

Newsletter of the Indian Academy of Sciences

SEVENTY-SEVENTH ANNUAL MEETING

*Physical Research Laboratory, Ahmedabad
18 – 20 November 2011*

The Seventy-Seventh Annual Meeting of the Academy held during 18 – 20 November 2011, and jointly hosted by the Physical Research Laboratory, the Space Applications Centre, and the Institute for Plasma Research, returned to Ahmedabad after a gap of 19 years (this was the fourth Annual Meeting in this city). The attendance by Fellows – 142 in all – was encouraging, while the response from invited teachers was less than expected.



Professor A. K. Sood's Presidential Address dealt with many features of the physics of soft condensed matter, essentially all in the classical domain. These included nonequilibrium phenomena and flow behaviours of such 'everyday' substances as milk, foam and blood, shampoo, paint, soap and surfactants, to name a few. The time and length scales involved in these phenomena – shear thinning and thickening, negative viscosity, chaos – are about one second and a thousand Ångströms respectively. These



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Published by

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Academy website at: www.ias.ac.in/patrika/

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Newsletter, please write to the
Executive Secretary of the Academy
(chandra@ias.ernet.in)

Forthcoming Events

Twenty-third mid-year meeting, Bangalore 13 – 14 July 2012

Refresher Courses

Statistical mechanics 30 April – 12 May 2012
Nehru Arts and Science College, Kanhangad

Motivational bridge course – Mathematical methods in
physics and laboratory practices for I and II B.Sc students 14 May – 2 June 2012
Yeshwant Mahavidyalaya, Nanded

Experimental physics – XXXVII 15 – 30 May 2012
Institute of Technical Education and Research, Bhubaneswar

Foundations of physics for senior school students 21 – 31 May 2012
Bengal Engineering and Science University, Shibpur

Experimental physics – XXXVIII 5 – 20 June 2012
BS Abdur Rahman University, Chennai

Theoretical physics 16 – 28 July 2012
University of Mumbai

Experimental physics – XXXIX 16 – 31 July 2012
NIT Karnataka, Surathkal

Experimental physics – XXXX 16 – 31 August 2012
IASc Premises, Bangalore

Theoretical and computational fluid dynamics 27 August – 8 September 2012
PSGR Krishnammal College for Women, Coimbatore

Experimental physics – XXXXI 4 – 19 September 2012
St. Xavier's College, Kolkata

Lecture Workshops

Transferable skills – the successful scientist's other toolbox
Manipur University, Canchipur 4 – 5 April 2012
North-Eastern Hill University, Shillong 9 – 10 April 2012

Mathematics 18 – 19 June 2012
Institute of Mathematical Sciences, Chennai

Mathematics 20 – 21 June 2012
Indian Institute of Science, Bangalore

Plane geometry to rubber-sheet geometry 29 – 30 June 2012
Harish-Chandra Research Institute and NASI, Allahabad

Periyar University, Salem 13 – 14 August 2012

phenomena are slow, essentially classical and of industrial relevance. The interplay of easily visualizable experiments and theory was impressive. Among other things, it was 'reassuring' to learn that the currently much advertised dietary milkshakes contain 1% milk and 99% air!

Sudhir Kakar's Public Lecture on 'A creative melancholy: The paintings of Rabindranath Tagore' was a psycho-analytical study of the wellsprings of inspiration that led to his body of work. The youngest – 13th – child of his parents, Rabindranath was



surrounded by family, wealth and culture, yet felt infinitely lonely. The speaker explored the subconscious currents that late in life found expression in the visual medium. It became clear that unresolved and unacknowledged traumas of childhood can come back to haunt one's later years. Creativity comes from a combination of the subconscious and the spiritual, the heart and the head. Tagore is indeed the Father of modern Indian painting.

The second Public Lecture by **Sudarshan Iyengar** of the Gujarat Vidyapith was on the 'Science-social science interface'. A fair amount of Gandhi's thinking and philosophy was woven into the narrative. Many



ideas came into focus – the post-Renaissance 'Enlightenment Project' of the late 18th century; the Baconian ideas of conquering and exploiting Nature leading to a loss of respect for it; protestant ethics, capitalism.... We were reminded that Adam Smith's 'Wealth of Nations' was influenced by Newton's mechanics, and while reason and objectivity are key to the scientific understanding of Nature, social science in comparison had 'missed the bus'. In the speaker's view, the philosophical foundations of both science and social science have been in trouble.

The two special lectures by **Samir K. Brahmachari** and Devang V. Khakhar were on new approaches to drug discovery, and on flow problems important in chemical engineering, respectively. The



former titled 'Open source drug discovery: A model for science 2.0 through crowd sourcing' exploited the availability of large genome sequences of many pathogens, combining them with a new method of working in which many students participate through 'crowd sourcing and social networking'. The latter titled 'Dense granular flows: Rheology and segregation' by

Devang V. Khakhar dealt with flow problems where the continuum fluid approximation is not adequate and account must be taken of granularity of materials. Practical cases of importance include flow patterns exhibited by gravel,



foodgrains, cement and the like. Even Saturn's rings were mentioned! Current industrial processes tend to be inefficient and over-designed. The speaker presented many such phenomena from both numerical and experimental points of view.

Three mini-symposia were organised, the topics being 'Chemical Biology', 'Recent Trends in High Energy Physics', and 'Fundamental Challenges in Plasma Physics'. We learnt through the first symposium that the Indian Institute of Chemical Biology, set up in 1982, is the first such in the world; and that while biological chemistry is reductive, chemical biology is holistic and integrative. The second symposium described results expected from the Large Hadron Collider, and steps beyond the standard model of elementary particle physics. In the third, the interactions of matter with extremely high intensity laser pulses – 3×10^{15} watts/cm² of radiation – were discussed.

There were, in addition, presentations by 21 Fellows and Associates, several recently elected. These covered a very wide variety of topics – cosmology with dwarf galaxies, vaccines to combat anthrax, the evolutionary advantages of Rapid Eye Movement Sleep, and some chemistry of gold. From this last, we learnt that one half of the world's gold mined each year ends up in India, and of this one half goes to Kerala.

The cultural events included a performance of the ballet 'Dance of Life' by the Darpana Academy ensemble, and a visit to the Akshardham Temple.

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TWENTY-THIRD MID-YEAR MEETING

13 – 14 July 2012

Programme

13 July 2012 (Friday)

- 0930 – 1010 **Session 1A – Special Lecture**
Ashutosh Sharma, IIT, Kanpur
Taming self-organization in highly confined soft matter to sub-100 nm scales: Fabrication of nanolens-arrays by spinodal instability of thin polymer films
- 1010 – 1300 **Session 1B – Lectures by Fellows/ Associates**
- 1010 **Utpal Sarkar**, PRL, Ahmedabad
Confronting the faster-than-light neutrinos
- 1030 **Srivari Chandrasekhar**
IICT, Hyderabad
Synthesis of bio-actives with relevance to human health care
- 1120 **G Balakrish Nair**
Translational Health Science & Tech. Inst., Gurgaon
From genomes to public health: The cholera example
- 1140 **Rakesh K Mishra**
CCMB, Hyderabad
Functional relevance of the non-coding part of the genome and evolution of complexity in animals
- 1200 **R P Chhabra**, IIT, Kanpur
Hydrodynamics of particles in visco-plastic fluids

- 1220 **Samit Chattopadhyay**, NCCS, Pune
Expression and modulation of CD44 variant isoforms in human cancers
- 1240 **M Rajeevan**, Ministry of Earth Sciences, New Delhi
Long-term variations of droughts over India
- 1430 – 1720 **Session 1C – Lectures by Fellows/ Associates**
- 1430 **K Porsezian**, Pondicherry University, Puducherry
Supercontinuum generation in photonic crystal fibers
- 1450 **C Pulla Rao**, IIT, Mumbai
Metallation of proteins
- 1510 **Ranjan K Mallik**, IIT, New Delhi
Performance evaluation and channel characterization for wireless systems
- 1600 **R K Kohli**, Panjab University, Chandigarh
Inter-plant interaction: Ecological disturbance through plant invasion
- 1620 **S J Bhatt**, Sardar Patel University, Vallabh Vidyanagar
Differential structures in C^ -algebras*
- 1640 **Subhasish Dey**, IIT, Kharagpur
Turbulence in mobile-bed streams
- 1700 **S R Barman**, UGC-DAE Consortium for Sci. Res., Indore
Quasicrystalline metallic adlayers
- 1800 – 1900 **Session 1D – Public Lecture**
Mahesh Rangarajan
Nehru Memorial Museum and Library, New Delhi
Making spaces for nature: Science, politics and the environment in an emerging economy

14 July 2012 (Saturday)

0900 – 0940

Session 2A – Special Lecture

Chandrima Shaha, NII, New Delhi
Endure, survive or perish? Life and death decisions by cells

0940 – 1230

Session 2B – Lectures by Fellows/ Associates

0940

Yogendra Singh, IGIB, Delhi
Survival strategies of bacterial pathogens

1000

Smitha V Thampi, PRL, Ahmedabad
Computed axial tomography's view of the ionosphere

1050

K N Raghavan, Institute of Mathematical Sciences, Chennai
Invariant theory and standard monomial theory

1110

V K Chandrasekar, Bharathidasan University, Tiruchirappalli
Event-related synchronization/ desynchronization in coupled nonlinear oscillator systems and applications

1130

Faiz Ahmed Khan, IIT, Hyderabad
Synthesis of marine natural products

1150

Manoj Saxena, Deen Dayal Upadhyaya College, New Delhi
Tunnel field effect transistor – a biomolecule sensor

1210

Abhishek Dey, IACS, Kolkata
Hydrogen, anybody?

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2012 ELECTIONS

Fellows

Amita Aggarwal

Sanjay Gandhi PG Institute of Medical Sciences, Lucknow
Area: Clinical immunology; rheumatology; juvenile arthritis



S Balasubramanian

Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore
Area: Molecular simulations; liquid state; computational chemistry



Rajendra P Chhabra

Indian Institute of Technology, Kanpur
Area: Transport phenomena; rheology; non-Newtonian fluids



Subhasish Dey

Indian Institute of Technology, Kharagpur
Area: Fluid mechanics; hydraulics; sediment transport



Abhishek Dhar

Raman Research Institute, Bangalore
Area: Nonequilibrium statistical physics; condensed matter physics: transport theory; mathematical physics



M Durga Prasad

University of Hyderabad, Hyderabad
Area: Theoretical chemistry; molecular vibrations



Pradip Dutta

Indian Institute of Science, Bangalore
Area: Heat transfer; energy studies



Faiz Ahmed Khan

Indian Institute of Technology, Hyderabad
Area: Synthetic organic chemistry; chemistry of natural products; synthetic methodologies



Mj Mahan

Vivekananda University, Howrah
Area: Geometric group theory; geometric topology; hyperbolic geometry



Ranjan K Mallik

Indian Institute of Technology, New Delhi
 Area: *Electrical engineering (communications)*

**M Rajeevan**

Ministry of Earth Sciences, New Delhi
 Area: *Climate variability; monsoon prediction; climate change*

**Rakesh K Mishra**

Centre for Cellular and Molecular Biology, Hyderabad
 Area: *Genomics; chromatin; epigenetics*

**AR Rao**

Tata Institute of Fundamental Research, Mumbai
 Area: *X-ray astronomy; X-ray instrumentation; high energy astrophysics*

**V Mohan**

Dr Mohan's Diabetes Specialities Centre, Chennai
 Area: *Diabetes & its complications; epidemiology; genomics studies; translational research*

**C Pulla Rao**

Indian Institute of Technology, Mumbai
 Area: *Inorganic chemistry; bio-inorganic chemistry; supramolecular chemistry; metalloproteins, metalloenzymes*

**Debasisa Mohanty**

National Institute of Immunology, New Delhi
 Area: *Bioinformatics; computational & structural biology; biophysics*

**V Ravindran**

Harish-Chandra Research Institute, Allahabad
 Area: *Perturbative quantum chromodynamics*

**G Mugesh**

Indian Institute of Science, Bangalore
 Area: *Bioinorganic chemistry; chemical biology; medicinal chemistry*

**Bhaskar Saha**

National Centre for Cell Science, Pune
 Area: *Immunology; signal transduction; parasitology*

**G Balakrish Nair**

Translational Health Science and Technology Institute, Gurgaon
 Area: *Clinical microbiology; molecular epidemiology; diarrhoeal diseases*

**Anindya Sarkar**

Indian Institute of Technology, Kharagpur
 Area: *Stable isotope geochemistry; palaeoclimatology; geochronology*

**Arup K Pal**

Indian Statistical Institute, New Delhi
 Area: *Operator algebras; non-commutative geometry; quantum groups*

**Krishnendu Sengupta**

Indian Association for the Cultivation of Science, Kolkata
 Area: *Condensed matter theory*

**AK Pani**

Indian Institute of Technology, Mumbai
 Area: *Numerical analysis; partial differential equations; industrial mathematics*

**Amit P Sharma**

International Centre for Genetic Engineering and Biotechnology, New Delhi
 Area: *Structural biology; malaria; protein translation*

**K Porsezian**

Pondicherry University, Puducherry
 Area: *Solitons, modulational instability; nonlinear fibre optics*

**VK Sharma**

Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore
 Area: *Chronobiology; evolution; animal behaviour*



AK Shukla

Indian Institute of Science, Bangalore
Area: Materials electrochemistry; fuel cells; batteries & supercapacitors



Sujit K Sikdar

Indian Institute of Science, Bangalore
Area: Cellular neurophysiology; ions channel physiology; pharmacology & biophysics; calcium dynamics



Utpal S Tatu

Indian Institute of Science, Bangalore
Area: Cell biology; biochemistry; molecular chaperones; infectious diseases



Ram Ratan Yadav

Birbal Sahni Institute of Palaeobotany, Lucknow
Area: Palaeoclimatology; tree-ring analysis; climate change & biodiversity



Honorary Fellows

Pradeep K Khosla

Carnegie Mellon University
Pittsburgh, USA



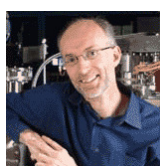
Shrinivas R Kulkarni

Caltech Optical Observatories
California Institute of Technology,
USA



SSP Parkin

Magneto – Electronics Group
IBM Almaden Research Center,
San Jose, USA



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SPECIAL ISSUES OF JOURNALS

Special Issue to commemorate the International Year of Chemistry 2011

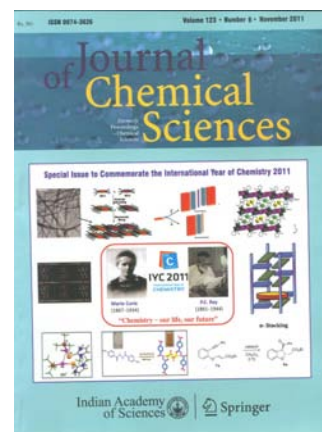
Editors: SS Krishnamurthy and Uday Maitra

Journal of Chemical Sciences, Vol. 123, No. 6,
November 2011, pp. 765 – 998

At the behest of the International Union of Pure and Applied Chemistry (IUPAC) and the United Nations Educational, Scientific, and Cultural Organization (UNESCO), the 63rd General Assembly of the United Nations at its meeting in December 2008 adopted

a resolution proclaiming 2011 as the International Year of Chemistry (IYC-2011). The year 2011 coincides with the 100th anniversary of the Nobel Prize in Chemistry awarded to Madame Marie Curie and the founding of the International Association of Chemical Societies. The objectives of IYC-2011 are to 'increase the public appreciation of chemistry in meeting world needs, to encourage interest in chemistry among young people, and to generate enthusiasm for the creative future of chemistry.' This year also marks the 150th birth anniversary of Acharya P C Ray, a pioneering chemistry researcher and an inspiring teacher hailed as the 'Father of Indian Chemistry'. There has been a great deal of interest around the globe to celebrate IYC-2011 in various ways. In India too, a number of institutions have taken the initiative to convey the importance of chemistry at all levels, particularly to young children through lectures, quiz competitions, demonstrations and interactive sessions.

The Editorial Board of the *Journal of Chemical Sciences* had decided that the Journal will celebrate this great event by bringing out a Special Issue during the year. The Board also decided that a number



of young and emerging investigators around the country could be invited to contribute articles for the special issue. It is gratifying to note that the response has been overwhelmingly positive in spite of the short notice, culminating in the publication of this special IYC-2011 commemorative issue.

The articles in this volume cover a broad spectrum of topics in several emerging areas of chemistry. We hope that readers will get a glimpse of how chemical researchers in India are approaching problems of the 21st century.

Structure, Reactivity and Dynamics

Guest Editors: Susanta Mahapatra and Sanjay Kumar

***Journal of Chemical Sciences*, Vol. 124, No. 1, January 2012, pp. 1 – 332**

Understanding structure, reactivity and dynamics is the core issue in chemical sciences. This special volume presents a nice blend of contemporary theoretical and experimental research covering important aspects of density functional theory (DFT) calculations, molecular dynamics (MD) simulations, light-molecule interactions, dynamics of chemical reactions including non-adiabatic interactions, collisions leading to reactions at cold and ultra-cold temperatures, development of theoretical methodologies and experimental techniques, and further strategies to deal with large-scale and nearly impossible computations. There are altogether 39 papers in this special issue contributed by leading researchers in their respective fields.

Density functional theoretical studies have been reported on hydrogen-bonded systems and their stabilities, chemical reactivity descriptors such as electronegativity and hardness, understanding interactions between two amino acids, proton affinity of amino acids in hydrophobic confinements, catalytic ability of certain organic reactions and adsorption processes.

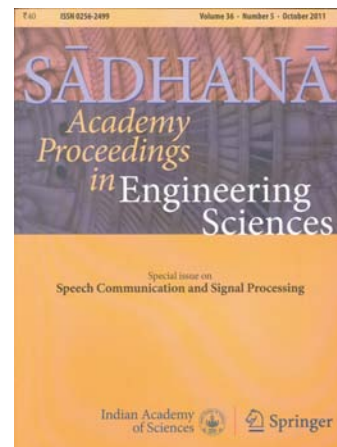


Speech Communication and Signal Processing

Guest Editor: B Yegnanarayana

***Sadhana*, Vol. 36, No. 5, October 2011, pp. 551 – 932**

This special issue deals with many challenging issues in speech processing. Communicating with a machine in a natural mode such as speech brings out not only several technological challenges, but also limitations in our understanding of how people communicate so effortlessly. The key is to understand the distinction between speech processing (as is done in human communication) and speech signal processing (as is done in a machine). When people listen to speech, they apply their accumulated knowledge of speech in relation to a language to capture the message. In this process, it is interesting to note that the input speech is processed selectively using the knowledge sources acquired over a period of time such as sound units, acoustic-phonetics, prosody, lexicon, syntax, semantics and pragmatics. This processing varies from person to person, and it is difficult for any individual to articulate the mechanism he/she is using in processing the input speech. This makes it difficult to write a program to perform the task of extracting message in speech by a machine. It should be noted that, for a machine, only the speech signal is available in the form of a sequence of samples, the rest of the mechanism involving identification of knowledge sources and invoking them on the input signal is a scientific challenge. Thus speech signal processing is one of the most interesting challenges that arouses curiosity among different scientific groups, such as linguists, phoneticians, (psycho) acousticians, electrical engineers, computer scientists and application engineers. This topic has been addressed in this special issue.



Fracture and Fatigue: Some New Insights

Guest Editor: BK Raghu Prasad

***Sadhana*, Vol. 37, No. 1, February 2012, pp. 1– 205**

It is over nine decades since fracture mechanics found its importance in the design of mechanical, aerospace and civil engineering structures. Its application

started in naval structures during the early part of 20th century.

The theory of fracture mechanics was initially found ideal to explain the failure of brittle materials like glass. Later it was modified for metals and now for quasi-brittle materials like concrete. It was further extended to polymers and much softer materials in the recent past. An important offshoot of fracture mechanics is the size effect which is clearly and strongly observed in quasi-brittle and heterogeneous materials like concrete.

In concrete, it is well-established that strength reduces with size. Other related factors are the presence of a fracture process zone (FPZ) and softening. Further, a study on FPZ has shown that the entire fracture behaviour is governed by fracture process at different scales such as micro-, meso- and macro. This led to multi-scale modelling of fracture. Size effect is also observed in other materials like magnesium.

Fracture caused by fatigue has a very different character and needs a special study. With the above in view, it was felt that a collection of papers devoted exclusively to bring out the above aspects would be useful for further research. This special issue of *Sadhana* presents papers dealing with the above topics.

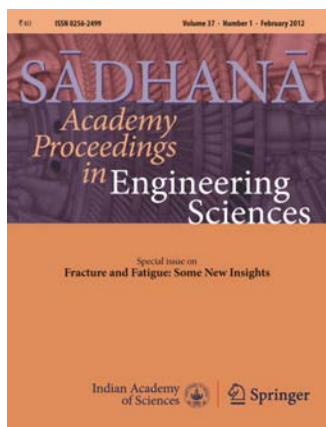
Proceedings of the Conference on Perspectives in Nonlinear Dynamics (PNLD-2010)

Editors: Neelima Gupte, Arul Lakshminarayan and Ram Ramaswamy

***Pramana*, Vol. 77, No. 5, November 2011, pp. 765 – 1022**

The third of the Perspectives in Nonlinear Dynamics meetings, PNLD 2010, was held in Bangalore from July 26 to 29, 2010 as a temporal – rather than spatial – satellite to STATPHYS 24 conference held in Cairns, Australia.

PNLD 2010 was held under the auspices of the International Centre for Theoretical Sciences, Bangalore as a part of the ICTS Nonlinear Sciences Perspectives Programme from 21 to 29 July. This had two components, a workshop on Quantum Chaos that was held from 21 to 25 July at IIT, Chennai and the PNLD



conference that was held in Bangalore from 26 to 29 July 2010.

The present volume contains the proceedings of the conference which, like its predecessors, was an appropriate occasion for a discussion of the current status of the field. The meeting highlighted nonlinear science research, and turned out to be an extremely useful forum for discussing emerging research directions, and presenting current research. A special effort was made at this conference to highlight the work of young Indian researchers.

The scientific programme for the meeting consisted of 38 invited talks, 12 contributed talks, and also a poster session. The conference attracted 100 participants from 12 countries.

The papers in this issue reflect the diversity of the talks in the conference and are organized in four sections: quantum chaos, biological systems, synchronization, coupled systems and networks, and nonlinear waves and solitons.

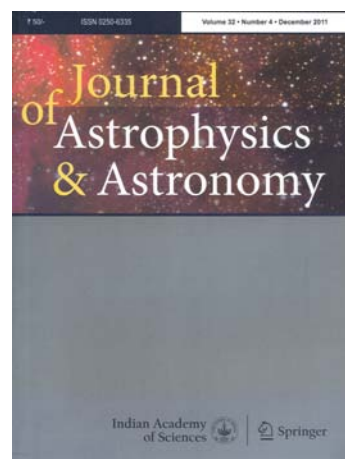
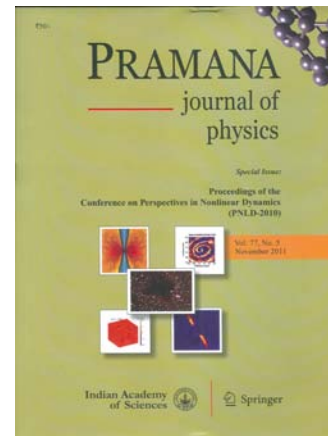
International Conference on Diffuse Relativistic Plasmas

Guest Editors: KS Dwarakanath, Lawrence Rudnick, N Udaya Shankar and Tiziana Venturi

***Journal of Astrophysics & Astronomy*, Vol. 32, No. 4, December 2011, pp. 425 – 640**

This special issue of the Journal of Astrophysics and Astronomy comprises papers presented at the International Conference on Diffuse Relativistic Plasmas organized by the Raman Research Institute, Bangalore and held at the RRI campus between March 1 and 4, 2011. The intent of

this conference was primarily to explore vital connections between diffuse synchrotron plasmas on a



range of cosmic scales and extreme astrophysics and also the feedback on cosmic evolution. This relatively neglected discovery space would, however, require advanced knowledge of radio surveys with exceptional surface brightness sensitivities derived from LOFAR, ASKAP and SKA to potentially ensure our understanding. The purpose of this conference, therefore, was to aspire to consolidate this very understanding.

Fifty-one participants from nine countries attended this conference which featured invited talks, contributed talks and poster papers and included lively, pertinent discussions. The presentations encompassed topics ranging from particle acceleration to diffuse relativistic plasmas in a variety of objects and also current radio surveys from ATCA, GMRT, and LOFAR. Speakers delved into the phenomenology of diffuse synchrotron structures associated with compact stellar remnants, stellar black holes, super massive black holes and galaxy clusters in a variety of environments and cosmic time. The underlying theme throughout the presentations was the study of high energy astrophysics that creates and sustains particles and fields, the environmental impact of radio mode activity and the role for this phenomenon in cosmic evolution.

DISCUSSION MEETINGS

Conference on Magnetism: Practice and Theory

Orange County, Coorg
30 November – 4 December 2011

Convener: DD Sarma (SSCU, IISc, Bangalore)

The discussion meeting on 'Magnetism: Practice and Theory' was held during 30 November to 4 December 2011 at Orange County in Coorg, Karnataka. There were 10 experts from abroad, 8 senior Indian scientists and 7 students/post-doctoral fellows, making a total of 25 participants. All the participants including the students and post-doctoral fellows presented their work. All these presentations were followed by intense discussions – an interesting feature of this meeting which was well appreciated. In fact, the programme of the next meeting which was held in Orange County in February 2012 also included this feature.



While all the presentations were on magnetism, the emphasis was primarily on the wide range of magnetism observed in a variety of transition metal oxide systems. In addition, a mix of experimental and theoretical investigations were presented reflecting the title and scope of this discussion meeting.

Conference on Physics and Chemistry of Spintronic Materials

Orange County, Coorg
22 – 26 February 2012

Convener: DD Sarma (SSCU, IISc, Bangalore)

This discussion meeting on 'Physics and Chemistry of Spintronic Materials' was held during February 22 – 26, 2012 at Orange County. There were 30 participants (4 experts from Ireland, Japan, Switzerland and USA, 7 from India, 9 students /post-doctoral fellows from India and 10 PhD students from Europe). The students from abroad were supported by a special grant from the University of Mainz in Germany. Unfortunately, one Canadian expert could not participate as the flight got cancelled after boarding it! As in our previous meeting



at Orange County in November 2011, students and post-doctoral fellows were also given slots for making oral presentations based on their work, besides presentations from senior scientists. The programme of this discussion meeting which was also designed to allow for intense discussions had a nearly equal mix of talks based on experimental and theoretical investigations.

Critical issues in phase transformations in metals and alloys

Orange County, Coorg
18 – 20 March, 2012

Convener: K Chattopadhyay (Department of Materials Engineering, IISc, Bangalore)

A meeting under the auspices of the Indian Academy of Science was held from 18 – 20 March, 2012 at the Orange County, Coorg to discuss "The critical issues in phase transformation in metals and alloys". A total of 23 scientists from all over India working in this field

A set of presentations revisited our understanding of phase transformation in important engineering alloys in the light of newer information that have emerged in the last few years due to the availability of better experimental and computational tools. These include talks by Balamuralikrishna, Sandip Ghosh Chaudhury and Dinesh Srivastava.

In recent times many open questions have emerged during different applications including some under extreme conditions. These questions are fundamental in nature but often ignored as the answers are not known. Vijayalakshmi highlighted some of these issues. Some of them are related to incomplete understanding of the behaviour of interface and D Banerjee, I Manna and Samajdar highlighted these in their presentations. An extension of this problem exists in thin films where the behaviour of the interface controls the mechanical properties. The use of modern tools can have great impact in our understanding as illustrated by Vikram Jayaram. S Chatterji looked at the issue of bonding across the interface due to diffusion. The modelling of phase transformation always complemented our



participated in the meeting. The meeting was divided into five sessions of extensive interaction. One of the highlights of the meeting was the participation of Srikumar Banerjee who has made a lifelong contribution to the development of this field in India. The talks covered the gaps that one discovers in applying our existing understanding of phase transformation in newer contexts. The context of reduced length scale in the domain of nanoparticles and nanoalloys was highlighted in at least three talks of K Chattopadhyay, GK Dey and PP Chattopadhyay. The transformation behaviour changes due to energy contributions from different surfaces and interfaces which are normally ignored in bulk.

understandings of phase transformation. Kulkarni talked about Monte Carlo simulation in the current context while TA Abinandanan highlighted the power of phase field simulation.

Finally, S Banerjee gave a talk highlighting some of the problems that he attempted to solve with his coworkers, some of whom were present in the audience and discussed how our understanding evolved not only with the introduction of newer tools but also from critical ideas that emerged during interactions with fellow colleagues. Overall, the meeting catalysed intense discussion and some future road maps which, it is hoped, many will pursue.

Science Writing Workshop

Indian Academy of Sciences, Bangalore

29 – 30 December 2011

Speaker: Robert Kanigel (Professor in Science Writing, MIT, USA)

Robert Kanigel, known for his biography 'The Man who knew Infinity: A life of the genius Ramanujan' was in India to lecture on the occasion of the 125th birth anniversary of Ramanujan. During this time, he also conducted a science writing workshop for journalists. The workshop brought together science writers from across the country for a thought-provoking, open discussion on the scope, concerns and challenges in science reporting. The workshop was inaugurated by Prof. P. Balaram, Director, Indian Institute of



Science. The participants included science writers, journalists from leading newspapers, political magazines and editorial staff of Indian Academy of Sciences. Also included was a face-to-face session between scientists and the journalists to discuss science writing.



This workshop organized by the Indian Academy of Sciences was partnered with the Centre for Advancement of Public Understanding of Science & Technology, National Board of Higher Mathematics and the Ramanujan Mathematical Society.

RAMAN PROFESSORS

Anthony K Cheetham (Goldsmiths' Professor of Materials Science, Department of Materials Science and Metallurgy, University of Cambridge, Cambridge, UK) spent two periods in India under the auspices of the Academy's Raman Chair. The first was from 21 September – 9 October 2011 and the second from 2 – 20 December 2011. During the first stay, Cheetham visited institutions in Pune, Mumbai, and Trivandrum,



and attended a conference in Cochin. During the second period, Cheetham visited Santiniketan, Calcutta, and Tumkur. Professor Cheetham delivered a total of 14 lectures at all these places.

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Sauro Succi from the Istituto Applicazioni Calcolo "Mauro Picone", Rome (Italy) occupied the Raman Chair in two phases – during October 2011 and February 2012. He was based at the Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bangalore. He visited the Indian Institute of Science, Bangalore, the Institute of Mathematical Sciences (IMSc), Chennai, the Inter-University Centre for Astronomy and Astrophysics



(IUCAA), Pune, the Nvidia Research Centre and closely interacted with faculty and students at these institutions. In collaboration with the group of Prof. Ansumali at

JNCASR, he worked on high-end simulations of fully developed turbulence. This work has been completed and submitted to *Nature*. He has also completed work on simulations of thermal flows which has recently been accepted for publication in *Communications in Computational Physics*. At IIMSc, he worked with Prof. Adhikari on lattice representations of differential operators of common use in field theories. At IUCAA, he interacted with Prof. Padmanabhan on recent analogies between gravitational theories and fluid dynamics. At Nvidia Research Centre, he discussed the possibilities of collaboration using high-end hemodynamic codes on most powerful Nvidia GPU machines. He delivered the Raman lecture on "Hydrokinetic Approach to Complex Flowing Systems: The legacy of P. L. Bhatnagar" at Indian Institute of Science on 2 February 2012 and also gave a talk on "Multiscale hemodynamics" at Nvidia Research Centre on 13 February 2012.

ACADEMY PUBLIC LECTURES

Recent developments in solid state lighting

Anthony K Cheetham

(Raman Professor, Goldsmiths' Professor of Materials Science, Department of Materials Science and Metallurgy, University of Cambridge, Cambridge, UK)

7 October 2011

Indian Institute of Science, Bangalore

The adoption of solid state lighting has the potential to reduce global electricity consumption by over 10%. The technology is based on the use of blue InGaN light emitting diodes (LEDs) combined with phosphors that convert some of the blue light into green, yellow and red. The state-of-the-art in this exciting field was discussed and some recent work on down-conversion phosphors was described. Opportunities in the area of up-conversion phosphors using rare earth doped oxides were also discussed. The applications of up-conversion (e.g., from IR to visible or visible to UV) include solid state lighting, photovoltaic cells, biosensors, photocatalysis for hydrogen production, and self-cleaning ceramics.

Recent advances in inorganic-organic framework materials

Anthony K Cheetham

7 December 2011

Indian Institute of Science, Bangalore

The study of porous metal-organic frameworks (MOFs) is one of the most fashionable areas of materials science. The zeolitic imidazolate frameworks (ZIFs) are a particularly interesting sub-class of MOFs on account of their close structural relationship to aluminosilicate zeolites. Recent studies on ZIFs, including novel synthetic routes, energetics, mechanical properties, their behaviour under pressure, and amorphization were discussed. Some ongoing work on dense frameworks, including their electronic and magnetic properties, as well as their nanostructures was also described.

The Restless Universe – Palomar Transient Factory

S R Kulkarni

(John D. & Catherine T. McArthur Professor of Astronomy and Planetary Science; Principal Investigator, Palomar Transient Factory; Director, Caltech Optical Observatories, California Institute of Technology, Pasadena, USA)

29 November 2011

Indian Institute of Science, Bangalore



Cosmic explosions were first noted nearly two thousand years ago. However, secure recognition and study began only a hundred years ago. What was once termed as Stella Nova (new stars) is now divided into two major families, novae and supernovae (with real distinct classes in each).

Equally the variable stars have a rich phenomenology. Together, supernovae and variable stars have contributed richly to key problems in modern astrophysics: distances to galaxies, cosmography and build-up of elements in the Universe.

The Palomar Transient Factory (PTF), an innovative 2-telescope system, was designed to explicitly chart the transient sky with a particular focus on events which lie in the nova-supernova gap. PTF is now finding an extragalactic transient every 20 minutes and a Galactic (strong) variable every 10 minutes.

The results so far: ultraluminous supernovae as the end of the most massive stars in the Universe, progress in understanding the origin of Ia supernovae (which were used by astronomers to discover dark energy), discovery of new classes or sub-classes of supernovae and identification of curious double degenerates of value to future gravitational wave observatories in space.

Ramanujan as Everyman

Robert Kanigel
(Author and Professor in Science Writing, MIT, Cambridge, USA)

30 December 2011
Indian Institute of Science, Bangalore



As the 125th anniversary of his birth approaches, it's natural to appreciate the mathematician Ramanujan for his genius, for the drama of his life's story, for the esteem he brings to mathematics, and to India. But it required only a slight shift of focus, which in this lecture Robert Kanigel offered, to see him not alone as genius but as Everyman, representing the hopes, dreams and strivings of ordinary people the world over. The lecture was very well attended as represented in the photo.

Hydrokinetic Approach to Complex Flowing Systems: The Legacy of P.L. Bhatnagar

Sauro Succi
(Raman Professor, Indian Academy of Sciences; Istituto Applicazioni Calcolo, CNR, Roma, Italy; Research Associate, Physics Department, Harvard University)

2 February 2012
Indian Institute of Science, Bangalore

Every scientific discipline stands on the shoulders of its giants. For the case of statistical physics, it is Ludwig Boltzmann, its founding father, and Josiah Willard Gibbs. However, further progress crucially depends on subsequent groundbreaking contributions by a small group of inspired leaders. In this lecture, Professor Succi paid a tribute to the work of Prabhu Lal Bhatnagar, and most notably to the Bhatnagar-Gross-Krook model kinetic equation, which has proved exceedingly influential for modern developments in (lattice) kinetic theory over the last two decades. Some of the most outstanding advances of lattice kinetic theory for complex flows, including the modelling of fluid turbulence and the rheology of soft-glassy materials were touched upon.

National Science Day 2012

28 February 2012
Divecha Centre for Climate Change, Indian Institute of Science, Bangalore

1) Beyond Oil and Gas: The Methanol Economy

GK Surya Prakash
(University of Southern California, USA)

Professor Surya Prakash in his lecture introduced the concept of methanol economy to an audience consisting of school children, research students, and faculty. He highlighted the advantages of using methanol as an alternative fuel for the future. There was a practical demonstration of a small internal combustion engine running on methanol. He argued that methanol could be



dispensed from regular gas stations with limited modifications and that it was safer than gasoline in case of a fire. He pointed out that the production cost of methanol was much lower than that of gasoline.

The lecture also dwelt on the history of hydrocarbons, factors leading to global warming and nuclear energy. He proposed various solutions to address the present fuel crisis. Though India has been trying to harness energy from wind mills, solar, hydro, geothermal and nuclear plants, he argued that India will still be short of liquid fuel transport. He proposed that India like China should plan for a methanol economy.

2) Power Generation from Solar Photovoltaic Concentrators

Kiran Shah
(Chroma Energy Private Ltd., Pune)

Kiran Shah in his talk discussed the advantage of electric power generation from photovoltaic panels when compared to solar-thermal route. He argued that modern multi-junction solar cells have high efficiencies (more than 40%) and hence will require less land area than that required by solar-thermal power generation.



The multi-junction solar cells are, however, very costly and hence have to be used in conjunction with concentrators. He showed that concentration factors in the range 500 to 1000 can be achieved without encountering problems associated with heat removal from the solar cells. He discussed the need for a secondary optical element to ensure a more uniform illumination of the solar cell. He showed that cost of power generation from solar photovoltaic concentrators will decline steadily in the next ten years.

International Women's Day

6 March 2012

Maharani Lakshmi Ammanni College for Women,
Bangalore

1) How do 'soft' materials move when pushed really hard?

Ranjini Bandopadhyay
(Raman Research Institute, Bangalore)

This talk introduced the concept of nonlinear rheology of 'soft' materials. The flow and deformation behaviours observed upon the application of shear stresses to familiar materials such as silly putty, aqueous foams, and aqueous solutions of cornflour were discussed. The intriguing nonlinear flow properties of clay suspensions and granular media under externally imposed forces were demonstrated by discussing some very recent experiments performed at the Raman Research Institute laboratory.



2) When size matters

Shobhana Narasimhan
(Jawaharlal Nehru Centre for Advanced Scientific
Research, Bangalore)

Even in our everyday life, we are fascinated by size, especially when things are very large or very small. Our fairy tales and myths are full of stories about giants and dwarfs and their magical powers. Even classically, size matters, because some properties scale with area or length, while others scale with volume. Thus the optimal shape for creatures on a massive planet like Jupiter would be quite different from that on Earth. Recently, with the birth of nanoscience, it is the realm of the very small that has captured the imagination of scientists and technologists. This is not just because of the possibility of miniaturization, and the ability to use smaller quantities of expensive materials like noble metals, but also because materials behave differently at small sizes. For example, 'non-magnetic' materials become magnetic, metals become insulators, and 'noble' metals like gold become chemically reactive.

SUMMER RESEARCH FELLOWSHIP PROGRAMME – 2012

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

The 2012 programme was announced in October 2011 and the last date for receiving applications was 2 January 2012. Selection Committees consisting of experts in different areas met during the third week of January 2012 to scrutinize and make the selections. The following table indicates subject-wise, the numbers of applications received from students and teachers and the fellowships offered.

Subject	Applications received		Fellowships offered	
	Students	Teachers	Students	Teachers
1 Life Sciences + Agricultural Sciences	4165	248	536	63
2 Engineering & Technology	5518	137	280	23
3 Chemistry	1675	114	217	48
4 Physics	1637	107	207	53
5 Earth & Planetary Sciences	622	14	141	4
6 Mathematics	533	40	101	16
Total	14150	660	1482	207

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

REFRESHER COURSES

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

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

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 conceptualisation and designing of the experiments initially with the assistance of a group from the Goa University. 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 a company in Bangalore: M/s Ajay Sensors and Instruments.

In 2010, the Academy set up an experimental physics laboratory in Bangalore. It is now possible to hold 4 to 6 courses in Bangalore besides courses that can be held in other parts of the country.

Some of the experiments that can be done with the kit were listed in the earlier issues of *Patrika*. Some new experiments were added in two of the courses held in Bangalore: (a) rigidity modulus of a brass wire from torsional oscillations; (b) calibration of a matched pair of transistors against a Pt thermometer and determination of k/e ; (c) percolation in pellets of graphite and white cement in different proportions; (d) Feigenbaum and Chua's circuits to study non-linear dynamics; (e) inversion temperature of Fe-Cu thermocouple and the verification of law of intermediate

metals; (f) tracing paramagnetic to ferromagnetic transition in nickel through a study of resistivity; (g) Martensite to Austenite transition in shape memory alloy traced by resistivity; (h) metal-insulator transition in strontium-doped lanthanum manganate below room temperature; (i) differential thermal analysis to study phase transition in potassium nitrate.

At every course, a series of lectures and problem-solving sessions are held to help the participants in conducting the experiments.

The following is a list of Experimental Physics Refresher Courses held with R Srinivasan as the Course Director. These form course numbers 32 to 36 in this series.

1. XXXII, Bangalore, IASc

12 – 28 October, 2011

No. of participants: 18 (13 students and 5 teachers) from Ahmedabad, Amravati, Ananthapur, Balasore, Bangalore, Bharuch, Channapatna, Kolkata, Ratnagiri, Tezpur, Tumkur, Vijayawada.



Resource Persons: R Srinivasan (Mysore), TG Ramesh (NAL, Bangalore), Seeta Bharathi (Bangalore), Manohar Nyayate (BN Bandodkar College of Science, Thane), Neeta Srivastava (RJ College, Mumbai), Neelam Kapoor (RKT College, Ulhasnagar).

Special Lectures: Cooling molecules with cold atoms by having an iron trap to trap the molecules and a MOT to trap the atoms at the same location (Sadiq Rangwala, RRI, Bangalore); experiments in optics (SV Subramanyam, IISc, Bangalore).

2. XXXIII, Bangalore, IASc

8 – 23 November, 2011

No. of participants: 13 (8 students and 5 teachers) from Ahmedabad, Chinnasalem, Dehradun, Delhi, Diphu, Gaziabad, Guntur, Kannur, Nagaur, Patna, Tumkur.

Resource Persons: R Srinivasan (Mysore), Seeta Bharathi (Bangalore), Sarbari Bhattacharya (Bangalore University), J Anandakumari (Siddaganga College for Women, Tumkur), Sarmishta Sahu (Maharani Lakshmi Ammani College, Bangalore).

Special Lectures: Spintronics (Anil Kumar, IISc, Bangalore); cryogenics and applications (S Kasthuriangan, IISc, Bangalore).

3. XXXIV, Bangalore, IASc

2 – 17 December, 2011

No. of participants: 26 (14 students and 12 teachers) from Ahmedabad, Bagalkot, Calicut, Coimbatore, Ernakulam, Hyderabad, Kannur, Latur, Madhubani, Madurai, Medak, Mumbai, Ooty, Puducherry, Pune, Rajkot, Roorkee, Tirunelveli, Vellore.

Resource Persons: R Srinivasan (Mysore), Seeta Bharathi (Bangalore), KRS Priolkar (Goa University, Goa), SM Sadique (Goa), Manohar Naik (GVM's Higher Secondary School, Goa), JBC Efreem D'sa (Carmel College of Women, Goa), TG Ramesh (NAL, Bangalore).

Special Lectures: P and S waves and the precursors indicative of earthquakes (Arun Bapat, Pune); a three-hour demonstration of experiments built by BD Chakradeo (Ambar Nath).

4. XXXV, St. Xavier's College, Ahmedabad

15 February – 1 March 2012

Coordinator: Rajesh Iyer (St. Xavier's College)

No. of participants: The participants included postgraduate and research students as well as faculty members from various colleges and universities across India.

Resource Persons: R Srinivasan (Mysore), Arun Patel, Urvi Chhaya, Mrudul Ghadvi and Rajesh Iyer (St. Xavier's College, Ahmedabad), TG Ramesh (NAL, Bangalore), TC Pandya, CJ Clement.

Special Lectures: Interesting findings of the Chandrayan Moon mission and its implications to humans (Prakash Chauhan, SAC, Ahmedabad); high magnetic field studies of materials (Venkataraman, IISc, Bangalore); shape memory alloys (TG Ramesh, NAL, Bangalore).

Extracts from Coordinator's report: The Course seems on the whole to have been a very positive

experience for the participants which was evident in the enthusiasm, interest and confidence in them learning, un-learning and re-learning new concepts. The Course indicated that there was considerable scope for contextualising physics, making it relevant for researchers and linking it with theoretical concepts to learn physics.

5. XXXVI, Bangalore, IASc

6 – 21 March, 2012

No. of participants: 15 (8 students and 7 teachers) from Alleppey, Bangalore, Chandigarh, Chitradurga, Hiriya, Karur, Kumaracoil, Mandya, Puducherry Santiniketan, Sultanpur, Vellore.



Resource Persons: R Srinivasan (Mysore), Sarbari Bhattacharya (Bangalore University, Bangalore), Sarmishta Sahu (Maharani Lakshmi Ammani College, Bangalore), AV Alex (St. Paul's College, Kalamassery), TG Ramesh (NAL, Bangalore).

Special Lectures: K Rajanna (IISc, Bangalore); KA Suresh (Centre for Soft Matter Research, Bangalore).

B. Other Refresher Courses

6. Techniques in neurosciences: behaviour to molecules

Sophia College, Mumbai

23 November – 8 December 2011

No. of participants: 20 participants (11 outstation and 9 local) from Bangalore, Dehradun, Delhi, Gandhinagar, Moradabad, Mumbai, Namakkal, Nagpur, Pune, Sangli, Tirupati.

Course Director: Tarala D Nandedkar (NIRRH, Mumbai)

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



Resource Persons: N Srinivasan (CBCS, Allahabad), Sandhya Koushika (NCBS, Bangalore), SC Lakhota (BHU, Varanasi), Padma Shastry (NCCS, Pune), Meher Ursekar (Bombay Hospital, Mumbai), Vidita Vaidya and Shubha Tole (TIFR, Mumbai), Nishigandha Naik (Nicholas Piramal, Mumbai), Rajani Bhisey (Mumbai), SD Kholkute (NIRRH, Mumbai).

Speakers/Demonstrators: R Mukhopadhyaya (BARC, Mumbai), Deepak Modi, Shaboni Mukerji, Nafisa Balsinor, Vrinda Khole, Kaushiki Kadam, Geetanjali Sachdeva and Smita Mahale (all from NIRRH, Mumbai), MC Arunan, A Lobo, H Ramachandran, Yasmin Khan, Sandra Mendes, Fatima (all from Sophia College, Mumbai), J Italia (Jai Hind College, Mumbai).

One of the major challenges of science education in India is the rapidly changing technology that needs to be integrated with the teaching-learning process so that high benchmarks are sustained. Technology transfers from research labs to educationists involve lasting interactions and this was discussed in this Refresher Course. The cutting edge in biology today is neurosciences, the brain being considered the 'final frontier' by many! Neuroscience is increasingly included in undergraduate and post graduate syllabi and techniques specifically used in this area deserve focussed consideration. However, biology is not technology-driven and the techniques included in the Refresher Course are relevant to all sub-areas of biology education such as biotechnology, zoology or life sciences. While the theme remains neurosciences, the techniques surely have wider applications and would be of use to almost all biology teachers, no matter what the specific curriculum is.

"Science needs variety of styles and approaches. Most individual researchers need to specialize, but the scientific enterprise as a whole is made more robust when scientists march to different drumbeats. Homogeneity breeds weakness: theoretical blind spots, stale paradigms, an eco-chamber mentality, and cults

of personality. A diverse *dramatis personae* is a powerful tonic against these ailments. Science benefits from its inclusion of the abstraction-addled, absent-minded professors, the control-freak obsessives, the cantankerous bean-counting statistics junkies, the congenitally contrarian devil's advocates, the hard-nosed data-oriented literalists and the starry eyed romantics who embark on high-risk, high-payoff ventures, stumbling frequently along the way" (VS Ramachandran).

The above quote is relevant to all academic endeavours. The teaching-learning process in India too requires a variety of styles and approaches. These are likely to evolve because of a persistent dialogue between academia and those into a lifetime of scientific pursuits. This Refresher Course is a modest celebration of this dialogue, which hopefully will generate variety to equip us to crack the mysteries of brain and behaviour.

Topics of Lectures: The human brain – a fMRI profile; a guided walk through the vertebrate brain; cognitive sciences; computational neurobiology; invertebrate model systems; assays using invertebrates; microscopy and photography; microphotography; cancer and cell lines; cells and their maintenance; staining of cultured cells; *C. elegans* as a model system; confocal microscopy; flow cytometry; 2D electrophoresis; protein purification; techniques in elucidating gene expression; molecular biology; validating gene expression; biostatistics; innovations in neuroscience education.

7. Foundation of mathematics for senior school students

Bengal Engineering and Science University (BESU), Shibpur

26 – 31 December 2011

No. of participants: 66 participants from Howrah district, Hooghly, Kolkata, Purba Medinipur.

Course Director: Amitabha Ghosh (BESU)

Course Co-ordinator: BK Guha (BESU)

Resource Persons: AK Ray, Amitabha Ghosh, BK Guha, AK Mallik, G Bandyopadhyay, B Mukhopadhyay, TK Roy and Sariful Alam (BESU), JK Bhattacharyya (SN Bose Centre, Kolkata), Jyoti Das and MK Sen (Calcutta University).

Mathematics is supposed to be the queen of all sciences. It forms the basic tool and language of physical sciences. Unfortunately in the regular school curriculum students are taught only a set of formulae

and are asked to solve problems on the basis of these formulae. They are not exposed to the beauty of mathematics and do not learn how the human brain operated and developed abstract ideas which ultimately could be used to find the workings of nature. The approach followed in the schools is not designed to create interest in the subject. This course was aimed at complementing the school curriculum with historical development of mathematical ideas and their practical applications to the world of modern physical sciences. Special lectures by eminent mathematicians were also arranged in the afternoons to show the directions in which the future science would lead.

Out of a large number of students from different parts of West Bengal who applied for attending the course, 69 students were selected on the merit of their academic record. It was quite encouraging to note that a large number of students from suburban and rural areas showed keen interest in such a programme.

Topics of Lectures: Imprecise mathematics; scaling effect; symmetry and group theory; extremum problems; iteration, chaos & fractals; ordinary differential equation; number theory; transcendental number & complex number i and its application in electrical engineering; eigenvalue and its application; fuzzy number theory and congruence and its application in divisibility; probability theory, statistics and its application in functional mathematics.

8. Astronomy and observation camp for senior school students

Birbhum Institute of Engineering and Technology, Suri

2 – 5 January 2012

No. of participants: 30 participants

Course Director: Amitabha Ghosh (BESU, Shibpur)

Course Co-ordinator: Sanjib Sen (Positional Astronomy Centre, Kolkata)

Resource Persons: Amitabha Ghosh, BK Guha (BESU), Sanjib Sen, Raja Ganguly, LM Jyoti and Lalit Biswas (PAC, Kolkata), A Bandyopadhyay and B Dasgupta (MP Birla Planetarium, Kolkata).

There is very little opportunity for most of our boys and girls to make actual astronomical observation. As a result they remain almost ignorant about this wonderful branch of science. A reasonable exposure to astronomy is not only required for becoming a professional astronomer but a good knowledge in astronomy can be very useful in many other branches of science and in

quite a few spheres of one's life. Thus a programme of the proposed nature can educate a group of young minds in the basic aspects of observational astronomy. Some idea about theoretical astronomy and cosmology provided during this programme is also useful to the students.

This course had both day-time lectures and evening/night observations. The Birbhum Institute of Engineering and Technology, Suri that is about 275 km from Kolkata and outside the Suri town limits on the bank of the Mayurakshi water reservoir was chosen for the observations as it was free from light and other pollution effects.

Topics of Lectures: The solar system and its basic features; movement of the heavenly bodies; fundamentals of observational astronomy; celestial coordinate system; ecliptic and celestial equator; solstice and equinoctical points; zodiacal constellations and asterisms; precession of the equinox and its effects on observational astronomy; our Milky Way galaxy; our universe and its characteristics; measuring the universe; **Practicals:** basics of naked eye astronomy and historical background; theory of refracting and reflecting telescopes; mounting and clock system; sky charts familiarization with planets and constellations; important stars and galaxies; moons of Jupiter and rings of Saturn.

9. Physics for secondary school science teachers

Gogate Jogalekar College, Ratnagiri

2 – 7 January 2012

No. of participants: 50 participants from various Marathi medium schools in and around Ratnagiri.

Course Director: S Ananthkrishnan (University of Pune)

Course Co-ordinator: GV Kelkar (IAPT, Ratnagiri)

Resource Persons: Priya C Gawade (Swami Swarupanand Vidyamandir, Ratnagiri), VD Kulkarni (Parvatibai Chowgule College, Goa), PT Sangare (Jagannath Gangaram Pednekar Middle School, Talvade), BD Sutar and VV Bhide (Gogate Jogalekar College, Ratnagiri), AV Mulye (Madhyamik Vidyalaya, Waravade), DM Bangar, RH Kalro.

Physics is a subject that needs demonstrations of experiments to emphasize on basic concepts which otherwise are not well understood by students even after repeated explanations, e.g. torque on a coil etc.

To get rid of the fears of teachers about damages while handling apparatus, a teacher should be given full freedom. All science teachers need physics teaching of relevant topics and sufficient experimental skills. The one-week duration programme was organized with this in mind.

For the present course, the topics from the physics section of 8th, 9th and 10th standard science text books were chosen which needed demonstrations to emphasize on basic concepts. Every teacher was provided with a kit consisting of nearly 75 items which included milliammeter, voltmeter, compass, horse shoe magnet, dynamometer, plier, screw driver, soldering material, convex and concave mirrors, etc. The Indian Association of Physics Teachers (IAPT) also contributed financial support to the Course. The feedback received from teachers, IAPT and the Education Officer of Ratnagiri District was quite positive.

Topics of Lectures: Pressure; magnetism; motion; fluid pressure; energy; sound; electric spark; electromagnetism; light.

10. Applications and paradigms of pattern recognition in image processing and computer vision

Dr GR Damodaran College of Science (DGRDCS), Coimbatore

23 January – 4 February 2012

No. of participants: 40 participants from Berhampur, Chennai, Coimbatore, Dharapuram, Karur, Kodaikanal, Kuttalam, Mysore, Noida, Palakkad, Pollachi, Tiruchirapalli, Virudhunagar, Vishakapatnam,

Course Directors: BL Deekshatulu (University of Hyderabad) Atul Negi (University of Hyderabad)

Course Co-ordinator: K Vanitha Sidambaranathan (DGRDCS)



Speakers: M Narasimha Murty (IISc, Bangalore), BL Deekshatulu, Atul Negi and Arun Agarwal (University of Hyderabad), AN Senthilvel (Coimbatore Institute of Technology), Bhabtosh Chanda and S Biswas (ISI, Kolkata), V Thavavel (Karunya University, Coimbatore), P Nagabhushan (University of Mysore), S Prabhu Venkatesh (NV Clinic, Dharapuram), V Thiyagarasu (Gobi Arts and Science College, Gobichettipalayam), RV Prakash (Simple Labs, Chennai), Sukhendu Das (IIT, Madras), Chitra T Rajan, R Kalpana and N Vivek (PSG College of Technology, Coimbatore), T Devi and M Sundaresan (Bharathiar University, Coimbatore), SK Jayanthi (Vellalar College for Women, Erode), BM Mehtre (Institute for Development and Research in Banking Technology, Hyderabad), NB Venkateshwarlu (GVP College of Engineering, Vishakapatnam), R Pradeep Kumar (Ampisoft Technologies Pvt. Ltd., Coimbatore).

Academic research is a vital activity for a teacher to build a true knowledge community. A teacher should provide quality inputs to young minds in order to construct strong educational foundation which goes beyond the norms of prescribed syllabi.

Engineering and technological education requires an exposure to recent technological developments and methods of experimentation. Computer science and technology is a rapidly growing field of research and education, which is an enabling technology that can have an impact on common civic society in all walks of life. Numerous areas in computer science now affect human lifestyle. Pattern recognition, computer vision and image processing are areas which span across science, technology and industry. In computer science, in addition to theory, hands-on exposure to tools is essential for true research.

Recognition of patterns is a cognitive task that is easy for human beings but is extremely difficult to embed into computing systems. Pattern recognition theory is vast and currently advances in machine learning have brought new insights. The applications of pattern recognition are wide ranging. Image processing is one such area, which spreads across industry applications such as biometrics, medical image processing, satellite geospatial data processing, document image processing, optical character recognition etc. Computer vision focusses on human computer interaction, camera sensors and intelligence. The lectures in this course hopefully laid the foundation to enhance the quality of teaching and research.

Topics of Lectures: Introduction to pattern recognition; unsupervised classification: clustering large datasets;

digital image processing techniques and object recognition; approaches to pattern recognition – statistical structural and neural learning; PR theory, discriminant functions, statistical decision theory; machine vision; feature extraction and principal component approaches; document image analysis; patterns in concurrent engineering; PAST open source statistical analysis tool; digital image and segmentation; introduction to biometrics with fingerprints; visual information systems and applications (CBIR); research methods; WEKA introduction, WEKA tool hands- on session; medical image processing; multi-agent systems and scheduling in image processing; prototyping for sensor data acquisition; robotics laboratory for computer vision; handwriting analysis; image compression; MATLAB & polyanalyst; computational intelligence – overview and applications; identification of coastal erosion/accretion – using digital image processing; relevant software tools to manipulate IRS imagery; image processing – essentials, enhancements and transformations, filtering and restoration pattern analysis based on Histo-objects; skeletons, morphology, texture, scene analysis, labelling, object recognition, architectures for processing; histoanalysis; Oracle 10g image databases simulated annealing and logistics; visual perception; overview on CBIR.

11. Cell and molecular biology techniques

Manipal Life Sciences Centre, Manipal University, Manipal

23 January – 4 February 2012

No. of participants: 25 participants from various colleges from all over India

Course Director: V Nagaraja (IISc, Bangalore)

Course Co-ordinator: K Satyamoorthy (Manipal University)

Resource Persons: V Nagaraja, KP Gopinathan, DN Rao, Usha Vijayaraghavan, Utpal Nath, P Kondaiah, K Somasundaram and K Muniyappa (all from IISc, Bangalore), J Nagaraju and Gowrishankar (CDFD,



Hyderabad), K Satyamoorthy, PM Gopinath, Satish Rao, Padmalatha S Rai, KP Guruprasad, TG Vasudevan, TS Murali, A Muthusamy, Vidhusankar, Shama Prasad and HS D'Souza (all from Manipal University).

The Manipal University has been organizing Refresher Courses in molecular biology for the last three years, the previous ones were held in January 2010 and January 2011 and therefore the present course is the third one under the direction of V Nagaraja.

The present course was aimed at exposing the participants to new principles and techniques in modern biotechnology and human genetics. The University is ideally suited to hold such courses as its Manipal Life Sciences Centre has all the modern equipment to carry out research in the field of biotechnology, molecular biology, human genetics and plant and animal tissue culture. Hands-on training on these laboratory instruments and the classes on theory behind them

enabled the participants to apply in teaching or in their research activities. Since teachers are the primary contact with the students, the course also motivates young students to take up career in research and developmental activities.

Topics covered: Excitements in basic research finding potential application; divergent growth allometry in leaf growth and its regulation by a microRNA; genomics of restriction-modification systems; utilities of microarrays in biomarker discovery and prediction of disease prognosis; DNA replication and cell cycle control; human genetic diversity; roles of a teacher; regulation of flower development: basic biology leads for crop improvement and biotechnology applications; techniques in fisheries biotechnology; next generation sequencing; applications of laser in biology and medicine; progress and greatest discoveries in medical science in the last millennium; prenatal diagnostics; genomics of microbial pathogens and discovery of new antimicrobial agents.

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LECTURE WORKSHOPS

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

1. Recent advances in biotechnology of health and disease

Madurai Kamaraj University (MKU), Madurai
7 – 8 October 2011

Conveners: SC Raghavan and PN Rangarajan (IISc, Bangalore)

Coordinators: P Varalakshmi and B Ashokkumar (MKU)

Speakers: PN Rangarajan, Anjali A Karande and SC Raghavan (IISc, Bangalore), Radha Venkatesan (Madras Diabetes Research Foundation, Chennai), R Murugesan (MKU), K Sundar (Kalasalingam University, Krishnan Koil), K Veluraja (Manonmanium Sundaranar University, Tirunelveli).



Participants: 120 participants from 17 colleges and universities in Madurai and other parts of Tamilnadu.

Topics covered: Traditional, modern and futuristic vaccines; cell-targetted therapy using plant toxins; regulation of gene expression by zinc finger transcription factors; nano-enabled drug delivery systems; mechanism of chromosomal translocations in cancer; genomics of type 2 diabetes; reverse vaccinology: from genome to vaccine; molecular dynamics simulation approach for influenza A Haemagglutinin.

2. Biotechnological aspects of environmental degradation and protection

The Oxford College of Science, Bangalore
13 – 14 October 2011

Convener: KA Natarajan (IISc, Bangalore)

Co-ordinator: S Bharathi (The Oxford College of Science)

Speakers: KA Natarajan, TV Ramachandra and Harish Bhat (IISc, Bangalore), Radha Kale (Mount Carmel College, Bangalore), Nayeem Ullah Khan (St. Joseph's College, Bangalore), N Nandhini (Bangalore University), SN Kannan (KSR College of Arts and Science, Tiruchengode).



Participants: 225 participants from 13 colleges in Bangalore.

Topics covered: Mining and bioremediation; phytoremediation, environmental issues; pros and cons of urbanization; importance of conserving biodiversity; vermi-composting and other healthy practices in agriculture.

3. Recent trends in chemistry

University of North Bengal (UNB), Darjeeling
11 – 12 November 2011

Convener: Anunay Samanta (University of Hyderabad)

Co-ordinator: Amiya Kumar Panda (UNB)

Speakers: D Basavaiah, Anunay Samanta and Samar Kumar Das (University of Hyderabad), Kankan Bhattacharyya and Subrata Ghosh (IACS, Kolkata), Nitin Chattopadhyay (Jadavpur University), Basudeb Basu and Swapan K Saha (UNB).



Participants: 158 participants from 13 colleges in Andhra Pradesh, Assam, Bihar, Sikkim, West Bengal and Nepal.

Topics covered: Modern trends in organic synthesis; olefin metathesis; international year of chemistry 2011: hundred years after Marie Curie won the Nobel Prize; rudiments of organometallics and applications in organic synthesis; fluorescence response of molecular systems in ionic liquids; samarium di-iodide-induced organic reactions; weak interactions and strong effects; supramolecular chemistry of polyoxometalates: new materials, unusual isolations and catalysis; single molecule spectroscopy.

4. Advances in bio-inorganic and nanochemistry

DAV Postgraduate College, Kanpur
12 – 13 November 2011

Convener: Sabyasachi Sarkar (IIT, Kanpur)

Co-ordinator: Sunil K Misra (DAV PG College, Kanpur)

Speakers: Lallan Mishra and Pralay Maiti (BHU, Varanasi), NK Pandey (University of Lucknow), SP Rath, Gurunath Ramanathan and Sabyasachi Sarkar (all from IIT, Kanpur).



Participants: 275 participants from 13 colleges in Kanpur and Lucknow.

Topics covered: Exploring new metal-based anticancer agents through their binding with DNA and nuclease activity; nanoparticle-controlled self-assembly in polyurethanes for nano-biomaterial and sustained drug delivery; moisture sensing application of Ag-loaded WO₃ ceramic nanomaterials; water-soluble carbon quantum dots for drug delivery and bio-imaging; metalloporphyrins in biology; sulphur and selenium: role of chalcogenides in enzyme catalysis; chemistry of the element in relevance to bioinorganic chemistry.

5. Nanotechnology and biosensors: present and future perspectives

Dayananda Sagar Academy of Technology and Management (DSATM), Bangalore

29 – 30 November 2011

Convener: TN Guru Row (IISc, Bangalore)

Co-ordinator: A Sreenivasa Rao (DSATM)

Speakers: BR Lakshmikantha (DSATM), TN Guru Row, GK Ananthasuresh, Prabal K Maiti, SK Sikdar, Abha Misra, Rudra Pratap, V Venkataraman, Namrata Gundiah, S Venugopal, Rishikesh Narayanan (all from IISc, Bangalore).

Participants: 825 participants from DSATM and other colleges in Bangalore.

Topics covered: Nanomaterials: design and fabrication using crystal engineering principles; electrical power scenario; bio-micromanipulation; DNA-based nanotechnology; ion channels to neuronal networks; micromechanical study of carbon nanotube; principles of nanotechnology; renewable energy; microfabricated bio-MEMS devices; biomechanics of tissues and cells; building blocks for nanotechnology; the ascent of channels with memory.

6. Emerging trends in chemistry

Queen Mary's College, Chennai

2 – 4 December 2011

Convener: M Palaniandavar (BDU, Tiruchirapalli)

Co-ordinator: N Anitha (Queen Mary's College)

Speakers: TK Chandrashekar (NISER, Bhubaneswar), KP Kaliappan (IIT, Mumbai), D Ramaiah (NIIST, Thiruvananthapuram), K Pitchumani and R Ramaraj (MKU, Madurai), G Mugesh and BR Jagirdar (IISc, Bangalore), D Basavaiah (University of Hyderabad), M



Eswaramoorthy (JNCASR, Bangalore), PT Manoharan (IIT, Chennai).

Participants: 300 participants from 20 colleges in Chennai and Tiruchirapalli.

Topics covered: Photosensitizers for photodynamic therapy: a new technique for treatment of cancer; organic synthesis; biomolecular recognition; design of functional organic molecules for biological applications; recent trends in green chemistry; metals in biology: bioinorganic chemistry; zinc hydrolases and their synthetic analogues; photoelectrochemistry and solar energy conversion; nanomaterials and their applications in catalysis and sensors; activation and functionalization of the C–H bond; bioinspired materials; materials for hydrogen generation and storage; green processes and catalysis; structural dynamics: optical and magnetic properties of II – VI semiconductors.

7. Fundamentals of molecular spectroscopy

Manipur University, Canchipur

14 – 16 December 2011

Convener: PK Das (IISc, Bangalore)

Co-ordinator: N Rajmuhon Singh (Manipur University)

Speakers: S Ramasesha and PK Das (IISc Bangalore), Ranjit Biswas (SNBCBS, Kolkata), Tapas Chakrabarty (IACS, Kolkata), N Rajmuhon Singh (Manipur University).



Participants: 97 participants from Manipur University, DM College of Science and GP Women's College in Canchipur.

Topics covered: Probing electronic state and structure; interaction of light and matter; fluorescence spectroscopy of molecules; vibrational and rotational spectroscopy of molecules; basic principle of laser and its application.

8. Recent trends in chemistry

Jayaraj Annapackiam College for Women (JACW), Periyakulam

15 – 16 December 2011

Convener: R Ramaraj (MKU, Madurai)

Co-ordinator: A Mary Imelda Jayaseeli (JACW)

Speakers: DS Pandey (BHU, Varanasi), C Retna Raj (IIT, Kharagpur), K Pitchumani (MKU), M Palaniandavar (BDU, Tiruchirapalli), G Anantharaman (IIT, Kanpur).



Participants: 207 students and teachers from 25 colleges in and around Coimbatore district.

Topics covered: Historical development of the theory of differential equations; differential equation model of atmospheric waves; nontrivial improvements in Rellich Kondrachov compact embeddings; green function techniques for differential equations; modelling ecosystem through differential equations; differential equation model for human immune system.



Participants: 180 participants from 10 colleges from different parts of Tamilnadu.

Topics covered: Interesting aspects of symmetry; plasmonic nanostructures, biocatalysts based on platinum group organometallic complexes; host-guest chemistry; biomolecular devices for dioxygen activation; interaction of metal complexes with DNA; multiple bonds in main group elements; chemistry of low valent main elements.

9. Differential equations and their applications

PSGR Krishnammal College for Women (PSGR KCW), Coimbatore

21 – 23 December 2011

Convener: P Kandaswamy (Bharthiar University, Coimbatore)

Co-ordinator: K Sumathi (PSGR KCW)

Speakers: P Kandaswamy (Bharthiar University, Coimbatore), M Venkatachallappa (Bangalore University), Girija Jayaraman (IIT, New Delhi), PV Arunachalam (Dravidian University, Kuppam), Aloknath Chakrabarti (IISc, Bangalore), BR Nagaraj (TIFR-CAM, Bangalore), RM Vasagam (Anna University, Chennai).

10. Current trends in nanoscience and technology

National Institute of Technology (NIT), Warangal

23 – 24 December 2011

Convener: AK Ganguli (IIT, Delhi)

Co-ordinator: Vishnu Shanker (NIT, Warangal)

Speakers: T Pradeep (IIT, Chennai), AK Ganguli and Charusita Chakravarty (IIT, Delhi), GU Kulkarni (JNCASR, Bangalore), BM Reddy (IICT, Hyderabad), Ghanshyam Krishna (University of Hyderabad).

Participants: 150 participants from 56 colleges in Andhra Pradesh.



Topics covered: Glowing molecules of gold; introduction to nanoscience and nanotechnology; graphene ribbons; affordable clean water using nanotechnology; the 'Indium' challenge: new generation transparent-conducting electrodes; computational methods in nanoscience; microemulsions as nanoreactors for designing nanomaterials; design of novel nanosized catalytic materials for energy utilization and environmental pollution control; thin films: nanostructured and nanostructuring.

11. Fundamental concepts in basic physics for master course students and teachers

PSGR Krishnammal College for Women (PSGR KCW), Coimbatore

5 – 6 January 2012

Convener: M Lakshmanan (BDU, Tiruchirapalli)

Coordinator: S Jayalakshmi (PSGR KCW)

Speakers: M Lakshmanan (BDU), Sudhir R Jain (BARC, Mumbai), KPN Murthy (University of Hyderabad).



Participants: 200 students and faculty from 13 institutions in and around Coimbatore.

Topics covered: Mathematical physics; classical mechanics; basic aspects of quantum mechanics; statistical mechanics.

12. Vista of science

Aurora's Degree & PG College, Hyderabad
11 – 12 January 2012

Convener: Subhash Chaturvedi (University of Hyderabad)

Coordinator: Sri Jyothsna P (Aurora College)



Speakers: ARP Rau (Louisiana State University, USA), Rajeev Wankar, Rajat Tandon, V Seshubai and E Hari Kumar (University of Hyderabad), Vikram Pudi (IIIT, Hyderabad).

Participants: 200 students and teachers from 11 colleges in Hyderabad and Secunderabad.

Topics covered: General science – an overview; cloud computing; optimal classification; Fermat's last theorem; the fascinating field of superconductors and their applications; general theory of relativity.

13. Mathematics

St. Joseph's College, Bangalore

20 – 21 January 2012

Convener: Mythily Ramaswamy (TIFR-CAM, Bangalore)

Coordinator: Renee D'Souza (St. Joseph's College)

Speakers: Harish Seshadri and Kaushal Verma (IISc, Bangalore), Sujatha Ramdorai (TIFR, Mumbai) and K Sandeep (TIFR-CAM, Bangalore).



Participants: around 100 students from 12 colleges in Bangalore.

Topics covered: Real analysis; ideas and concepts linking together the emergence of various groups of numbers; introduction to complex analysis; introduction to measure theory.

14. Mathematical modelling in science and engineering

Sri Venkateswara University (SVU), Tirupati
24 – 25 January 2012

Convener: PV Arunachalam (Dravidian University, Kuppam)

Coordinator: S Sreenadh (SVU)

Speakers: PV Arunachalam (Dravidian University), P Kandaswamy (Bharathiar University, Coimbatore), BR Nagaraj (TIFR-CAM, Bangalore), T Amaranath (University of Hyderabad).



Participants: 125 participants from SVU and other institutions in Chittoor district.

Topics covered: Mathematical modelling in global perspective; differential equation; differential equation model for Stokes flow; differential equation models of human immune system.

15. Plant biotechnology: a way to future

Christ University, Bangalore
27 – 28 January 2012

Convener: V Nagaraja (IISc, Bangalore)

Coordinator: VL Vasantha (Christ University)

Speakers: HS Savithri, Utpal Nath, Usha Vijayraghavan and C Jayabaskaran (IISc, Bangalore), TH Ashok, Ramanjini Gowda, Rohini Sreevathsa, KN Ganeshiah (UAS, Bangalore), G Ravikanth (ATREE, Bangalore).

Participants: 130 participants from 14 colleges in Bangalore.

Topics covered: Biotechnological approach to develop virus-resistant plants; applications of plant biotechnology in agriculture; production of edible vaccines in plants; species recovery of endangered plants; an integrated



approach to pyramid drought-adaptive traits by transgenic technology; genes and geometry: genetic control of organ shape in plants; the making of a flowering stem: lessons from molecular genetics and genomics of flowering in model plants; secondary metabolites and their applications; science and history of the art of discovering medicinal plants.

16. Modern trends in biology

Sri Ramakrishna Degree College, Nandyal
2 – 3 February 2012

Convener: AS Raghavendra (University of Hyderabad)

Coordinator: G Ramakrishna Reddy (Sri Ramakrishna Degree College, Nandyal)



Speakers: AS Raghavendra, S Dayananda and P Apparao (University of Hyderabad), Sathyanarayana Singh (Osmania University, Hyderabad).

Participants: 100 participants from Sri Ramakrishna Degree College in Nandyal.

Topics covered: Genomics and proteomics; why plants are fascinating; integrated pest management; horizontal gene transfer; screening and production of novel antibiotics; signal production – drug targets; host-pathogen interaction in plants; high CO₂ and global warming.

17. Frontier areas in life sciences

Lady Doak College, Madurai

16 – 17 February 2012

Convener: G Marimuthu (MKU)

Coordinator: R Shenbagarathai (Lady Doak College)

Speakers: K Emmanuel Rajan (BDU), G Marimuthu, K Veluthambi and Hussain Munavar (MKU), TJ Pandian (Annamalai University, Chidambaram), S Mahadevan (IISc, Bangalore), Sathish Mundayoor (RGCB, Thiruvananthapuram), RM Pitchappan (Chettinad University, Chennai).



Participants: 191 participants from 16 different colleges across Tamilnadu.

Topics covered: Molecular mechanisms of learning; genetic code – a frozen accident; behaviour of bats; primordial germ cells and their derivatives for genome conservation in fish; RNA silencing in plants; recent studies on stationary phase in bacteria; role of biotechnology in modern health care; journey of man to the genographic – a genomic perspective.

18. Analysis and differential equations

Jain University, Bangalore

16 – 18 February 2012

Convener: Phoolan Prasad (IISc, Bangalore)

Coordinator: JV Ramana Raju (Jain University, Bangalore)

Speakers: PS Datti and Prashant Sreenivasan (TIFR-CAM, Bangalore), Phoolan Prasad and AK Nandakumaran (IISc, Bangalore).

Participants: 125 students and 30 teachers from 25 colleges in Bangalore.



Topics covered: Basic linear algebra required for mathematical analysis; connection between linear spaces and analysis; multivariable calculus and linearization view point of differential calculus; linear algebra techniques for a system of ordinary differential equations; exposition of phase space analysis for the solutions of differential equations; nonlinear analysis concerning differential equations and perturbations; partial differential equations; classification of non-linear PDE's; Cauchy problem; historical development of partial differential equations.

19. Frontiers in science and engineering – opportunities for graduates

Deen Dayal Upadhyaya College (DDUC), New Delhi

17 – 18 February 2012

Convener: Manoj Saxena

Speakers: AK Ghatak (New Delhi), Kehar Singh (New Delhi), Sanghamitra Bandyopadhyay (ISI, Kolkata), KL Chopra (IIT, Kharagpur), Deepak Kumar and Sanjay Puri (JNU, New Delhi), Anurag Sharma, K Thyagarajan and Santanu Chaudhury (IIT, Delhi).

Participants: 162 students and faculty from 27 institutions in Delhi.

Topics covered: Einstein and his year of miracles; optoelectronic techniques for information security; metaheuristic techniques for solving single and multiobjective optimization; ab-initio creation of thin film nanomatter; quantum processing through dark states in a network; the optical fiber: backbone of the internet; photonics: the science and technology of light; excitement of computer vision; pattern formation in nonequilibrium systems.

20. Recent trends in chemistry and biochemistry

Sri Siddhartha Institute of Technology (SSIT),
Tumkur

17 – 18 February 2012

Convener: KJ Rao (IISc, Bangalore)

Coordinator: MK Veeraiah (SSIT)

Speakers: K Sankara Rao, Utpal Tatu, AJ Rao, S Ramakrishnan, TN Guru Row and KJ Rao (IISc, Bangalore), BA Patil (Think and Ink Science Foundation, Bangalore).



Topics covered: Molecules which defy the rules; tips for laboratory experiments; organic semiconductors in flexible electronic devices; amphiphilic liquid crystals; metals in biology; medicinally important metalloproteins; photodynamic therapy (PDT); biomolecular recognition.



Participants: 250 participants from 16 colleges in Karnataka.

Topics covered: Cities, climate change and green initiative; proteomics in health and disease; application of biotechnology in medicine and agriculture; making of a Nobel laureate – Madame Curie; polymers, best gift of chemistry; XRD, chemistry's most powerful tool; nanoscience and nanotechnology.

21. Recent advances in chemistry – Explore 2012

Christ University, Bangalore

17 – 18 February 2012

Convener: Uday Maitra (IISc, Bangalore)

Coordinator: SJ Hepziba (Christ University)

Speakers: Uday Maitra, G Mugesh, Satish A Patil and N Jayaraman (IISc, Bangalore), D Ramaiah (NIIST, Thiruvananthapuram).

Participants: 140 participants from 50 colleges in Bangalore.

22. Supramolecular chemistry and nanoscience

Christ College, Irinjalakuda

23 – 24 February 2012

Convener: George K Thomas (IISER, Thiruvananthapuram)

Coordinator: M Babu Anthony (Christ College)

Speakers: KV Radhakrishnan (NIIST, Thiruvananthapuram), Sunil K Narayanankutty (CUSAT, Cochin), George K Thomas, KM Sureshan, Reji Varghese, Vineesh Vijayan (IISER).



Participants: 137 PG students and 27 teachers from 14 colleges in Kerala.

Topics covered: Conducting polymers; medicinal chemistry; supramolecular chemistry; molecular recognition; nanomaterials; green chemistry; supramolecular chemistry and NMR.

23. Instrumental techniques in chemical sciences

Dr Babasaheb Ambedkar Marathwada University (DBAMU), Osmanabad

25 – 26 February 2012

Convener: DD Dhavale (University of Pune)

Coordinator: MK Patil (DBAMU)

Speakers: Anunay Samanta (University of Hyderabad), Gulshan Rehlan (BARC, Mumbai), DD Dhavale, Santosh Haram, RS Kusurkar and Vaishali Shinde (University of Pune), PR Rajmohan (NCL, Pune).



Participants: 140 students and 60 teachers from 22 colleges of the University.

Topics covered: Basics and applications of fluorometric analysis; radioanalytical techniques; $^1\text{H-NMR}$; IR spectroscopy; $^{13}\text{C-NMR}$; basic concepts of XRD; 2D-NMR.

24. Biosciences for industry: modern tools, informatics and research orientation

Apeejay Stya University (ASU), Gurgaon

25 – 27 February, 2012 and 24 – 26 March 2012

Convener: Asha Chandola-Saklani (ASU)

Speakers: K Muralidhar and BC Das (University of Delhi), SK Jain (Jamia Hamdard University), Asha Chandola-Saklani, MP Mahajan and Anupama Diwan (ASU), Alok Kumar Singh (Air India).

Participants: 70 students in the first workshop and 44 students in the second workshop from 7 institutions in and around Gurgaon.

Topics covered: Applications of modern biological tools and career options in pharma, biotech, agriculture and healthcare industry; various lab activities.



25. Quantum mechanics, molecular resonance spectroscopy and hands-on experience in spectroscopy

Institute for Intensive Research in Basic Sciences (IIRBS), Mahatma Gandhi University, Kottayam and St. Thomas College, Pala

1 – 3 March, 2012

Convener: MS Gopinathan (IISER, Thiruvananthapuram)

Coordinators: I Ibnusaud (IIRBS) and Gem Mathew (St. Thomas College, Pala)

Speakers: MS Gopinathan and Ayan Datta (IISER, Thiruvananthapuram), KL Sebastian and S Ramasesha (IISc, Bangalore), K Mangala Sunder, N Chandrakumar and Christy George (IIT, Chennai), TN Vasudevan (Calicut University).



Participants: 100 participants from 14 schools and colleges in and around Kottayam district.

Topics covered: An overview of theoretical chemistry; introduction to quantum mechanics; computational chemistry; molecular spectroscopy; principles of interaction between radiation and matter; group theory; 1D NMR and 2D NMR spectroscopy; magnetic resonance spectroscopy; recent developments in magnetic resonance spectroscopy and imaging and hands-on session in computational chemistry and NMR.

26. Partial differential equation

S V National Institute of Technology (SVNIT),
Surat

1 – 4 March 2012

Convener: Phoolan Prasad (IISc, Bangalore)

Coordinator: MN Mehta (SVNIT)

Speakers: Phoolan Prasad and AK Nandakumaran (IISc, Bangalore), S Baskar, Neela Nataraj and S Sivaji Ganesh Sista (IIT, Mumbai), K Sandeep (TIFR-CAM, Bangalore), MN Mehta (SVNIT).



Participants: 83 students and 30 teachers from 14 institutions in and around Surat.

Topics covered: First-order linear and quasilinear partial differential equation; Laplacian equation and its analysis; heat equation, one dimensional-two dimensional, diffusion equation; wave equation and its convergence; stability up to Huygen's principle; weak formulation of the Dirichlet problem; heat, wave and diffusion equation; advection-diffusion equation with its application for injection of drug chemical in human body.

27. Molecular spectroscopy: theory, instrumentation and applications

Banaras Hindu University (BHU), Varanasi

2 – 3 March 2012

Convener: Anunay Samanta (University of Hyderabad)

Coordinator: Satyen Saha (BHU)

Speakers: Anunay Samanta (University of Hyderabad), S Umapathy (IISc, Bangalore), Kankan Bhattacharyya (IACS, Kolkata), Sobhan Sen (JNU, New Delhi), Souvik Maiti (IGIB, New Delhi), SK Sengupta (BHU) and Swapan Kumar Ghosh (BARC, Mumbai).



Participants: 228 participants from 11 institutions in and around Varanasi.

Topics covered: Principles and applications of fluorescence spectroscopy; single molecule spectroscopy; Raman spectroscopy; Fourier-transformed infrared and NMR spectroscopy; application of molecular spectroscopy in biology; theoretical aspects of molecular spectroscopy.

28. Modern trends in chemistry

St. Joseph's College, Irinjalakuda

6 – 7 March 2012

Convener: G Mugesh (IISc, Bangalore)

Coordinator: Rosabella K Puthur (St. Joseph's College)

Speakers: PS Mukherjee, G Mugesh and Satish A Patil (IISc, Bangalore), G Sekar (IIT, Chennai).



Participants: 145 participants from 8 colleges in Irinjalakuda.

Topics covered: Supramolecular coordination; metals in biology: bioinorganic chemistry; synthesis for organic semiconductors; magnetic clusters and electron-rich sensors for explosives; metalloproteins and drug

discovery; coupling reactions; organic semiconductors in electronic devices; synthesis of enantiomerically-enriched alcohols by asymmetric synthesis.

29. Challenges in environmental restoration — SAWCER 2012

Bharathidasan University (BDU), Tiruchirapalli
5 – 6 March 2012

Convener: KA Natarajan (IISc, Bangalore)

Coordinator: M Krishnan (BDU)

Speakers: KA Natarajan (IISc, Bangalore), TJ Pandian (MKU), M Lakshmanan (BDU), KV Krishnamurthy (Institute of Ayurveda and Integrative Medicine, Bangalore), L Kannan (Tiruvalluvar University, Vellore), N Parthasarathy and N Sakthivel (Pondicherry University).



Participants: 320 participants from 35 institutions in Tamilnadu.

Topics covered: Conservation of biosphere and its anthropogenic influence; coastal ecosystems of India: diversity, threats, conservation and management; mining pollution and restoration; eco-restoration; eco-restoration of endangered plant species; role of mathematical modelling in biological systems; xenogenesis; biological nanomaterials.

30. Recent advances in biological sciences

Shree M & N Virani Science College (SMNVSC), Rajkot
5 – 6 March 2012

Convener: Tarala D Nandedkar (NIRRH, Mumbai)

Coordinator: Shivani Patel (SMNVSC)

Speakers: Suman Govil (DBT, New Delhi), Bharat B Chattoo (Genome Research Centre, Vadodara), Archana



Gayatri (MS University, Vadodara), Tarala Nandedkar and Deepak Modi (NIRRH, Mumbai), Alok Dhawan (ILS, Ahmedabad University).

Participants: 318 students and 36 teachers from SMNVSC and other colleges in Rajkot.

Topics covered: Opportunities for research in biotechnology; nanotechnology: a bottoms approach; genomic research; pre-implantation genetic diagnosis; trends in microbial biotechnology; biomarkers in cancer research.

31. Statistical and quantum physics

St. Joseph's College, Bangalore
13 – 15 March 2012

Convener: G Srinivasan (Bangalore)

Coordinator: RA Angiras (St. Joseph's College)

Speakers: G Srinivasan (Bangalore), Vinod Krishan and Sadiq Rangwala (RRI, Bangalore).



Participants: 60 students and 15 teachers from 5 colleges in Bangalore

Topics covered: Statistical physics and its applications; quantum mechanics; quantum optics.

32. Molecular and developmental biology

PSGR Krishnammal College for Women
(PSGR KCW), Coimbatore

15 – 16 March 2012

Convener: K Veluthambi (MKU)

Coordinator: S Poornima (PSGR KCW)

Speakers: Sathish Mundayoor (RGCB, Thiruvananthapuram), K Dharmalingam and K Veluthambi (MKU), K Muniyappa, PN Rangarajan and K Somasundaram (IISc, Bangalore), D Sudhakar (Tamilnadu Agricultural University, Coimbatore).



Participants: 129 students and 22 teachers from 10 colleges in Coimbatore

Topics covered: Molecular methods to study pathogenic mechanisms; fungi: our constant companions; genomics of microbial pathogens and discovery of new antimicrobial agents; RNA silencing and silencing suppression in plants; engineering insect resistance in plants; past, present and future of DNA sequencing; traditional, modern and futuristic vaccines; role of a RNA binding protein in brain tumour malignancy.

33. Modern chemistry and biology

Aurora's Degree & PG College, Hyderabad

16 – 17 March 2012

Convener: Ahmed Kamal (IICT, Hyderabad)

Coordinator: KMR Nambiar (Aurora College)

Speakers: JS Yadav, Ahmed Kamal (IICT, Hyderabad), Rajan Sankaranarayanan and Imran Siddiqi (CCMB, Hyderabad), Shekhar Mande (NCCS, Pune), Kalidas Sen and TP Radhakrishnan (University of Hyderabad).



Participants: 200 participants from 21 colleges in Hyderabad and Secunderabad.

Topics covered: Natural products synthesis for drug discovery; advances in medicinal chemistry and development of cancer therapeutics; confining the space: confinement as a material design tool; materials at the nanoscale and chemistry connection; X-ray vision of biomolecules; new methods for plant breeding by clonal seed formation; interdisciplinary sciences in modern biology.

34. Research paradigms in networking and communications

SVS Institute of Computer Applications
(SVSICA), Coimbatore

30 – 31 March 2012

Convener: MV Pitke (Mumbai)

Coordinator: D Saravanakumar (SVSICA)

Speakers: MV Pitke (Mumbai), TGK Murty (ARCI, Hyderabad), T Parthasarathy (ISI, Chennai), K Giridhar (IIT, Chennai), V Thavavel (Karunya University, Coimbatore), T Senthilkumar (Amrita University, Coimbatore).



Participants: 163 participants from different universities and colleges in Coimbatore.

Topics covered: Current trends in satellite communications; remote sensing observation and evolution of communication networks, photonic technologies; new research trends in network and its mathematical issues; NS-2 network simulator tool techniques; futuristic research issues in optimization techniques and models; new research performance analysis of broadband cellular and social networks; application of genetic concepts in Matlab & 'Orange' – open source tool; research model development issues in networking and communications-based statistical methods.

35. Recent trends in chemistry

Sikkim Government College, Gangtok
30 – 31 March 2012

Convener: Anunay Samanta (University of Hyderabad)

Coordinator: Bhaskar Chakraborty (Sikkim Government College)

Speakers: BC Ranu and Tapan Kanti Paine (IACS, Kolkata), Arun Chattopadhyaya (IIT, Guwahati), Samaresh Bhattacharya (Jadavpur University, Kolkata), Basudeb Basu (University of North Bengal, Siliguri), Anunay Samanta (University of Hyderabad), Bhaskar Chakraborty (Sikkim Government College).

Participants: 120 participants from colleges in and around Gangtok.

Topics covered: Green reaction medium and green catalyst for organic reactions; everyone will be a chemist one day; the advent of nano; modelling mononuclear nonheme iron enzymes: mechanistic studies of O_2^-



dependent transformation reactions; greener approach in the synthesis and 1,3-dipolar cycloaddition reactions of a α -chloronitrones; reactivity of biomimetic iron complexes containing iron-carbon bond.

36. Trends in advanced life science research

Ayya Nadar Janaki Ammal College (ANJAC), Sivakasi
30 – 31 March, 2012

Convener: G Marimuthu (MKU)

Coordinators: DNP Sudarmani and D Prabhu (ANJAC)

Speakers: TJ Pandian (Annamalai University, Chidambaram), G Marimuthu, K Veluthambi and M Hussain Munavar (MKU), M Krishnan (BDU), S Kannan (Bharathiyar University, Coimbatore).

Participants: 160 participants from colleges in Madurai

Topics covered: Biotechnology: opportunities, challenges and global trends.

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Repository of Scientific Publications of Academy Fellows

In a previous issue of Patrika, the efforts to set up a Repository of Scientific Publications of all (past and present) Fellows have been described. This has reached a definite shape now.

This work was begun in mid-2010, and so far has involved three phases, the work being carried out by Messrs. Informatics based in Bangalore. The total number of Fellows is (approximately) 600 past and 1000 present. At the end of Phase III, 31 March 2012, the Repository contained about 84,000 items of metadata, and 16,500 full text PDFs with another 2110 on hold.

Hereafter, the work of maintaining and adding to the Repository, and keeping it always up to date, will be handled mainly by staff at the Academy, and with help from others as and when needed. Efforts to trace scientific publications of past Fellows – now about 12,000 in the Repository – will continue but this will be a somewhat slow process. Present Fellows will be reminded twice a year to send information about their current publications, and mechanisms for them to respond easily will be set up.

By its very nature, such a Repository will contain errors which we will continuously try to eliminate. It is already a valuable resource for the scientific community in India and elsewhere, and it is hoped this will grow.

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).

Fellows are requested to check their publication lists on the Repository and report any errors or problems to eprints@ias.ernet.in.

Fellows who have not sent their latest list of publications are requested to send the list by email to eprints@ias.ernet.in. The processing of lists already received (from 411 Fellows) is still on.

Several Fellows have said the Repository should allow voluntary submission of publication metadata and, where appropriate depending on publisher policy, full text. The facility for voluntary submission by Fellows will be enabled soon, and it is hoped that it will become the most common means of updation of the Repository. Submissions will be checked by office eprints staff for conformance with Repository policies (published on the same website).

Locating and gathering publication metadata and full text for deceased Fellows is much harder, and we will use different methods to achieve this. But this note is an opportunity to request Fellows to inform Academy office (by email to eprints@ias.ernet.in) if they have information or can help get information about publications of deceased Fellows whom they knew or whose work and career they are familiar with. This will help build a very valuable archival collection of research for the Academy.

A snapshot of the Repository Home Page is shown below:

The screenshot shows the homepage of the Indian Academy of Sciences Publications of Fellows repository. The browser address bar displays repository.ias.ac.in/index.html. The page header features the Indian Academy of Sciences logo and the text "INDIAN ACADEMY of SCIENCES Publications of Fellows (An Open Access Repository)". Below the header, there is a navigation menu with links for "Home", "About Us", "Browse by Year", "Browse by Subject", "Browse by Fellow", "Latest Items", "Advanced Search", "Submission Guidelines", "Repository Policies", "Help", and "Contact Us". A search bar is located in the top right corner. The main content area displays "Welcome to Publications of IAS Fellows" and includes social media icons for Atom, RSS 1.0, and RSS 2.0. A central message box states: "This is an Open Access Repository of publications of Fellows of the Indian Academy of Sciences. It attempts to collect, preserve and disseminate the intellectual output of the Academy available as publications by its Fellows in peer-reviewed journals. Thanks for using the repository!". The footer contains the text "Publications of the IAS Fellows is powered by EPrints 3. Copyright © Indian Academy of Sciences." and the EPrints logo.

OBITUARIES



Parag Prabhakar Sadhale (elected 2009)

Parag P Sadhale, fondly called *Parag* by his friends and *PPS* by his students, departed from us in the early hours of 20 January 2012. He was a gentle and sensitive person living in a fast-paced world in which it is increasingly difficult to distinguish music from noise.

Born on 16 June 1960, Parag attended the King George's School, Dadar, Mumbai and subsequently secured his Bachelor's (Ruia College, Mumbai; 1980) and Master's (M. S. University of Baroda; 1982) degrees in Science with microbiology as the main subject. After working in Hindustan Lever for a short while, he pursued his PhD on RNA processing with Terry Platt (*Sadhale & Platt, Mol. Cell. Biol. 12:4262-70, 1992*) at the University of Rochester, New York (1991). He did his postdoctoral work on RNA polymerase subunits with Nancy Woychik (*Sadhale & Woychik, Mol Cell Biol. 14: 6164-70, 1994*) at the Roche Institute of Molecular Biology, New Jersey. He joined the Department of Microbiology and Cell Biology, Indian Institute of Science, Bangalore as an Assistant Professor in March 1995 and became full Professor in March 2009.

He was initiated into research on baker's yeast (*Saccharomyces cerevisiae*) and until the end used the same system, primarily, to ask key questions in biology. In his laboratory, he dealt with two main aspects of yeast biology. The first one was on transcription, the process by which the genetic information encrypted in DNA is converted in the form of RNA. The key enzyme involved in this process is RNA polymerase II which is composed of several subunits. Parag's laboratory studied the roles of Rpb4 and Rpb7, the two subunits associated with the RNA polymerase II complex. Rpb7

is essential for viability of *S. cerevisiae* whereas Rpb4 is required for its growth, primarily during stress conditions. His laboratory demonstrated that overexpression of Rpb7 rescued some of the phenotypes displayed by *S. cerevisiae* lacking Rpb4 (*Sharma and Sadhale, J. Genet. 78: 149-156, 1999*). Further, complementation studies showed that Rpb7 homologs from other lower eukaryotes, e.g. *Schizosaccharomyces pombe*, *Candida albicans* and *Dictyostelium discoideum* rescued the growth of *S. cerevisiae* lacking Rpb7, demonstrating functional conservation across a wide number of species (*Singh et al., Nucleic Acids Res. 32: 201-10, 2004*). His laboratory also showed that the other subunit, Rpb4 affected the transcription of a subset of genes, e.g., galactose metabolism, under normal and stress conditions (*Pillai et al., J. Biol. Chem. 278:3339-46, 2003*). Further studies from his group revealed that the N-terminal regions of Rpb4 and Rpb7 are important in interacting with the core RNA polymerase II complex (*Sampath et al., J. Biol. Chem. 283:3923-31, 2008*). Interestingly, Rpb4 is recruited on the active transcription complexes of several genes and is important for transcriptional elongation (*Verma-Gaur et al., Eukaryot Cell. 7:1009-18, 2008*). In addition, Parag's group elucidated the role of Rpb4 in the slime mould, *Dictyostelium discoideum*, during distinct developmental stages of its life cycle (*Naorem & Sadhale, BBRC 377:1141-6, 2008*). In his own inimitable style, he used to quip that 4 and 7 were, perhaps, not as well known as other numbers, e.g., 5 and 3 (tumor suppressor p53) which reflected his subtle sense of humour. A number of papers have appeared from several other groups in the recent past, vindicating his choice of the topic and the importance of the subject.

The other major area of interest in Parag's laboratory was *Candida albicans*, which causes fungal infections in immuno-compromised individuals. Initial studies revealed that *C. albicans* lacking a key enzyme in galactose metabolism (GAL10) showed several altered properties in cell wall organization, colony morphology, response to oxidative stress, filamentation etc (*Singh et al., Fungal Genet Biol. 44: 563-74, 2007*). This study led to identification of novel regulators of virulence. A seminal finding is the function of GAL102, a homolog of dTDP glucose 4.6 dehydratase which was shown to have important roles during stress and infection (*Sen et al., Plos Pathogens 11:e1002384, 2011*). Further characterization of other novel genes is currently in progress by the students in his laboratory. In addition, using phage display technology, his laboratory identified

peptides that may have potential diagnostic value as they distinguished *C. albicans* from other closely related species (Anandakumar *et al.*, *PLoS One.* 6:e16868, 2011).

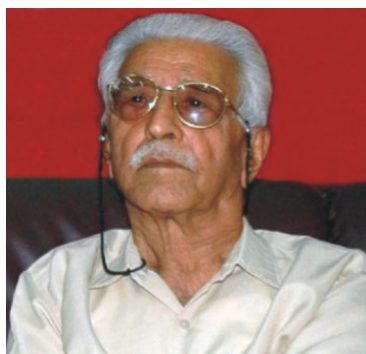
There are several distinguishing features of Parag's personality. He loved methodical work that resulted in a good study and was thrilled with his latest publication in *Plos Pathogens* – quality was more important to him than quantity. He actively sought high technology approaches to address biological problems. In fact, the first micro-array studies from India were published by his laboratory (Pillai *et al.*, *Curr. Sci.* 81: 574-578; *J. Biol. Chem.* 278:3339-46, 2003). To improve the quality of work, he actively collaborated with several colleagues and was generous in sharing credit. Parag was a dedicated teacher who taught microbiology in a non-traditional manner that encouraged students to be more imaginative. He enjoyed the company of dedicated and eager students and actively mentored them. The students of REAP-Biology, an outreach programme of IISc for the benefit of undergraduate students in Bangalore colleges, greatly appreciated his lectures and teaching style. He also participated in the Academy's Science Education Panel activities and delivered lectures in various colleges. Parag was involved in several other activities, eg., selection of students for the KVPY programme, organization of several meetings involving the Society of Biological Chemists, Yeast Biology, Transcription, etc.

In addition to his academic pursuits, he was closely associated with several companies. He actively encouraged the setting up and oversaw the growth of Genotypic Technologies, a company in Bangalore that offers advanced genomic solutions to researchers in biology. In addition, he collaborated with Piramal Life Sciences, Mumbai in trying to identify drug targets against *C. albicans*.

Being a multifaceted personality, Parag was a key person in strengthening the cultural activities in the IISc campus. Parag had great interest in classical and light music. This interest was nurtured while he was in school and he got his initial training in Hindustani classical music with Pandit Vansantrao Kulkarni. He was an accomplished harmonium player and played with several well known artistes. Parag was comfortable with family members and loved the company of good friends. He created a lasting impact on all who interacted with him.

Parag is survived by his parents, ex-wife and daughter. His family members, teachers, colleagues, students and friends recall his broad smile, rejoice in his accomplishments and multi-faceted life and pray for his peace. He will be greatly missed!

* * * * *



Dharni Dhar Awasthi (elected 1978)

Dharni Dhar Awasthi, India's leading lichenologist for more than seven decades, passed away on 21 August 2011 in Lucknow. Awasthi, considered the father of Indian lichenology, was born on 28 September 1922 in Uttarakhand and received his primary education in village Naret and Askote, high school from Pithoragarh and Intermediate from Almora district.

Awasthi obtained his B.Sc. and M.Sc. (Botany) degrees in 1943 and 1945 respectively, from Lucknow University. He joined the department of Botany as Research Assistant in 1946 and later worked in a stipendiary training programme in systematic botany and taxonomy for 2 years (1946-48) at the Botanical Garden and Herbarium, Calcutta under the auspices of Botanical Survey of India. During this period he got interested in the taxonomic studies of Indian lichens which he pursued throughout his later life.

Back in Lucknow, Awasthi worked as a Botanical Assistant for about 4 years during 1948-52 at the National Botanical Garden (National Botanical Research Institute (NBRI), Lucknow), which was then under Department of Agriculture, Uttar Pradesh. During this period he extensively explored the difficult and remote areas of the Himalayas and collected both angiosperm and lichens and these collections are presently preserved at the NBRI herbarium and provide useful data for carrying out studies on the climate change in the area. He travelled months together in difficult terrains

of the Himalayas for plant explorations. Awasthi joined the Department of Botany, Lucknow University as Lecturer from 1952-1971 and as Reader from 1971-1983 and worked as Emeritus Scientist of CSIR from 1984 to 1987. As a faculty member, he initiated work on Indian lichens and obtained his first Ph.D. degree in Botany under the guidance of SN Das Gupta in 1961. He got an opportunity to work as Fulbright Alumnus of National Science Foundation USA, for advanced training in Lichenology under William A Weber, at the University of Colorado, USA (1960-63) and earned another Ph.D. degree from that University. During this tenure, he visited most of the European herbaria and gathered a huge number of exsiccate specimens. At present all of his personal herbarium specimens (herb.-AWAS) and specimens of Lucknow University herbarium (LWU) have been transferred on a permanent loan to the NBRI herbarium (LWG).

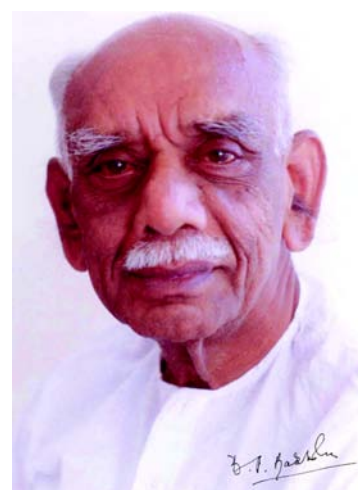
After rejoining the University of Lucknow in 1963, Awasthi vigorously pursued taxonomical investigations on Indian lichens. He explored almost all the phytogeographical regions of the country and some of the lichen-rich sites in the neighbouring country Nepal for his collection of lichens. The vast research work carried out by him enabled him to publish 'Catalogue of the lichens from India, Nepal, Pakistan and Ceylon (1965)'. He monographed the lichen genus *Dirinaria* (1975) on a worldwide basis. Later on, Awasthi keyed out the macro- and microlichens of India, Nepal and Sri Lanka (1988, 1991). For beginners in the field of Lichenology in India he published 'A Handbook of lichens (2000)' and a 'Compendium of the macrolichens from India, Nepal and Sri Lanka (2007)'.

Awasthi also established a personal library, comprising of both rare and ancient updated literature on lichens. His personal lichen herbarium (herb.-AWAS) also represents some of the most unique and important lichen taxa collected from difficult terrains of the Himalayas. Awasthi alone or jointly revised more than 70 genera of lichens and described more than 75 species new to science. He worked over 35 years under various research projects financially supported by CSIR, UGC, State Council of Science and Technology, Lucknow and Botanical Survey of India. The financial support through various Government agencies enabled him to establish a foremost centre of lichenological investigations in the country with a well-developed herbarium.

For his outstanding contribution to the field of this rare branch of botany, Awasthi received the Prof. P. Maheshwari Memorial Lecture of INSA in 1991, was elected a Fellow of Indian Academy of Sciences, Bangalore (1978) and Indian National Science Academy, New Delhi (1984). His distinguished services in the field of lichenology were also recognized internationally as the International Association for Lichenology honoured him with the prestigious Acharius Medal in 1992. This medal is named after the famous lichenologist Eric Acharius, the father of lichenology. Awasthi was an Honorary Member of the British Lichen Society since 1993 and has often been referred to as Father of Indian Lichenology on account of his pioneering efforts for the establishment and development of lichenology in the country. Some of the lichen genera and species named in honour of Awasthi are *Awasthiella indica*, *Awasthia melanotricha*, *Anaptychia awasthii*, *Anthracotheceum awasthii*, *Arthothelium awasthii*, *Bottaria awasthii*, *Cryptothecia awasthii* and *Lobaria awasthiana*.

Awasthi was known to be a great mentor, a person with uncompromising ethics, compassion, commitment to duty, national pride and a par excellence human being. Awasthi had contributed immensely to the growth of lichenology in India and paved the way for further researches on this rare and unique branch of botany. No one can write a research paper on Indian lichens without referring to DD Awasthi.

* * * * *



Bangalore Puttaiya Radhakrishna (elected 1956)

Bangalore Puttaiya Radhakrishna (BPR) – a pre-eminent geologist of India, passed away peacefully at the age of 94 on 26 January, 2012 at his residence in

Bengaluru. His impeccable service to the cause of earth sciences in the country, can hardly be matched by anyone else, and therefore, his demise has left a void hard to fill.

Radhakrishna was born in Bengaluru on 30 April 1918. His parents Puttaiah and Venkamma were from a distinguished family and Puttaiah is known to have served the cause of downtrodden vokkaligas (the farmer community) in the pre-independence days. He had studied geology and specialized in the art of printing and publishing. He served as Superintendent in the Government Printing Press. Thus it may be said that BPR must have inherited his aptitude for geology, printing and publishing, and serving society.

BPR passed B.Sc (Hons) with a first class in 1937, and joined the Mysore Geological Department (now State Department of Mines and Geology of the Government of Karnataka) as Geological Assistant. He worked with eminent geologists such as Bellur Rama Rao and CS Pichamuthu, matured as an excellent field geologist and remained as an “unrepentant field geologist” till the end. During his early career, he carried out exploration in Bellara Gold Fields in Tumkur District and Byrapur chromite deposit in Hassan District. He was both an academic researcher and an outstanding exploration geologist.

His research on the late Archean Closepet Granite and his report that its origin was the granitization of Peninsular Gneiss was recognized and for this he was awarded the Ph.D degree of the Mysore University in 1956. His contributions to the Precambrian crustal evolution and related metallogenesis, accretionary growth of the Indian shield and the geomorphic evolution of the Western Ghats, are well known.

He rose through the ranks and became the Director of the Department of Mines and Geology in 1965. Under his stewardship, he nurtured the Mineral and Groundwater extensions in the Department. Karnataka’s Mines and Geology Department was one of the earliest to start a separate groundwater cell in the country to scientifically explore, develop and manage groundwater resources in hard rock terrain. Under his guidance hundreds of reports on geological studies and groundwater were published by the Department. Application of remote sensing and electrical resistivity methods for groundwater exploration were introduced in the early 1970s itself in the State. BPR also started the Chitradurga Copper Company in 1966. While serving as Director, he was also appointed the Chairman, Mysore Minerals Ltd., the mining arm of the Government of Karnataka in

1967. He retired as Director of Mines and Geology in 1974, and soon after the Karnataka Government appointed him as the Chairman of the Chitradurga Copper Company and later utilized his services as the Chairman and Managing Director of the Karnataka Copper Consortium in 1976. He also served as Member of the Board of Directors of the Bharat Gold Mines Limited that operated the Kolar gold field and the Hutti Gold Mines Limited, that operated the Hutti gold mines. He retired from Government Service in 1979.

Under his guidance, exploration on iron, manganese and chromite played a pivotal role in the growth of iron and steel industry and also laid the basis for mineral exports from Karnataka. Investigations on flux and cement grade limestones in the Archean schist belts, as well as Proterozoic Kaladgi and Bhima basins of northern Karnataka, helped in meeting the requirements of steel industry and development of cement industry in the State. BPR was also responsible for detailed exploration of copper in the state, which led to the setting up of the copper mines at Ingaldhal in Chitradurga District, Kalyadi in Hassan District, and Tinthini in Raichur District. His understanding of the importance of industrial minerals encouraged mining and processing of china clay, bauxite and quartz and led to the growth of ceramic and glass industry in Karnataka. He prepared a vision document for groundwater development in hard rock terrain in the State, which provided the road map for scientific and sustainable development of groundwater resources, which is relevant to this day. The legislation for preventing indiscriminate development of groundwater, which the State Government is implementing now, is a concept which he proposed almost 50 years ago. BPR believed in the relevance of scientific studies and research, and it is this approach, which distinguished him from other geoscientists and endeared him to geological, mining and social circles.

Although BPR was a field geologist at heart, he always had great appreciation for the importance of geophysics, geochemistry and geochronology for understanding the solid earth and contributed to it in an advisory capacity.

BPR is well known in the national and international geological community for his yeomen service to earth sciences through the Geological Society of India, of which he was one of the founding members. He contributed to its establishment and growth, through dedicated service, as Secretary (between 1958 and 1973), as Editor (between 1973 and 1992) and as President (between 1992 and 2006). It is no exaggeration to state that it was his dedication which

has accorded the Society its prestigious place in the world of geoscience. The main aim of the Society is to publish results of researches on Indian geology and provide a platform for geological discussions. The 'Journal of the Geological Society of India', which initially started as an annual publication, became a quarterly and later a monthly journal during his tenure as Editor. To this day, it remains the main publication channel for geologists of India and is one of the most punctually published journals from the country. Under his careful guidance, the Society also published memoirs, textbooks and field guides from time to time. BPR's editorials in the journal were always eagerly looked forward to for their immediate relevance to science and society. These editorials have been compiled in the Society's special publication titled 'Random Harvest'.

BPR encouraged young geoscientists to present their research as invited talks at the Geological Society's monthly meetings. BPR facilitated close interaction between overseas and Indian scientists by organizing field workshops and international seminars. Many of these conferences led to fruitful collaborative researches, from which Indian geoscience has greatly benefitted. Russian scientists, who worked under one such collaborative programme, discovered a new lead tellurium chloride mineral in the Kolar Gold bearing quartz veins, which they named after him as 'Radhakrishnaite', thus rendering his name immortal.

While BPR encouraged specialists from different parts of the country to write or edit books published by the Society, he also authored several books, the principal among them are the 'Geology of Karnataka', 'Mineral Resources of Karnataka', 'Gold – the Indian Scene' and 'Antarjala (Groundwater in Kannada)'. He also edited several memoirs. Among them, the memoirs on Archean Greenstone belts of South India, Granulites of South India and Sahyadri are landmark publications. BPR was a voracious reader and had great flair for writing biographical accounts in Kannada. He wrote about his father in 'Nanna Thande' in 1949. He also wrote biographical accounts of some outstanding personalities such as C. V. Raman, Madame Curie, Srinivasa Ramanujan, Charles Darwin and B.G.L. Swamy. The Kannada language and style adopted by him, received appreciation from stalwarts in Kannada literature like D. V. Gundappa. These biographies are not mere translations, but are indeed well referenced and researched books.

For his contributions to science and society, BPR was honoured by several institutions. He was elected the Fellow of the Indian Academy of Sciences

(1956); the Indian National Science Academy (1972), Honorary Fellow of the Geological Society of London (1986), the Geological Society of America (1990), and the Indian Geophysical Union (1996). He was awarded an honorary D.Sc by the Indian School of Mines, Dhanbad in 1992. The Government of India conferred on him the National Mineral Award in 1971, Padma Shri in 1991, and the National Mineral Award for Excellence in 2000. He is also a recipient of the D. N. Wadia Medal of the Indian National Science Academy, the Rajyothsava Award of the Government of Karnataka (1974), Sir M. Visveswaraiiah Award for 1996, the Millenium Award of the Geochemical Society of India (2000) and the Sahitya Academy Award for Biography for the years 1997 and 2002, the Jawaharlal Nehru Centenary Award of the Indian Science Congress Association (2007).

BPR was an academician and an applied earth scientist who contributed to the growth of the mineral industry in Karnataka. He was among the first to develop the science of groundwater development in the hard rock terrain in India. He was a great promoter of earth science research and an institution builder. He will be greatly missed by the geological community. It would do us well to emulate his sterling qualities for the continuous growth of earth sciences in our country. For it can be said that over the past five decades BPR truly strode the country's geological scene like a Colossus!

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Padmanabha Krishnagopal Iyengar (elected 1969)

Padmanabha Krishnagopal Iyengar, pioneer of neutron scattering research in India and initiator of pulsed fast reactor at the Bhabha Atomic Research Centre was also an inveterate innovator and motivator of people. Starting his scientific career as a young Research

Assistant at the Tata Institute of Fundamental Research in 1952, he retired in 1993 from his formal scientific, technical and administrative responsibilities as Chairman, Atomic Energy Commission. He was the first Chairman who was trained within the country, except for a short stint of eighteen months at Chalk River Nuclear Laboratories in Canada. He was committed to the cause of Indian science and in particular, to atomic energy till his last days. He passed away on 21 December 2011.

PK Iyengar was truly a product of his times. Sixteen years of age at the time of Indian independence, he had absorbed the pre-independence ethos and spirit and transformed it into a guiding principle for his life: people's utter dependence on foreign goods and technology made Iyengar believe that if India has to survive, it has to provide for itself through its own science and technology.

Iyengar obtained his M.Sc degree in Physics (1952) from Trivandrum and was appointed as a Research Assistant at the Tata Institute of Fundamental Research in Dr Raja Ramanna's group. A 1-million-volt accelerator of charged particles had been installed at the Institute at the time. This is where he got his initial grounding in detecting nuclear radiation and in building electronics required for counting nuclear particles and in fabricating other advanced electronic units for measurement of slowing down of fast neutrons in different media. This period of about five years of learning and experimentation instilled in him a style of working which moulded his personality in years to come.

The neutron measurements at TIFR were a preparation for the utilization of neutrons from *Apsara*, India's first nuclear reactor which became critical on August 4, 1956. However, even before the starting of *Apsara*, India had signed an agreement with Canada for building a bigger reactor, *Cirus*, at Trombay similar to their NRX reactor at Chalk River, Canada. A team of many engineers and a few scientists was sent to Chalk River for training in 1956. Iyengar had the good fortune to be chosen to work with BN Brockhouse – an extraordinary scientist who won the Nobel Prize for Physics (with CG Shull) in 1954. Brockhouse was a scientist who had an intuitive approach and could get to the heart of a problem without getting embroiled in details of mathematical tools, necessarily used in Physics. Iyengar was a complete match to him in his approach to science; the eighteen months during 1956-58 that he spent with Brockhouse turned out to be a period of great value as it consolidated

his belief in himself and kindled his innovative spirit for developing newer methods and devices for experimentation and study.

Impressed by Iyengar's abilities, motivation and independent nature, Brockhouse asked him to stay longer at Chalk River's expense. However, Iyengar had different plans. He explained to Brockhouse that he had obligations to his institution, his parents and siblings in India. While at Chalk River, Bhabha had provided for his living expenses there and salary in India. He had impressed upon the team members that it was they who had to establish new science and technology in the Atomic Energy Establishment Trombay (now BARC). Therefore, for Iyengar it was a duty and an obligation to stand up to the expectations reposed in him. Brockhouse appreciated his deep commitment to India and Iyengar returned in March 1958.

Iyengar was full of confidence and ideas about starting a full fledged neutron scattering programme at Trombay. He was encouraged and supported by Raja Ramanna in this. Satya Murthy and I* joined Iyengar in August 1958. An automatic neutron diffractometer, a major piece of equipment, was the first to be built and installed at *Apsara* in less than two years. This was soon followed by an inelastic scattering spectrometer. Measurements on the magnetic structure of an alloy of iron and tin and lattice vibrations in iron crystal were the first to be reported in less than three years from start. In parallel, more neutron instruments were built for using neutrons from *Cirus* reactor. When *Cirus* produced its first neutrons, spectrometers from *Apsara* were shifted there and some new ones were installed and ready for experiments; inelastic scattering measurements on magnesium and ammonium chloride were reported in 1962 at an international meeting at Chalk River, Canada. By 1962 the Trombay group for studying condensed matter with neutrons had more than a dozen scientists and technical personnel.

In recognition of this growth and scientific output of the BARC group, the International Atomic Energy Agency (IAEA) accepted India's invitation to hold the next international meeting on inelastic scattering of neutrons by solids in the winter of 1964 at Bombay; by the time of the meeting several new instruments, including a window-filter spectrometer and a multi-arm

*Obituary written by BA Dasannacharya

spectrometer which had interesting innovative features introduced by Iyengar, were in place. Then on, Iyengar and his group contributed extensively to measurements of lattice vibrations and other inelastic scattering studies in several materials. In the area of magnetism the contributions included studies of antiferromagnetic alloys and dynamics of magnetic spins by neutron scattering. The group was well established and many of Iyengar's colleagues were recognized in their own right as leading workers in the field. Meanwhile, Iyengar got a PhD and also the Bhatnagar Award. Iyengar expanded his area of investigations in the late sixties to studies of magnetic alloys and spin relaxation in ferrites using the technique of the Mossbauer effect; this led to some innovations in instrumentation and a number of publications. Had the Trombay group depended on importing instruments, it would have been nowhere near to being as competitive as it became later.

Following the 1964 IAEA meeting, a programme for introducing neutron scattering at nuclear reactors in South-East Asian countries was initiated by IAEA at the suggestion of Ramanna & Iyengar. India initially built a neutron diffractometer for the Philippines and a number of physicists from the Philippines, South Korea, Thailand, Indonesia and Taiwan were trained. Some of them visited BARC for further advanced training. Under the Regional Cooperation Agreement (RCA) of IAEA, BARC supplied spectrometers to most of these countries and neutronic study of condensed matter was started. This RCA became a template for other regional collaboration programmes of IAEA. This initiative substantially contributed to establishing the field of neutron scattering for the study of condensed matter in South-East Asia.

The next phase in Iyengar's scientific career is concerned with development of the fast reactor assembly, PURNIMA 1 (Plutonium Reactor for Neutron Investigations in Multiplying Assemblies).

Internationally, the sixties saw the development of pulsed neutron sources with a view to using them for neutron scattering experiments; USSR had built a pulsed fast reactor in early sixties and Italy was contemplating one, accelerator based photo-neutron and spallation sources were being developed. A team of scientists under Iyengar, who by then was Head, Nuclear Physics Division, BARC, was sent to Italy and USSR in 1967 to learn about their programmes. It was felt that a pulsed fast reactor could be a possibility

for installation at the then proposed reactor research centre for fast reactors at Kalpakkam. However, there was no experience in building fast reactor systems and it was therefore decided to set up a critical-facility (a small reactor which produces no power) for neutronic experiments at BARC. This would provide valuable experience for handling fast-neutron prompt critical assemblies which incidentally is also very relevant in connection with nuclear explosive systems. This was obviously one of the considerations as following events would prove. With Ramanna guiding the overall physics programme at BARC, Iyengar spearheaded the programme to design and build India's first fast neutron reactor assembly, PURNIMA 1, which became critical on May 18, 1972.

Around this time, India's interest in a Peaceful Nuclear Experiment (PNE) for leaching of copper ores was presented at a meeting at IAEA in Vienna. Ramanna was clearly building up the preparedness for a nuclear device. When the time came and Indira Gandhi gave the signal to go ahead towards the end of 1972, Ramanna chose Iyengar as the leader of the team to oversee and guide the PNE project. The PNE was conducted successfully on 18 May 1974 about twenty months after the go-ahead signal. The PNE was, as Iyengar put it, "the most exhilarating experience of my career This involved building up a group, inculcating a spirit of cooperation and jointly achieving results." Following this he was awarded *Padma Bhushan* by the Government of India.

When Ramanna took over as Director, BARC in 1972, the mantle of Directorship of the Physics Group was handed over to Iyengar. Over the years, from 1972 to 1983, he was given expanding responsibilities of other Groups than Physics in BARC, culminating in the Directorship of BARC in 1984. He became the Chairman, Atomic Energy Commission in 1990 for a three-year term. Naturally, his administrative responsibilities and scope of work continually expanded during this period. Iyengar played an important leadership role in planning for new accelerators at VEC, CAT and TIFR. Realizing that exposure to the worlds' best facilities is necessary for our scientists, Iyengar established collaborative programmes with laboratories like CERN (Geneva), Fermilab (Chicago) and Rutherford Appleton Laboratory (UK). These collaborations not only allowed our scientists access to the laboratories but provided us opportunities to develop frontline technologies; these in turn substantially contributed to our own

programmes. It is this foresight that he brought to bear on all programmes which were undertaken at BARC, be they in physical sciences, biological sciences, or engineering and technology. And in matters of importance to BARC like, for example, the commissioning of *Dhruva*, he would get involved personally and lead from the front. The author also remembers his unstinted support and encouragement to the superconductivity programme after the discovery of high temperature superconductors in the late seventies. However, his support was not confined to generating some research papers alone, but to overall development of both science and technology emerging out of the effort.

Another programme which he supported strongly in the late eighties, and was personally involved in, was that of cold fusion which now goes under the name of condensed matter nuclear science. A controversial area of research at any time, his involvement, in my view, was basically because of his strong belief in experimental science, in the power of observation as against over-dependence on existing theories to predict 'all' phenomena (accept Vedas as last word!).

Many developmental programmes were undertaken in BARC when Iyengar was the Director and in DAE when he was the Chairman, AEC. In his decision-making during these phases he would, characteristically, not allow nibbling procedural issues to come in

the way of important scientific and technological progress.

PK Iyengar retired in 1993 but continued to be a member of the Atomic Energy Commission for the next five years.

After his retirement he was Advisor to Kerala Government's Department of Science and Technology between 1993 and 1997. During this period he established the Rajiv Gandhi Institute at Thiruvananthapuram. He took a keen interest in rural science education through his involvement, as a Trustee, in the NGO, Agastya Foundation, whose nerve centre is in a rural area in Chittoor District of Andhra Pradesh.

This profile would be incomplete if it did not mention his disagreement with some aspects of the Indo-US nuclear deal. This was a result of his strong belief, born out of a long experience of working in a regime of sanctions from nuclear powers, that the deal would come in the way of India pursuing independent basic research and technical development in cutting edge areas related to atomic energy and the country would be that much poorer for it.

The perception and understanding that basic science and technology are two sides of a coin, the *ardhanarishwara* of modern civilization, was fully integrated in the persona of PK Iyengar and his career was a balance between the two.

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HINDI WORKSHOP

In accordance with the Official Language Implementation rules, two workshops were jointly organized by the Indian Academy of Sciences and Raman Research Institute, Bangalore. In the last six months two workshops were held – one on 27 December 2011 and the other on 6 March 2012 at the RRI/Academy premises.

Shri MG Savadatti (Hindi Consultant) and Dr SN Mahesh (CAIR, Bangalore) were the guest speakers at these workshops which were attended by many officials from both the institutions.

Guidelines about usage of the Hindi software 'Saransh' and general information about usage of Hindi through software were discussed during these workshops.



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