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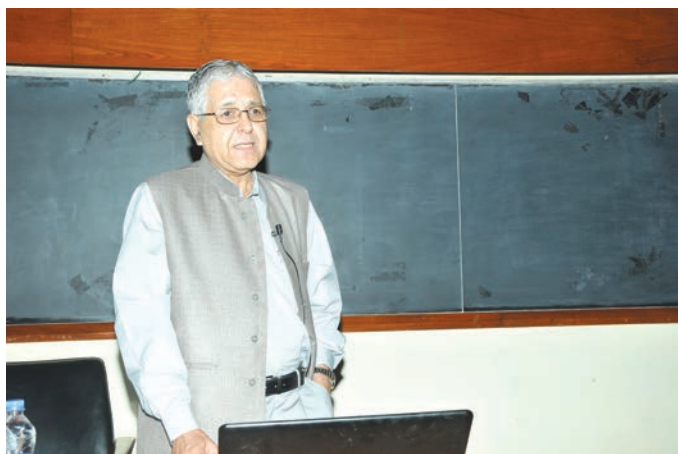
September 2014

Newsletter of the Indian Academy of Sciences

TWENTY-FIFTH MID-YEAR MEETING

4-5 JULY 2014

Following tradition, the 25th Mid-Year Meeting of the Indian Academy of Sciences was held at the Indian Institute of Science, Bangalore, between 5th and 6th July 2014. A special lecture was delivered by **Arun K. Grover**, Vice Chancellor, Panjab University, Chandigarh. In his lecture



he reflected on the noteworthy contributions made since 1970s towards the understanding of the physics of zero-magnetization spin-ferromagnets and its applications.

In a public lecture, **Aruna Roy** (Mazdoor Kisan Shakti Sangathana, Rajasthan) spoke about why scientists need to communicate their research to the public. Pointing towards the Koodankulam nuclear debate, she said the issue was not about its application or the acquisition agricultural land, but that it raised concerns regarding the area that was already vulnerable as it was tsunami-affected. Most of the facts known to the public today are by and large media-fed. To make informed choices, Roy urged the scientific community to make their findings

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Newsletter, please write to the
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Forthcoming Events

Eightieth Academy Annual Meeting, Chennai 7 – 9 November 2014

Refresher Courses

- Experimental Physics
Goa University 11 – 26 November 2014
- Experimental Physics
Vidya Vikas Institute of Engineering & Technology, Mysore 11 – 26 November 2014
- Materials Preparation and Properties Measurement-3
Indian Academy of Sciences, Jalahalli, Bangalore 2 – 17 December 2014
- Classical Mechanics and Electromagnetism
SDM College, Ujjire 8 – 20 December 2014
- Application of Quantum Mechanics to 'Atoms, Molecules and Radiation'
Indian Academy of Sciences, Jalahalli, Bangalore 8 – 20 December 2014
- Experimental Physics
SMVDU, Katra 10 – 25 December 2014
- Foundations of Physics
IWSA, Navi Mumbai 20 December 2014 – 02 January 2015
- Crystallography, Mineralogy, Igneous Petrology and Thermodynamics
Indian Academy of Sciences, Jalahalli, Bangalore 26 December 2014 – 09 January 2015
- Theoretical Physics
Tezpur University, Assam 6 – 20 January 2015
- Advances in Chemical Sciences and Sustainable Development
Central University of Rajasthan 12 – 25 January 2015
- Experimental Physics
Central University of Rajasthan 10 – 25 March 2015

Lecture Workshops

- Scope of Physics and Electronics
Holy Cross Degree College for Women, Hyderabad 19 – 20 November 2014
- Nanoscience & Nanotechnology: Challenges and Opportunities
Mody University of Science & Technology, Rajasthan 21 – 22 November 2014
- Recent Advances in Conservation of Biodiversity and Evolutionary Biology
Government Degree College, Srikalahasthi 24 – 25 November 2014
- Classical Mechanics
Loyola College, Chennai 4 – 6 December 2014
- Interdisciplinary Approach of Research in Life Sciences
PSGR Krishnammal College for Women, Coimbatore 19 – 20 December 2014



public without the fear of political intervention. She lamented that scientists were not communicating their science to the public and that they work behind closed doors. She emphasized the importance of access to knowledge and reflected on her 11-year journey that brought the Right To Information (RTI) into force. She said that in order to overcome inequality and injustice in the country, we need to apply scientific temper – analysis, reason, trial and error, experimental observations and the power of logic.

A half-day symposium on the Life and Science of CV Raman was also organized which reflected upon the life and research of Sir CV Raman. A booklet based on the life of CV Raman was brought out which chronicled his early life, his Nobel Prize, the founding of the Indian Academy of Sciences and other milestones.



G. Venkataraman (Radio Sai Global Harmony, Prasanthi Nilayam) spoke on “Raman, the man, his contribution, and his message: what they mean to us in the 21st century”. He cited several anecdotes from the life of Raman and other prominent scientists of that time. Venkataraman also spoke of Raman’s personal struggle at IISc and while setting up the Raman Research Institute. In the second half of this talk, Venkataraman focussed on how scientific as well as technological progress made by our national



labs had not manifested as economic progress. He said that given support and encouragement, we do have the competence to move forward. Raman correctly saw the future of our country in our youth, in research and the fruits of research manifesting as the development of the nation. Venkataraman also spoke of the role the Academy must play through education and scholarship, and by creating public awareness, to connect research and economic development, and through them, enable the advancement of society, so as to make the Founder's vision come true. **Dipankar Bhattacharya** (IUCAA, Pune) introduced Raman's work on the physics of



musical instruments, especially the *tanpura*, *veena*, *tabla* and *mridangam*. **S. Umopathy** (IISc, Bangalore), whose work is based on Raman Spectroscopy explained



the principles of this technique. Using Raman Spectroscopy, it is easy to understand molecular events like protein folding, or how neurons (brain cells) interact with each other, and to understand molecule rotation and movement of bonds. In his talk, Umapathy highlighted a new technique developed in his lab, called UMARS, which may prove useful in detecting explosives in liquids. **A. K. Sood** (IISc, Bangalore) touched upon the impact of Raman's discovery on the



field of condensed matter physics, in particular in the area of nanoscience. Sood also reflected on the wide applicability of Raman transitions in cold atoms as atom beam splitters. In his talk, Sood explained why Raman spectroscopy was a powerful tool in unraveling the physics of solids, and in understanding nanosystems and phase transition.



The talks presented during the meeting ranged from healthcare to plasmonics. Some of the lectures delivered by the Fellows and associates are listed below:

S. K. Sikdar (IISc, Bangalore) presented his work on understanding the neuronal mechanisms of epilepsy using electrophysiological approaches.

M. Jayananda (University of Delhi, Delhi) spoke on why studying the Archean continental crust is

important: it allows us to understand the origin of life and tells us how the Earth evolved to become a habitable planet. Studying the Dharwar craton in southern India enriches our understanding of the geologic and tectonic history of the early Earth. He also highlighted the features of the Archean Earth.

K. S. M. S. Raghava Rao (CFTRI, Mysore) discussed the role chemical engineering can play in food technology and how integration of the two fields could help the food industry. Using a few case studies, he spoke about some of the technologies, such as the ATPE developed at CFTRI. He highlighted the need to devise different methods for food extraction, as well as the difficulties faced in removing impurities from food extracts.

Sudip Chattopadhyay (NIT, Durgapur) spoke on how the HY5bZIP protein regulates its expression by a feedback loop mechanism in *Arabidopsis* seedling development.

According to a review in the journal *Nature* (2003), surface plasmons (SPs) are of interest to a wide spectrum of scientists, ranging from physicists, chemists and materials scientists to biologists. Renewed interest in SPs comes from recent advances that allow metals to be structured and characterized on the nanometre scale. SPs are being explored for their potential in optics, magneto-optic data storage, microscopy and solar cells; they are also used to construct sensors for detecting biologically interesting molecules. **G. V. Pavan Kumar** (IISER, Pune) discussed the recent advances made in this field and how these can find use in microfluidics.

Sumantra Madal (IGCAR, Kalpakkam) spoke about crystallographic properties of grain boundaries.

T. Govindaraju (JNCASR, Bangalore) discussed novel diagnostic and therapeutic tools for detection and inhibition of amyloidogenesis in Alzheimer's disease.

Asit K. Chakraborti (NIPER, Mohali) spoke on supramolecular assemblies, describing the origin of catalysis by ionic liquids and the molecular basis for rate acceleration in aqueous media.

M. Krishnamurthy (TIFR, Mumbai) spoke about making a compact laser-driven plasma accelerator for mega electronvolt energy neutral atoms. For decades, it has been known that intense laser fields

EIGHTIETH ANNUAL MEETING

Chennai
(hosted by IMSc in association with IIT-M, CLRI, CMI, MSSRF and IGCAR)

7 – 9 NOVEMBER 2014

Programme

7 November 2014 (Friday)

- 0930–1100 **Inauguration & Presidential Address**
Dipankar Chatterji, IISc, Bangalore
Inhibition of bacterial transcription: Action of antibiotics
- 1200–1300 **Lectures by Fellows/Associates**
- 1200 **Balaji R. Jagirdar**, IISc, Bangalore
Activation of unreactive chemical bonds in small molecules
- 1220 **K. V. Adarsh**, IISER, Bhopal
Ultrafast light-induced effects in amorphous chalcogenide thin films
- 1240 **Nahid Ali**, IICB, Kolkata
Visceral leishmaniasis: Strategies to combat the disease
- 1400–1500 **Lectures by Fellows/Associates**
- 1400 **P. P. Mujumdar**, IISc, Bangalore
Hydrologic impacts of climate change: Quantification of uncertainties
- 1420 **S. Shivaji**, LV Prasad Eye Institute, Hyderabad
Cold-loving microbes: Biodiversity, genes and genomes
- 1440 **K. Manjunath**, IISc, Bangalore
Hope probabilities in certain point processes
- 1530–1730 **Symposium – ‘X-ray Crystallography’**
- 1530 **T. N. Guru Row**, IISc, Bangalore
The nature of a chemical bond involving elements in Group 14–17 from experimental charge density studies

produce strongly ionized plasma. Nanomaterials are known to explode under the charge pressure to give MeV energy, highly charged ions. Can this system be used to produce MeV neutrals? How nanocluster ensembles can be used to make this feasible and the success in this endeavour was presented in this lecture.

Averaging operations play an important role in various contexts in mathematics and physics. Investigating geometric means on matrices and their relevance in diverse areas were discussed by **Tanvi Jain** (ISI, New Delhi).

Zhumur Ghosh (Bose Institute, Kolkata) spoke on her work on regulatory networks modulating stem cell biology.

Susanta Mahapatra's (University of Hyderabad, Hyderabad) talk was on nonadiabatic chemical dynamics. He discussed representative examples illustrating the variety of nonadiabatic molecular processes studied by him.

Most of the structures of transition metal oxides have negligibly small dipole moments associated with them. In a talk titled 'Engineering non-vanishing dipoles in transition metal oxides', **Priya Mahadevan** (S N Bose National Centre for Basic Sciences, Kolkata) presented recent efforts to understand why this happens and how to use these insights to engineer materials of choice.

Epilepsy is a common neurological disorder characterized by synchronized hyperexcitability of neurons, seizures and neuronal death. One of the continuing research interests of **S.K. Sikdar's** (IISc, Bangalore) laboratory has been to understand the fundamental neuronal mechanisms of this neurological disorder using *in vitro* models of epilepsy. In his talk titled 'Understanding neuronal mechanisms of epilepsy: Electrophysiological approaches', he summarized some of the research findings.

Manikuntala Kundu (Bose Institute, Kolkata) spoke on deciphering stress response pathways in mycobacteria.

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1600	Dhananjai Pandey , IIT (BHU), Varanasi <i>Complementary role of X-ray, neutron and electron diffraction in materials research</i>		<i>for Mycobacterium tuberculosis persistence</i>
1630	Shekhar C. Mande , NCCS, Pune <i>Early Indian contributions to crystallography</i>	1440	C. Vineeth , VSSC, Thiruvananthapuram <i>Optical remote sensing of the terrestrial upper atmosphere</i>
1700	Tej Pal Singh , AIIMS, New Delhi <i>Structural basis for therapeutic applications of innate immunity proteins as protein antibiotics</i>	1520	Nikhil Tandon , AIIMS, New Delhi <i>Epidemiology of non-communicable diseases in India – Across the life course</i>
1800–1900	Public Lecture Gopalkrishna Gandhi Former Governor of West Bengal <i>Who know India?</i>	1540	Thomas J. Pucadyil , IISER, Pune <i>Membrane fission: Analyses using novel assay systems</i>
	8 November 2014 (Saturday)	1600–1700	Business Meeting of Fellows
0900–0940	Special Lecture R. L. Karandikar , CMI, Chennai <i>Power and limitations of opinion polls</i>	1730–1830	Public Lecture D. Subbarao , Former Governor, RBI <i>India – Mega Trends</i>
0940–1020	Lectures by Fellows/Associates		9 November 2014 (Sunday)
0940	C. V. Ramana , NCL, Pune <i>Inspirations from natural products: New catalytic methods by metal complexes</i>	0900–0940	Special Lecture Ashok Jhunjunwala , IIT, Chennai <i>Can decentralised solar enable 24x7 power to every home in India?</i>
1000	Abha Misra , IISc, Bangalore <i>Carbon nanomaterials and engineering applications</i>	0940–1300	Lectures by Fellows/Associates
1050-1300	Symposium – ‘Neutrinos and the India-based Neutrino Observatory’	0940	Tarun Souradeep , IUCAA, Pune <i>Hints of ‘Beyond Standard Model’ cosmology in the cosmic microwave background</i>
1050	Amol Dighe , TIFR, Mumbai <i>The world of neutrinos</i>	1000	R. Mahalakshmi , IISER, Bhopal <i>Membrane protein folding and stability: Underlying similarities in bacteria and humans</i>
1120	Vivek Datar , BARC, Mumbai <i>Current status and future prospects of neutrino mass measurement</i>	1050	Eknath Ghate , TIFR, Mumbai <i>Number theory via representation theory</i>
1150	D. Indumathi , IMSc, Chennai <i>Neutrino oscillation, global status and role of INO</i>	1110	Santanu Mukherjee , IISc, Bangalore <i>Controlling stereochemistry at the quaternary center through olefin functionalization and desymmetrization</i>
1220	N. K. Mondal , TIFR, Mumbai <i>India-based neutrino observatory project</i>	1130	Annapurni Subramaniam , IIA, Bangalore <i>Exploring the nearby galaxies – Present and future</i>
1250	Discussion	1150	M. Subba Reddy , CDFD, Hyderabad <i>Canonical vs non-canonical ubiquitination: Control of protein fate</i>
1400–1540	Lectures by Fellows/Associates	1210	Naveen Garg , IIT, New Delhi <i>Approximation algorithms for hard optimization problems</i>
1400	Nisanth N. Nair , IIT, Kanpur <i>Supercomputers against superbugs: Unveiling the molecular details of antibiotic resistance through multiscale modeling</i>	1230	Angshuman Nag , IISER, Pune <i>Colloidal semiconductor nanocrystals with magneto- and opto-electronic properties</i>
1420	B. Gopal , IISc, Bangalore <i>Studies on sigma factor/anti-sigma complexes reveal a molecular rationale</i>		

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ASSOCIATES – 2014

K. V. Adarsh

IISER, Bhopal

Ultrafast Nonlinear Optics, Amorphous Semiconductors, Condensed Matter Physics



R. Mahalakshmi

IISER, Bhopal

Membrane Protein Biophysics, Protein Folding, Spectroscopy



P. Ajith

ICTS-TIFR, Bangalore

Gravitational-Wave Physics and Astronomy, Relativity and Gravitation, Astrophysics



Angshuman Nag

IISER, Pune

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Anshu Pandey

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Ullasa Kodandaramaiah

IISER, Thiruvananthapuram

Evolutionary Biology, Ecology



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JOURNAL IMPACT FACTOR 2013

The impact factor for the year 2013 of all the journals published by the Academy are as follows. Most journals have shown a significant improvement.

Journal	Impact Factor – 2012	Impact Factor – 2013
Bulletin of Materials Science	0.584	0.870
Journal of Astrophysics and Astronomy	0.336	0.500
Journal of Biosciences	1.759	1.939
Journal of Chemical Sciences	1.298	1.224
Journal of Earth System Science	0.695	0.794
Journal of Genetics	0.876	1.013
Pramana – Journal of Physics	0.562	0.720
Proceedings – Mathematical Sciences	0.191	0.380
Sadhana – Engineering Sciences	0.393	0.587
Current Science	0.905	0.833

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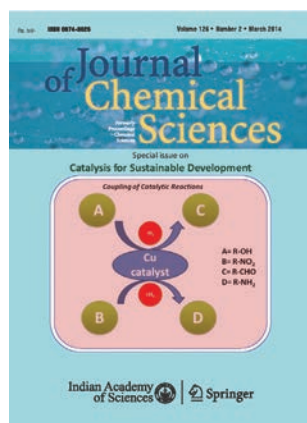
SPECIAL ISSUES OF JOURNALS

Catalysis for Sustainable Development

Editors: M. Lakshmi Kantam and K.S. Rama Rao

Journal of Chemical Sciences, Vol. 126, No. 2, March 2014, pp. 309–532

This special issue contains the contributions of invited speakers and scientists who participated in the 21st National Symposium on Catalysis (CATSYMP21) held at CSIR-Indian Institute of Chemical Technology, Hyderabad, during 11-13 February 2013. The theme was Catalysis for Sustainable Development. This symposium was attended by more than 400 scientists/researchers from different countries who presented their expertise/R&D findings in the form of 12 plenary lectures, 33 invited lectures, 63 oral presentations and 207 poster presentations. The



symposium addressed present-day scientific challenges and technological demands of the chemical industry and R&D. The main focus of the conference was on the recent advances in catalytic science and technology for sustainable development. The topics in this special issue cover, in 23 articles, a diverse range of areas pertaining to catalysis.

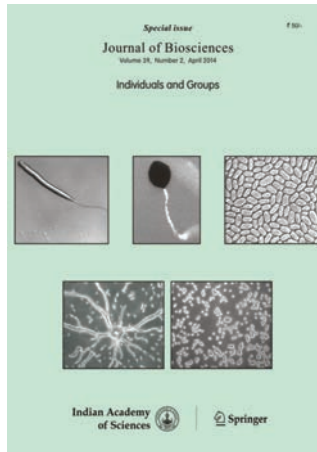
Individual and Groups

Editors: Vidyanand Nanjundiah and Stuart A. Newman

Journal of Biosciences, Vol. 39, No. 2, April 2014, pp. 171–332

The 12 papers in this special issue of *Journal of Biosciences* are based on talks given at a discussion meeting on the theme 'Individuals and Groups' that was held in Almora from 22 to 31 May 2012. About 50 people took part, all of them as discussants and approximately half as speakers as well. Not everyone who spoke contributed an article; the shortfall was made up partially by some who were unable to attend but agreed to write. These papers are a fair representation of the range of viewpoints, though not systems, covered at Almora. The aim of the meeting was to explore the evolutionary basis of group behaviour in biology and discuss commonalities and differences between diverse

viewpoints. A question that might provide a common theme had been suggested to the speakers: To what extent can one account for group behaviour in terms of the properties of the constituent units as exhibited when they are isolated, and to what extent does one need to invoke group-level, 'emergent' traits? As will be seen, the



question is addressed in different ways, some overlapping and others in apparent conflict, by the authors of this special issue. Even though the responses concern group behaviour in biological systems, many contain indications of how the individual versus group issue is confronted in physics and chemistry. Within biology, groups at different levels of organization – genes, proteins, metabolic pathways, cells, organisms and species – are considered.

Cihan Saçlioglu, Önder Pekcan and Vidyanand Nanjundiah compare and contrast physical, chemical and biological systems. In the physical and chemical systems that are usually studied, proximate causes suffice to account for cooperative behaviour in groups, whereas in living systems one must more often take recourse to historical contingencies and other distant causes. In a parallel fashion, the behaviour of organisms in groups is influenced by physics (e.g. size), chemistry (e.g. adhesion), biology (e.g. relatedness) and of course evolution.

Multicellular development is the supreme example of group behaviour; three papers highlight different implications that can be drawn from it.

Patrick Bateson nicely summarizes the task that must be confronted: reductionist biology has succeeded in deepening our knowledge of how to take things apart; now one must begin to think of how to bring the parts together. It is important to study developmental change – epigenetic processes – if we wish to understand what makes a group of cells behave as one unit and, by extension, what makes a group of animals behave as one unit.

Scott F Gilbert takes off from the numerous recorded instances of obligatory symbiotic associations that are present in metazoan bodies and have a decisive influence on the phenotype of the host (e.g. on the immune system). He makes the radical suggestion

that we should begin to look at organisms not merely as groups of genetically identical cells but as groups of multicellular groups of cells ('holobiont', for the integrated organism consisting of host cells and persistent symbionts). Gilbert's view of group behaviour as exhibited by holobionts has intriguing parallels to group behaviour in asexual organisms that are considered to be members of the same species.

Marta Linde-Medina and Stuart A Newman cite different examples of multicellular development to illustrate that evolution can (i) be slow and gradual (as natural selection via the accumulation of minor changes would demand), (ii) depend (to different extents in the history of multicellular forms) on interaction of the developing organism with the environment (unlike in conventional evolutionary theory), and (iii) lead to abrupt qualitative changes of form (something inconsistent with the predictions of natural selection) if feedbacks or other complex interactions are present. In the last case, cells which come pre-adapted with the requisite property (e.g. motility and adhesivity) could be triggered, in a collectivity, or in physically interacting collectivities, to form a novel multicellular structure by a small genetic or environmental change.

Contrary to conventional selectionist thinking, micro- and macro-evolution may therefore be based on different principles according to these authors. Both Bateson and Linde-Medina & Newman cite genetic assimilation as a possible process through which an evoked environmentally induced change remains heritable in the absence of the environmental stimulus.

The next two papers deal with multicellularity that comes about in an unusual manner: not because the clonal progeny of a zygote stay together, but because physically separated cells, which may or may not have a higher than average probability of sharing genes via recent common descent, come together.

Dominika M Wloch-Salamon draws attention to the fact that there can be situations in which single gene effects and shared genes may underlie cooperative traits. She discusses the explicit example of genetic variation in a single cell influencing a trait that impinges on social behaviour, interestingly, in brewer's yeast – an organism that was long thought of (wrongly, as she points out) as constitutively unicellular. Wloch-Salamon considers group-level traits that are present in yeast and other microorganisms including *Escherichia coli* that have recently been discovered to have a social life.

Silvia De Monte and Paul B Rainey continue with the theme of facultative sociality. Their focus is on the origin of group behaviour, which they attribute plausibly to the formation of ephemeral groups by cells that are also capable of living freely. Participation in a group is viewed as a transitory and non-reproductive phase in the life cycle of a cell. How do the standard requirements for evolution by natural selection (the existence of entities that display heritable variation in traits that are correlated with lifetime reproductive fitness) fare under these circumstances? If groups do not reproduce as groups, and the composition of a group in one generation is only weakly linked (via heredity) with the composition of a group in the next, can group-level traits contribute to fitness at all (and so conceivably evolve by natural selection)? The first question is answered by saying that strict parent-offspring relationships are not necessary; it is sufficient that some individuals in a group in one generation are ancestors to some individuals in a group in the following generation. The second question is answered in the affirmative with the explicit example of a model of motile cells that vary in their ability to form groups by adhering to one another.

Bahram Houchmandzadeh emphasizes the importance of looking closely at the consequences of a null evolutionary hypothesis before assuming that selection must be at work. He demonstrates that randomly occurring birth and death processes, which by their very nature change the population size by one unit, are sufficient to account for many group-level phenomena.

Göker Arpag and Ayse Erzan examine regulatory gene and protein interactions from a physicalist viewpoint. They show that analogously to the preferred phase (gas, liquid or solid) of a physical system, what looks like an evolved adaptation in a system of biological molecules may simply be statistically the most probable configuration of a system that arises from 'self-organization'. Arpa? and Erzan too emphasize that one must first test the appropriate null hypothesis before invoking natural selection.

Carlos Sonnenschein, Ana Soto, Annapoorni Rangarajan and Prakash Kulkarni debate how to view carcinogenesis, conventionally thought of as an example of narrow group interest (that of the cancer cells) overriding the broader good (that of the organism). The theoretical frameworks used to address these questions are the tissue organization field theory (CS and AS), the cancer stem cell hypothesis (AR),

and the concept of intrinsically disordered proteins (PK). Their paper is explicit about the epistemological and ontological issues that lie behind scientific debates but are often ignored.

Ellen Clarke, Telmo Pievani and George Katsiaficas round off the special issue with three papers that deal largely with philosophy. Clarke teases out the multi-level hierarchies inherent in group phenomena. She points out the usefulness of viewing group behaviour as analogous to a phase transition. Clarke joins Wloch-Salamon and De Monte & Rainey in alluding to stickiness as an example of an individual-level trait that lends itself to exploitation for a group-level adaptation.

By sharply scrutinizing the long-standing (and recently revived) debate on kin selection and group selection, and exposing the sterility of dichotomous framings, Pievani performs a major service. He convincingly argues that the exclusivity insisted on by adherents of one or the other hypothesis is chimerical. Nature is messy; explanations that combine what seem to be different approaches are not just pragmatic, they are inevitable. According to Pievani, it is often forgotten that Darwin advocated precisely such a plurality of views. Pievani and Clarke agree, moreover, that multi-level selection theory is the appropriate way to update the concept of natural selection.

Katsiaficas builds his discussion around the analysis of human cooperation carried out by the 14th century scholar Ibn Khaldun, who has claims to have initiated the scientific study of human society and, in his consideration of the emergence of humans from 'the world of monkeys' through a process in which 'species become more numerous', aspects of evolutionary theory. Finally, as characterized by Katsiaficas, Ibn Khaldun's view of the emergence of human society being accompanied by 'human beings becoming who they in essence are', echoes the group-individual dialectic seen at all levels throughout this collection.

In a nutshell, the papers in this issue offer a range of explanations for the evolution of cooperative behaviour in biological groups – for how, as the title of this Introduction states, one emerges out of many. They include 'old fashioned' natural selection acting on individual members of the group; natural selection fostered by shared genes; multi-level selection; pre-adaptation and self-organization; and reciprocal dynamical interactions between individuals, groups and the environment. A group may consist of

individuals between whom genes are rarely or never exchanged. The ontogeny of group behaviour is likely to offer strong clues regarding its underlying basis. Finally, it is important to guard against the temptation of single answers to evolutionary questions; the uniqueness of the group may be as salient as the uniqueness of the individual.

Proceedings of the National Conference on Nuclear Physics – Part I and II

Editors: Keshab C. Panda and Zashmir Naik

Pramana, Vol. 82, No. 4–5, April–May 2014, pp. 617–945

The National Conference on Nuclear Physics (NCNP) was held at the School of Physics, Sambalpur University, during 1–3 March 2013, under the sponsorship of UGC, DST, CSIR, BRNS and MCL.



The aim of this Conference was two-fold: (1) to provide a scientific platform to the nuclear physics community of India to present their recent research works and to provide a platform for them to interact with others for the development of their respective fields in nuclear physics and (2) to provide an academic platform to students in order to derive inspiration and motivation for their higher studies in nuclear physics.

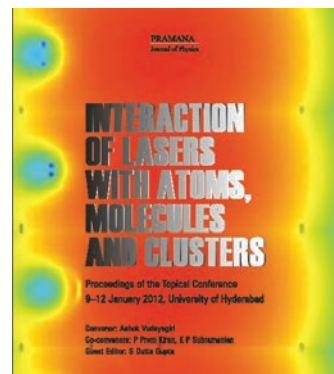
The Conference comprised 30 invited talks including 1 key note address on the progress and prospects of hundred years of nuclear physics and 12 oral contributions. Out of the 30 invited talks, 6 were devoted to experiments carried out in (i) Variable Energy Cyclotron Centre, Kolkata, (ii) Inter-University Accelerator Centre, New Delhi, (iii) Indian National Gamma Array, TIFR-BARC Accelerator, Mumbai and (iv) Relativistic Heavy-Ion Collider, CERN, Geneva. The theoretical talks were devoted to a wide spectrum of nuclear structures, nuclear reactions and nuclear astrophysics events. The conference was attended by 130 participants from all over India. These proceedings of NCNP 2013 contain the invited talks received before the extended deadline.

Proceedings of the Topical Conference on Interaction of Lasers with Atoms, Molecules and Clusters – TC2012

Editors: S. Dutta Gupta

Pramana, Vol. 83, No. 2, August 2014, pp. 165–289

Atomic and molecular physics and lasers have benefited each other, for a very long time. Lasers were invented only because of the theoretical work by Einstein, Rabi and others towards understanding atom–light interactions, and in turn, lasers



provided a very useful tool for producing and probing atomic species with higher efficiency and better precision and hence for understanding the structures and functions of atoms and molecules. This knowledge in turn helped in the invention of better lasers. Thus, they are interlinked to each other. In recent times, atomic/molecular physics has benefited even more by the application of laser-based tools. Laser-induced breakdown spectroscopy, laser-produced plasma, precision spectroscopy of atoms, optical cooling of atoms, creation of exotic atomic species such as BEC, etc., are a few of the applications wherein lasers are used in atomic physics. Hence, a conference was organized under the auspice of Indian Society of Atomic and Molecular Physics (ISAMP), on 'Interaction of Lasers with Atoms, Molecules and Clusters' at University of Hyderabad in January 2012. The conference was jointly organized by School of Physics, ACRHEM of University of Hyderabad as well as TCIS Hyderabad, under the umbrella organization of ISAMP.

Started in 1975 in Ahmedabad, ISAMP – a gathering of scientists involved in research on various areas of atomic and molecular physics – has grown in size and scope, encompassing diverse ranges of scientific interests. Under its auspice, a national conference on Atomic and Molecular Physics is organized once in two years, and a smaller thematic conference, focussed on a specific topic, in the intervening years. The conference on 'Interaction of Lasers with Atoms, Molecules and Clusters' is one such. A few of the selected papers presented in this conference have been brought forward in this issue.

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SUMMER RESEARCH FELLOWSHIP PROGRAMME FOR STUDENTS AND TEACHERS

Summer Fellowships are awarded to bright students and motivated teachers to work with Fellows of the Academy on research-oriented projects for a period of eight weeks. Starting on a small scale in 1995, this programme has, in recent years, grown enormously in size and reputation. This is particularly so after the Indian National Science Academy (New Delhi) and the National Academy of Sciences India (Allahabad) joined this Academy in 2007 in running this programme.

The following table provides information on the number of applications received and the number of Fellowships awarded and availed in 2014.

Sl. No.	Subjects	No. of applications received		No. of fellowships offered		No. of fellowships availed	
		Students	Teachers	Students	Teachers	Students	Teachers
1.	Life Sciences (incl. Agric. Sciences)	4093	279	551	68	499	58
2.	Engg. & Tech.	12881	268	417	44	337	34
3.	Chemistry	1997	159	238	58	216	42
4.	Physics	2021	105	247	25	207	22
5.	Earth & Planetary Sci.	912	16	117	09	105	09
6.	Mathematics	1010	42	135	15	121	13
	TOTAL	22914	869	1705	219	1485	178
	GRAND TOTAL	23783		1924		1663	

Many institutions in the country helped the programme by hosting Summer Fellows and providing them the necessary facilities, such as laboratory support, accommodation, etc. The following tables give information on (a) the cities in which 10 or more Summer Fellows were placed and (b) institutions that hosted 10 or more Summer Fellows in 2014.

(a) Cities in which 10 or more Summer Fellows were placed in 2014:

Sl. No.	Cities (as hosts)	No. of SRFs
1	Bangalore	439
2	New Delhi	180
3	Mumbai	156
4	Hyderabad	152
5	Kolkata	85
6	Pune	84
7	Chennai	74
8	Thiruvananthapuram	58
9	Mohali	34
10	Bhubaneswar	29
11	Varanasi	28
12	Kanpur	24
13	Guwahati	22
14	Ahmedabad	21
15	Ropar	20
16	Kharagpur	18
17	Goa	17
18	Nainital	17
19	Lucknow	15
20	Tiruchirappalli	12
21	Vellore	11
22	Puducherry	10

(b) Institutions that hosted 10 or more Summer Fellows in 2014:

Sl. No.	Institutions (as hosts)	No. of SRFs
1	IISc, Bangalore	286
2	IIT, Mumbai	78
3	UOH, Hyderabad	51
4	BARC, Mumbai	42
5	IIT, Chennai	39
6	IISER, Mohali	32
7	BHU, Varanasi	26
8	NCL, Pune	26

Sl. No.	Institutions (as hosts)	No. of SRFs
9	IIT, Kanpur	24
10	IIT, Guwahati	22
11	JNCASR, Bangalore	22
12	NCBS, Bangalore	22
13	CDFD, Hyderabad	21
14	NCCS, Pune	21
15	UOD, Delhi	21
16	IIT, Ropar	20
17	UOD (SC), New Delhi	20
18	IISER, Thiruvananthapuram	19
19	IIT, New Delhi	19
20	IIT, Kharagpur	18
21	ARIES, Nainital	17
22	CCMB, Hyderabad	17
23	IISER, Pune	17
24	JNU, New Delhi	16
25	NII, New Delhi	16
26	PRL, Ahmedabad	16
27	ISI, Kolkata	15
28	IIA, Bangalore	14
29	IISER, Kolkata	14
30	NPL, New Delhi	13
31	TIFR – CAM, Bangalore	13
32	TIFR, Mumbai	13
33	Bharathidasan University, Tiruchirappalli	12
34	ICT, Mumbai	12
35	IICT, Hyderabad	12
36	RGCB, Thiruvananthapuram	12
37	CMMACS, Bangalore	11
38	NISER, Bhubaneswar	11
39	RRI, Bangalore	11
40	SINP, Kolkata	11
41	AIIMS, New Delhi	10
42	Bose Institute, Kolkata	10
43	IGIB, Delhi	10
44	NGRI, Hyderabad	10
45	NIIST, Thiruvananthapuram	10
46	NIO, Dona Paula, Goa	10
47	Pondicherry University, Puducherry	10

Many institutions in the country were benefited by the programme as several of their own students and teachers got selected under the programme and availed an opportunity to work at institutions elsewhere. The following is a list of such institutions from which 10 or more Summer Fellows were selected in 2014.

SI. No.	Institutions benefitted by SRFP	No. of SRFs
1	UOD, New Delhi	44
2	NITK, Surathkal	39
3	BHU, Varanasi	38
4	IIT, Roorkee	38
5	Bharathidasan University, Tiruchirappalli	27
6	CUSAT, Cochin	26
7	Pondicherry University, Puducherry	25
8	VIT University, Vellore	25
9	Anna University, Chennai	24
10	SASTRA University, Thanjavur	24
11	IIT, Kharagpur	23
12	IISER - Nadia, Kolkata	22
13	Jadavpur University, Kolkata	21
14	BITS - Pilani, Rajasthan	20
15	NIT, Rourkela	20
16	University of Pune, Pune	20
17	University Calcutta, Kolkata	19
18	Andhra University, Visakhapatnam	18
19	SVNIT, Surat	18
20	IISER, Bhopal	16
21	NIT, Tiruchirappalli	16
22	TNAU, Coimbatore	16

SI. No.	Institutions benefitted by SRFP	No. of SRFs
23	HIT, Kolkata	15
24	IISER, Mohali	15
25	ISM, Dhanbad	15
26	IISER, Pune	14
27	NIT, Calicut	14
28	Presidency University, Kolkata	14
29	St. Stephen's College, New Delhi	14
30	University of Hyderabad, Hyderabad	14
31	IISER, Thiruvananthapuram	13
32	IIT – Bombay, Mumbai	13
33	IIT – Madras, Chennai	13
34	R.V. College of Engg., Bangalore	13
35	Tezpur University, Tezpur	13
36	University of Madras, Chennai	13
37	IIT, Kanpur	12
38	NIT, Warangal	12
39	BITS – Pilani, Goa	11
40	NIT, Durgapur	11
41	RGU - IIIT, Basar	11
42	Central University of Tamil Nadu, Thiruvarur	10
43	Jamia Millia Islamia, New Delhi	10
44	NISER, Bhubaneswar	10
45	S.S.N. College of Engg., Chennai	10
46	St. Xavier's College, Kolkata	10

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

REFRESHER COURSES

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

Two-week Refresher Courses are aimed at helping teachers to add value to their teaching and are designed to have direct relevance to the study materials covered in the graduate and under-graduate syllabi followed in universities and institutions in the country. The following Courses were held from March to July 2014.

A. Refresher Courses in Experimental Physics

The Refresher Courses in Experimental Physics were held under the direction of R Srinivasan, who was instrumental in the conceptualization and designing of the experiments. He has so far held 61 Courses in different parts of the country since 1999. These experiments are useful for laboratory programmes at BSc and MSc levels, and many universities in the country have adopted these experiments as part of their curricula. In order to conduct the Refresher Courses, a user-friendly kit containing several components has been developed and manufactured under licence by M/s Ajay Sensors and Instruments, Bangalore.

The following is the list of Experimental Physics Courses held from March 2014 to August 2014.

1. LVII. P.D. Patel Institute of Applied Sciences, Changa, Gujarat

18 March–04 April 2014

Co-ordinator: CK Sumesh (P.D. Patel Institute of Applied Sciences)

No. of Participants: 40 participants from various parts of the country.

Resource Persons: R Srinivasan, CK Sumesh, Kinnari H Parekh, Manohar Nyayate, Rucha Desai.

2. LVIII. Goa University, Goa

12–27 May 2014

Course Director: Kaustubh R Priolkar (Goa University).

No. of Participants: 24 participants from various parts of the country.

Resource Persons: KR Priolkar, SM Sadique, JBC Efrem D'Sa, Manohar Naik

Special Lectures: PR Sarode, RV Pai, (both from Goa University) and Elgar Desa (NIO, Goa).

3. LIX. Government College, Rajahmundry

27 May – 11 June 2014

Co-ordinator: Ramachandra K Rao (Government College, Rajahmundry)

No. of Participants: 35 participants including from other institutions.

Resource Persons: R Srinivasan, Valluri Srinivasa Rao, TK Viswewara Rao, K.Ramchandra Rao

Special Lectures: TNKV Prasad (ANGR University, Tirupati), M Senthil Pandian (SSN College of Engineering, TN), Govind S Krishnaswami (CMI, Chennai).

4. LX. University of Mumbai, Mumbai

3–18 June 2014

Course Director: R. Nagarajan (UM-DAE-CBS)

Co-ordinator: Radha Srinivasan (University of Mumbai)

5. LXI. Amrita Vishwa Vidyapeetham, Kollam

16 June–01 July 2014

Co-ordinator: Ganesh Sundaram (Amrita Vishwa Vidyapeetham)



6. LXII. IISER Mohali, Mohali

8–23 July 2014

Co-ordinator: Arvind (IISER Mohali)

B. Other Refresher Courses

7. Recent Trends in Computer Science and Engineering: Refreshing the Young Minds

Guru Nanak Dev Engineering College, Bidar

10–22 March 2014

Course Director: BL Deekshatulu (IDRBT, Hyderabad)

Course Co-ordinators: Wanjerkhede, M Shesharao (Guru Nanak Dev Engineering College).



No. of participants: 35.

Resource Persons: Arun Agarwal, Ramesh Manza, BL Deekshatulu, Chakravarthy, Gangadharan, V Ravi, H Mallikarjun, Bapi Raju, Ananth Raj, Ravindra Dastikop, Vijay Singh, Sahana Murthy

Topics Covered: Introduction to robotics; remote sensing: applications and processing; data in cloud: cloud computing and data-intensive applications; computer vision: an overview; a systematic approach to topographic map processing; diabetic retinopathy using MATLAB – I; probability theory; dimensional analysis; quantum statistics; theory of stochastic processes; phase transitions and critical phenomena.

8. Quantum Mechanics

Bishop Moore College, Mavelikara

5–18 May 2013

Course Director: M Lakshmanan (Bharathidasan University, Tiruchirapalli)

Course Co-ordinator: D Sajan (Bishop Moore College)

No. of participants: 43.

Resource Persons: G Rajasekaran, M Lakshmanan, HS Mani, Govind S Krishnaswami.



Topics Covered: Formulation, Schrodinger equation, angular momentum and hydrogen atom; approximation methods and scattering theory; symmetries and conservation laws, Klein-Gordon and Dirac equations; time-dependent perturbations, field quantization.

Special Lecture: G Rajasekaran (IMSc, Chennai)

9. Bioinformatics in Modern Biology

Manipal University, Manipal

5–17 May 2014

Course Director: V Nagaraja (IISc, Bangalore)

Co-ordinator: K Satyamoorthy (Manipal University)

No. of participants: 17 participants from various parts of the country.



Resource Persons: V Nagaraja, Shekar Mande, K Thangaraj, Upendra Nayak, Renu Durairaj, R Manimekalai, K Satyamoorthy, K Acharya, R Anantharamanan

Topics Covered: Introduction to bioinformatics; introduction to biological databases; mind, body and health – fitness training; online resources for teaching/research; NCBI and its resources; pathway databases; protein structure databases; structure visualization tools; genome browsers.

10. Materials Preparation and Measurement of Properties – 1

Indian Academy of Sciences, Jalahalli Campus, Bangalore

6–21 May 2014

Course Director: TG Ramesh (NAL, Bangalore)

Co-ordinator: G Madhavan (Indian Academy of Sciences)

No. of participants: 26.



Resource Persons: R Srinivasan, TG Ramesh, Arun Baligan, Seeta Bharati, Sarbari Bhattacharya, Soma Dutta, Anil Pugalia.

Topics Covered: Pelletizer constant-current source and DC differential amplifier; TCR of Cu-Ni alloys, thermal and electrical conductivity of copper and thermal conductivity of a poor conductor; preparation of thin film by evaporation; preparation of thin film by DC sputtering; photovoltaic cell; mechanical alloying of thermoelectric materials, para to ferroelectric transition in barium titanate; L-C-R-Bridge; lock-in amplifier AC susceptibility, Van der Pau four-probe technique for resistivity measurement; thermoelectric effects in metals and semiconductors; thermoelectric effects in metals and semiconductors; phase transitions in nickel and its alloys; tracing phase transition in shape memory alloy by resistance; DTA for study of phase transitions.

Special Lectures: HL Bhat, AM Umarji, KBR Varma (all from IISc, Bangalore), V Shubha, TS Kannan (NAL, Bangalore), R Nagarajan ((UM-DAE-CBS).

* * * * *

LECTURE WORKSHOPS

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

1. Mathematical Modelling using Differential Equations

Maharanis Science College for Women, Bangalore

6–7 March 2014

Convener: Pradeep G Siddheshwar (Bangalore University, Bangalore)

Co-ordinator: RK Vanishree (Maharanis Science College for Women)

No. of participants: 100



Topics Covered: On the Newtonian three body problem; why do we need analysis and linear algebra for ODE?; Chaos and Synchronization; ODEs and PDEs – what they convey about what they represent?

2. Recent Advances in Materials Chemistry

Bharathidasan Institute of Technology, Trichy

7– 8 March 2014

Conveners: S Natarajan & R Ramaraj (IISc, Bangalore, MKU Madurai)

Co-ordinator: K. Jothivenkatachalam (Bharathidasan Institute of Technology)

No. of participants: 241

Topics Covered: The Chemistry of Donor-Acceptor (DA) cyclopropanes; colour and chemistry; photo-electrochemistry and solar energy conversion; inorganic-organic hybrids: synthesis, structure and properties; symmetry in chemistry and chemical biology; exploiting



photoexcited molecules for sensing environments; unravelling the interaction of nanomaterials with biomolecules using classical molecular dynamics simulation; ordered nanoporous materials and their applications; electrochemistry and our common future.

3. Advances in Spectroscopy

Government Victoria College, Palakkad

7–8 March 2014

Convener: PT Manoharan (IIT, Chennai)

Co-ordinator: K Padmakumar (Government Victoria College, Palakkad)

No. of participants: 125

Topics Covered: Introduction to spectroscopy; introduction to EPR spectroscopy; Raman spectroscopy; introduction to Mossbauer spectroscopy; photoelectron spectroscopy; NMR spectroscopy.

4. Applications and Numerical Solutions of Differential Equations

Cluster Innovation Centre, University of Delhi

7–8 March 2014

Convener: Ajit Iqbal Singh (ISI, New Delhi)

Co-ordinator: Shobha Bagai (Cluster Innovation Centre, University of Delhi)

No. of participants: 130

Topics Covered: Introduction to numerical methods; method of characterization for a single linear PDE; error analysis of the numerical methods; genuine nonlinearity, conservation laws and shocks; introduction of the numerical methods; introduction to stochastic differential equations I; introduction to stochastic differential equations II; traffic flow model.

5. Computer Science and Differential Equations

Deshabandhu College, New Delhi

7–8 March 2014

Convener: Ajit Iqbal Singh (ISI, New Delhi)

Co-ordinator: Harindri Chaudhary (Deshabandhu College)

No. of participants: 180

Topics Covered: Social networks; computing various measures; hardware software co-design of embedded systems; use of rapid miner: a data mining tool; Indian language OCR and its applications; introduction to numerical methods; error analysis of numerical methods.

6. Topics in Theoretical Physics

Presidency College, Chennai

10–11 March 2014

Convener: M Lakshmanan (Bharathidasan University)

Co-ordinator: S Vijayalakshmi (Presidency College, Chennai)

No. of participants: 150

Topics Covered: Basics of classical and statistical mechanics; basic postulates of quantum mechanics; comparison between classical and quantum mechanics.

7. New Frontier's in Biology

KLE Society's Nijalingappa College, Bangalore

10–11 March 2014

Convener: RR Rao (Bangalore)

Co-ordinator: TK Ghori (KLE Societys Nijalingappa College)



No. of participants: 100

Topics Covered: Introduction to epigenetics; concept of evolution; pollen – biology behind its development; telomere; biodiversity; evolution and human health; pollination biology; classical taxonomy to modern taxonomy.

8. Interdisciplinary Approach to Life Science Research

PSGR Krishnammal College for Women, Coimbatore

14–15 March 2014

Convener: G Marimuthu (Madurai Kamaraj University)

Co-ordinator: Harathi PB (PSGR Krishnammal College for Women)

No. of participants: 100



Topics Covered: Pheromones and its biological significance; assisted reproductive technology; towards interdisciplinary research: from top scoring graduates to top thinking graduates; biomarkers in environmental toxicology; fifty years of the operon model; biology and behaviour of bats; transgenic and cloned animals; animal models for human health.

9. Molecular Diagnostics and Therapeutics

Pds. Dr D.Y. Patil University, Navi Mumbai

20–21 March 2014

Convener: Tarala D. Nandedkar (NIRRH, Mumbai)

Co-ordinator: Madhusudan P Samant (Pds. Dr D.Y. Patil University)

No. of participants: 100

Topics Covered: Recent trends in reproductive biology; hormones and their receptors; endometrium receptivity; power of evolution; evolution and human health; molecular markers for diagnosis and prognosis of prostate cancer; advances in ART.

10. Spectroscopy in Chemical Biology

Banaras Hindu University, Varanasi

21–22 March 2014

Convener: Anunay Samanta (University of Hyderabad, Hyderabad)

Co-ordinator: Satyen Saha (Banaras Hindu University, Varanasi)

No. of participants: 260

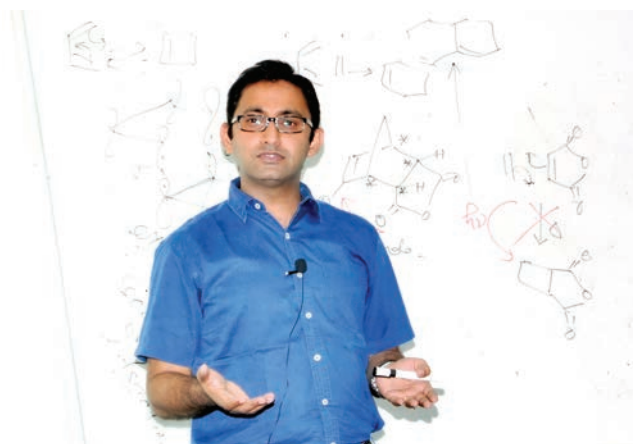
Topics Covered: Fluorescence spectroscopy: the basics and some applications; time domain fluorescence spectroscopy: applications to problems in biology; spectroscopic studies of drug–DNA interaction; NMR spectroscopy and its application in chemical biology; exploring nuclease activity of some transition metal complexes using spectroscopic techniques; domain specific studies of multi-domain proteins; ultrafast studies of GFP; NMR spectroscopy and its applications in chemical biology; spectroscopic studies of drug DNA interaction; career in Science: what's next after MSc?

11. Fundamental Concepts in Chemical Sciences

Dr Babasaheb Ambedkar University, Aurangabad

21–24 March 2014

Convener: Satish Patil (IISc, Bangalore)



Co-ordinator: Suresh Gaikwad (Dr Babasaheb Ambedkar University, Aurangabad)

No. of participants: 170

Topics Covered: Polymerization and mechanism; synthesis and reaction mechanism I; concepts in inorganic chemistry I; pericyclic reactions; concepts in quantum mechanics; properties of conducting polymers; introduction to metal-organic frame works; stereochemistry and asymmetric synthesis; introduction of nanomaterials.

12. Recent Advances in Chemical Biology

Manipur University, Imphal

24–26 March 2014

Convener: Santanu Bhattacharya (IISc, Bangalore)

Co-ordinators: Rajmuhon Singh, Nongmaithem/ Ningthoujam, Debananda (Manipur University)



No. of participants: 100

Topics Covered: Why should we worry about chemical biology?; science and scientists; how breaks help to fix DNA damage and repair in cancer; nutrient-responsive proteins and metabolic networks; quest for stress-responsive genes in crop species; regulatory networks involved in plant immunity; drosophila and zebra fish: alternative models; functional proteomics: role of CaP in dehydration stress tolerance; Raman effect made simple for wider applications; coinage metal clusters for sensing applications; exploiting the chemical diversity in biological systems; structural characterization of peptides and proteins; chemical biology of plant-microbe interactions.

13. Climate Change Studies: An Organismal Approach

Sathyabama University, Chennai

27–28 March 2014

Convener: T Subramoniam (Sathyabama University)

Co-ordinator: T Sasiprabha (Sathyabama University)

No. of participants: 85

Topics Covered: Marine ecosystem; power plant effluent system; ocean acidification; coral reef bleaching.

14. Molecular Biology in the 21st Century

Mar Athanasios College for Advanced Studies, Tiruvalla

28–29 March 2014

Convener: S Mahadevan (IISc, Bangalore)

Co-ordinator: Biju Dharmapalan (Mar Athanasios College for Advanced Studies)

No. of participants: 200

Topics Covered: The wonderful world of restriction enzymes; mechanisms of DNA-protein interactions; Is the Operon model relevant in the 21st century?; current advances in eukaryotic gene expression; new insights on how ribosomes make proteins; challenges of vaccine development.

15. Recent Trends in Physics

Avvaiyar Government College for Women, Karaikal

28–29 March 2014

Convener: K Porsezian (Pondicherry University, Pondicherry)

Co-ordinator: S Santhosh Kumar (Avvaiyar Government College for Women, Karaikal)

No. of participants: 250

Topics Covered: Nonlinear dynamics to chaotic dynamics; crystals and modern technology; quantum mechanics: learning and teaching, objective reality in classical physics; revolutions in optical fibre communication.

16. Advances in Biology and Biotechnology

SV University, Tirupati

2–4 April 2014

Convener: S Dayananda (University of Hyderabad)

Co-ordinator: Ch Appa Rao (SV University)

No. of participants: 350

Topics Covered: Hormone – and biopesticide – based physiological disruption during insect development; conservation of coastal biodiversity; asexual reproduction, embryonic stem cells and coelom in animal kingdom and importance of the embryonic stem cells.

17. Functional Materials and Their Applications in Devices

Andhra University, Visakhapatnam

3–4 April 2014

Convener: S Ramasesha (IISc, Bangalore)

Co-ordinator: V Veeraiah (Andhra University, Visakhapatnam)

No. of participants: 140



Topics Covered: The renaissance in battery development; essentials of electrochemical capacitors; electro-optic effects; electro-optics: concepts to devices; electro-optics: concepts to devices; photovoltaics: theory; photovoltaics: devices; introduction to molecular materials; organic light-emitting diodes and organic photovoltaics.

18. Supramolecular Chemistry – Concepts and Perspectives

Mahila Maha Vidyalaya, BHU

4–5 April 2014

Convener: Partha Sarathi Mukherjee (IISc, Bangalore)

Co-ordinator: Sailaja S Sunkari (Mahila Maha Vidyalaya, BHU)

No. of participants: 250



Topics Covered: Metal–organic frameworks: new materials for industry, energy and environmental applications; H-bonded supramolecular assembly of donor – acceptor chromophores; self-assembly and supramolecular catalysis part I; self-assembly and supramolecular catalysis part II; Supramolecular Chemistry – An introduction; Introduction to Nanomagnetism part I; introduction to Nanomagnetism part II; Molecular Recognition and Supramolecular Chemistry part I; Molecular Recognition and Supramolecular Chemistry part II; Why are Weak Interactions Important? A Perspective from Supramolecular Chemistry part I; A Perspective from Supramolecular Chemistry part II.

19. Recent Trends in Chemistry

Mother Teresa Womens University,
Kodaikanal

4–6 April 2014

Convener: M Palaniandavar (Central University of Tamil Nadu, Thiruvarur)

Co-ordinator: S Jose Kavitha (Mother Teresa Womens University)

No. of participants: 100

Topics Covered: Permanent colour and chemistry; structure and function of metallobiomolecules – I; bioinorganic chemistry; nanomaterials for biological applications; recent progress in nanoscience and technology; ordered nanoporous materials: a new class of inorganic solids; growing gold microplates on a hot plate; porous materials: strategies to control their pore size and applications; unusual acids in the synthesis of inorganic compounds; bioinspired chemistry for energy and environment; structure and function of metallobiomolecules – II; bioinorganic chemistry of iron transport and storage; metals in medicine – I: non-covalent DNA and protein binding Cu(II) and Ru(II) complexes as cytotoxic and cellular imaging agents; para cest-MRI contrasting agents; metals in medicine – II.

20. Recent Advances in Chemical and Environmental Sciences

ABES Engineering College, Ghaziabad

5–6 May 2014

Convener: SK Dogra (IIT, Kanpur)

Co-ordinator: Sunita Goyal (ABES Engineering College, Ghaziabad)

No. of participants: 100

Topics Covered: Nanoscience and nanotechnology in nature and for our future; quantization and degeneracy of energy levels; intermolecular forces; environmental risk assessment of a contaminated site; climate change, disaster and sustainable development; prospect of organic farming in India; conservation of environment and biodiversity; basics, principles and application of NMR and MRI.

21. Recent trends in synthesis of chemical compounds

NIT, Silchar

5–7 May 2014

No. of participants: 140

Convener: BC Ranu (Indian Association for the Cultivation of Science, Kolkata)

Co-ordinator: Pranjit Barman (NIT, Silchar)

Topics Covered: Green tools and green catalysis in organic synthesis – part I; probing dioxygen activation mechanism in nanohaemoxygenases by bio-mimetic-Iron complexes; green tools and green catalysis in organic synthesis – part II; functional modelling of C-C bond cleaving nonheme iron oxygenases; recent

trends of Multi-Component Reactions (MCRs) in organic synthesis ; structure and reactivity of zeolites and their application as green catalysts; conceiving an idea and its journey towards benefaction to the mankind; basics of computational chemistry; materials at the nanometer length scale: from the roman ages to recent advances; surface plasmon oscillation of the small metallic particulates.

22. Himalayan Biodiversity and Bioresources: Mapping, Utilization and Conservation

University of Kashmir, Srinagar

8–10 May 2014

Convener: R Umashaanker (University of Agricultural Sciences, Bangalore)

Co-ordinator: Manzoor A Shah (University of Kashmir)

No. of participants: 100

Topics Covered: Self-assembly and supramolecular catalysis; molecular recognition and supramolecular chemistry; supramolecular chemistry – current status; introduction to nanomagnetism; why are weak interactions important? a perspective from supramolecular chemistry; chemistry of self-assembled coordination frameworks; H-bonded supramolecular assembly of donor – acceptochromophores.

23. Physics of Earthquakes and Hazard Analysis

SMVD University, Katra

27–29 May 2014

Conveners: Vinod K Gaur (IIA and CMMACS Bangalore)

Co-ordinator: Sunil Kumar Wanchoo (SMVD University, Katra)

No. of participants: 91



Topics Covered: Seismotectonics of southern Asia collision band: NW Arabia to Assam; physics of rock behaviour under stress; elastic strain and fracture strain energy and seismic moment; earthquake waves in bounded and unbounded media, P, S and surface waves; waves in a spherical earth and the ray parameter, time-distance curves; earthquake waves and ground motion, seismic moment and earthquake magnitude; calculation of ground accelerations; GPS geodesy and the earthquake cycle in the Himalaya, existence of a locked interface beneath the Himalaya; seismic imaging of the subsurface: receiver functions; scaling laws: seismic hazard analysis at site; seismic risk assessment; earthquake resistant structures and building codes.

24. Recent Advances in Chemistry

Mizoram University, Aizawl

2–4 June 2014

Convener: BC Ranu (Indian Association for the Cultivation of Science, Kolkata)

Co-ordinator: Mohondas N Singh (Mizoram University, Aizawl)

No. of participants: 100

Topics Covered: Green tools and green catalysis for organic synthesis – I; coordination chemistry of the transition metal ions: a fascinating area of research; green tools and green catalysis for organic synthesis-II; organometallic complexes of the platinum metals: synthesis, structure and catalytic application; crystal engineering in designing soft-materials-I; crystal engineering in designing soft-materials-II; chemical bonding and potential energy surface; nano-science and its application; all-metal aromaticity and hydrogen storage; ferrate (VI): a green chemical in waste water treatment.

25. Recent Trends in Reproductive Biology

Kishinchand Chellaram College, Mumbai

20–21 June 2014

Convener: Tarala D Nandedkar (NIRRH, Mumbai)

Co-ordinator: Yamini Tayal (Kishinchand Chellaram College)

No. of participants: 140

Topics Covered: Hormones and their receptors; endometrium receptivity; power of evolution; evolution and human health; molecular markers for diagnosis;

molecular markers for diagnosis and prognosis of prostate cancer; advances in ART.

26. Progress and Prospects of Biotechnology

St. Josephs College, Irinjalakuda

26–27 June 2014

Convener: E Vijayan (CUSAT, Cochin)

Co-ordinator: George Naijil (St. Josephs College)

No. of participants: 100



Topics Covered: Perspectives and the biology of stem cells; fish reproductive physiology; hormone receptors and its significance in hormone action; biotechnology and regenerative medicine using stem cells; passage through the history of neuro-endocrinology; bio-signaling; the prokaryotic immune system; fluorescent proteins as tools to track signaling pathways involved in neural progenitor maintenance *in vitro* and *in vivo*; CRISPR system – role in evolution of the host.

27. Emerging Trends in Chemistry

Devanga Arts College, Aruppukottai

18–20 July 2014

Convener: M Palaniandavar (Central University of Tamil Nadu, Thiruvavur)

Co-ordinator: T Esakkidurai (Devanga Arts College)



REPOSITORY OF SCIENTIFIC PUBLICATIONS OF ACADEMY FELLOWS

The digital repository of publications of Fellows was created with several aims. Beyond the obvious one, namely that of enabling access to all the publications of all Fellows, it was also felt important to create bibliographies that were not available, especially in the pre-digital days. Also, several journals that were published in India as well as elsewhere are not yet digitised, so one aim was also to enable access to at least some publications from such journals.

We would like our Repository to be “Open Access”, or OA, i.e. all content should be free for view by anybody anywhere and be free for them to reuse under a creative commons licence. However, given the complex ways in which the journal publishing world operates, this aim is not yet completely met. While all content in the repository is indeed freely accessible by all everywhere, our repository comes under the ‘gratis’ (or free to read) OA category, but is not ‘libre’ (namely totally free) OA.

Maybe in time that will happen, but as of now, the Academy cannot offer libre OA since a proportion of the collection of articles are governed by copyrights that are owned by the publishers of the journals in which the articles appeared. This has already attracted the attention of funding agencies; indeed, DBT and DST recently made public a draft of a proposal to bring a mandate for scientists of all institutions supported by their research funds to deposit the final versions of accepted papers that have resulted from the funds provided by DBT and DST into an OA repository such as that provided by the Academy.

But we can do better; so, keeping some of these points in mind, the Academy repository invites all Fellows to deposit the full text of publications that are already allowed by publishers to be deposited in an institutional repository. So far the proportion of full-text publication records in the Academy repository is quite low (~20,700+ with full text out of ~92,000+ total records, assuming that there are no errors). Your action in providing the preprints will thus help to increase the value of the repository.

Care should be taken to ensure that Fellows (namely the authors) retain the right to self-archive their papers (either the final accepted version or the publisher version when allowed) in an OA repository when they sign the publisher's copyright form. Many publishers do allow this. We also (perhaps optimistically!) presuppose that Fellows will send the final accepted version of all their accepted papers immediately upon acceptance to the Academy repository for full OA access. This can, of course, not do much for the older publications. But if Fellows have preserved the final accepted version of those too, then they should send them for deposit in the Academy repository. For publications of deceased Fellows, the problem is an order of magnitude harder.

An Academy mandate in this regard would surely help, because experience has shown that publishers respect such mandates. It clearly is important that the Fellowship and the Council need to discuss some of the above points in greater detail. Do send your views and comments to eprints@ias.ernet.in.

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HINDI WORKSHOP

The Indian Academy of Sciences jointly with Raman Research Institute organized a Hindi Workshop on 27 June 2014. The workshop was conducted by Shri Supromany Swami, Senior Hindi Officer, South Western Railway, Bangalore.

Hindi Week was celebrated jointly by the Indian Academy of Sciences and Raman Research Institute during 15-19 September 2014. Various competitions in areas such as essay/letter writing, singing and knowledge of administrative terminology, etc., were organized.

Also, 23 September 2014, on the occasion of Hindi Day, a special lecture by Sri Mahadev G Savadatti, who spoke on 'Exploring Hindi in South Indian Languages' was organized. This was followed by prize distribution to the winners of the various competitions held during Hindi Week.

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OBITUARIES



Parthasarathy Ganguly
(elected 1994)

P. Ganguly, a distinguished solid state chemist who worked at the Indian Institute of Technology (IIT), Kanpur, Indian Institute of Science, Bangalore, and later at National Chemical Laboratory, Pune, passed away on the night of 6 May 2014 following a massive heart attack. Ganguly, born on 20 January 1942 at Hooghly, West Bengal, had his early education in Chennai,

where he obtained his MSc and PhD from Loyola College. He worked with Father Lourdus Yeddanapalli at Loyola College in 1971 in the area of heterogeneous catalysis. After his PhD, Ganguly moved to the Chemistry Department at IIT Kanpur and joined C.N.R. Rao as a Research Associate. When Rao moved to IISc in November 1976 to start the Materials Research Centre (MRC) and the Solid State and Structural Chemistry Unit (SSCU), Ganguly also moved to Bangalore and set up research facilities to study solids. A year later, he became a faculty member and continued working in SSCU until 1990, when he left for NCL to head the Physical Chemistry and Materials Chemistry Division. He had also served as Chairman of SSCU before leaving for NCL. Ganguly retired from NCL in 2002 and continued as a CSIR Emeritus Scientist for five more years. After retirement, he settled in Pune.

At IIT Kanpur, Ganguly worked with C.N.R. Rao on perovskite oxides having general formula ABO_3 and oxides having K_2NiF_4 -related structures. At IISc, Ganguly was primarily responsible for setting up research facilities to study solids at SSCU, such as high temperature furnaces, Gouy balance and Faraday balance magnetometers to study magnetic properties, electrical conductivity measurements (both high and

low temperature), thermopower measurements, preparative solid chemistry laboratory for carrying out co-precipitation, and precursor and high-temperature ceramic methods to synthesize solids. He was largely responsible with Rao and his students for the preparation of a number of cation-substituted perovskites in the series LnMO_3 (Ln = rare earth metal and M = transition metal), sodium tungsten bronzes, La_2MO_4 (M = Fe, Co, Ni, Cu). He was deft in designing new equipment, and skilled in glass blowing, vacuum-ceiling quartz tubes and similar experimental techniques. Ganguly developed a photoacoustic spectrometer in SSCU. He later developed a novel technique to enhance photoacoustic signals from the solid surface with volatile liquids on the surface. He showed that this technique can be used to study the surface acidity of oxides, adsorption of molecules on solids, and phase transitions in solid. Ganguly, along with Rao, did extensive research, and together they published a voluminous amount of work in these areas. Nevill Mott's proposition of minimum metallic conductivity is one concept that significantly influenced Ganguly. He spent considerable time in compiling the metallic conductivity of both metals and metal oxides to see if there was a material at the boundary of metal-to-insulator transition which could become a superconductor. If the material is also magnetic, what happens to the magnetic property at the boundary?

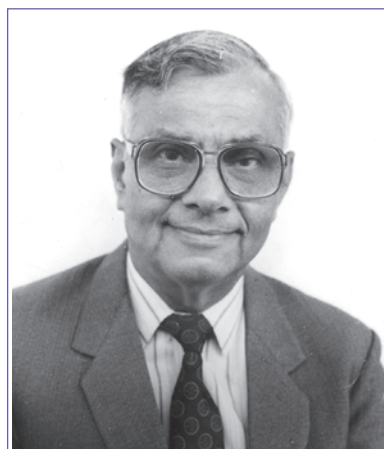
After moving to NCL in 1990, besides pursuing research in oxide chemistry, Ganguly started working on Langmuir–Bodgett films, specifically their X-ray structure. He also worked on the sizes of atoms and ions in molecules and solids, specifically on atomic radii, crystal radii, orbital radii and published a series of papers in *Journal of the American Chemical Society* and other journals. Over a dozen students worked on their PhDs with Ganguly. He authored over 150 research papers. He was a Fellow of the Indian Academy of Sciences, Bangalore.

Ganguly travelled widely – he was a visiting scientist at the Universities in Oxford and Cambridge, Bordeaux University in France, Purdue University in USA, the IBM Labs at Yorktown Heights, USA, and the International Centre for Theoretical Physics, Italy. He

also visited Japan frequently. Ganguly had a multi-dimensional personality – he was a scholar of English literature, a sculptor, and a wine brewer. He was also a good sportsman in his younger days.

He is survived by his wife Lalitha, their daughter and son.

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Ram Kumar Varma
(elected 1977)

R. K. Varma, former Director of the Physical Research Laboratory (PRL), Ahmedabad, passed away on 14 May 2014 following a massive heart attack. He was an internationally renowned plasma physicist and one of the pioneers of this field in the country.

Varma was born in Sardhana in Meerut district of Uttar Pradesh on 31 March 1935. He obtained his BSc in 1953 from Agra University. Soon after completing his MSc in 1956 from Lucknow University, he joined the Tata Institute of Fundamental Research (TIFR), Bombay, as a Research Assistant. At TIFR, Varma received training in many areas of theoretical physics, including plasma physics. During this period, he also began his research work on cosmic ray acceleration and plasma kinetic theory. In 1961, under a Fulbright Scholarship, he pursued his PhD at the University of California in La Jolla, obtaining his PhD in 1965 under the guidance of the legendary plasma physicist Marshall Rosenbluth and worked on plasma instabilities and general stability theories relevant to magnetic fusion devices. After spending

a year as a Resident Research Associate at the NASA Langley Research Center, Hampton, Varma returned to TIFR in 1966 to join the plasma group of the institute.

It was around this time that he started his fundamental work on the non-adiabatic effects in the motion of charged particles in a magnetic field and came up with a novel Schrödinger-like equation for the dynamics of the particle. His seminal paper on this topic published in *Physical Review Letters* received much attention from the fusion community, as it provided a useful model to understand certain aspects of particle losses in a magnetic mirror machine.

In 1968, at the invitation of Vikram Sarabhai, Varma moved to PRL, where a new plasma physics programme was being initiated. On arriving at PRL, he quickly familiarized himself with the Laboratory's research activities related to space plasmas – particularly ionospheric physics, solar wind interactions with the Earth's magnetic field and cosmic ray acceleration, and began to actively contribute towards theoretical modelling and interpretation of experimental observations. He continued to work on various aspects of plasma instabilities and plasma turbulence with applications to fusion as well as space phenomena. He made seminal contributions in many areas of theoretical plasma physics, including tokamak physics, where he provided valuable insights into a 'pinch' effect, dusty plasmas, plasma interaction with neutral matter, soliton physics and laser plasma interactions.

However, his primary interest was to explore and exploit the quantum–classical relationship that had found its first expression in his work on non-adiabatic effects in charged particle trajectories in a magnetic field. Over the years, he developed a number of new ideas to explore this relationship and to suggest a new conceptual framework for explaining certain macroscopic experimental phenomena. In fact, he was not content with just developing a theoretical framework and predicting its possible experimental manifestations, but was keen to participate actively in doing the experiments as well. Thus, with the formation of an experimental

programme in plasma physics in the early 1970s, Varma became an enthusiastic experimentalist. He became involved with this group in a very sophisticated experiment on the tunnelling of electrons from a non-adiabatic magnetic mirror. The motivation was his theory, which attributed the nonadiabatic loss of particles from a mirror trap to tunnelling from the adiabatic potential well, by particles of energy lower than the maximum height of the potential barrier and predicted the decay of the number of particles from the trap with multiple lifetimes.

Apart from his research work, Varma was also a dedicated and excellent teacher who mentored many generations of young physicists at PRL – several of whom are now well-known, established researchers all over the world. For many years he conducted a successful school on plasma physics at ICTP, Trieste, that benefited a large community of young plasma physicists in the developing world. He contributed a great deal to the scientific growth of PRL as well – particularly during his tenure as Director during the period 1987–1995. Well loved by students and colleagues, he was a cheerful soul – a lover of Urdu poetry and ghazals, a talented singer of Hindustani classical music and a great raconteur and fun-loving personality.

Varma was elected a Fellow of all the three national science academies of the country (Indian Academy of Sciences, Bangalore, in 1977; Indian National Science Academy, New Delhi, in 1985 and the National Academy of Sciences, Allahabad, in 1988) as well as the Astronautical Society of India. He served as the Chairman of the Plasma Society of India (1978–1982) and was a recipient of the H. C. Shah Award and Gold Medal (1977).

He leaves behind his wife Sushma, and their sons Hemant and Rajat.

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Tazhuthaveetil Mathai Jacob
(elected 1976)

T. M. Jacob passed away on 6 June 2014. Jacob was born in Kaloor village (Thodupuzha taluk) in Kerala on 6 June 1927. He completed his BSc in Chemistry in 1949 and BSc (Hons) in Chemistry in 1951 from Loyola College, Madras. Subsequently, he worked for a year as lecturer in St Joseph's College, Bangalore. During 1952–1957, he completed his PhD in Organic Chemistry from IISc, under the supervision of Sukh Dev. From 1957 to 1959, he worked as National Research Fellow at IISc and subsequently, one year each as Research Associate at University of Toronto, Canada and at Steven's Institute of Technology, New Jersey, USA.

The turning point in his academic career came in 1961, when he joined the research group of Har Gobind Khorana at the Enzyme Research Institute, University of Wisconsin, USA. Jacob worked there for three years as a Project Associate and later as an Assistant Professor from 1964 to 1966. The strong foundation in synthetic organic chemistry that Jacob built up through his academics in chemistry and then in organic chemistry in Sukh Dev's laboratory helped him to become a significant contributor to the research projects of Khorana. In the 1960s, Khorana published a series of about 60 papers under the main title 'Studies on polynucleotides', on the chemical synthesis of polynucleotides of specific sequences and their ability to support homopeptide synthesis, in *Journal of American Chemical Society* and *Journal of Molecular Biology*. He was involved in the chemical synthesis of polynucleotides of different permutations and combinations of the bases, which were used for the *in vitro* decoding experiments by Nirenberg

at the National Institutes of Health, USA, which fetched the Nobel Prize for Khorana, Holley and Nirenberg.

Jacob returned to India in 1966 as a Senior Research Fellow at the Department of Biochemistry at IISc. He became Assistant Professor in 1968, and Professor in 1975. He superannuated in 1987. Subsequently, he continued as INSA Senior Scientist until 1991 at the department. Jacob initiated a new area of research – immunology of nucleic acids, in the Department of Biochemistry, probably for the first time in the country. During the two decades of his stint as a faculty member, Jacob carried out a systematic investigation on the production, purification and determination of the specificities of anti-nucleic acids antibodies, with a view to obtaining antibodies of well-defined narrow specificities for the use as tools to study genetic material both *in vivo* and *in vitro*. He also wanted to use such antibodies to study the specificity of nucleic acid–protein interactions occurring at different steps of gene expression.

Jacob was also involved in collaborative studies with M. A. Viswamitra (Department of Physics, IISc), who studied the crystal structure of B-DNA sequences, which were synthesized by Jacob. The collaborative research project between Jacob and Viswamitra was one of the projects that supported the DST Unit on Genetic Engineering, which was established at IISc in 1982, with the efforts of T. Ramakrishnan, who was the then Chairman of the Microbiology and Cell Biology Laboratory (MCBL) at IISc, and others. Jacob was also a key member of the ICMR Centre for Advanced Research in Genetics and Cell Biology (1974 – 1991), an interdepartmental research group funded by the Indian Council of Medical Research. The other members of the group were H. Sharat Chandra, M. A. Viswamitra, and T. Ramakrishnan. The origin of molecular biology in IISc took place in the 1970s, with the encouragement and support of the then Director, Satish Dhawan. Jacob, along with Joseph D. Cherayil (who was earlier in the research group of Robert W. Holley and who purified alanine tRNA for its structural determination that won the Nobel Prize), and Joseph D. Padayatty, initiated research on molecular-biology-based themes in the Department of Biochemistry.

Jacob along with T. Ramakrishnan, who initiated molecular biology research in MCBL, launched an interdisciplinary PhD programme in molecular biology

at IISc. Jacob started the 'Lunch Time Molecular Biology Seminar', which used to be held on Thursdays between 1 pm and 2 pm at the Department of Biochemistry. A large number of students from the laboratories across the Division of Biology used to present papers on molecular-biology-based themes in the seminar. Even after Jacob's leaving the Institute in 1991, the seminar was continued by G. Padmanaban and it continued for almost 40 years since its inception. Jacob was a mentor not only to the students of his research group (now occupying high positions in both academia and industry all over the world) but also to a large number of students in the Department of Biochemistry and in IISc at large. He was always approachable to students with any problem, be it academic or personal, and many students have benefited from their interaction with him.

Jacob was a life member of the Society of Biological Chemists (India) and the Association of Microbiologists (India). He was a Fellow of the Indian Academy of Sciences and the Indian National Science Academy.

In 1952, Jacob married Rosamma. They are now survived by a large family, consisting of his son (Mathew Jacob at the Supercomputer Education and Research Centre and the Department of Computer Science and Automation, IISc), four daughters, and their children.

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Vikram Bhagvandas Mehta
(elected 1993)

V. B. Mehta was born on 15 August 1946, exactly a year before our first Independence Day. He

passed away, after a brave battle with cancer, on 4 June 2014. He is survived by his wife, distinguished sociologist Indra Munshi.

Vikram graduated in science from Bombay University in 1968. He then went to Berkeley, and was awarded a Ph.D. in 1976 at University of California for his work in algebraic geometry. On his return to India in 1977, he joined the School of Mathematics, Tata Institute of Fundamental Research (TIFR), Mumbai. After a spell there, he went to the University of Bombay in 1981, only to move back to TIFR two years later. He retired from TIFR as Senior Professor in 2011, and went to IIT-Bombay as Raja Ramanna Fellow. He was a Fellow of the Indian Academy of Sciences (Bangalore) as well as the Indian National Science Academy (New Delhi) and a recipient of the S. S. Bhatnagar Award in 1991.

Vikram's first major work was with C. S. Seshadri. In a fundamental paper, they generalized the Narasimhan–Seshadri theorem (on stable and unitary bundles on Riemann surfaces) to the case of punctured surfaces. In brief, they proved that irreducible unitary representations of the fundamental group correspond to stable parabolic bundles of (parabolic) degree zero, with parabolic structures at the punctures. This paper began Vikram's long engagement with vector bundles. Soon afterwards, he joined A. Ramanathan in a very productive partnership that broke new ground in two entirely different directions. Their first collaboration resulted in a theorem that is a cornerstone of the theory of semi-stable bundles on higher-dimensional varieties. In essence, they proved that restriction to a general hyper surface of high enough degree preserves semi-stability. Using this, they were able to extend results of Donaldson on surfaces to higher dimensions. Their second collaboration resulted in a very elegant definition, that of a Frobenius–split variety. This is a concept that only makes sense for algebraic varieties defined over a field of positive characteristic. When a variety is Frobenius-split, very strong vanishing theorems hold, and these yield, as easy corollaries, deep facts about the singularities of many classical *complex algebraic* varieties – including Schubert varieties – facts that till then could only be proved by difficult methods or not at all.

Vikram had an extraordinary number of collaborators – approximately thirty. Apart from Ramanathan, he shared long innings with N. Lauritzen, V. Srinivas, T.R. Ramadas and S. Subramanian.

He had a very clear mind and could reduce a problem to its essentials – this made him a very good teacher and research partner. Vikram was also capable of returning to a question again and again. He was particularly fascinated by a circle of ideas in the characteristic p context that involves stable bundles and ' p -curvatures'. Among his last works was a project with Helene Esnault which brought to fruition a long quest. In a remarkable application of a model-theoretic result of E. Hrushovski, they proved that 'simply connected projective manifolds in characteristic $p > 0$ have no nontrivial stratified bundles.'

He loved to discuss mathematics, and many a project began with Vikram walking into an office and explaining a question that had been bothering him for a while. He was rarely without his shoulder-bag that contained – in addition to a much-used writing pad, a floppy hat, a pipe (that one never saw him smoke) and an inhaler – a rolled-up and dog-eared copy of a reprint or preprint that he would refer to constantly to illustrate a point or to raise a question. Vikram was a keen chess-player and follower of cricket. He had certain stock phrases and favourite quotations. He would often take his leave

of one with the exhortation to 'keep cranking away!' More eloquently, he would often quote Newton regarding 'the subject of inquiry'.

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A. Nagaraj

A. Nagaraj, who served the Academy since 1978, passed away on 6th July 2014, as a result of an illness. He was actively involved in the publishing activities of the Academy journals, and during last 20 years of his service, he handled the complete editorial responsibilities of the *Bulletin of Materials Science*. Our deepest sympathies to the bereaved family. We at the Academy will always miss him.

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INDIAN ACADEMY OF SCIENCES

C.V. RAMAN AVENUE, P.B. NO. 8005, BANGALORE 560080, INDIA

SPECIAL PUBLICATIONS

Sl.No.	Titles	Pages	Year of Publication	Authors/Editors	Price (In Rs)
1.	Memoirs on Crystal Physics	318	-	C V Raman	200
2.	Lectures on Physical Optics Part - I	160	1959	C V Raman	150
3.	Physiology of Vision	164	1968	C V Raman	100
4.	Special Publication-1 Lectures on Catalysis	78	1975		100
5.	Special Publication-2 Lectures on Physics	60	1975		100
6.	The Aiyabhata Project	234	1978	U R Rao, K Kasturirangan	150
7.	Rural Technology	330	1980	Amulya Kumar N. Reddy	250
8.	Alloys Design	162	1981	S Ranganathan, V S Arunachalam, R W Cahn	100
9.	Nuclear Tracks-Space Physics Geophysics and Nuclear Physics	124	1982	J N Goswami	100
10.	Crystallographic Statistics-Progress and Problems	313	1982	S Ramaseshan, M F Richardson, A J C Wilson	150
11.	Surveys in Fluid Mechanics (Volume 1-3)	1110	1982, 1983, 1993	R Narasimha, S M Deshpande, APJ Abdul Kalam	600
12.	Wood Heat for Cooking	255	1983	K Krishna Prasad, P Verhaar	150
13.	Contributions to Crystallography	252	1983	C N R Rao	150
14.	Gravitation and Relativistic Astrophysics	152	1984	A R Prasanna, J V Narlikar, C V Vishveshwara	150
15.	Extragalactic Energetic Sources	180	1985	V K Kapahi	100
16.	Photons, Galaxies and Stars	428	1985	R Hanbury Brown	200
17.	Water Resources Systems Planning	355	1985	M C Chaturvedi, Peter Rogers	200
18.	Supernovae, their Progenitors and Remnants	172	1985	G Srinivasan, V Padmakrishnan	100
19.	Reactions and Reaction Engineering	332	1987	R A Mashelkar, R Kumar	200
20.	Reliability and Fault - Tolerance Issues in Real-Time Systems	280	1987	N Viswanadham	150
21.	Reaction and Reaction Engineering	331	1987	R A Mashelkar, R Kumar	200
22.	C V Raman Pictorial Biography	177	1988	C Ramachandra, S Ramaseshan	300
23.	Advanced Ceramics	168	1988	E C Subbarao	100
24.	Composite Materials and Structures	166	1988	K A V Pandala	100
25.	Journey into Light - The Life and Science of C V Raman	570	1988	G Venkataraman	300
26.	Bird Flight	90	1990	S Dhawan	100
27.	Recent Advances in Modelling and Control of Stochastic Systems	170	1991	N Viswanadham, V S Borkar	100
28.	Perspectives in Structural Biology	746	1991	M Vijayan, N Yathindra, A S Kolaskar	500
29.	Parallel and Real Time Distributed Computing	224	1992	R K Shyamasundar	150
30.	Biogeochemistry of the Arabian Sea	254	1994	D Lal	100
31.	The Monsoon trough boundary layer	422	1997	R Narasimha, D R Sikka, A Prabhu,	200
32.	Rare Nuclear Process in Low Energy Heavy Ion Physics	295	1998	P Sugathan, N Madhavan, R Singh, A K Sinha	250
33.	Isotopes in the Solar System	234	1999	J N Goswami, S Krishnaswami	200
34.	Percolation Theory and Particle System	236	2000	Rahul Roy	325
35.	Butter Flies of Peninsular India	254	2000, 2006	Madhav Gadgil	470
36.	Mathematical Analysis	142	2001	Alladi Sitaram, Vishwambhar Pati	185
37.	Probability and Statistics	201	2001	Mohan Delampady, T Krishnan, S Ramasubramanian	190
38.	Fresh Water Fishes of Peninsular India	288	2002	R J Rajit Daniel	290
39.	Number Theory	102	2003	Shallesh Shirali, C S Yogananda	125
40.	Frontiers in Materials Science	870	2004	Baldev Raj and K Bhanu Sankara Rao	500
41.	Amphibians of Peninsular India	268	2005	R J Rajit Daniel	315
42.	Ray Chaudhuri Equation At the Cross Roads	157	2007	Naresh Dadhich, Pankaj Joshi, Prdair Roy	100
43.	Lilavati's Daughters - The Women Scientists of India	368	2010	Rohini M. Godbole, Ram Ramaswamy	300
COLLECTED WORKS/FESTSCHRIFTS					
44.	Topics in Nonlinear Optics (Collected Works)	291	1982	N Bloembergen	350
45.	Prof. K R Ramanathan's Selected Papers - 2 volumes	978	1983	Indian Academy of Sciences	1000
46.	Topics in Genetic Analysis - Selected Papers	320	1985	G Pontecorvo	350
47.	Laser Spectroscopy and other topics - Selected Papers	632	1985	G W Series	550
48.	Raja Ramanna 60 th Birthday Felicitation Volume	421	1985	IASc, INSA, IPA	450
49.	Computer Modelling and Applications in Metallurgical Research and Industry	263	1986	D N Sah, R Vijayaraghavan, P R Roay	250
50.	Scientific Papers of C.V. Raman - 6 Volumes	4126	1988	S Ramaseshan	2500
51.	Essays on Particles and Fields (Prof. M G K Menon Festschrift)	324	1989	R R Daniel, B V Sreekantan	350
52.	From Mantle to Meteorites-A Garland of Perspectives (Prof. D Lal Festschrift)	322	1990	K Gopalan, Vinod K, B L K Somayajulu, J D Macdougall	350
53.	Molecular Conformation and Biological Interactions (Prof. G N Ramachandran Festschrift)	722	1991	P Balaram, S Ramaseshan	500
54.	Researches on Cellular Slime Moulds (Selected Papers)	406	1991	J T Bonner	350
55.	Hepatitis B Virus and the Public Health (Selected Papers)	460	1992	B S Blumberg	450
56.	The collected works of Dorothy Crowfoot Hodgkin Volume - I, II & III	1632	1994	G G Dodson, J P Glusker, S Ramaseshan, K Venkatesan	3500

CONFERENCE PROCEEDINGS					
57.	Liquid Crystals (Proceedings of the 1973 International Conference)	569	1973	S Chandrasekhar	450
58.	Computing in Crystallography	529	1980	R Diamond, S Ramaseshan, K Venkatesan	450
59.	Materials Processing in Space - A Workshop	321	1982	S Ramaseshan, MK Tiwari	350
60.	International Colloquium on Baryon Non Conservation (ICOBAN)	284	1982	V S Narasimhan, P Roy, KVL Sarma, B V Sreekantan	350
61.	Proceedings of the International Symposium on Biomolecular Structure & Interactions	636	1984	IASc and IISc	450
62.	Direct Nuclear Reactions-Proceedings of the International Seminar-1989	555	1989	NG Pullaswamy	450
63.	A Variety of Plasmas - Proceedings of the 1989 International Conference on Plasma Physics	554	1991	A Sen, P K Kaw	450
64.	Proceedings of the tenth DAE Symposium on High Energy Physics	546	1993	Sunanda Banerjee, Probir Roy	450
65.	PULSARS- Proceedings of the Diamond Jubilee Symposium of the IASc	326	1995	G Srinivasan	350
66.	Recent Advances in Plasma Physics	178	1997	B Buli	250
67.	Workshop on High Energy Physics Phenomenology (WHEPP-5)	316	1998	Rajiv V Gava, Rohini M Godbole	350
68.	Rare Nuclear Processes in Low Energy Heavy Ion Physics	296	1999	P Sugathan, N Madhavan, A K Sinha, R Singh	350
69.	The Physics of Black Holes	292	2000	N Mukunda, J Pasupathy, C V Vishveshwara	350
70.	Proceedings of the Sixth Workshop on High Energy Physics Phenomenology (WHEPP-6)	360	2000	Rahul Basu	350
71.	Physics with Multi Detector Array	234	2001	Binay Desmahapatra	250
72.	Optical Solitons: Theory and Experiments	328	2001	K Porsezian, V C Kuniakose	350
73.	Foundations of Quantum Theory and Quantum Optics (Volume I)	318	2001	Shasanka Mohan Roy	350
74.	Foundations of Quantum Theory and Quantum Optics (Volume II)	270	2002	Rupmanjari Ghosh	350
75.	Proceedings of the International Symposium on Advances in Superconductivity and Magnetism: Materials Mechanisms and Devices	494	2002	R Pinto, R Nagarajan, A K Grover	450
76.	Proceedings of the Ninth International Conference on Heavy Ion Accelerator Technology	360	2002	A Roy, S K Datta, M B Kurup, S Kalais	350
77.	Mesoscopic and Disordered Systems	296	2002	A M Jayamavar, HR Krishnamurthy, A K Raychaudhuri	350
78.	Liquid Crystals and other Soft Materials	466	2003	B K Sadashiva	450
79.	Proceedings of the Seventh Workshop on High Energy Physics Phenomenology (WHEPP-7)	246	2003	Biswarup Mukhopadhyaya	250
80.	Proceedings of the Fourth International Conference 2001 on Physics and Astrophysics of QUARK-GLUON PLASMA	559	2003	Bikash Sinha, Dinesh Srivastava, Yogendra Pathak Viyogi	450
81.	IGGC - 2004 Proceedings of the Fifth International Conference on Gravitation and Cosmology	278	2004	B R Iyer, V C Kuniakose, C V Vishveshwara	250
82.	Proceedings of DAE-BRNS Eighth Workshop on High Energy Physics Phenomenology (WHEPP-8)	324	2004	S Uma Sankar, Urjit A Yajnik	350
83.	Proceedings of the Conference on Neutron Scattering	480	2004	R Mukhopadhyay, V K Aswal, V C Rakhecha	450
84.	Proceedings of the IX International Symposium on Particles, Strings and Cosmology	656	2004	DP Roy, Sunanda Banerjee, K Sridhar	450
85.	Perspectives in Nonlinear Dynamics (PNLD-2004)	636	2005	Ramakrishna Ramaswamy, Rajarshi Roy, Neelima Gupte	450
86.	Proceedings of the 22nd IUPAP International Conference on Statistical Physics	1192	2005	Sushanta Dattagupta, H R Krishnamurthy, Rahul Pandit, T V Ramakrishnan, Dipimam Sen	450
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