazar flux and polarization show variability on diverse timescales in isolated EM bands, simultaneous observations at multi EM bands would be potentially important for understanding the central engine, standard models of AGN, etc. Empowered with today’s growing multiwavelength observing facilities, this is a feasible reality.

The international conference on Variability of Blazars: From Jansky to Fermi, the proceedings of which comprise this special issue of Journal of Astrophysics & Astronomy, was held at Guangzhou University, China. This conference was held during 14–16 December 2012. This conference was attended by 135 participants from around the globe. The programme included 12 invited talks, 31 contributed talks, and 63 posters.
The Masterclass series of eBooks to be published by the Indian Academy of Sciences, Bengaluru, brings together pedagogical articles on single broad topics reproduced from Resonance – Journal of Science Education, published monthly by the Academy since January 1996. Primarily directed at students and teachers at the undergraduate level, the journal has brought out a wide spectrum of articles in a range of scientific disciplines. Articles in the journal are written in a style that makes them appealing to readers from diverse backgrounds, and they also provide a useful source of instruction that is not always available in textbooks.

It is fitting that the first book in the series, Organic Chemistry Masterclasses, is by a legendary teacher, Professor Subramania Ranganathan. A highly acclaimed and distinguished organic chemist from IIT Kanpur, he has been a regular contributor to Resonance and his articles enjoy wide popularity among the journal's readership.

While the book will primarily be available in digital format, there will also be a limited print run to augment visibility.

The Fellowship is invited to participate in this endeavour and provide suggestions of topics and authors for future Masterclass ebooks.

* * * * *

DISCUSSION MEETINGS

Modelling Host-Pathogen Interactions – A Multi-Scale View

Orange County, Coorg
30 November – 3 December 2014

Convener: Somdatta Sinha (IISER, Mohali)

This meeting was intended to be a small gathering of about 20 people, both experimentalists and theorists, working on different aspects of modelling host-pathogen interactions including epidemiology. The idea was to discuss the critical issues that address host-pathogen interactions at a specific scale, and also confront the problems of merging the scales to arrive at a description of the development and spread of infection process at the systemic level. With a few talks and plenty of discussions it was a real brainstorming of 18 Indian researchers from various institutes across India and 2 researchers from UK and The Netherlands. The participants were a mix of few senior experienced scientists, and many young faculty, postdoctoral and research fellows.

Two sets of overview talks were planned – first, on different approaches, and then on few important infections that are common in India and are caused by different types of pathogens (virus, bacteria, protozoa, etc).

The session on “Know the pathogen, vector and host” included talks on Malaria – where the plasmodium parasite and its mode of action; HIV – molecular biology of infection and disease etiology; Tuberculosis – a bioinformatic and computational analysis and modelling of the pathogen across scales; Gastrointestinal diseases – a major health threat in developing countries; and the biophysics of toxin interactions with the intestinal cell membranes.

The second day had short presentations by other young participants, which covered mathematical modelling of host pathogen interactions and their spread in population,
modeling genotype-phenotype correlations, biochemical pathway analysis in Leishmania, computational analysis of promiscuity in enzymes for possibilities of evolving new biochemical reactions, and viral underpinnings of cancers.

There was continuous discussion among participants on all the above-mentioned topics during meal times and after the sessions. Experimentalists could see what theoreticians do and understand the need for their model predictions, and the theoreticians got a view of the complexity and details of experimental techniques that are needed for data.

Structural Engineering Materials for the Future: The Way Forward

Orange County, Coorg
3 – 6 December 2014

Convener: K Chattopadhyay (IISc, Bengaluru)

This meeting was attended by 20 specialized and established academicians and scientists and a few young researchers. These lectures were intended to discuss the state of the art and the challenges pertaining to scientific aspects in the field of development and processing of engineering alloys. The emphasis was on understanding the issues in respective fields that require a short-term goal or an elaborate long-term research program.

The first session was dedicated to titanium alloys, where Dipankar Banerjee of IISc (formerly, Chief Controller of R & D for materials and Aerospace, Ministry of Defence) highlighted the demands of titanium-based materials in the aerospace sector. He also introduced the current challenges in the processing of titanium alloys and the need for scientific understanding of the processes involved therein. Sujoy Kar of IIT Kharagpur also highlighted the role of microstructure of titanium alloys on certain problems like room temperature dwell fatigue, which is unique to titanium.

From another strategic sector, Department of Atomic Energy, A. K. Bhaduri of IGCAR, Kalpakkam, discussed the issues and challenges in high-temperature materials and fabrication technologies currently under development or to be developed for the boiler and turbine components of Advanced Ultra Super-Critical (AUSC) Power Plants. S.C. Sharma of VSSC, Thiruvananthapuram, gave a comprehensive account of the materials for Indian space a programme. He highlighted the role of structural materials in the recent successful missions of Indian space research Organization (ISRO) and also discussed the challenges to further the developments in this regard.

In the next session G. K. Dey of BARC, Mumbai, presented a detailed overview of materials for nuclear reactors, especially on the development of new Zr-based alloys from the view point of scientific understanding and technological needs. The discussion on zirconium alloys was further elaborated through the lecture of I. Samajdar of IIT Bombay, who presented the role of microstructural engineering in optimizing the properties of zirconium alloys. R. Tiwari of BARC updated the audience on the current activities pertaining to the development of Niobium-based alloys for high temperature applications.

Steels are one of the most important engineering materials with plenty of growth prospect in the Indian scenario. With this view point, a complete session was dedicated to steels. In this session, the R & D division of two major steel companies representing public and private sectors also participated along with academia and research organizations. While Santosh Kumar of Research and Development Centre in Steel (RDCIS) of Steel Authority of India elaborated on the steels for future, Rahul Verma of Tata Steel R & D updated the audience on the future challenges and opportunities in the area of automotive steels and construction grade steels. S. B. Singh of IIT Kharagpur presented the science behind the development of high strength steels. K. Laha of IGCAR, Kalpakkam, briefed about the current status of research in the area of steels for Indian fast fission and fusion reactors.

Superalloys play an important role in strategic as well as commercial applications involving high temperature and high strength. A complex science is involved in the design of superalloys. In this discussion meeting, Sanjay Sondhi of General Electric (GE) presented a detailed overview about the progress, challenges and opportunities in the field of superalloy research. This was further substantiated by the talk of S. Karthikeyan of IISc, who updated the audience on current trends in superalloy research from the view point of computational approaches in alloy development as well as in process design. An excellent example of alloy development in this regard was presented by M. Surendra of IISc on the newly designed cobalt-base superalloy of his group.

The engineering applications of high temperature alloys require protective coatings. Jayaram’s (IISc) talk was focussed on integrating thermo-mechanical
behaviour of coatings at different length scales, while Joshi (ARCI, Hyderabad) gave an account of the emerging challenges in the area of surface coatings.

The last technical session of the discussion meeting was on the microstructural aspect of processing of magnesium alloys with a view to their potential for automotive applications and also on scientific issues pertaining to the processing and stability of multi-component alloys via solidification and ball milling routes. These talks were delivered by Satyam Suwas of IISc and K. Biswas of IIT Kanpur.

Frontiers of Structural Materials Research
Orange County, Coorg
22–26 February 2015

Convener: U. Ramamurty (IISc, Bengaluru)

This discussion meeting was attended by 34 participants, 8 of whom were students pursuing their PhDs. The workshop had participants from Switzerland, South Korea, Spain, Germany, Japan and USA, in addition to those from India.

Javier Llorca of IMDEA Materials Institute Madrid, Spain, spoke about “High temperature mechanical behavior of nanoscale multilayers”.

Vikram Jayaram of Indian Institute of Science, Bengaluru, spoke on “Development of a fracture testing geometry that is stable in load-control”.

Andreas Mortensen of EPFL, Switzerland, spoke on “Probing the strength of metal reinforcing phases”.

Mo Li of Georgia Institute of Technology, USA, spoke on “Mechanical anisotropy in amorphous solids from continuum to nanoscale”.

R. Narasimhan of Indian Institute of Science, Bengaluru, delivered a talk on “Continuum modelling of crystallographic slip and twinning and numerical formulations”.

John Banhart of Technical University – Berlin, Germany, spoke on “Synchrotron X-ray and Neutron imaging in materials research”.

Jae-il Jang from Hanyang University, South Korea, spoke on “Time-dependent nanoscale deformation of advanced materials”.

P. J. Guruprasad of Indian Institute of Technology, Bombay, spoke on “Discrete dislocation dynamics: challenges and way forward”.

Ravi Sankar Kottada of Indian Institute of Technology, Madras, spoke on “Mechanical behaviour of high entropy alloys (HEA) synthesized by mechanical alloying and spark plasma sintering”.

Koteswararao V. Rajulapati of University of Hyderabad, delivered a talk on “Strain rate sensitivity of bulk multi-phase nanocrystalline alloys evaluated by nanoindentation”.

Praveen Kumar of Indian Institute of Science, Bengaluru, spoke on “Resolving paradox of high strength – High ductility through severe plastic deformation”.

R. Lakshminarayan of Institute of Science, Bengaluru, spoke on “Mechanisms of fracture in brittle bulk metallic glasses”.

The meeting was enjoyable and enriching for all the participants as each speaker was given a substantial amount of time, which allowed him to give a detailed presentation that was always followed by some lively discussion through question and answer sessions. Also, the natural environment of Coorg provided a tranquil atmosphere that the participants enjoyed thoroughly.
In an effort to encourage women in India to break traditional moulds and pursue a successful career in science, the Indian Academy of Sciences has set up a Women in Science Panel which conducts regular workshops, seminars and talks by eminent woman scientists to inspire and encourage girls to pursue a career in science.

1. The Anna Mani ‘Women in Science’ Workshop (22–23 August 2014)

The Women in Science (WiS) Panel of the Indian Academy of Sciences (IAS) organized a two-day workshop at CMR Institute of Management Studies, Bengaluru, on 22 and 23 August 2014. The workshop coincided with the 96th birth anniversary of the late Anna Mani, an eminent women scientist of the country. It was attended by over 400 undergraduate and postgraduate students and teachers from ten different colleges across Bengaluru.

The aim of the workshop was to inspire youngsters to pursue science as a career, and to depict how women can be successful in it by sheer perseverance and by not being burdened by the archaic rules of a patriarchal society. The workshop consisted of lectures by eight women scientists from different fields of science. The lectures were followed by a panel discussion on issues concerning women pursuing a career in science research. This session was presided over by Dipankar Chatterji, the President of the Indian Academy of Sciences. The panelists (Dipankar Chatterji, Dipshikha Chakravortty, Gargi Dasgupta, Indumati and Rohini Godbole) touched upon different topics such as the many reasons behind fewer women scientists pursuing research, how to prepare for a career in science, establishing a stable support system and mentorship and balancing professional and personal life.

Science not only improves health and quality of life but also influences culture and civilization, said Chandrima Shaha (National Institute of Immunology, Delhi), in her talk “A career in science: The pleasure of finding things out”. R. Sowdhamini (National Centre for Biological Sciences, Bengaluru) spoke on lectin, interleukin and methyltransferase protein super-families, on which her research is based. She encouraged young girls in the audience to do things that would bring them joy and a sense of fulfilment. Sharing her experiences as a computational biologist, she stated that as one’s career attains a certain level, it can be handled from anywhere with the help of technology. This allows seamless integration of personal and professional lives. Shubha V. (National Aerospace Laboratory, Bengaluru) gave an elaborate account of the work carried out during the past 40 years in her lab. Shobhana Narasimhan (JNCASR, Bengaluru) motivated students to take up science by introducing the fun aspects of doing science. She explained the Density Functional Theory and its relevance with simple analogies and applications. Kalpana Margabandhu (IBM-India, Bengaluru) engaged students with her life’s journey: from a young enthusiastic girl to the Director of a CIO lab in IBM. Using the example of the human gut micro flora
Salmonella enteric, the bacteria that causes Salmonella, Dipshikha Chakravortty spoke about how bacteria can both be essential and deleterious to the human body. Kusala Rajendran (Centre for Earth Science, IISc, Bengaluru) presented the challenges faced by a woman as an earth scientist: the major part of her work involves looking for earthquake evidences in hostile and inimical regions of the planet, many times with her being the only woman in a large exploration group.

2. “Women in Science: A career in Science” (17 October 2014)

The Panel of Women in Science conducts a series of seminars/lectures on the topic “Women in Science: A Career in Science” under their Role Model Program. These seminars are conducted to address the various career options for women in the field of science. The seminars have presentations by leading women scientists to showcase their work to an audience of both genders.

Such a seminar was held on 17 October 2014 at Deen Dayal Upadhyaya College, University of Delhi, New Delhi. There were four talks: Chandrima Shaha, Director, National Institute of Immunology, New Delhi, spoke on “Scientific career: the pleasure of solving mysteries”. Kasturi Datta, DBT Distinguished Biotechnology Professor, School of Environmental Sciences, Jawaharlal Nehru University, New Delhi, spoke on “Evidence for hyaluronan bonding protein 1 (HABP1) as a tumor biomarker”. Paramjit Khurana, J.C. Bose National Fellow, Department of Plant Molecular Biology, University of Delhi South Campus, New Delhi, spoke on “Engineering plants for the changing climatic scenario”. Niloufer Shroff, Head, Electronics Materials and Components Division, Electronics Niketan, DEITY, MCIT, spoke on “Photonics research in India – A personal view”. This was followed by a panel discussion “Encouraging women in science will enrich science”. The panel comprised Chandrima Shaha, Niloufer Shroff, Mridula Gupta, Riddhi Shah, Geetha Venkataraman and Mini Shaji Thomas.

There were 139 participants from Acharya Narendra Dev College, Miranda House, G.D. Goenka Public School and Deen Dayal Upadhyaya College, New Delhi.

3. Indo-French “Women in Science” Seminar through CEFIPRA (3-5 February 2015)

A “Women in Science” Seminar was held at Indian Institute of Science between 3 and 5 February 2015 in collaboration with the Indo-French Centre for the Promotion of Advanced Research. This seminar featured poster presentations by young researchers and lectures by women scientists on their work. The seminar was funded by the Indo-French Centre for the Promotion of Advanced Research. Apart from presentations by scientists and students from both countries, the seminar included discussions on the ways of increasing participation of women in academics. In addition to providing a platform for young women scientists to showcase their work to an international audience, this seminar provided them an opportunity to interact and learn from their French peers. Opportunities for collaboration and funding between scientists in India and France were addressed. Also discussed were issues that hinder the participation of women in science, in both India and France, and the ways to resolve them. The panel of experts agreed upon the need to set up a networking program where scientists can interact with young audience and their families, to help and mentor them. They concluded that initiatives should be taken to sensitize society to ensure that women have strong support from their families which would enable them to prosper both in their personal lives as well as their academic careers.
NATIONAL SCIENCE DAY 2015

February 28, National Science Day (NSD), marking the discovery of the Raman Effect, is celebrated to create awareness about the contribution of Indian scientists (including engineers) and Institutions. Inculcation of scientific temper and capacity building of science communicators is also a vital component of NSD celebration. The theme for this year was “Science in Nation Building”.

The Academy Trust (TAcT) in association with Agastya International Foundation, Bengaluru, celebrated NSD on 26 February 2015 in the premises of the Indian Academy of Sciences. Over 100 students from Poornaprajna High School were invited. Prof Dipankar Chatterjee, Chair and Managing Trustee of TAcT and President of the Indian Academy of Sciences, inaugurated the NSD celebrations. In his inaugural address, Chatterji recalled the scientific contribution of Sir C V Raman.

An exhibit of science models was organised by Agastya. Using simple science models, students demonstrated various phenomena such as solar and lunar eclipse, and seasonal changes. Students also visited the Museum at the Raman Research Institute, which houses Raman’s prized collection of gems, crystals, minerals, and rock specimens as well as birds, beetles and butterflies.

A film entitled ‘Raman – the Man of Science’ was screened for the students.

This was followed by a very informative talk on “India’s Mars Orbiter Mission” by B R Guruprasad, Public Relations Officer, Indian Space Research Organization (ISRO).

SUMMER RESEARCH FELLOWSHIP PROGRAMME FOR STUDENTS AND TEACHERS – 2015

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

The 2015 Programme was announced in September 2014, and the last date for receiving applications was 30 November 2014. Selection Committees consisting of experts in different areas met during the third week of December 2014 to scrutinize and make selections. The following table indicates the number of applications received from students and teachers and the subject-wise shortlist.

<table>
<thead>
<tr>
<th>Subjects</th>
<th>No. of applications received</th>
<th>Shortlisted for selection</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Students</td>
<td>Teachers</td>
</tr>
<tr>
<td>Life Sciences</td>
<td>4326</td>
<td>172</td>
</tr>
<tr>
<td>Engineering &amp; Technology</td>
<td>12928</td>
<td>172</td>
</tr>
<tr>
<td>Chemistry</td>
<td>2221</td>
<td>117</td>
</tr>
<tr>
<td>Physics</td>
<td>2517</td>
<td>88</td>
</tr>
<tr>
<td>Earth &amp; Planetary Sciences</td>
<td>933</td>
<td>11</td>
</tr>
<tr>
<td>Mathematics</td>
<td>998</td>
<td>33</td>
</tr>
<tr>
<td>TOTAL</td>
<td>23923</td>
<td>593</td>
</tr>
<tr>
<td>GRAND TOTAL</td>
<td>24517</td>
<td>2158</td>
</tr>
</tbody>
</table>

In the next issue of Patrika, the number of fellowships actually availed and some analysis of the data will be included.
Two-week Refresher Courses are aimed at helping teachers 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 March to July 2014.

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 61 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 September 2014 to February 2015.

1. LXIII. Experimental Physics – 63
   Sri Krishnadevaraya University, Anantapur
   07 – 22 October 2014
   Co-ordinator: T. Subba Rao (Sri Krishnadevaraya University, Anantapur)
   No. of Participants: 25
   Resource Persons: TG Ramesh; R Srinivasan; Thota Subba Rao; Deepa Seetharaman.

2. LXIV. Experimental Physics – 64
   Goa University, Goa
   11 – 26 November 2014
   Co-ordinator: KR Priolkar (Goa University, Goa)
   No. of Participants: 30
   Resource Persons: KR Priolkar; E Desda; Manohar Naik; MS Sadique

3. LXV. Experimental Physics – 65
   Vidyavikas Institute of Engineering and Technology, Mysore
   11 – 26 November 2014
   Co-ordinator: C. Ningappa (Vidyavikas Institute of Engineering and Technology, Mysore)
   No. of Participants: 25
   Resource Persons: R Srinivasan; TG Ramesh; C Ningappa; Sarmishta Sahu; MS Chandrasekhara.

4. LXVI. Experimental Physics – 66
   SMVDU Katra, Katra, Jammu and Kashmir
   11 – 25 December 2014
   Convener: Yugal Khajuria (SMVDU Katra, Katra)
   Co-ordinator: Jitendra Sharma (SMVDU Katra, Katra)
   No. of Participants: 26
   Resource Persons: Vivek Kumar Singh; Vinay Kumar; Pankaj Biswas; Ram Prakesh.

5. LXVII. Experimental Physics – 67
   Central University of Karnakata, Gulbarga
   06 – 22 January 2015
   Co-ordinator: Bharat Kumar (Central University of Karnakata, Gulbarga)
   No. of Participants: 35

B. Other Refresher Courses

   Indian Academy of Sciences, Jalahalli, Bengaluru
   09 – 24 September 2014
   Course Director: TG Ramesh (NAL, Bengaluru)
   Co-ordinator: G Madhavan (Indian Academy of Sciences, Bengaluru)
   No. of Participants: 13
   Resource Persons: Arul Paligan, TG Ramesh, Sarbari Bhattacharya; Prasanta; AM Umarji; R. Srinivasan; HL Bhat; KBR Varma; Rajanna.

7. Designing Experimental Projects in Physics
   Midnapore College, Midnapore
   08 – 21 October 2014
   Course Director: Aswini Ghosh (IACS, Kolkata)
   Co-ordinators: Subhash C. Samanta and Alfazuddin Thander (Midnapore College, Midnapore)
   No. of Participants: 40
   Resource Persons: G Bhattacharya; S Dutta; S Minhaz; D Syam; S Chakrabarti; S Samanta; A Dasgupta.

   Indian Academy of Sciences, Jalahalli, Bengaluru
   02 – 17 December 2014
   Course Directors: TG Ramesh (NAL, Bengaluru)
   Co-ordinator: G Madhavan (Indian Academy of Sciences, Bengaluru)
   No. of Participants: 24
   Resource Persons: Preeti Bhobe; Seeta Bharati; Prasanta; Basavaraj Angadi; TG Ramesh; R Srinivasan.

9. Application of Quantum Mechanics to ‘Atoms, Molecules and Radiation’
   Indian Academy of Sciences, Bengaluru
   08 – 20 December 2014
   Course Director: Arvind Kumar (HBCSE, TIFR, Mumbai)
   Co-ordinator: G Madhavan (Indian Academy of Sciences, Bengaluru)
   No. of Participants: 29
   Resource Persons: Arvind Kumar; Abbas Rangwala; Usha Devi; Swapan K Ghosh and DM Deb.
10. Classical Mechanics and Electromagnetism  
SDM College, Ujire  
08 – 20 December 2014  
Course Director: M. Lakshmanan (Bharathidasan University, Tiruchirapalli)  
Co-ordinator: Chetan Rao (SDM College, Ujire)

No. of Participants: 45  
Resource Persons: M Lakshmanan, HS Mani, K Govind, G Rajasekaran.

11. Foundations of Physics  
IWSA, Navi Mumbai  
20 December 2014 to 02 January 2015  
Course Director: S. Kailas (Bhabha Atomic Research Centre, Mumbai)  
Co-ordinator: Lalitha Dhareshwar (IWSA, Navi Mumbai)  
No. of Participants: 25  

12. Crystallography, Mineralogy, Igneous Petrology and Thermodynamics  
Indian Academy of Sciences, Jalahalli, Bengaluru  
26 December 2014 to 09 January 2015  
Course Director: Alok K. Gupta (University of Allahabad, Allahabad)  
Co-ordinator: TD Mahabaleswara (Indian Academy of Sciences, Bengaluru)

No. of Participants: 35  
Resource Persons: R. Shankar; SC Phatak; Sumathi Rao; Sudipta Mukherji; Bobby Ezhuthachan.

13. Theoretical Physics,  
Tezpur University, Tezpur  
06 – 20 January 2015  
Course Director: SM Bhattacharjee (RKM’s Vivekananda University, Howrah)

Co-ordinator: Ng. K. Francis (Tezpur University, Tezpur)  
No. of Participants: 35  
Resource Persons: R. Shankar; SC Phatak; Sumathi Rao; Sudipta Mukherji; Bobby Ezhuthachan.

14. Advances in Chemical Sciences and Sustainable Developments  
Central University of Rajasthan, Ajmer  
12 – 25 January 2015  
Course Director: Mugesh G (IISc, Bengaluru)  
Co-ordinators: Pardasani R T/Sunil (Naik Central University of Rajasthan, Ajmer)  
No. of Participants: 30

Resource Persons: Harkesh B. Singh; Jitendra K Bera; Subash Khushu; GU Kulkarni; NV Thakkar; M Periasamy.

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

1. New Vistas in Chemical and Biological Sciences  
Kumadvathi First Grade College, Shimoga  
01 – 02 August 2014  
Convener: Uma Shaanker R (UAS,GKV, Bengaluru)  
Co-ordinator: Vinayaka KS (Kumadvathi First Grade College, Shimoga)
No. of participants: 100

Topics Covered: Genetic diversity: what does it really mean and why measure it?; Plant Carotenoid Cleavage Dioxygenase: Phylogenetic and Comparative genome analysis; Tree of life – Molecular phylogenetics; DNA barcoding: promises and pitfalls; Phylogenetics: A case study in Drosophila; Tree of life: Angiosperms phylogeny group; Genetics and genomics of speciation; prospecting drought tolerant genes from adapted plant types; Resistance to toxin – Evolution; Genomics as a tool to discover metabolic pathway.

2. Biodiversity and its Conservation
St. Xavier’s College, Palayamkottai
07 – 08 August 2014
Convener: RR Rao (Bengaluru)
Co-ordinator: Louis Jesudass (St. Xavier’s College, Palayamkottai)
No. of participants: 100

Topics Covered: Floristic diversity in India: Inventorization, Conservation and Bioprospection – a priority agenda for 21st century; Bioprospecting Bioresources : Why, What and How?; “Floristic Diversity in India: An overview; Pollination Biology: The most critical event for reproductive success; Reproductive Constraints: Major drivers for species vulnerability; Biology of Carnivorous Plants; Why plants have laxatives when they have no bowels to move? An evolutionary prespective to bio-prospecting?

3. Physics of Electronic Materials
St. Xavier’s College, Kolkata
08 – 09 August 2014
Convener: Bose DN (Kolkata)
Co-ordinator: Ghosh Subhankar (St. Xavier’s College, Kolkata)
No. of participants: 100

Topics Covered: Introduction to Electronic Materials; Electronic and opto-electronic experiments on single functional nanowires: a new paradigm of electronic materials; Quantum and Nanoelectronic Semiconductor Devices; Magnetism: Basics and Phenomena; Advanced Heterostructure based Nano Scale MOSFETs.

4. Genetic Diversity, Molecular Evolution and Genomics
VIT, Vellore
12 – 14 August 2014
Convener: Uma Shaanker R (UAS, GKV, Bengaluru)
Co-ordinator: Siva Ramamoorthy (VIT, Vellore)
No. of participants: 125

Topics Covered: Genetic diversity, Molecular Evolution and Genomics; Genetic diversity: what does it really mean and why measure it?; Plant Carotenoid Cleavage Dioxygenase: Phylogenetic and Comparative genome analysis; Tree of life – Molecular phylogenetics; DNA barcoding: promises and pitfalls; Phylogenetics: A case study in study in Drosophila; Tree of life: Angiosperms phylogeny group; Genetics and genomics of speciation; prospecting drought tolerant genes from adapted plant types; Resistance to toxin – Evolution; Genomics as tool to discover metabolic pathway; chemistry of a series of metal-bis (dithiolene) complexes and a metal-o-phenylenediammine complex; simulation of the dynamics of molecules; Raman spectroscopy; NMR spectroscopy – applications in chemistry.

5. Recent Advances in Chemistry: Challenges and Opportunities
Raghnathpur College, Purulia
21 – 22 August 2014
Convener: Samar Kumar Das (University of Hyderabad, Hyderabad)
Co-ordinator: Bhaskar Biswas (Raghnathpur College, Purulia)
No. of participants: 160

Topics Covered: Green chemistry: what and why?; organometallic complexes of the platinum metals: synthesis, structure and catalytic application; metal and metal oxide: nanoparticles for future use; hydrogen bonding; polyoxometalates: synthesis, structure and supramolecular chemistry.

6. Spectroscopy – Application in Chemistry
MCM DAV College for Women, Chandigarh
22 – 23 August 2014
Convener: Sathyamurthy N (IISER, Mohali)
Co-ordinator: Sagarika Dev (MCM DAV College for Women, Chandigarh)
No. of participants: 100

Topics Covered: Structure and dynamics: a spectroscopic view; why do molecules absorb or emit light?; Matrix Isolation Infrared Spectroscopy; Femtosecond and Attosecond spectroscopy.

7. Recent Advancement in Environmental Science in Sustaining Natural Resource and Maintaining Healthy Livelihood
St. Pious X Degree & PG College for Women, Hyderabad
22 – 23 August 2014
Convener: Ranjan Sen (CDFD, Hyderabad)
Co-ordinator: Mala Das Sharma (St. Pious X Degree & PG College for Women, Hyderabad)
No. of participants: 100

Topics Covered: Mathematical modeling for sustainable development of natural resources; Enhancing environmental services; the role of Science and Technology in the protection of environment; the process and applications of
Remote sensing, GIS and GPS; environmental pollution and impact assessment; environment friendly approaches for plant disease management; synergy between energy and environment: sustainable waste management practices.

8. Recent Trends in Nonlinear Physics
Kanchi Mamunivar Centre for PG Studies, Puducherry
22 – 23 August 2014
Convener: Porsezian K (Pondicherry University, Pondicherry)
Co-ordinator: Rajkumar T (Kanci Mamunivar Centre for PG Studies, Puducherry)
No. of participants: 150
Topics Covered: Non-linear optics: recent applications; understanding nonlinearity: unraveling nature – I & II; manipulating matter wave solitons in BEC; solitons in optical fibre communications.

Government Arts College, Melur, Madurai
04 – 05 September 2014
Convener: G Baskaran (The Institute of Mathematical Sciences, Chennai)
Co-ordinator: A John Peter (Government Arts College, Melur, Madurai)
No. of participants: 100
Topics Covered: Next Generation Materials : Nano-Science Perspective; Introduction to Quantum Mechanics; theoretical approach in materials investigation; design of energy materials using electronic structure methods; theoretical approach in materials investigations Continuation; structural and electronic properties of electrochemical materials by first principles approach.

10. Advances in Biology
Cauvery College for Women, Tiruchirapalli
10 – 12 September 2014
Convener: Saidapur S K (Dharwad)
Co-ordinator: Abirami H (Cauvery College for Women, Tiruchirapalli)
No. of participants: 150
Topics Covered: Biology: The Basic Concepts; Nanoparticles: in vitro, in vivo and in Silico Studies; Biological Clocks – An Introduction; Perspectives in Molecular Endocrinology; Perspectives in Molecular Endocrinology; idea of evolution and its implications; Advances in Plant Biotechnology; biology of telomeres; basics of stem cell sciences; formation of planet earth and beginning of life.

11. Plant Taxonomy
St. Joseph's College, Bengaluru
12-13 September 2014
Convener: R R Rao (Bengaluru)
Co-ordinator: Haridasan VK (St. Joseph's College, Bengaluru)
No. of participants: 150
Topics Covered: Role of ethno botany in search of newer drug plants and conservation of biological diversity; systems of plant classification of ancient India; botanical nomenclature and endangered species; reproductive biology and conservation of plant diversity; molecular plant taxonomy.

12. Mathematics
St. Joseph College, Bengaluru
15 – 17 September 2014
Convener: Mythili Ramaswamy (TIFR Centre for Applicable Mathematics, Bengaluru)
Co-ordinator: Maria Ancy (St. Joseph College, Bengaluru)
No. of participants: 65
Topics Covered: Analysis of some ODE models; Use of linear algebra in the analysis of ODE; ODE systems and stability analysis; three body problem and numerics for ODE; Introduction to fourier series; use of fourier series in some PDE models.

13. Crystallography, Statistical Mechanics and Quantum Mechanics
Vijaya College, Bengaluru
19 – 20 September 2014
Convener: Rao K J (IIISC, Bengaluru)
Co-ordinator: Aswini P (Vijaya College, Bengaluru)
No. of participants: 125
Topics Covered: Quantum mechanics; statistical mechanics; crystallography.

14. Biological Sciences: Research Prospects and Applications
Karpagam University, Coimbatore
25 – 26 September 2014
Convener: Aparna Dutta Gupta (University of Hyderabad, Hyderabad)
Co-ordinator: Nalini Padmanabhan (Karpagam University, Coimbatore)
No. of participants: 125
Topics Covered: Science and Scientists; new insights on microbial survival strategies; Chemical biology; genomics in applied Biology; DNA barcoding and its applications; stem cells and their applications; metabolic engineering – a case study; aquaculture boom: Induced breeding practices.

15. Recent Trends in Chemistry
   AVVM Sri Pushpam College, Thanjavur
   26 – 27 September 2014
Convenor: Ramaraj R (Madurai Kamaraj University, Madurai)
Co-ordinator: Chandramohan G (AVVM Sri Pushpam College, Thanjavur)
No. of participants: 175
Topics Covered: A ‘Click’ away from discovery: Part 1; Photo electrochemistry and Solar Energy Conversion; Hard-Soft Acids and Bases (HSAB) in the synthesis of framework compounds; the role of coordination chemistry in colored inorganic compounds; Recent Trends in Fluorescence Spectroscopy: Fundamentals; principles of molecular dynamics simulation and its applications; recent trends in fluorescence spectroscopy: some interesting applications; self-assembly of nano structured material; introduction to electronic structure calculations and applications.

16. Emerging Trends in Biological Sciences
   Dr N G P Arts and Science College, Coimbatore
   06 – 08 October 2014
Convenor: Veluthambi K (Madurai Kamaraj University, Madurai)
Co-ordinator: Kannikaparameswari N (Dr N G P Arts and Science College, Coimbatore)
No. of participants: 150
Topics Covered: Rice functional genomics by gene targeting, Rice functional genomics by y T-DNA tagging; development and Functional Studies of Earthworm Nervous system; the function of riboflavin in regeneration of earthworm; Cancer Biology; emerging aquaculture; biology and behaviour of bats, biological clock; plant DNA barcoding.

17. Recent Trends in Chemistry
   Stella Maris College, Chennai
   07 – 08 October 2014
Convenor: Subramanian V (CLRI, Chennai)
Co-ordinator: Mary N L (Stella Maris College, Chennai)
No. of participants: 150
Topics Covered: Click Reactions in Organic Synthesis: A ‘Click’ Away from Discovery: Part 2; Photo electrochemistry and Solar Energy Conversion; Hard-Soft Acids and Bases (HSAB) in the Synthesis of Framework Compounds; Spectro electrochemistry; The Role of Coordination Chemistry in Colored Inorganic compounds; Electrochemical Energy Systems; Organic Thin Films; Low Melting Mixture as a Novel Green Reaction Medium; Breakdown of Born-Oppenheimer Approximation in Molecular Collisions and Reactions.

18. Concept of Fluid Dynamics and its Application
   Indian School of Mines, Dhanbad
   08 – 10 October 2014
Convenor: Rathish Kumar B V (IIT, Kanpur)
Co-ordinator: Singh M K (Indian School of Mines, Dhanbad)
No. of participants: 100

19. New Approaches of Geological Field Studies
   Arya Vidyapeeth College, Guwahati
   09 – 11 October 2014
Convenor: Nibir Mandal (Jadavpur University, Kolkata)
Co-ordinator: Hrishikesh Baruah (Arya Vidyapeeth College, Guwahati)
No. of participants: 70

20. Modern Trends in Biological Sciences
   Nehru Memorial College, Tiruchirapalli
   09 – 11 October 2014
Convenor: TJ Pandian (Madurai)
Co-ordinator: Meenakshisundaram M (Nehru Memorial College, Tiruchirapalli)
No. of participants: 100
Topics Covered: Selectable marker elimination in transgenic rice with sheath blight resistance; transgenic stacking and selectable marker elimination; sexuality, reproduction, embryonic stem cells and coelom in animal kingdom; xenogenesis tuna out of mackerel; biology and behaviour of bats; Biological Clock; recent advances in leptospiral research; Recent advances in Leptospiral Research; Microalgal biotechnology; Proteomic data resources in Insect pest – A tool for pest management.

21. Photonic Materials
   Sastra University, Thanjavur
   10 – 11 October 2014
Convenor: Porsezian K (Pondicherry University, Puducherry)
Co-ordinator: Vasanth Jayakantha Raja R (Sastra University, Thanjavur)
No. of participants: 150
Topics Covered: Nonlinear optics and Photonic materials; application of fiber optics; nonlinear optical properties of electrospun nanofibers; crystal growth techniques; biosensors.

22. Nanotechnology: Energy and Health
Fergusson College, Pune
10 – 11 October 2014
Convener: Sulabha K Kulkarni (IISER, Pune)
Co-ordinator: Haribhau M Gholap (Fergusson College, Pune)
No. of participants: 150
Topics Covered: Nanotechnology Fundamentals; Nanotechnology: applications; nanotechnology for Health; nanotechnology for energy.

23. Vistas in Biology – Biotechnology and Biodiversity
Mizoram University, Aizawl
14 – 15 October 2014
Convener: R R Rao (Bengaluru)
Co-ordinator: Amritesh C Shukla (Mizoram University, Aizawl)
No. of participants: 100
Topics Covered: Floristic diversity in India: Documentation, Conservation and Utilization; Role of Biotechnology for Conservation and Sustainable Utilization of Plants from North-East India; Science and Technology in India- Glorious past and Bright future; Engineering the organ: constituents for regeneration decoded; Taxonomy of Indian Lichens; Plant taxonomy and ethno botany in promoting medicinal plants research in India; diversity, distribution and bio-prospection of Indian lichens.

24. Translational Research in Life Sciences: Towards Improvement of Health
Jiwaji University, Gwalior
27 – 29 October 2014
Convener: Ishan Patro (Jiwaji University, Gwalior)
Co-ordinator: Tiwari P K (Jiwaji University, Gwalior)
No. of participants: 100
Topics Covered: Translational research in life sciences; Preventive and protective health care; Translational research in Ayurveda with special reference to diabetics; Epigenetics of gallbladder cancer: Biomarker approach; Antioxidants – A boon for human life; Developmental neurotoxicity: A challenge to human health; Point of care diagnostics for disease surveillance and control; Opportunities for young scientists; Blood groups and nutritional behavior; Enabling translational medicine in oral cancer; Gerontology and geriatrics: Neuro inflammation as a major factor for age associated brain disorder.

25. Biotechnology
Alphores Womens Degree and PG College, Telangana
07 – 08 November 2014
Convener: Anand Kumar P (Prof. Jayashankar Agricultural University, Hyderabad)
Co-ordinator: Gouthami Krishna Kumari P (Alphores Womens Degree and PG College, Telangana).
No. of participants: 150
Topics Covered: Transgenic plants or pesticides; GM crops and food security; biomass as bioresource for bio fuels; synthetic biology: the challenges and opportunities; drug design and discovery.

26. Contemporary Topics in Biology
DAV College, Chandigarh
10 – 11 November 2014
Convener: Anand Bachhawat (IISER, Mohali)
Co-ordinator: Rupinder Jeet Kaur (DAV College, Chandigarh)
No. of participants: 100
Topics Covered: Vaccines and biotechnology; The human microbiome: or 'Are microbes controlling your life?; Packing and visualizing DNA; Stem Cells: Today's Research, Tomorrow's Therapy; Systems Biology; Modelling in Biology; Integrating Information from Genes and Genomics for Crop Improvement.

27. Scope of Physics and Electronics
Holy Cross Degree College for Women, Hyderabad
14 – 15 November 2014
Convener: Chaturvedi S (University of Hyderabad, Hyderabad)
Co-ordinator: Sriranga K (Holy Cross Degree College for Women, Hyderabad)
No. of participants: 100
Topics Covered: Physics in biological system; nanoelectronics; display of electronics project; physics and Electronics in diverse field.
28. Elementary Mathematics for First Year Undergraduate Students

*Christ University, Bengaluru*

**19 – 21 November 2014**

Convener: Alladi Sitaram (Bengaluru)

Co-ordinator: Mayamma Joseph (Christ University, Bengaluru)

**No. of participants:** 50

**Topics Covered:** Infinite sequences and series; some concepts in probability and statistics; tilings; divergent series: some physics applications; The basics of Fourier series; "15 and 290 theorems" and Manjul Bhargava, the Fields medalist; Geometry beyond Euclid.

29. Modern Biology and Modern Chemistry

*Aurora's Degree and Post Graduate College, Hyderabad*

**20 – 21 November 2014**

Convener: Rajan Sankaranarayanan (CCMB, Hyderabad)

Co-ordinator: Nambari K M R (Aurora's Degree and Post Graduate College, Hyderabad)

**No. of participants:** 125

**Topics Covered:** An amoeba for all seasons; Creating the epithelial mesh during Drosophila embryogenesis; neural stem cells as a model for studying HIV-1 neuro degeneration; Neurons, Nature and Nurture – Understanding differences in child development; The task of turning a single cell into a complex embryo; Biological Paradoxes.

30. Nanoscience and Nanotechnology: Challenges and Opportunities

*Mody University of Science & Technology, Sikar*

**21 – 22 November 2014**

Convener: Ashok K Ganguli (Institute of Nanoscience and Technology, Mohali)

Co-ordinator: Amlan Kumar Das (Mody University of Science and Technology, Sikar)

**No. of participants:** 100

**Topics Covered:** Introduction to nano science and technology and their applications in various field. Application of nano-materials and technology in solar energy, magnetic storage device, catalysis, nanosensors, application of nanomaterials in biological and medical science.

31. Making of an Organism

*Sophia College for Women, Mumbai*

**21 – 22 November 2014**

Convener: Tarala D Nandedkar (NIRRH, Mumbai)

Co-ordinator: Yasmin Khan (Sophia College for Women, Mumbai)

**No. of participants:** 100

**Topics Covered:** Pheromone application technology in sustainable agriculture; natural products; liposomal drug carriers for targeted cancer therapy – past, present and future; andrographolide.

32. Recent Advances in Conservation of Biodiversity and Evolutionary Biology

*Government Degree College, Srikalahasthi*

**24 – 25 November 2014**

Convener: R R Rao (Bengaluru)

Co-ordinator: Swathi G (Government Degree College, Srikalahasthi)

**No. of participants:** 150

**Topics Covered:** Biodiversity India, Concerns and Strategies; Biology: the basic concepts; idea of evolution and its impact on biology; Pollination: an important requirement for reproductive success in flowering plants; Reproductive ecology and conservation of plant diversity; Basics of Stem Cell Science; Idea of evolution and its impact on biology; Plant life in the Himalayan Cold deserts.

33. Spectroscopy of Emerging Materials

*University of North Bengal, Darjeeling*

**26 – 27 November 2014**

Convener: Siva Umapathy (IISc, Bengaluru)

Co-ordinator: Anirban Misra (University of North Bengal, Darjeeling)

**No. of participants:** 200

**Topics Covered:** Laser Spectroscopy I: applications in Chemistry and Physics; absorption spectroscopy: fundamentals and special applications; photoinduced donor acceptor charge transfer process: Basic photophysics and application; States of Water in some biomimic systems: a vibrational Spectroscopic analysis; R&D in an industrial environment: the use of ICP-MS for water fingerprinting at Shell; fluorescence spectroscopy: fundamentals and special applications; a glimpse into the light-induced processes occuring in flexible solar cell material; laser spectroscopy ii: applications in biology and medicine.

34. Cellular Renaissance

*Jai Hind College, Mumbai*

**28 – 29 November 2014**

Convener: Tarala D Nandedkar (NIRRH, Mumbai)

Co-ordinator: Yasmina Dordi Avari (Jai Hind College, Mumbai)

**No. of participants:** 150

**Topics Covered:** Dental stem cells; understanding cancer stem cells; human islet engineering for diabetes research and therapeutics; stem cells: potency, properties and practice, stem cells in tissue homeostasis and cancer; old ovaries and new eggs: hatching the controversy.
35. **Frontiers in Wildlife Biology**  
*St. Berchmans College, Changanassery*  
01 – 02 December 2014  
Convener: Mewa Singh (University of Mysore, Mysore)  
Co-ordinator: Martin J Babu (St. Berchmans College, Changanassery)  
No. of participants: 125  

**Topics Covered:**  
Spatial temporal and behavioural processes in distribution of species; trends in elephant conservation; conservation aspects of Nilgiti Tahr; role of education in conservation; ecology and conservation of lion tailed Macaque in Western Ghats.

36. **Classical Mechanics**  
*Loyola College, Chennai*  
04 – 06 December 2014  
Convener: Balakrishnan V (IIT, Chennai)  
Co-ordinator: Joseph Prabagar C (Loyola College, Chennai)  
No. of participants: 100  

**Topics Covered:**  
Classical mechanics in the general framework of dynamical systems; Degrees of freedom; Generalized momenta; Two-body central force problem.

37. **Spectroscopic Techniques and Application to Chemical Structure Elucidation**  
*Nirmala College for Women, Coimbatore*  
05 – 06 December 2014  
Convener: Ramaraj R (Madurai Kamaraj University, Madurai)  
Co-ordinator: Vasudha V G (Nirmala College for Women, Coimbatore)  
No. of participants: 175  

**Topics Covered:**  

38. **Current Trends in Plant Sciences**  
*Telangana University, Nizamabad*  
08 – 09 December 2014  
Convener: R R Rao (Bengaluru)  
Co-ordinator: Vidya Vardhini B (Telangana University, Nizamabad)  
No. of participants: 150  

**Topics Covered:**  
Power of Evolution; Pollen pistil interaction: a complex mating game before fertilization; Floristic diversity in India: Inventorization, Conservation and Bioprospection – a priority agenda for 21st Century; Evolution of Human Health; Fundamental and applied aspects of pollination biology; New and emerging challenges in field oriented Taxonomy and Ethnobotany.

39. **Developmental and Molecular Biology**  
*PSGR Krishnammal College for Women, Coimbatore*  
11 – 12 December 2014  
Convener: Veluthambi K (Madurai Kamaraj University, Madurai)  
Co-ordinator: Vinodhini S (PSGR Krishnammal College for Women, Coimbatore)  
No. of participants: 120  

**Topics Covered:**  
Selectable marker elimination in transgenic rice with sheath blight resistance; plant viruses as epitope display system; Rice Functional Genomics by Gene Targe; The biology and pathogenesis of geminivirus; transgenic resistance to plant virus disease; Non-coding RNAs – micro RNAs and brain tumor; Mechanism of hormone action; next generation DNA sequencing.

40. **Plants for People and People for Plants**  
*Government Arts College, Thanthonimalai, Karur*  
18 – 20 December 2014  
Convener: Marimuthu G (Madurai Kamaraj University, Madurai)  
Co-ordinator: Kandhasamy M (Government Arts College, Thanthonimalai, Karur)  
No. of participants: 100  

**Topics Covered:**  
"Pollination Biology: An Essential Eco-Service for Sustainability of Plant Diversity; Biology and Behavior of Plant Visiting Birds; Floristic Diversity in India: some concerns and Strategies; Biological Clock; Emerging challenges in field Oriented Taxonomy and Ethnobotany with particular Reference to India; Recruitment Constrains: Major Drivers for Species Vulnerability; Orchid Biology – The Science of Orchids; biology of Carnivores plants; Biodiversity and Climate Change; Molecular and Functional Characterization of Bacopa monnieri – A Retraprospective Review I; Phytogeography india; Molecular and Functional Characterization of Bacopa monnieri – A Retraprospective Review.

41. **Interdisciplinary Approach of Research in Life Sciences**  
*PSGR Krishnammal College for Women, Coimbatore*  
19 – 20 December 2014  
Convener: Aparna Dutta Gupta (University of Hyderabad, Hyderabad)  
Co-ordinator: Sasikala G (PSGR Krishnammal College for Women, Coimbatore)
No. of participants: 100

Topics Covered: Functional proteomics: applications and current achievements; nano materials for life science applications; functional genomics for modern biology research; sexual plasticity: molecular markers from bony fishes to evaluate endocrine toxicology; nanocarriers for improved drug delivery and cancer treatment; chromatography and mass spectrometry; applications of mass spectrometry in advanced research; search for novel molecules and novel target for ecofriendly insect pest management.

42. Fluid Dynamics and its Applications
PSGR Krishnammal College for Women, Coimbatore
22 – 24 December 2014
Convener: Kandaswamy P (Bharathiar University, Coimbatore)
Co-ordinator: Sumathi K (PSGR Krishnammal College for Women, Coimbatore)
No. of participants: 125

Topics Covered: Wave motion; ScILab and Open Sources for Fluid Dynamics; Shear Flow Instability; Fundamentals of Thermodynamics; flow Patterns in Immiscible Liquid Mixtures; Applications in Enhanced Heat and Mass transfer; Modelling of Fluidized Bed Coal Gasifiers; Applications of Thermodynamics; Stability of Swirling Flows; Future trends in Fluid Dynamics.

43. Climate Change
GB Pant University of Agriculture and Technology, Pantnagar
26 – 27 December 2014
Convener: Majumdar P P (IISc, Bengaluru)
Co-ordinator: Shiva Prasad B J (GB Pant University of Agriculture and Technology, Pantnagar)
No. of participants: 125

Topics Covered: Introduction: Climate Change – Science and IPCC Projection; Climate Change and its likely impacts on extreme weather events and various ecosystems – Myth and reality; Climate Change Impacts on Water Resource; Climate Change Impacts on Hydrology: Scale Issues and Uncertainty; climate change and its effects on Rice and Wheat Production.
Co-ordinator: M M Swamy (J S S College for Women, Mysore)

No. of participants: 140

Topics Covered: Plant life in Himalayan cold deserts; fundamental and applied aspects of pollination biology; floristic diversity in India: an overview; biology of parasitic angiosperms: gold mine of botanical curiosities; pollen pistil interaction: a complex mating game before fertilization; red list categories and criteria for plants; plant nomenclature; wild plants of western ghats: treasure house of genetic diversity, relatives of cultivated plants and store house of medicinal plant wealth.

47. Frontiers in Chemistry
St. Xaviers College, Palayamkottai
09 – 11 January 2015
Convener: Palaniandavar M (IIT, Mumbai)
Co-ordinator: Baby Mariyatra M (St. Xaviers College, Palayamkottai)

No. of participants: 110

Topics Covered: Investigating weaker \( \beta-\beta \) interactions in designer organic molecules using NMR and fluorescence spectroscopy; the role of coordination chemistry in the stable inorganic pigments; N-Heterocyclic carbenes as ligands for transition metal complexes: synthesis and catalysis; new mineral acids in the assembly of framework compounds; evolution and revolution of organic synthesis; porous solids: what are they?; metathesis and its utility in organic synthesis; organic chemistry of Aluminium: lessons learnt over last 100 years; Metal DNA interactions and development of metal based anticancer agents; Bio-inspired unsupported lone pair interactions: design and applications; structure and function of metallo-biomolecules and small molecule analogues; hydrogen and hydrogenase.

48. Frontier Areas of Biotechnology
St. Marys College, Thrissur
16 – 17 January 2015
Convener: Edathil Vijayan (CUSAT, Kochi)
Co-ordinator: Neethu R (St. Marys College, Thrissur)
No. of participants: 150
Topics Covered: Biotechnology of Brain peptides; Molecularization of Biology; tissue engineering. The art of growing body parts: Concepts in early mammalian development and its implications; Traditional, modern and Futuristic vaccine; Scope of lignocellulosic biofuel; Biotechnology of stem cells and regenerative medicine.

49. Elementary Mathematics for First Year Pre-University Students
Christ University, Bengaluru
19 – 20 January 2015
Convener: Alladi Sitaram (Bengaluru)
Co-ordinator: Smita S Nagouda (Christ University, Bengaluru)

No. of participants: 55

Topics Covered: A journey through mathematics; Sequences and Series; Some Algorithmic Excursions; Elementary questions from probability Theory; random walks in physics.

50. Basics of Nonlinear Dynamics
Bishop Moore College, Mavelikara
21 – 22 January 2015
Convener: Lakshmanan M (Bharathidasan University, Tiruchirapalli)
Co-ordinator: Lynnette Joseph (Bishop Moore College, Mavelikara)

No. of participants: 125

Topics Covered: Introduction to non-linear dynamics (solitons and chaos); bifurcations and chaos; characterization and synchronization of chaos.

51. Advances in Biological Sciences
P E S R SN College of Arts & Science Ponda, Goa
22 – 24 January 2015
Convener: Saidapur S K (Dharwad)
Co-ordinator: Bhosale S H (P E S R S N College of Arts & Science, Ponda, Goa)

No. of participants: 125

Topics Covered: Florist diversity in India: inventorization, conservation and bioprospection; evolution of sexuality; sex chromosomes and dosage compensation; why animals resort to migration despite having to confront enormous challenges enroute?; power of evolution; how do animals orient and navigate?; origin of universe; sexual selection; plant taxonomy and its role in advancing medicinal plants research in India.

52. Recent Advance in Materials and Electrochemical Science
Victoria College, Palakkad
22 – 23 January 2015
Convener: Sampath S (IISc, Bengaluru)
Co-ordinator: Padmakumar K (Victoria College, Palakkad)

No. of participants: 125

Topics Covered: Raman spectroscopy: principle, realization and application; using electrochemical techniques to convert trash to treasure; materials under extreme pressure; electrochemistry and material science; understanding hydrophobicity; superhydrophobicity.
53. Applications of Bioinformatics in Drug Designing  
D Y Patil University, Navi Mumbai  
22 – 23 January 2015  
Convener: Tarala D Nandedkar (NIRRH, Mumbai)  
Co-ordinator: Selva Kumar (D Y Patil University, Navi Mumbai)  
No. of participants: 80  
Topics Covered: Bioinformatics and NMR Spectroscopy; structural, molecular and cellular aspects of ligand-receptor interaction; molecular modeling and systems biology; converting non druggable genes to druggable targets; mechanism of catalysis and drug resistance; identification of leads from marine seaweeds; screening of potential drug targets for cancer; docking human beta tubulin with marine secondary metabolites.

54. Biological Sciences in the 21st Century  
PSG College of Arts and Science, Coimbatore  
23 – 24 January 2015  
Convener: Mahadevan S (IISc, Bengaluru)  
Co-ordinator: Brindha D (PSG College of Arts and Science, Coimbatore)  
No. of participants: 150  
Topics Covered: Plant genetic engineering; new insights on microbial survival strategies; molecular markers; nanotechnology for sustainable agriculture; emerging aquaculture; nano-food synthesis.

55. Recent Trends in Physics  
NGM College, Pollachi  
23 – 24 January 2015  
Convener: Porsezian K (Pondicherry University, Puducherry)  
Co-ordinator: Kanakaraju R (NGM College, Pollachi)  
No. of participants: 200  
Topics Covered: Basics of classical mechanics; chemical bonding; optical fibre communication; basic quantum mechanics.

56. Applications of Statistics  
K T H M College, Nashik  
23 – 24 January 2015  
Convener: Anil Gore (Pune)  
Co-ordinator: Alaka Padhye (K T H M College, Nashik)  
No. of participants: 100  
Topics Covered: Statistics in cosmetic industry; doing statistics with farmers and wild animals; statistics in epidemiology; statistics in astrology; statistical assessment of indigenous medicine; statistics in market research; statistics and diabetes.

57. Spectroscopy and Applications  
Loyola College, Chennai  
27 – 28 January 2015  
Convener: Siva Umamathy (IISc, Bengaluru)  
Co-ordinator: Jacob M (Loyola College, Chennai)  
No. of participants: 100  
Topics Covered: Laser Spectroscopy; Cavity Ring Down Spectroscopy – Applications in the Atmospheric Chemistry; Study of Short-Lived Species: Electronically Excited Molecules and Photochemical Transients; Kinetic Investigations in Gas Phase using Spectroscopic Tools; Molecular Vibrational Spectroscopy and Introduction to Modern Theories; Fluorescence Spectroscopy: The Fundamentals and Some Applications; Introductory Nuclear Magnetic Resonance Spectroscopy (NMR).

58. New Frontiers in Chemistry  
Periyar Government Arts College, Cuddalore  
29 – 30 January 2015  
Convener: Subramanian V (CLRI, Chennai)  
Co-ordinator: Chakaravarthy J (Periyar Government Arts College, Cuddalore)  
No. of participants: 150

59. Vistas in Biosciences  
Periyar Government Arts College, Cuddalore  
30 – 31 January 2015  
Convener: R R Rao (Bengaluru)  
Co-ordinator: Francis Xavier T (Periyar Government Arts College, Cuddalore)  
No. of participants: 125  
Topics Covered: Emerging challenges in field oriented taxonomy and ethnobotany disciplines: some tasks for future; floristic diversity in India: inventorization, conservation and bio prospection – concern and strategies; gene silencing and its applications in plants; transgenic rice; biology of carnivorous plants; Charles Darwin and origin of species; environmental changes and plant community responses; complex web of floral-faunal interactions and lesions for biological conservation; reproductive ecology and conservation; pollen-pistil interaction: a prerequisite for fertilization; medicinal plants: challenges and prospects; recent advances in herbal drugs.

60. Recent Advances in Contemporary Topics in Biology  
Sree Siddaganga College of Arts Science and Commerce, Tumkur  
05 – 06 February 2015  
Convener: K R Shivanna (ATREE, Bengaluru)  
Co-ordinator: Sateesh Waradev N (Sree Siddaganga College of Arts Science and Commerce, Tumkur)  
No. of participants: 150  
Topics Covered: Biodiversity of Western Ghats; recent trends in taxonomy; power of evolution; evolution and human health; biology of telomeres; recent advances in RNA research; pollen-pistil interaction and fertilization in flowering plants; reproductive ecology and conservation of plant diversity.
61. **Role of Natural Products in Affordable Healthcare**  
*Telangana University, Nizamabad*  
05 – 06 February 2015  
**Convener:** Yadav J S (IICT, Hyderabad)  
**Co-ordinator:** Naseem (Telangana University, Nizamabad)  
**No. of participants:** 150  
**Topics Covered:** Natural products; the role of synthetic organic chemist in human healthcare; the use of natural products in the management of human healthcare: scope and opportunities; a versatile natural product for the generation of structurally diverse bioactive diterpenes; role of natural products in healthcare and synthesis of some marine natural products; pharmacological interventions targeted at drug induced cardio toxicity; unusual diterpenoids and triterpenoids from Indain mangrove flora.

62. **Selected Topics in Pure and Applied Physics**  
*K S Rangasamy College of Technology, Tiruchengode*  
06 – 08 February 2015  
**Convener:** Lakshmanan M (Bharathidasan University, Tiruchirapalli)  
**Co-ordinator:** Rajendran V (K S Rangasamy College of Technology, Tiruchengode)  
**No. of participants:** 150  
**Topics Covered:** Emerging concepts and challenges of thin film coatings in biomedical engineering; global warming: a scientist looks at scenario; role of quantum mechanics in material science; nano science and technology and its important applications; structural and functional analysis of some regulatory proteins, search for novel room temperature quantum matter.

63. **Skopion Scientia**  
*Government Women’s First Grade College, Kolar*  
11– 12 February 2015  
**Convener:** Dipshikha Chakravortty (IISc, Bengaluru)  
**Co-ordinator:** Beena D B (CMR Institute of Management Studies, Bengaluru)  
**No. of participants:** 150  
**Topics Covered:** Community behavior of microbes; Science and Industry and its future; Forestry Research – prospects in tree improvement; genetic engineering approaches for improving crop productivity under stress held condition: option and opportunities.

64. **Applicable Mathematics**  
*K S Rangasamy College of Arts and Science, Tiruchengode*  
12 – 14 February 2015  
**Convener:** Arunachalam P V (Dravidian University, Tirupathi)  
**Co-ordinator:** Karthikeyan P (K S Rangasamy College of Arts and Science, Tiruchengode)  
**No. of participants:** 150  
**Topics Covered:** Mathematical modeling for immune system; finite element method for elliptic and parabolic PDEs; compactness versus finiteness; nonlinear differential and difference equations; wave motion; applications of nonlinear partial differential equations.

65. **Modern Trends in Chemistry**  
*Christ University, Bengaluru*  
13 – 14 February 2015  
**Convener:** G Mugesh (IISc, Bengaluru)  
**Co-ordinator:** Prasad Prahlad Pujar (Christ University, Bengaluru)  
**No. of participants:** 150  
**Topics Covered:** Green Chemistry; photochemistry; organic synthesis; bioinorganic chemistry; theoretical and materials chemistry.

66. **Recent Advances in Chemical Sciences**  
*Karunya University, Coimbatore*  
18 – 19 February 2015  
**Convener:** G Mugesh (IISc, Bengaluru)  
**Co-ordinator:** Vedichi Madhu (Karunya University, Coimbatore)  
**No. of participants:** 150  
**Topics Covered:** Green Chemistry: Origin and Necessity; Prediction of Vibrational, Nuclear Magnetic Resonance and Electronic Spectra of Small Molecules Using Computational Chemistry Tool; Greening the Chemistry Curriculum; Interaction of Biomolecules with Carbon Nanomaterials; Acids, Bases and Compounds; Bioinorganic Chemistry: From Oxygen Transport to Metal-mediated Catalysis; One Molecule, Many Wonders One Molecule, Many Wonders; Inorganic Oxides as Host for Color; Bioinspired Chemistry for Energy, Environment and Human Health.

67. **Emerging Trends in Biotechnology**  
*Srimad Andavan Arts & Science College, Tiruchirapalli*  
19 – 20 February 2015  
**Convener:** Veluthambi K (Madurai Kamaraj University, Madurai)  
**Co-ordinator:** Thirumalai Vasan P (Srimad Andavan Arts & Science College, Tiruchirapalli)  
**No. of participants:** 100  
**Topics Covered:** Plant genetic engineering; proteomics and its applications; applications of RNA interference (RNAi); plant genetic engineering; biotechnology in human health; marker-assisted plant breeding.
68. Current Trends in Chemistry  
Udai Pratap College, Varanasi  
20 – 21 February 2015  
Convener: M S Singh (BHU, Varanasi)  
Co-ordinator: Ashutosh Gupta (Udai Pratap College, Varanasi)  
No. of participants: 150  
Topics Covered: Behaviour of atoms and molecules in confined environment; behaviour of atoms and molecules in confined environment; Brief history, basic concept, classification, recent advancement (particularly in enamine and iminium-catalysis) and domino asymmetric organocatalyst; memory of chirality; anti-cancer activity of heteroleptic Ruthenium (II), Rhodium (III) and Iridium (II) complexes; history of chemistry and organic chemistry.

69. Organic and Inorganic Self–Assembly  
KIIT University, Bhubaneswar  
20 – 21 February 2015  
Convener: Partha Sarathi Mukherjee (IISc, Bengaluru)  
Co-ordinator: Anita Pati (KIIT University, Bhubaneswar)  
No. of participants: 125  
Topics Covered: Supramolecular coordination; molecular architectures for sensing and catalysis; design, synthesis and applications of supramolecular ensembles of organic and metal-organic hybrids; the subcomponent self-assembly approach; effect of second coordination sphere on the reactivity of biomimetic iron complexes; H2 storage and CO2 capture in porous framework materials.

70. Spectroscopic Methods in Chemistry  
Narasinha Dutt College, Howrah  
23 – 24 February 2015  
Convener: Uday Maitra (IISc, Bengaluru)  
Co-ordinator: Indranil Bhattacharyya (Narasinha Dutt College, Howrah)  
No. of participants: 150  
Topics Covered: Introduction to pulse-FT NMR; molecular spectroscopy-I; stereochemistry basics; activation of dioxygen; hammet equation: The first structure-reactivity correlation in organic chemistry; organic chemistry and modern medicine.

70. Life Science Research – Present and Future  
Christ University, Bengaluru  
25 – 26 February 2015  
Convener: Dipshokha Chakravortty (IISc, Bengaluru)  
Co-ordinator: Biljo V. Joseph (Christ University, Bengaluru)  
No. of Participants: 87  
Topics Covered: Basic aspects of genetic engineering; community behavior of microorganisms; growth pattern of the leaf and plant organs; frontline responders: Arsanals of innate immunity.

72. Frontiers in Advanced Bio-Chemical Science  
Dasaratha Deb Memorial College, Khowai  
25 – 26 February 2015  
Convener: Ranu B C (IACS, Kolkata)  
Co-ordinator: Banti Ganguly Chakraborty (Dasaratha Deb Memorial College, Khowai)  
No. of Participants: 120  
Topics Covered: Green catalysis and green tools in organic synthesis; all metal aromaticity and conceptual DFT; quantum fluid density functional theory; quantum fluid density functional theory; sweet chemistry: synthesis and applications of small molecule carbohydrates; activation of dioxygen by nonheme iron enzymes and model complexes; recent advances of various protection and deprotection techniques in amino acids and peptides chemistry.

73. Advances in Endocrinology and Genetics  
St. Aloysius College, Mangaluru  
27-28 February 2015  
Convener: Ranganath HA (Bengaluru)  
Co-ordinator: Precilla D'Silva (St. Aloysius College, Mangauru)  
No. of Participants: 150  
Topics Covered: Progress in endocrinology: from past to present; Mendelian genes to synthetic genomes: an overview; the endocrine system of vertebrates: an overview; Secrets of the Human Genome,some unearthed and more hidden; genomic medicine? where do we stand?; complicated action of hormones; advances in hormone research and applications; epigenetics and epigenomics? can they explain the unexplainable?

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HINDI WORKSHOPS

Indian Academy of Sciences and Raman Research Institute jointly organised a workshop on 9th December 2014 to provide training on SARANSH software. The training session was conducted by Sri Gagan Sharma, Technical Head, Aryan E-Soft Private Limited, New Delhi.

A workshop on “Hindi: Modern Perspectives” by Dr M Sankara Prasad, (Retd) Dy General Manager (OL), HAL, Bengaluru, was also conducted jointly by the two institutions on 24th March 2015.
The Repository is at http://repository.ias.ac.in. Repository content can be viewed by year, by subject (sectional committee name), and by Fellow name (names as in Academy Year Book).

The number of records (publications) listed in the Repository has crossed 92,299, and full-text files are available for over 20,751 of them. The work of updating the Repository happens continuously, but records can be added only when Fellows send the information to the Academy office. In short, the Repository, while being useful and among the best in the country, is growing very slowly.

This needs to change, and your help is crucial. We request the Fellowship to contribute full-texts of their papers (the versions as allowed by the publisher) immediately upon acceptance by a journal, as well as older papers, in particular those in journals that are yet to be digitised (yes, there are still many!).

In case you have a ResearchGate or ORCID account, please let us know – this provides another means for us to find your publications and make them available on the Academy Repository.

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**OBITUARIES**

**B. M. Udgaonkar**

(elected 1969)

Bhalchandra M. Udgaonkar was born on 14 September 1927 in Karad, Maharashtra. He was an outstanding student in his school and college years, obtaining the first rank in MSc from the then Royal Institute of Science, Mumbai. He began his research career in 1949 at the Tata Institute of Fundamental Research (TIFR), Mumbai, under the guidance of Homi J. Bhabha. He was sent for training at the French Atomic Energy Commission, Saclay, for 18 months (1953–1955), and on his return was actively involved in building up the core reactor theory group of what is now the Bhabha Atomic Research Centre. Around 1960, Udgaonkar returned to his earlier interest: particle physics, and built the theoretical physics group at TIFR, which soon acquired international reputation. He made pioneering contributions to Regge pole theory and the bootstrap approach in particle physics. In the late sixties, he turned to the problems of science education at the school, college and university levels. Through his extensive writings and leadership abilities, he soon emerged as the top science educationist of the country.
He was instrumental in setting up the Homi Bhabha Centre for Science Education (HBCSE) in 1974, now a National Centre of TIFR.

Udgaonkar was a Fellow of the Indian Academy of Sciences and the Indian National Science Academy. He was also member of the University Grants Commission (UGC) in the seventies; member of the Pugwash Executive Council (1987–1997); first President of the Indian Association of Physics (1971–1973); and President of the Indian Academy of Social Sciences (1988–1989). He received the Hari Om Trust Award of UGC (1985) and the Padma Bhushan in 1985.

On the personal front, he bore with great fortitude the loss of both his parents in his early college years. His son, Jayant, is now an accomplished scientist at the National Centre for Biological Sciences, Bengaluru. Tragically, he lost his daughter Geeta while she was pursuing advanced studies in the US. A ‘Geeta Udgaonkar Award’ has been instituted in her memory since 1983 at TIFR for the best PhD thesis of the year in physics.

After his retirement in 1991, Udgaonkar regularly visited HBCSE at its Anushaktinagar campus until a few years ago. He passed away on 21 December 2014.

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**C. SivaRaman (elected 1977)**

Churya SivaRaman, a renowned biochemist from CSIR-National Chemical Laboratory (NCL), Pune, passed away on 24 June 2014 at the age of 90. He was one of the pioneering enzymologists of the Biochemical Sciences Division at NCL along with (late) J. C. Sadana and V. Jagannathan. The major UNDP programme of UNESCO was initiated by this trio and SivaRaman was its coordinator.

SivaRaman was born on 2 December 1923 in Palaghat (Kerala) to Justice C. KunhiRaman and Janaki. After graduation from Presidency College in 1945, he pursued his PhD under the guidance of M. Damodaran (University of Madras) on dietary fats in relation to liver-fat deposition. Damodaran moved to NCL in 1948 and SivaRaman joined NCL as a scientist in 1950. He went on to become the Deputy Director and Head of the Biochemistry Division at NCL until his formal retirement in 1984. He had been to University of Leeds, UK, on deputation for 2 years. He worked on citrase, now known as citrate lyase, from bacterial sources. He continued his research on the same enzyme at NCL. Citrate lyase is the key enzyme in fermentation of citrate and a possible marker in evolutionary biology. The enzyme is a complex assembled from three non-identical subunits. Two subunits have distinct enzymatic activities, and one functions as an acyl-carrier protein. Bacterial citrate lyase, si-citrate synthase and ATP-citrate lyase exhibit similar stereospecificities and show cofactor cross-reactions. His group worked on citrate lyases from Klebsiella aerogenes, *Streptococcus faecalis* and *Escherichia coli*. One of the significant contributions by SivaRaman was on *E. coli* citrate lyase, which exhibited an unusual architecture, having a single large fused acyl carrier protein associated with six copies of each of the enzymatic subunits.

He was one of the pioneering scientists who initiated the discipline of biotechnology. He developed immobilized penicillin acylase system, the usefulness of which was established in pilot-scale studies in collaboration with S. Ramachandran and S. S. Borkar (Hindustan Antibiotics Ltd, Pune). He also developed open pore matrices for yeast for continuous production of ethanol from cane molasses. His contributions were appropriately recognized by Vividhlaxi Audyogik Samshodhan Vikas Kendra (VASVIK), a non-profit NGO. In 1985, he was given the VASVIK award for his work on the development of high-tech process for production of 6-aminopenicillanic acid.

After his superannuation, SivaRaman continued working on penicillin acylase in an advisory capacity. He was consultant for review of teaching and training programmes sponsored by the Department of Biotechnology, New Delhi. He was elected Fellow of the Indian Academy of Sciences and the Indian National Science Academy. SivaRaman is survived by his son and daughter.

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**Vasant R. Gowariker (elected 1985)**

Vasant Ranchod Gowariker was born in Pune on 25 March 1933 and had his early education in the
princely city of Kolhapur. His Master’s degree and Doctoral research work were carried out in chemical engineering in the University of Birmingham, UK. After obtaining his PhD, Gowariker joined the Theoretical Physics Division of the Atomic Energy Research Establishment at Harwell. He subsequently moved to Imperial Metal Industries (Kynoch) Ltd. of the Summerfield Research Station, Kidderminster, as Senior Technical Officer in the Ballistics and Mathematical Services Department.

Gowariker was active in research those days on topics related to heat and mass transfer as well as solid rocket graphite nozzle erosion. He was also interested in mathematics and was elected as an Ordinary Member of the American Mathematical Society in 1963.

Vikram Sarabhai had established the Space Science and Technology Centre (SSTC) with a view to develop solid propellant rockets for sounding rocket applications. The development of the propellant system was a key activity and for this he chose Vasant Gowariker – a person with experience in design and performance of solid rocket systems. Rocket development at SSTC in 1967 was at a nascent stage. Gowariker took charge of the situation fairly quickly and succeeded in developing a propellant based on commercially available polyester resin. He went on to establish facilities that would not only cater to the production of various input materials, but also to the processing of propellants along with associated inspection and quality control capabilities. Between 1973 and 1978, he successfully established the Polymer Complex – R&D wing for polymers and chemicals; the Propellant Fuel Complex for scaling up the products and process; and the Ammonium Perchlorate Experimental Plant for producing the solid propellant oxidizer; and the Solid Propellant Space Booster Propellant Plant for processing large-sized case-bonded propellants.

Gowariker was the Director of Vikram Sarabhai Space Centre during the years 1979 to 1985. This period saw the culmination of the SLV project and initiation of the PSLV project. The development of the Hydroxyl Terminated Polybutadiene (HTPB) propellant was a significant event and his decision to use this in the PSLV solid propellant rocket stages was a momentous one. In mid 1970s, Gowariker took up a DST-sponsored project to make petroleum crude from non-edible oilseeds.

During his tenure as Secretary to the Government of India in the Department of Science and Technology (DST) during 1986–1991, Gowariker set up the Technology Information Forecasting and Assessment Council, Vigyan Prasar for taking up large-scale science popularization tasks/activities and the National Centre for Medium Range Weather Forecasting. He also initiated measures to popularize science and was the Founder-President of the National Children’s Science Congress and the National Centre for Science and Technology Communication.

After his stint as Secretary, DST, Gowariker served as Scientific Adviser to the Prime Minister between 1991 and 1993, and then subsequently relocated to Pune to take over the Vice-Chancellorship of Pune University. His emphasis was on strengthening the research base in the University and towards this he entered into joint research agreements with DAE, ISRO and DRDO. He encouraged Government departments and corporate bodies to endow chairs in the University departments for encouraging research. In April 1998, he took up a DST-sponsored project to bring out a Fertilizer Dictionary. This was a nine-year effort resulting in what is now called the Fertilizer Encyclopedia.

Gowariker was appointed by the Maharashtra Government as Chairman of the Rajiv Gandhi Science and Technology Commission for a period of five years from 2008. The establishment of a Gene Bank, a Biomedical Engineering Centre and a Science Centre at Solapur are examples of the Commission’s work under Gowariker’s leadership.

Gowariker’s writings ranged from the popular to the serious. His earliest writing – a series of articles under the title of ‘Out into Space’ appeared in Science Today during 1968–1969 – was aimed at young readers. His later writings included books on polymer science, demography and Katha ISRO Chi – the story of ISRO in Marathi. Gowariker was a Fellow of all the leading science and engineering academies in India and the recipient of a number of honorary doctorates and awards of professional bodies, including the Aryabhata Award of the Astronautical Society of India and the FIE Foundation Award. In recognition of his significant contributions, the Government of India conferred on him the Padma Shri in 1984 and Padma Bhushan in 2008.

Vasant Gowariker passed away on 2 January 2015. He is survived by his wife Sudha and three daughters.

R. K. Lal (elected 1986)

Ravindra Kumar Lal, former Professor of Geology and INSA Senior Scientist at Banaras Hindu University (BHU), Varanasi, passed away on 19 October 2014. He was born on 14 October 1936 at Darbhanga in Bihar. His father, K. N. Lal, was a noted agricultural scientist at the then College of Agriculture and
later served BHU as Registrar. R.K. Lal received his early education including Bachelor’s (1956) and Master’s degrees (1958) from BHU. Lal began his academic career as a Lecturer in the Department of Geology, BHU, in 1958. He then went to the University of Toronto, Canada, under the Canadian Commonwealth Scholarship and earned a doctorate in metamorphic petrology in 1966 working with W. W. Moorhouse. After returning to India, Lal became Reader in 1972 and later Professor in 1982 at the BHU Geology Department. He served as the Head of the Geology Department from 1986 to 1990 and continued after his superannuation in 1996 as CSIR Emeritus Scientist (1997–2001) and as INSA Senior Scientist (2003–2005). Lal thus had a very long association with BHU, a premier centre of learning in India.

He taught metamorphic petrology, mineralogy, experimental petrology and thermodynamics, Precambrian stratigraphy, etc., to graduate and post-graduate students with great clarity. He had a very productive career and authored over 100 research papers in peer-reviewed journals. He was also a keen field geologist. Some of his publications set a bench-mark in petrology. The salient research contributions of Lal and his co-workers include: (i) ‘Restite’ origin of the high-grade K-deficient cordierite – gedrite rocks of Fishtail Lake, Ontario, Canada; (ii) detailed petrological characteristics including geothermobarometry of the classic example of the Barrovian type progressive metamorphism of meta-pelites from Sini, Singhbhum, Jharkhand and Takdah, Darjeeling Himalaya; (iii) petrology of the low-pressure andalusite–sillimanite type of regional metamorphism of the Khetri Copper Belt, Rajasthan, and (iv) chemographic relationships of the high-grade silica-deficient sapphirine-bearing rocks of Sonapahar, Meghalaya.

Lal was a recipient of Alexander von Humboldt Fellowship. The Indo-German research collaboration between BHU and the Universities of Kiel and Bonn on the southern Indian high-grade metamorphic rocks was his brainchild. This collaboration expanded with time as a sustained collaborative research programme from which IIT Kharagpur, Jadavpur University and Mysore University also greatly benefited. From this point onwards, Lal focussed mainly on the detailed geothermobarometry of granulites of the Southern Granulite Belt (SGB), Dharwar Craton of Karnataka and Tamil Nadu. He made a brave attempt to formulate new chemical potential diagrams to explicitly demonstrate the observed sequence of reaction textures during the metamorphic evolution of Mg–Al quartz-absent sapphirine granulites of Kiranur and Ganguvarpatti areas of Tamil Nadu and sapphirine–spinel–quartz granulites of Paderu area in Andhra Pradesh, and calibration of several new internally consistent geothermobarometers.

He received the La Touche Medal of the Mining Metallurgical and Geological Institute, Kolkata (1958); he was the first recipient of Professor M.R. Srinivasa Rao Award by the Geological Society of India, Bengaluru (1985); and the National Mineral Award of the Ministry of Steel and Mines, Government of India (1995). He was elected a Fellow of the Indian Academy of Sciences, Bengaluru (1986), National Academy of Sciences (India), Allahabad (2001) and Indian National Science Academy, New Delhi (1994). He also served on numerous committees and panels for INSA, the Shanti Swarup Bhatnagar Prize, Wadia Institute of Himalayan Geology (Dehradun) and the Geological Society of India (Bengaluru). He can be described as one of the most distinguished petrologists of his generation.

He is survived by his wife (Sudha Lal), son (Ashesh Kumar Lal) and daughters (Sujla Narain and Subhra Sahay).

Srinivasacharya Raghavan was born in Tillaisthanam in Tanjavur in 1934. He completed his undergraduate studies at St. Joseph’s College, Tiruchirappalli.

At TIFR in 1957, Raghavan was already working on algebraic and analytic number theory under the supervision of K. G. Ramanathan. Raghavan’s was the first paper from TIFR to appear in *Annals of Mathematics*. He had by then become an expert on the work of C. L. Siegel, one of the great mathematicians in the first half of the 20th century. One of Siegel’s interests centred around the representation of integers by integral quadratic forms. Raghavan generalized this in a deep way, and Andre Weil, who was one of the permanent members at the Institute for Advanced Study (IAS), Princeton (and also an editor of the *Annals of Mathematics*), was so impressed that he invited Raghavan to visit IAS soon thereafter.

He was recipient of the Bhatnagar Award. He was a Fellow of INSA as well as IASc. Over the years, he served as Editor of the *Proceedings of Mathematical Sciences* of IASc; Dean, School of Mathematics at TIFR and Member of the Council of INSA. Raghavan served as Secretary and Council Member of the Indian Mathematical Society during 1970–1975, and was also a member of the Editorial Board of its journal for many
years. He was interested in teaching besides research, and taught for a few years at the Centre for Mathematics, Bombay University. After retirement, he was with the Chennai Mathematical Institute (then called SPIC Mathematical Institute) for a short time before settling down to a retired life. Even afterwards, he was interested in certain aspects of Srinivasa Ramanujan’s work.

In the mid-seventies, the School of Mathematics at TIFR started a division of Applied Mathematics, initially located at the Indian Institute of Science, Bengaluru. The idea was to engage in those aspects of mathematics which have application potential. Accordingly, it was called TIFR Centre for Applicable Mathematics. Raghavan moved to Bengaluru after the initiator, K. G. Ramanathan, returned to Mumbai in a few years.

Raghavan is survived by his wife, son, daughter-in-law and two grandsons.

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Joseph Devassy Padayatty was born on 10 July 1928 in Puthanpally, Varapuzha (Kerala). He was the only child to the farming family of Devassy Ouseph Padayatty and Mariam Devassy.

He began his career as a teacher, and went to the US to work towards a PhD on bacteria and phages at a time when ‘phage’ was a term discussed only in Cold Spring Harbor and CalTech. Enrolling at the St. Louis University, Missouri, in the Department of Biochemistry, then headed by the Nobel Laureate Edward Adelbert Doisy (who discovered vitamin K), he obtained his PhD (1961–65) followed by postdoctoral research (1965–68). In 1968, he joined Indian Institute of Science (IISc), Bengaluru, as a pool officer and was eventually offered a faculty position at the Department of Biochemistry, where he worked until his retirement in 1988.

At IISc he elucidated the molecular mechanisms involved early in the germination of rice and was the first to clone a gene in India. He, along with his colleagues at IISc, introduced molecular biology in India, eventually establishing it as a distinct field within biochemistry.

He worked on T4D bacteriophage during his postdoctoral work as well as during his stint at IISc as a pool officer, from where he continued the work on phages in his independent laboratory. Padayatty later started working on a locally isolated phage, the colitis phage. He made remarkable contributions in both the fields, molecular biology of phages and rice, establishing himself as a pioneer. Asking important questions in biology and the relentless, uncompromising pursuit to find answers to those questions fostered an excellent academic ambience in his laboratory, which in turn led to notable achievements. At a time when it was rare for PhD work to be accepted for publication in *Nature*, two papers in the ‘letters’ format got published in *Nature* from Padayatty’s lab. The first one was on the transcriptional events that occur in rice embryo during germination. The second one was the discovery that the histone genes in rice were not restricted to one strand, but were distributed over both the strands of DNA, thereby establishing the bidirectional transcription of the histones gene cluster in rice. This was one of the many first findings to the credit of Padayatty’s lab, which was the first to clone genes (including making a genomic library, screening for genes of interest, isolating and characterizing the genes and performing partial sequencing) and to report on the organization of histones genes in a plant system. In recognition of his pioneering work in these areas, he was elected to the fellowship of the Indian Academy of Sciences (1986) and the Indian National Science Academy (1987).

After retirement, he went back to his ancestral home and spent his spare time advising various institutions in Kerala on Biotechnology, one of the main beneficiaries being the Cochin University of Science and Technology. His main passion, post-retirement, was farming and he tried to use his scientific knowledge and scientific temper in modern agriculture.

He passed away on 26 August 2014.

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