

ANNUAL REPORT

APRIL 2004 - MARCH 2005



INDIAN ACADEMY OF SCIENCES, BANGALORE

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I ntroduction

The Academy was founded in 1934 by CV Raman with the main objective of promoting the progress and upholding the cause of science (both pure and applied). It was registered as a Society under the Societies Registration Act on 24 April 1934.

It commenced functioning with 65 fellows. Its formal inauguration took place on 31 July 1934 at the Indian Institute of Science, Bangalore. On the afternoon of that day its first general meeting of Fellows was held at which CV Raman was elected its President and the draft constitution of the Academy was approved and adopted. The first issue of its proceedings was published in July 1934.

The present report covering the period April 2004 to March 2005 represents the seventy-first year of the Academy since its founding.



2.1 2005 Elections

A total of 354 nominations received for fellowship in different disciplines were considered by the eight sectional committees and subsequently by the council. Following postal balloting, 25 new fellows were elected, the fellowship effective from 1 January 2005. A list of their names follows while Annexure 1 gives some of their particulars. Also elected was a new Honorary Fellow.

New Fellows:

- | | |
|----------------------------|----------------------------|
| 1. Ali, Sher | 14. Lahiri, Goutam K |
| 2. Arora, Baldev Raj | 15. Mishra, Gyan Chandra |
| 3. Batra, Janendra K | 16. Mukherjee, Sunil Kumar |
| 4. Budhani, Ramesh Chandra | 17. Pandita, PN |
| 5. Chandra, Amalendu | 18. Raghunathan, VA |
| 6. Chaudhuri, Subhasis | 19. Rai Choudhuri, Arnab |
| 7. Chokshi, Atul H | 20. Rajan, CS |
| 8. Das, Shankar Prasad | 21. Raju, T Ramaswamy |
| 9. Das, Suresh | 22. Sarin, Shiv Kumar |
| 10. Joseph, KT | 23. Shaha, Chandrima |
| 11. Kasbekar, Durgadas P | 24. Shyam Sundar |
| 12. Krishnamoorthy, K | 25. Singh, Vinod K |
| 13. Lahiri Majumder, AN | |

New Honorary Fellow:

Subra Suresh

2.2. In memoriam

The Academy regrets to report the death of the following sixteen fellows and an honorary fellow during the period up to March 2005. Annexure 2 gives additional information about them.

Fellows:

1. Biswas, SN
2. Burma, DP
3. Daniel, RR
4. David, Joy C
5. Ganapathi, K
6. Goel, Parmatma S
7. Kedharnath, S
8. Lala, Anil Kumar
9. Malhotra, SL
10. Mehrotra, RC
11. Mukherjee, AS
12. Nag, Biswaranjan
13. Paintal, AS
14. Ramanna, Raja
15. Srinivasan, Ramachandran
16. Trehan, SK

Honorary Fellow:

Crick, Francis Harry Compton

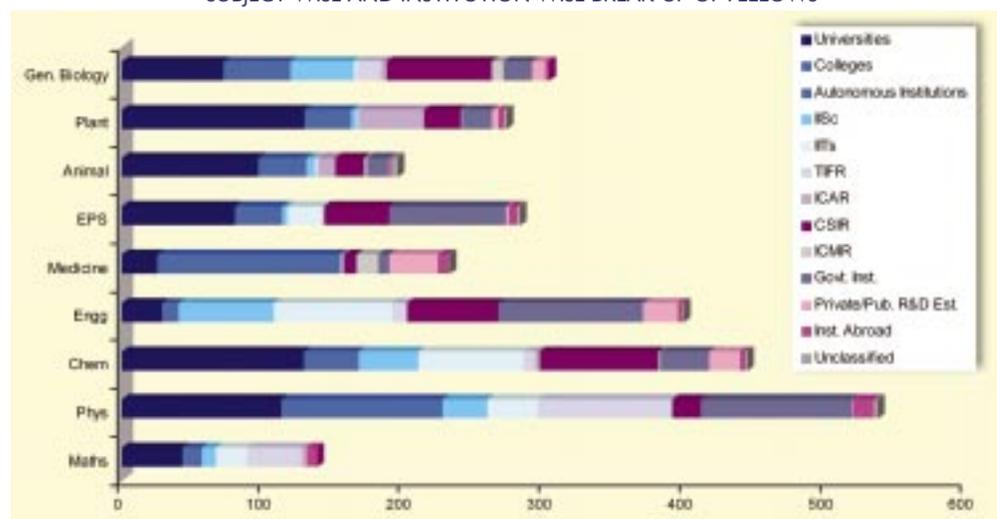
2.3 Strength of the fellowship

	Fellows	Honorary Fellows
1 April 2004	849	47
Elected (Dec. 2004)	25	1
Deceased (2004 – 2005)	16	1
1 April 2005	858	47

2.4 Fellowship analysis

During the past few years, some information of interest concerning the fellowship is included in the Annual Report. This year we include information on nominations and elections. Information on nominations received was readily available from the year 1967 onwards. Annexure 3 gives the institution-wise and subject-wise numbers of nominations and those elected.

SUBJECT-WISE AND INSTITUTION-WISE BREAK-UP OF FELLOWS



3 Council

Two statutory meetings of the council were held in Bangalore on 3 July and 4/5 December 2004.

4 Associates

Thirty two nominations were received and the following six were selected as Associates in 2004 (see also Annexure 4). The selections continue to be restricted to those below the age of 32 and their tenure ceases after five years or after the Associate attains the age of 35 whichever is earlier.

1. Chakrabarti Subhabrata
2. Gupta, Anjan Kumar
3. Patwardhan, AW
4. Raghavan, NR Srinivasa
5. Ramakrishna, S Anantha
6. Shankar, V



5 Publications

5.1 Journals

Publication activity is one of the major activities of the Academy and the 11 journals continue to appear on their scheduled dates of appearance. The following are some of the highlights of this activity during the year.



5.1a Journal of Earth System Science

The Proceedings of the Academy started in 1934 were published as two sections (A and B) until 1977 when they were split into theme journals. The Proceedings: Earth and Planetary Sciences was one of the theme journals. In January 2005, its name changed to *Journal of Earth System Science*. According to the Editors, “it was felt that the earlier title was inconveniently long and gave the mistaken impression that it is a conference-proceedings publication discouraging potential authors from submitting manuscripts to the journal.” The new title is not only short, it also reflects the broad scope of the journal. The journal hopes to publish highly interdisciplinary quality research papers – new data, ideas, and conceptual advances – in Earth System Science in its broadest sense. This includes the solid earth, the atmosphere, the hydrosphere, and the biosphere; it also addresses related aspects of planetary and space sciences. The frequency of the journal has also been increased from 4 to 6 issues a year from January 2005 to reduce the time interval between submission and publication of the manuscripts.



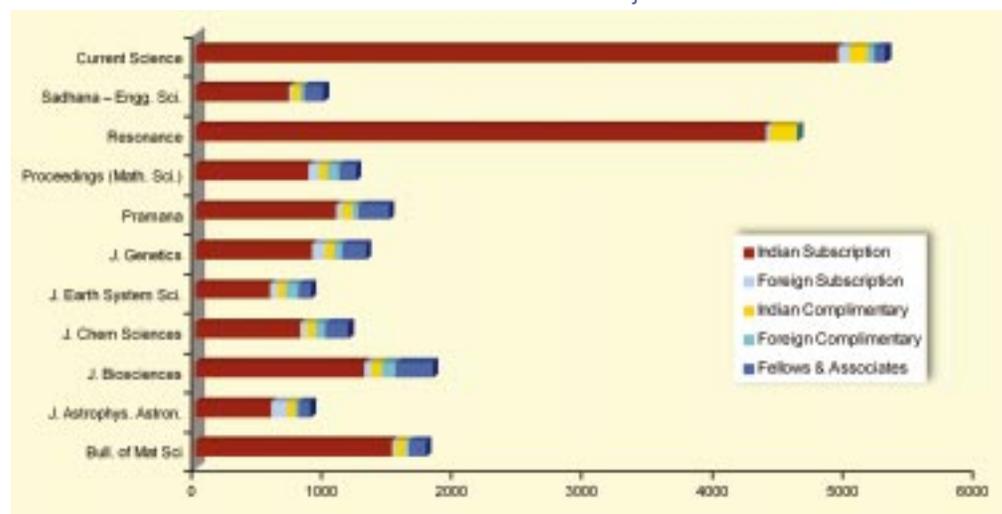
5.1b e-Pramana

Effective January 2005, e-Pramana was launched. This is a software program that facilitates online processing of all the editorial operations of the journal and will be useful to authors, referees and editorial board members who have easy access to Internet. Authors with web access can submit manuscripts by web-upload, and track the process in the processing of their manuscripts. Referees can access the papers that they have agreed to review, as well as to upload their reports. Editorial board members and editors can access all relevant information on manuscripts at appropriate stages of processing. Editorial office staff can interface with all these operations completely electronically and speedily as many processes have been automated. The use of the application will be secured and controlled by login with separate and distinct user

privileges for editors, editorial board members, authors, referees and editorial staff. The current manual procedures will, however, continue to be available for those who do not have ready access to the web.

Table 1 gives journal-wise data on the number of pages published during the calendar year 2004. Table 2 presents journal-wise information on papers submitted for publication and Table 3 gives the journal circulation figures for the calendar year 2004.

CIRCULATION OF THE ACADEMY'S JOURNALS



5.2 Special issues of journals

Many special issues of topical importance were published as part of the regular numbers of some of the journals. A description of these follows:

Multi-source multi-sensor information fusion

Guest Editor: Jitendra R Raol

Sadhana, Vol. 29, No.2, April 2004, pp. 143–248

The human brain routinely carries out information processing and fusion. The objective is to collect observations from various similar or dissimilar sources and sensors, extract the required information (inferences) and combine/fuse these to obtain an enhanced status and identity of a perceived object. This process is crucial for survival and growth not only of human beings but of most other living creatures and can be termed as multi-source multi-sensor information fusion (MUSSIF).

MUSSIF is rapidly finding ever-increasing applications in biomedical, industrial automation, aerospace systems and environmental engineering. This is expected to give better spatial

coverage, redundancy, robustness and accuracy. The complete process of MUSSIF can involve study of several allied disciplines: signal/image processing, numerical algorithms, statistical estimation, sensor management, control and optimization, neural networks, fuzzy systems, and database management. Many principles and techniques from these fields carry over to the process of MUSSIF.

This special issue aims at consolidating some recent efforts in this area. There are six papers, which elucidate data on fusion strategies and algorithms, performance evaluation, and achievable accuracy, mainly for aerospace applications.



Neutron Scattering

Guest Editors: R Mukhopadhyay, VK Aswal and VC Rakhecha

Pramana, Vol. 63, Nos. 1/2, July/August 2004, pp.1–471

A conference on neutron scattering was held at the Bhabha Atomic Research Centre, Mumbai during January 2004. The participants were from Austria, France, Germany, Japan, South Korea, Spain, Switzerland and UK. This special issue contains two articles on neutron beam research in India, 18 invited articles, and 48 contributed papers presented at the conference.

The topics covered different aspects of structure (diffraction and SANS), dynamics (inelastic and quasielastic scattering), neutron optics and neutron interferometry, neutron activation analysis and neutron scattering techniques. The variety of materials studied being quite wide is attributable to strong collaborations within India between BARC and the university system, mediated by Inter-University Consortium for DAE facilities. Given a sizeable neutron scattering community in India that will continue to grow, the guest editors hope that it will be beneficial to more frequently hold such conferences in India at suitable intervals.

Quaternary history and palaeoenvironmental record of the Thar Desert in India

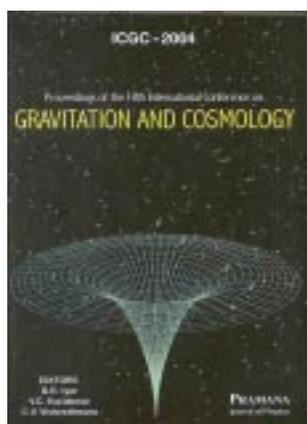
Guest Editor: Ashok K Singhvi

Proceedings: Earth and Planetary Sciences, Vol. 113, No.3, September 2004, pp. 367–515

An international symposium on the 'Evolution of deserts' was held at PRL, Ahmedabad during 1992. Enthused with the success of this meeting and recognizing the overall scientific potential and societal relevance of a study of deserts, the Department of Science and Technology (DST), New Delhi invited a few scientific groups to synergize and work on a major, coordinated programme towards the understanding of the ideological evolution of the Thar Desert in India. These groups discussed various aspects of such a study and a comprehensive programme of research entitled 'Quaternary, stratigraphy and palaeoenvironmental history of the Thar Desert' was formally initiated in 1996-97, as a coordinated research programme — Intensified Research Activity in High Priority Areas — in Earth Sciences. The participating institutions were: PRL, Ahmedabad; CAZRI, Jodhpur; Delhi University; Deccan College, Pune; IIT, Mumbai. Its basic mandate was to present the sedimentary record of the Thar Desert in as much a detail as possible and authenticate it with rigorous chemical, petrographic, sedimentological, isotopic and other laboratory and field characterizations. Good chronometric controls based principally on the optical dating methods and some on ESR techniques formed a key input to the project. The nature of sedimentary record of the Thar implied sub-structuring of the programme into three major projects, viz., proxy measures of palaeoenvironmental and paleomonsoonal changes

in western India using aeolian and lacustrine records of Thar Desert and its margins; alluvial sequences of Luni basin and quaternary environmental history and characterization and genesis of calcretes. This special section of *Proceedings* presents five overviews, summarizing the results from these sub-projects. These reviews are derived from, and build on, over forty publications that emerged out of these projects. These also draw on the previous results to provide a context to the discussions of new results. Each review is thus a comprehensive state-of-the-art appraisal on each sub-area.

The five overviews present a major advance in our understanding of the Thar and serve as an appetizer for more intensive research in the region. Areas in the extreme west (near the border) and the eastern margins are yet unexplored and so are paleosands reaching out to Delhi and beyond. It is hoped to follow some of these in due course.

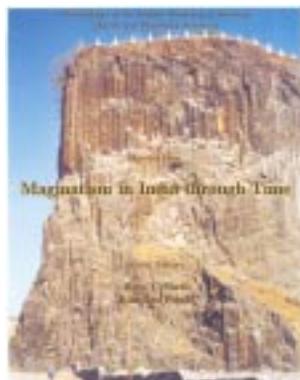


Gravitation and Cosmology

Guest Editors: BR Iyer, VC Kuriakose and CV Vishveshwara

Pramana, Vol. 63, No.4, October 2004, pp. 645–920

The fifth International Conference on Gravitation and Cosmology (ICGC-2004) was hosted by the Cochin University of Science and Technology, Kochi in January 2004. The focal themes of the meeting were cosmology, gravitational waves and quantum gravity. There were seventeen plenary talks, eight shorter talks which were more specialized than the plenary talks but still accessible to a wide audience, and a concluding conference overview. There was a public outreach lecture by C M Will titled ‘Was Einstein right?’ and a delightful pre-dinner talk by C V Vishveshwara on ‘The cosmos in cartoons’. There were four workshops on the topics of “classical aspects of gravitation”, “quantum aspects of gravitation”, “cosmology”, and “gravitational waves and relativistic astrophysics” respectively, two running in parallel at a time. This special issue presented the text of fifteen of the plenary talks, six short talks and summaries of the four workshops.



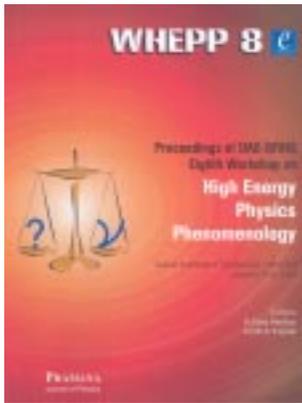
Magmatism in India through time

Guest Editors: Hetu Sheth and Kanchan Pande

Proceedings: Earth and Planetary Sciences, Vol. 113, No, December 2004, pp. 517–838

The Indian subcontinent contains an unusually rich rock record covering much of geological history. India is a key part of all global tectonic schemes, and home to many world-class geological treasures. Among them are the granites of the Precambrian Indian Shield, the mafic dyke swarms intruding them, classical continental flood basalt provinces like the Deccan and Rajmahal Traps, and many carbonatite-alkaline complexes. These fabulous igneous rocks, formed at different times during the Earth’s history, can provide valuable insights into how the Indian continental crust and the sub-Indian mantle have evolved physically and chemically over time.

It was felt that a comprehensive research volume on the broad theme of magmatism in India over time would help in achieving a better understanding of India’s long, complex and fascinating geological evolution, and would provide the global earth science community with a valuable and widely used information source. This special issue contains twenty-two peer-reviewed papers whose subject areas are petrology and geochemistry, geochronology, geophysics, structural and regional geology and physical volcanology.



High Energy Physics Phenomenology – WHEPP 8

Guest Editors: S Uma Sankar and Urjit A Yajnik

Pramana, Vol. 63, No.6, December 2004, pp. 1101–1407

The DAE-BRNS Eighth Workshop in High Energy Physics Phenomenology (WHEPP-8) was held at IIT, Mumbai in January 2004. This workshop attracted leading researchers in phenomenology from all over the world in two weeks of intense work on problems in high energy phenomenology and astroparticle physics.

The workshop had four working groups. A few themes were identified and an invited plenary talk on each of these themes was delivered. Participants presented additional talks during the working group sessions which developed the themes and posed well-defined problems which were addressed during the workshop. The problems that were discussed and listed in the working group reports are included in these proceedings. The studies, which have already reached fruition, have been published in other research journals. It is hoped that the rest of the studies will soon be published.

Genetic determinism

Guest Editors: Vidyanand Nanjundiah, Stuart A Newman and Scott F Gilbert

Journal of Biosciences, Vol. 30, No.1, February 2005, pp. 1–142

This special issue of the journal is based on the talks given at a discussion meeting on the theme of Genetic Determinism held in Pelling, Sikkim in December 2003.

The basis of our understanding of the relation between genes and organisms — or between genotype and phenotype — is a long-standing issue in biology; it has been thrown into focus by recent advances in our ability to manipulate genetic material. An attractively straightforward view is based on what one might call genetic determinism. It holds that our phenotypes are, in effect, what our genes say they are. To begin with, phenotypes are considered capable of being partitioned. Each gene ‘causes’ or ‘is responsible for’ a particular part of the phenotype. A mutation in one gene would have an effect that can be looked at separately, from the effect of a mutation in some other gene. This view has been challenged as being simplistic, but how wrong is it? How good is the evidence that single gene changes lead to unitary changes in the phenotype with negligible attendant consequences? What are the implications of viewing living organisms as being in some sense specified by their genes – as opposed to being endowed with a fair degree of plasticity, morphological, behavioural and otherwise? Admittedly the two points of view are not entirely in opposition; to suggest otherwise would be to set up a straw man. But the fact is that the perennially fashionable notion of genetic determination lays stress on the former. It is this emphasis on one point of view that the Pelling meeting was designed to question.

As the articles in this issue show, what turned out was slightly different. The papers have been grouped in the following sequence, chosen to reflect the main themes: history; genes and development, environment and plasticity; epigenetics; cancer and language. Reading them will make clear that broad questions on the role of genes and approaches to addressing them recur across levels and disciplinary boundaries.

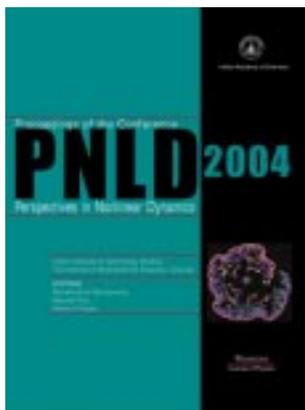
Bio-inorganic chemistry

Guest Editor: TK Chandrashekar

Journal of Chemical Sciences Vol. 117, No.2, March 2005, pp. 67–201

Bio-inorganic chemistry has developed rapidly in recent years. A number of laboratories in India have made significant contributions to this area. The main objective of this special issue is to highlight the recent work emerging from India in this important and fascinating interdisciplinary area and to pay homage to Bhaskar Maiya who passed away in March 2004.

The topics covered included porphyrin chemistry, supramolecular chemistry and photochemistry.



Perspectives in nonlinear dynamics (PNLD 2004)

Guest Editors: Ramakrishna Ramaswamy, Rajarshi Roy and Neelima Gupte

Pramana Vol. 64, Nos. 3/4 March/April 2005, pp.

This special issue of *Pramana* has emerged out of the papers presented at the conference on Perspectives in Nonlinear Dynamics (PNLD 2004), jointly organised by IIT, Chennai and The Institute of Mathematical Sciences in Chennai in July 2004. This conference, a satellite to Statphys 22, the International Conference on Statistical Physics which took place in the preceding week in Bangalore, attracted over 120 participants, 35 of these from outside India. A detailed report of the meeting can be found in *Current Science* (87, 1167 2004).

PNLD 2004 brought together leading researchers from across the world and the energetic and active nonlinear dynamics community of India. The success of this conference was due to the enthusiastic participation and support of this collective, which has organised itself into a research community in the past twenty years. The meeting served a dual purpose: to showcase the volume and level of work done in this subject in India to the international community, and to expose the community to the cutting edge of forefront research done by leaders in the field from as many as 14 different countries who attended the meeting. These proceedings are intended to be a record of this conference, and to serve as a reference for the research which the conference hopes to have nucleated.

5.3 Special Publications:

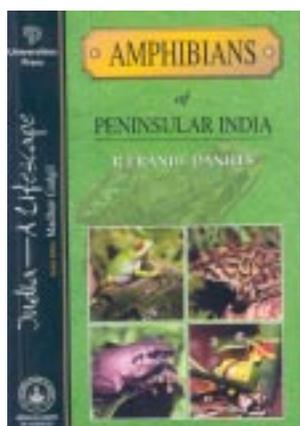
Amphibians of Peninsular India

RJ Ranjit Daniels

Co-published by Universities Press, pp. 268+117 colour plates, Rs. 315/-

India has a fascinating flora and fauna. Not only are the large and spectacular animals like tigers and elephants fascinating but small and less dramatic animals as well. Amphibians, including salamanders, caecilians, frogs and toads are among these. Some species are common and familiar: toads sitting under a street lamp, frogs hopping in a paddy field, frogs and toads singing from a garden pond, while others are rare and seldom seen.

To appreciate, and conserve the fauna we must understand it. To do that we must learn about it. Some things can be learnt from books. Indian amphibians have been studied for many years both by students for scientific purposes and by others who use their knowledge to exploit the amphibians for other ends such as food. In this book, Ranjit Daniels has brought together much



of what we have learned about amphibians from books and from his own extensive experience with these animals in the field.

This volume on amphibians represents the third fascicle to be published under Project Lifescape (the earlier two volumes dealt with butterflies and freshwater fishes). These accounts are meant to assist high school, college and postgraduate students and teachers of biology in reliably identifying these taxa. They would also include ancillary information on distribution, ecology and behaviour that would help design field exercises and projects focusing on first-hand observations of living organisms. The information thus generated could feed into a countrywide system of monitoring ongoing changes in India's lifescape to support efforts at conservation of biological diversity, as well as control of invasives, of weeds, pests, vectors and diseases. Hopefully, the accounts would also stimulate popular interest in the broader spectrum of India's biological wealth, much as Salim Ali's books have done for birdlife over the last sixty years.



(a) Monte Carlo and related techniques

Orange County, Coorg

Nov. 28 – Dec. 5, 2004

The meeting was held at the Academy's meeting facility in Orange County and was attended by 23 statisticians, probabilists and engineers. The discussions focussed on Monte Carlo and other statistical techniques in applied sciences and technology. The meeting began with two lectures on Markov Chain Monte Carlo by RL Karandikar (ISI, New Delhi) and T Krishnan (Systat Software, Bangalore) followed by A Sarkar (GE Global Research, Bangalore) on statistical and mathematical modelling issues arising in marketing and finance, notably in risk analysis. S Juneja (TIFR, Mumbai) lectured on the importance of sampling for rare event simulation. S Jalnapurkar (IISc, Bangalore) talked on the Cucker-Smale formulation of statistical learning theory; Rahul Roy (ISI, New Delhi) lectured on probabilistic models in evolution, concentrating on the problem of detecting the most recent common ancestor for two species. Sudeshna Adak (GE Global Research, Bangalore) discussed mathematical and statistical issues thrown up by current research in MRI; Srikant Iyer (IIT(K)/IISc) talked on limit theorems for random geometric graphs.

PS Sastry (IISc, Bangalore) spoke on the ongoing work in his laboratory on temporal data mining which addresses the problem of recognizing temporal patterns from

symbolic time series data, that can serve as signatures for certain underlying phenomena; Abhay Bhatt (ISI, New Delhi) spoke on limit theorems for random directed spanning trees, making connections with the theory of record values; B Rajeev (ISI, Bangalore) explained his work on properties of Brownian motion traced from a last (or a most recent) exit from a set.

There were mini-sessions on self-intersecting random walks, on fluid limits and historical processes with noisy observations, and on real time simulation of a celebrated example of random walk with absorbing boundaries.

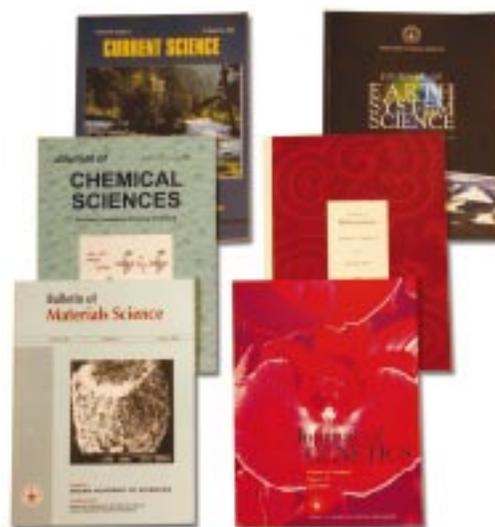
The meeting concluded with a happy prospect of continued interaction and possible research collaboration among participants.

(b) The fluid earth

Indian Academy of Sciences/JNC, Bangalore

January 10 – 4, 2005

A three-day meeting on the fluid earth was first organized by the Academy. Participants from NGRI and C-MMACS attended the meeting. The discussions focussed on earth science issues essentially involving material flows and how their solutions could be greatly facilitated using the powerful concepts of structural homologies and geometrical similitude. The topics covered included solidification of inner core, compaction and melt extraction, mantle plumes, magma chambers, conduit flows, eruptive dynamics, pyroclastic flows and turbidity currents, and flow in porous media .





Black Holes: Surprises, puzzles and clues for fundamental physics

Abhay Ashtekar

Pennsylvania State University, Pennsylvania

17 December 2004, Indian Institute of Science, Bangalore

As Subrahmanyan Chandrasekhar put it, black holes of nature are the most perfect macroscopic objects in the universe: the only elements in their construction are concepts of space and time. They have also proved to be a treasure trove for fundamental physics. Their properties have amazed relativists, baffled quantum field theorists and provided deep clues on the relation between general relativity, quantum physics and statistical mechanics, the three pillars of modern physics. This lecture was an attempt to tell this fascinating story to non-experts.



A journey from the centre of the earth

Herbert E Huppert

University of Cambridge, UK

13 January 2005, Indian Institute of Science, Bangalore

This lecture was a guided tour through the Earth, starting at the intensely hot, dense centre. The tour wandered through the solid inner core of the earth, the liquid outer core, which is in continuous vigorous motion, thereby maintaining the magnetic field of the earth, and then through the mantle, where minerals, coal and oil were laid down for use. As the tour progressed, the most important processes that occurred in the oceans and atmospheres were pointed out. Insights into the past, present and future of our earth were offered with safe return guaranteed.



Science in low earth orbit

Claude Nicollier

CB/NASA Johnson Space Center, Houston, USA

31 January 2005, Indian Institute of Science, Bangalore

Since the early eighties, the space shuttle has been engaged more than a hundred times in low earth orbit for different purposes. Many shuttle missions had objectives in fields such as space sciences (astronomy and solar physics) physics of the earth's atmosphere, biology, medicine, materials and fluid physics, and earth sciences. Some of these missions

had direct science objectives, others served these scientific disciplines through the deployment, assembly, or maintenance of scientific platforms, satellites, or telescopes. Examples of such shuttle applications were presented in this lecture, in particular the tethered satellite and the Hubble Space Telescope.



Human embryonic stem cells: basic and clinical applications

Joseph Itskovitz-Eldor

Technion-Israel Institute of Technology, Haifa

23 February 2005, Raman Research Institute, Bangalore

Human embryonic stem cells (hESCs) are pluripotent cells, capable of differentiating into representative cells of all three germ layers of the embryo to later generate each and every tissue of the human body. This unique quality is the basis of the current research aimed at generating healthy cells and tissues for transplantation purposes and discovering new genes and drugs in the hope of curing several common and severe diseases of humankind, namely diabetes mellitus, Parkinson's, heart failure etc. This presentation discussed applicative approaches for the derivation, maintenance and safety of hESCs as well as ethical concerns surrounding their possible source for cellular therapy; special emphasis was given on cardiovascular repair.



Professor Abhay Ashtekar, Director of the Institute for Gravitational Physics and Geometry at the Pennsylvania State University visited India as the twenty-second Raman Professor of the Academy during the period December 2004–January 2005. Ashtekar is a world leader in the area of quantum gravity and general relativity and is well known for what has come to be known as the *Ashtekar Variables*. His significant achievements include discovery of new variables for general relativity which has opened a new avenue to quantum gravity; developed quantum theory of geometry, made key contributions to global problems in general relativity and the role of topology in quantum field theory. During his visit to India he was based at the Raman Research Institute and interacted with their students and faculty. He also visited and lectured at other institutions in Bangalore as well as Pune, Mumbai and Jaipur.

9 Mid-year Meeting 2004

The 15th Mid-Year Meeting of the Academy was held at the Indian Institute of Science, Bangalore on July 2 and 3, 2004. The programme included two special lectures, a public lecture and seventeen presentations by recently elected Fellows and Associates. This time as many as 45 university and college teachers – more from places as far apart as Amritsar, Gorakhpur, Imphal, Jammu and Silchar – attended the meeting as guests of the Academy, along with over 200 Fellows and Associates from across the country. The full programme is in **Annexure 5**. The following gives the abstracts of the special lectures and the public lecture.

9.1 Special Lectures:

Samir Bhattacharya (Indian Institute of Chemical Biology, Kolkata)

Insulin signalling defects and diabetes type-2

This form of diabetes has been declared by the WHO as an epidemic disease, accounting for 90–95% of all diabetics. In this form, the insulin level is normal or higher, but its action on target cells is decreased because of a defect in the signal transduction pathway. The work at IICB has led to a molecule derived from a plant which causes significant increase in insulin activity, which may help to ameliorate this form of the disease.

Satish R Shetye (National Institute of Oceanography, Dona Paula, Goa)

Why the difference in climates of India and Arabia? An oceanographer's perspective

Climate of a location is a consequence of a complex series of effects of varying magnitudes. This presentation argued that the rather inconspicuous (on the global scale) East African Mountains along the coast of Somalia play a major role in making Arabia have an arid climate and India have enough precipitation to support an agrarian population.

A large fraction of the Indian subcontinent receives its rainfall from the low pressure systems (LPS) that form over the Bay of Bengal during the Indian Summer Monsoon. For such systems to form, the sea surface temperature has to exceed approximately 28 C. The bay satisfies this condition. The Arabian Sea does not. Had the sea been

warmer, it too would have bred LPS, that would then have moved west or northwest or northward (as they do in the bay) and Arabia too would have received precipitation comparable to that over large parts of India.

Analysis of heat budgets of the Arabian Sea and the Bay of Bengal suggests that the Arabian Sea is cooler because the winds there are stronger. The winds over the western Arabian Sea form a “western boundary current” in the atmosphere, a jet known as the Findlater Jet. Formation of the jet is possible because of the presence of the East African Mountains.

While the above role of the mountains in deciding the climates of India and Arabia is at present a conjecture, numerical experiments with global coupled atmosphere-ocean models should make it possible in the near future to check its validity. However, available experimental results, though not quite suited for the purpose, do support the conjecture.

9.2 Public Lecture:



C Ramachandra Guha (Writer and Historian, Bangalore)

Redeeming the idea of India

This lecture asked and answered the question—why is there an India at all? The very existence of a united and largely democratic India flies in the face of the theories of political science, which hold that endemic poverty and cultural diversity are inimical to the process of nation-formation. The lecture revisited the work and vision of the founding fathers, of those who nurtured and built a democracy on such insecure foundations. It also critically assessed the threats to the idea of India, as manifest in the rise of religious fundamentalism, the persistence of poverty, and the massive variations between the different states of the Union.

Some of the other presentations at the meeting were devoted to such diverse topics as glutathione homeostasis in yeast by AK Bachhawat (IMTECH, Chandigarh), molecules-to-materials and molecules-in-materials by TP Radhakrishnan (University of Hyderabad), dark matter as relics of the early universe — quark hadron phase transition by BC Sinha (SINP, Kolkata), eye care delivery model for developing countries by G Nageswara Rao (LV Prasad Eye Institute, Hyderabad), lizard reproductive strategies by Bhagyashri A Shanbhag (Karnatak University, Dharwad), and the case history of the deadly Chandipura virus by Dhruvajyoti Chattopadhyay from the BC Guha Centre in Kolkata.



On July 1st, the day prior to the meeting, special programmes were arranged for the teacher invitees. These included general and separate subject-wise group discussions, visits to institutions in Bangalore and special lecture in mathematics.

10th Annual Meeting 2004 - Varanasi

The Academy held its 70th Annual Meeting at Banaras Hindu University, Varanasi, during 25-27 November 2004, signalling a return to this fascinating city after a gap of eighteen years. In addition to about 200 Fellows, Associates and other participants, close to 50 teachers from colleges and universities from different parts of the country attended as invited guests of the Academy.

The highlights of this meeting included the Presidential address by TV Ramakrishnan on the opening day; two symposia – ‘A New Look at Traditional Medicine’ and ‘Genetics and Health’; the inaugural S Ramaseshan Memorial Public Lecture given by Montek Singh Ahluwalia, Deputy Chairman of the Planning Commission; two special lectures by Rajaram Nityananda and SC Lakhotia; a public lecture by Veer Bhadra Mishra on ‘The Ganga at Varanasi and the travail to stop her abuse’; and presentations by eight recently elected Fellows and Associates. The following gives the abstracts of the presidential address, public lectures and special lectures.

10.1 Presidential Address:



Many Electrons Together: Strange New Quantum Worlds

TV Ramakrishnan, Banaras Hindu University, Varanasi

When a large number of electrons come close, as happens in solids, novel collective phenomena emerge which continue to challenge our understanding. Examples are the fractional quantum Hall effect in which transverse electrical resistance of the material is in exact submultiples of fundamental constants, high temperature superconductivity which harbours a metallic phase unlike any that we have known, and colossal magnetoresistance in manganites. After a brief perspective on these, the speaker outlined his idea of coexisting localized polaronic states and extended electronic states, for manganites.

10.2 Special Lectures:



(a) High ambitions at low frequencies: the GMRT and beyond

Rajaram Nityananda, National Centre for Radio Astrophysics, Pune

Over the last three decades, Indian astronomers have moved into an ecological niche, the study of the universe at radio frequencies of a gigahertz and below. This activity culminated in the Giant Metrewave Radio Telescope (GMRT) at Khodad, now in active international use. This area is now undergoing a resurgence with developments in cosmology and technology and a worldwide consortium to build the Square Kilometre Array — a hundred GMRTs — has come into existence.

This lecture described these developments and placed them in the context of the relevant astronomical objects, physical processes, and observational techniques



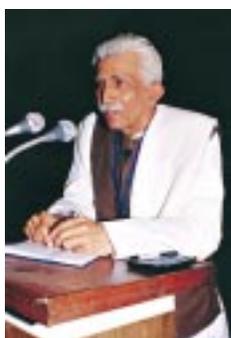
(b) Non-coding DNA: junk, or a necessity for origin and evolution of biological complexity?

SC Lakhota, Banaras Hindu University, Varanasi

Much of the remarkable progress in biological sciences during the past five decades following the unravelling of DNA structure has been based on the so-called “central dogma of molecular biology” which provides a formal basis to understand the flow of information from genes to phenotype. A strong faith in the “central dogma” has resulted in a common belief that any sequence of DNA or a gene is of relevance only if it has a protein-coding function and consequently, a significant proportion of molecular biological studies during the past few decades have been propelled by the concept that the non-coding DNA is “junk” or “selfish” or “parasitic”. On the other hand, sequencing of genomes of large number of species, ranging from bacteria to human, has clearly re-established the earlier inference of classical geneticists and cytologists that much of the DNA in genomes of higher organisms does not carry typical “genes” or protein-coding genetic information. As the biological complexity has increased with evolution, the proportion of DNA in the genome that does not code for protein has also increased. Thus while non-coding DNA is almost non-existent in bacteria, it can make up as much as 90% or more of the genome in higher organisms like mammals. Is the “non-coding” DNA in our genomes really “junk”, whose accumulation to such high proportions reflects some kind of “failure” of natural selection, or is it a necessity for the biological complexity? It is now clear that the genetic differences between any two related species are mostly due to changes in the ‘non-coding’ DNA rather than in the protein-coding genes. Thus while human genome has ~25 fold more DNA compared to the fruit fly, the protein-coding genes appear to be only ~2.5-fold greater. The

evolutionary increase in biological complexity is thus not due to a greater variety of proteins but due to more complex regulatory circuits that allow a greater variety of combinations of similar numbers of proteins so that more complex structures and organizations can come into being. The non-coding DNA not only provides for the more complex regulatory circuits, but may also function directly through its RNA product. Like in the primitive “RNA-world”, the ribonucleic acid molecules can be, and indeed are, functionally versatile even in the modern “DNA-world”. In conformity with this new paradigm, increasing numbers of non-coding genes are being identified in different species. Some examples, including from the speakers laboratory, were discussed.

10.3 Public Lectures:



The Ganga at Varanasi and the travail to stop her abuse

Veer Bhadra Mishra, Banaras Hindu University, Varanasi

Ganga is divine. She is Bhukti-Mukti-Dayini (provider of wellbeing and salvation) for all irrespective of caste, creed, philosophy, gender and form of life. She is the eternal source of Indian culture.

Today Ganga is suffering. It all started with the advent of the industrial revolution and unplanned urbanization. Market forces of today have made this suffering acute. The big cities situated on her banks, like Varanasi, with a population density of 1,00,000 per square km. In their densest parts, have made her water septic at certain points. Where will the believers go? Because of their commitment for the river and religious practices, they have become an endangered species. They do not have a forum to express their suffering and interact articulately with the modern world. If the abuse of the river continues, the religious practitioners and with them the Indian cultural tradition related with water, will die.

About 450 million people in Ganga’s catchment live on her fresh water. Who will provide fresh water for 45 percent of the population of India? Big water companies have sensed the problem and have made ambitious plans. A lone Foundation of Varanasi has responded to the challenge thrown by the polluters and now the profiteers. The Foundation and the municipal corporation (VNN) are working together to serve the river in the holy city. It is a kind of public-private partnership which has proposed a technically appropriate and economical solution to remove the major pollution of Ganga in Varanasi. Appropriate technology, commitment of the city for Ganga and respect in the heart of millions for the divine river are one side. Vested interests and market forces are on the other. Nowhere else in India do we see a situation like this in

the cleaning of a river. People are suffering. The travail to stop the abuse of the river in Varanasi needs national attention and support.



S Ramaseshan Memorial Public Lecture

Globalization, and science in India

Montek Singh Ahluwalia, Planning Commission, New Delhi

The Ramaseshan Memorial Lecture, the first in a new series, was given by Montek Singh Ahluwalia on the subject of 'Globalization and Science in India'. It was a beautifully delivered and lucid exposition to a packed hall. The speaker recalled the economic scene in the industrial and colonial periods, and the revolutionary changes that have taken place in more recent times in international trade and manufacturing practices. He pointed out that the quality and quantity of Indian scientific research is not quite as encouraging as it should be, and is restricted to a rather small number of institutions.



10.4 Symposium on "A new look at traditional medicine"

The symposium on Traditional Medicine was coordinated by MS Valiathan. In his historical overview Valiathan recalled the evolution of the Ayurvedic system over several millennia. Textual references from the time of the Buddha, the works of Charaka, Sushruta and Agnivesha, the later Samhitas, the surgical procedures pioneered by Sushruta and the heights reached at Takshashila and Varanasi were all eloquently described. After several centuries of stagnation and decline, the current revival and recognition of Ayurveda is heartening. Other speakers in the symposium, Ashok Vaidya and Bhushan Patwardhan, covered reverse pharmacology of herbal and Ayurvedic products, and the possibility of combining Ayurvedic knowledge with the strengths of science and technology. R Kumar described the basic principles governing the search for effective drugs from Indian medicinal plants, including protocols for validation and standardization.



10.5 Symposium on "Genetics and health"

The second symposium on Genetics and Health was put together by N Appaji Rao. In his own presentation on 'Consanguinity, endogamy and community genetics' he pointed out that, contrary to naïve expectation, fertility, fecundity and post-natal fatality were not much affected by the social practice of marriages among close relatives. Other speakers covered 'Genomics, immunology and infectious diseases' (RM Pitchappan), gene mutations in corneal dystrophies (Chitra Kannabiran), and the case of viral proteins which equip themselves to perform multiple tasks in the infected cell (Shahid Jameel).

10.6 Lecture presentations by new Fellows/Associates

The 30-min lecture presentations by new Fellows and Associates covered a range of topics. AK Tyagi (Univ. of Delhi South Campus, New Delhi) on Genetically anchored sequence of rice genome, gene discovery and functional analysis; S Umapathy (IISc, Bangalore) on Capturing molecules in action by Raman Spectroscopy; Siddhartha Gadgil (ISI, Bangalore) on Symmetries of spheres; Sudhanshu Vratil (NII, New Delhi) on Japanese encephalitis vaccine: moving away from mouse brain; G Ravindra Kumar (TIFR, Mumbai) on a brief, yet intense affair with light; B Yegnanarayana (IIT, Chennai) on person authentication from voice: the search for new features in speech; MVN Murthy (The Institute of Mathematical Sciences, Chennai) on fractional exclusion statistics: a generalized Pauli principle; and finally Sreebrata Goswami (IACS, Kolkata) on carbon-nitrogen bond fusion reactions with metal mediation.

The souvenir brought out by the host institution included a very interesting collection of articles describing the history and cultural continuity of Varanasi, and youthful reminiscences of growing up at Banaras Hindu University written by several distinguished alumni. The full programme is in Annexure 6.



As part of its continuing efforts to improve the quality of science education and its teaching four main activities are being carried out and these are (a) summer fellowships (b) participation of teachers in meetings (c) refresher courses for teachers (d) lecture series for student/teachers.

11.1 Summer fellowships

Summer Fellowships are awarded to bright students and motivated teachers to work with Fellows of the Academy on research-oriented projects. Started on a relatively small number of just 3 fellowships awarded in 1995, the programme has grown in size both in terms of the number of applications received and the number of fellowships awarded. The programme conducted by the Academy has an all-India character in that the selected summer fellows work in institutions around the country. During the year

2004 summer fellowships were offered to 37 teachers and 167 students from all over the country.

11.2 Participation of teachers in Academy meetings

The Academy has built up a database of teachers from colleges and universities all over the country based on recommendations received from the Fellows of the Academy. A few of these teachers are invited at the Academy mid-year and annual meetings every year to give them an opportunity to attend scientific lectures and to meet and interact with Fellows. About 90 teachers attended the Academy meetings in Bangalore and Varanasi.

11.3 Refresher courses for teachers

This important all-India programme is designed to help motivated teachers to improve their background knowledge and teaching skills. The course is for two weeks and teachers selected from all over the country undergo a rigorous course of lectures, discussions and tutorial sessions. During the last 6 years refresher courses on a variety of topics have been organized throughout the country. The following refresher courses were held during the year.

(a) Experimental Physics



Bhavnagar University, Bhavnagar, 25 October – 7 November 2004

No. of participants: 14

Course Director: MK Mehta; *Course Co-ordinators:* SP Bhatnagar and RV Upadhyay

Resource persons: KR Rao (Bangalore), RV Mehta and SP Bhatnagar (Bhavnagar University), KR Priolkar and Efrem D'sa (Goa University), VN Potbhare and CS Narayan Murthy (MS University, Baroda), HH Joshi (Saurashtra University), S Kannan (CSMCRI, Bhavnagar), VK Aswal and A Mukhopadhyay (BARC, Mumbai), Alok Banerjee (Indore), AW Joshi (Pune) and Raibagkar and FI Surve (Nowrosjee Wadia College, Pune).

Teacher participants were from Ahmedabad, Amerali, Bhavnagar, Himatnagar, Jalgaon, Kapadwanj, Kutch, Nagpur, Nashik, Secunderabad.

Extracts from the report on the course are given in Annexure 7.

(b) Experimental Physics



University of Mysore, Mysore, 1–15 November 2004

No. of participants: 16

Course Director: R Srinivasan, *Course Co-ordinators:* L Paramesh and R Somashekar

Resource persons: AV Gopala Rao, TK Umesh, C Ranganathaiah, D Revannasiddaiah, MA Shridhar, J Shashidhara Prasad, P Venkataramaiah, Somanath Dutta, L Paramesh, R Somashekar and KS Mallesh (all of University of Mysore), R Srinivasan (Raman Research Institute, Bangalore), CS Sundar (IGCAR, Kalpakkam),

MVN Murthy (Inst. Math. Sciences, Chennai), SM Sadique and KRS Priolkar (Goa University) and NC Shivaprakash (IISc, Bangalore).

The teacher participants represented institutions from Ahmedabad, Amravati, Bangalore, Calicut, Cannanore, Davangere, Gudivada, Hassan, Kalamassery, Kochi, Kolkata, Madurai, Mysore, Solapur, Virudhunagar. Extracts from the report submitted by the course coordinators are given in Annexure 8.

(c) Plant Genetic Engineering



Madurai Kamaraj University, Madurai, December 7–21, 2004

No. of participants: 23

Course Director: K Veluthambi

Resource persons: K Veluthambi, S Krishnaswamy, AK Gupta, R Usha, Ranjan Prasad and K Dharmalingam (all of Madurai Kamaraj University), V Balaji (Tel Aviv University), D Sudhakar (Tamil Nadu Agricultural University), K Palanichelvam (Samuel Roberts Noble Foundation, Oklahoma, USA), K Sankara Rao and Ram Rajasekaran (IISc, Bangalore) and Vai Ramanathan (Metahelix, Bangalore).

The teacher participants were from Ahmedabad, Allahabad, Alwarkurichi, Bangalore, Chennai, Cochin, Ernakulam, Gorakhpur, Guntur, Guwahati, Itanagar, Jodhpur, Kattankulathur, Madurai, Manipur, Mysore, Pathanamthitta, Sambalpur, Tiruchirappalli and Vallabh Vidyanagar. A report on the course is in Annexure 9.

(d) Animal Behaviour



Madurai Kamaraj University, Madurai, December 8–21, 2004

No. of participants: 22

Course Director: G Marimuthu, Course Co-ordinator: Sripathi Kandula

Resource Persons: MK Chandrashekar and Vijay Kumar Sharma (JNCASR, Bangalore); KN Ganeshiah (GKVK, Bangalore); Anindya Sinha (NIAS, Bangalore); G Marimuthu and TJ Pandian (MKU); Edosa Omoregie (Univ. of Jos, Nigeria); Milind Watve (Abasaheb Garware College, Pune); Ravi Sankaran (SACON, Coimbatore);

Aparup Das (Poornaprajna Inst. Bangalore); Sharat Kumar Palita (Nayagarh College); R Gadagkar (IISc, Bangalore); K. Thiyagesan (AVC College, Mayiladuthurai.

The teacher participants were from Agali, Bangalore, Belgaum, Bhimavaram, Bihar, Dharmapuri, Dharwad, Durg, Goa, Gorakhpur, Hardoi, Hyderabad, Itanagar, Muvattupuzha, Mysore, N. Lakshmipur, Pantnagar, Pithoragarh, Pondicherry, Purba Medinipur, Surat, Tiruchirappalli, Tirunelveli. A report on the course is given in Annexure 10.

(e) Developmental biology



Indian Institute of Science, Bangalore, 14–20 December 2004

No. of participants: 7

Course Director: V Nanjundiah

Resource Persons: Shubha Tole (TIFR, Mumbai); Neeraj Jain (National Brain Res. Centre, Maneswar); BV Shyamala and NB Ramachandra (Univ. of Mysore); Annapoorni Rangarajan, Upendra Nongthomba and V Nanjundiah (IISc, Bangalore). A report on the course appears in Annexure 11.

(f) Photonics and materials



University of Madras, Chennai, 14–25 February 2005

No. of participants: 19

Course Director: P Natarajan; Course Co-ordinator: P Ramamurthy

Resource persons: PK Palanisamy and S Ganesan (Ann University, Chennai), Girijavallabhan (CUSAT); G Krishnamurthy (TIFR, Mumbai); George Thomas (RRL, Trivandrum); C Srinivasan (MKU); Srikanth M Oak (CAT, Indore); A Samanta (Univ. of Hyderabad); Kankan Bhattacharyya (IACS, Kolkata); P Natarajan, P Ramamurthy and Samyuktha (all of Univ. of Madras).

Teacher participants were from Allahabad, Belgaum, Chennai, Chidambaram, Indore, Karaikudi, Madurai, Mangalore, Namakkal, Thodupuzha, Udipi, Vellore, Warangal. The topics covered in the course are given in Annexure 12.

Lecture workshops for students/teachers

(a) Quantum field theory

Mar Thoma College, Tiruvalla, 9–11 November 2004

Participants: 90 students and teachers from the Mar Thoma and other colleges

Speakers: Diptiman Sen (IISc, Bangalore); G Rajasekaran and Romesh K Kaul (Inst. Math. Sci, Chennai).

Topics covered: Dirac equation and its solutions, spin of the electron, hole theory; Klein-Gordon equation for real and complex scalar fields, coupling to electromagnetic fields and gauge invariance; necessity for second quantization, second quantization for bosons and fermions, Fock space, creation and annihilation operators; special lecture on “Is there a final theory?”; review of special theory of relativity, vector and tensor notation; energy-momentum tensor, EM potentials and fields; introducing EM fields in the Dirac equation, non-relativistic reduction; action principle, derivation of equations of motion from action; second quantization of Klein-Gordon field and its propagator; EM interactions and four-fermi theories (V-A); second quantization of Dirac field and its propagator; second quantization of electromagnetic fields.

(b) Solid state physics and quantum mechanics



B.C.M. College for Women, Kottayam, 18–19 November 2004

Participants: 124 Students and teachers from colleges from several cities in Kerala, such as Amalagiri, Changanacherry, Kanjirappally, Kottayam, Manarcad, Mannanam, Uzhavoor.

Speakers: KL Sebastian, PK Das and S Ramasesha (all of IISc, Bangalore); K Babu Joseph (Rajagiri School, Kochi).

Topics covered: The strange world of quantum mechanics; lasers; electrons in solids.

(c) Modern biology

Aurora's Degree College, Hyderabad, 29–30 December 2004



Participants: 250 students and faculty from universities and colleges

Speakers: MRN Murthy and K Muniyappa (IISc, Bangalore); LS Shashidhara, Ramesh V Sonti, Rakesh Mishra and V Radha (all of CCMB, Hyderabad); Dinesh Kumar (Directorate of Oil Seeds, Hyderabad) and Shekhar C Mande (CDFD, Hyderabad).

Topics covered: Protein folding; Embryo of *D. melanogaster*; plant-microbe interaction; genome structure and regulation; DNA helix; mechanism of cell cycle and apoptosis; functional genomics in plant; genomics of *M. tuberculosis*.

(d) Evolution

Mangalore University, Mangalagangothri, 7–8 January 2005

Participants: 85 students and faculty from universities and colleges

Speakers: SK Saidapur and Bhagyashri Shanbhag (Karnatak University, Dharwad); HA Ranganath (University of Mysore); R Shankar and KK Vijayalaxmi (Mangalore University).

Topics covered: Darwin – The maker of modern biology; evolution of Darwinism; evolution of reproductive strategies in vertebrates; impact of Darwin's thought on biology and medicine; chromosomes and evolution; How was the earth's climate in the past?; genes and evolution; sexual selection; biology of ageing: An evolutionary perspective; and cancer, environment and genes.

(e) Molecular biology



PSG College of Arts and Science, Coimbatore, 28–29 January 2005

Participants: 350 students and faculty from colleges

Speakers: DN Rao, Umesh Varshney, P Kondiah, S Mahadevan, KP Gopinathan and Saumitra Das (all of IISc, Bangalore).

Topics covered: DNA repair; regulation of translation in prokaryotes and eukaryotes; DNA microarray; regulation of gene expression in bacteria; gene expression during development in metazoans; developmental decisions in prokaryotes; transcriptional regulation in eukaryotes; and viruses and our strategies to fight them.

(f) Recent trends in modern biology



SV University, Tirupati,

31 January – 1 February 2005

Participants: 120 students and faculty from colleges

Speakers: V Nagaraja, DN Rao, P Kondaiah, PB. Seshagiri and PN Rangarajan (all of IISc, Bangalore); P Reddanna (Univ. of Hyderabad) and S Krupanidhi (Sri Sathya Sai Inst. of Higher Learning, Puttaparthi).

Topics covered: Restriction-modification enzymes; mechanism of gene transfer in bacteria; gene expression analysis by microarrays; signalling cascades in inflammation; designer genes involvement in axis specification; embryonic stem cell technology: gene therapy; selfish genes – plasmid addiction systems; molecular biology of cancer; animal transgenesis; cell-mediated immunity–role of signal molecules; traditional, modern & futuristic vaccines; and enzymes as molecular targets of drug development.

(g) Analysis, Probability and Statistics

Raman Research Institute, Bangalore, 4–6 February 2005

Speakers: A Sitaram, G Misra, S Ramasubramanian, M Delampady, C Varughese and BV Rajarama Bhat (all of ISI, Bangalore); T Krishnan (Systat Software, Bangalore).

Title of lectures: Infinite series, singular values of matrices, poisson processes in insurance, statistics in microbiology, fourier series, puzzles from probability theory, randomness, clocks, curves and christiaan Huygens and monte carlo methods.

(h) Quantum chemical computations



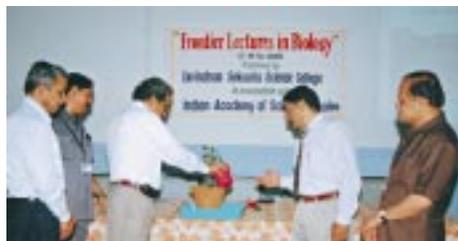
CMS College, Kottayam, 7–9 February 2005

Participants: 29 students and faculty from CMS College

Speakers: S Ramasesha, AG Samuelson and KL Sebastian (all of IISc, Bangalore) and Swapan Pati (JNCASR, Bangalore).

Topics covered: Introductory quantum chemistry; molecular modelling; MO calculations; and normal mode analysis.

(i) Frontier lectures in biology



GSS College, Belgaum, 17–19 February 2005

Speakers: HA Ranganath, Mewa Singh (University of Mysore); BA Shanbhag, SK Saidapur (Karnatak University); P Syamasundara Rao (Agricultural University, Hyderabad); Nairanjan Sant, S Kagnikar and Ajay Desai (Belgaum).

Topics covered: Genes and genomics; spatial and niche separation among primates in the Annamalai hills, the Western Ghats; behavioural ecology and wildlife management; sexual selection; natural selection and human health; role of beneficial birds in agricultural ecosystem; biodiversity around Belgaum; restoration of rural biodiversity; elephant behaviour and evolution of behaviour.

(j) Chemical theories and applications

Gauhati University, Guwahati, 19–21 February 2005

Speakers: PK Chattaraj and S Bandyopadhyay (IIT, Kharagpur); BM Deb (SN Bose Centre, Kolkata); KK Das (Jadavpur University, Kolkata); A Chandra (IIT, Kanpur); S Adhikari (IIT, Guwahati); RC Deka (Tezpur University, Tezpur).

Topics covered: Chemical dynamics; computer simulations; statistical mechanics; quantum mechanics; molecular orbital theories; molecular symmetry and quantum chemical computation.

(k) Spectroscopy and its applications



Kongunadu Arts and Science College, Coimbatore, 26–27 February 2005

Speakers: Mohan Srinivasarao (Georgia Inst. of Tech. USA); AW Parker (Rutherford Appleton Lab, Oxfordshire); K Iwata (Univ. of Tokyo, Japan); S Umapathy, Uday Maitra and S Ramakrishnan (all of IISc, Bangalore)

Topics covered: Modern trends in spectroscopy; time resolved spectroscopy; Raman spectroscopy, electronic and vibrational spectroscopy, fluorescence spectroscopy and NMR spectroscopy.

(l) Chemistry

Madurai Kamaraj University, Madurai, 9–11 March 2005

Participants: 145 students and faculty from university and colleges in Madurai

Speakers: T Ramasami and AB Mandal (CLRI, Chennai); TK Chandrashekar (RRL, Trivandrum); M Periasamy (Univ. of Hyderabad); PT Manoharan and MV Sankaranarayanan (IIT, Chennai); S Umapathy, S Natarajan and AR Chakravarty (all of IISc, Bangalore); M Vairamani (IICT, Hyderabad)

Topics covered: Geometrical factors in host-guest interaction involving biomolecules, tetrapyrrolic macrocycles, receptors for cations and anions, development of organotitanium reagents, mossbauer spectroscopy, basics of spectroscopy, raman spectroscopy, use of hydrothermal methods and copper containing proteins.

(m) Microscopic techniques in biology

University of Pune, 9–11 March 2005

Participants: 120 students from the departments and university of Pune.

Speakers: BB Nath, AN Bhisey and RA Bhisey (all of Univ. of Pune); UV Wagh (Bharati Vidyapeeth, Pune); Nishigandha Naik (ACTREC, Navi Mumbai); L Limaye (NCCS, Pune); A Basu (NIV, Pune).

Topics covered: Light microscopy, cytophotometry using UV and visible light, fluorescence microscopy, principles and applications of confocal microscopy, applications of flow cytometry, introduction to electron microscopy and modern electron microscopic techniques.

(n) Quantum computers

Jawaharlal Nehru University, New Delhi, 10-15 March 2005

Participants: 35 students and faculty from JNU and neighbouring institutions.

Speakers: Anu Venugopalan (GGS Indraprastha Univ, Delhi); SK Sarkar, Karmeshu, Rupamanjari Ghosh and Deepak Kumar (all of JNU, New Delhi).

Topics covered: Information science, two-level systems, quantum algorithms, quantum mechanics and physical systems.

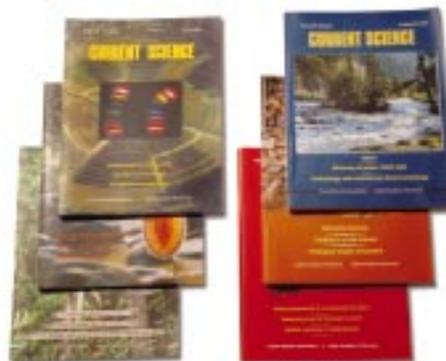
The activities of the Academy are carried out under Non-Plan and Plan. Non-Plan mainly consists of publications activity while Plan includes programmes on science education, annual/mid-year meetings/discussion meetings etc. A summary of the income and expenditure for 2004–2005 follows:

(a) Non-Plan (Publications activity)

Income	Rs. in lakhs	Expenditure	Rs. in lakhs
Grant – DST	67.00	Journal Printing	40.56
Grant - DAE	1.00	Postage	16.53
Subscriptions	57.18	Editorial/Sectional Committee Meetings	3.55
Others	7.40	Salaries	60.53
(Deficit	21.86)	Others (Maintenance of building, equipment etc.)	33.27
			154.44

(b) Plan

Income	Rs. in lakhs	Expenditure	Rs. in lakhs
Grant – DST	160.50	New building construction	8.61
Grant – Department of Space		Science Panel	53.34
Grant – DAE		Annual/mid-year meetings	28.10
		Others (special publications, pension fund, modernization)	70.00
		(Surplus	0.45)
	160.50		160.50



13 Acknowledgements

The Academy's publication activities are largely due to the voluntary and unpaid services of editors, members of editorial boards and the large number of reviewers who examine and comment on manuscripts sent to them for opinion. Several fellows also contributed their services in other Academy activities such as organizing annual meetings and discussion meetings and conducting programmes on science education, etc. The Department of Science and Technology, the Department of Space and the Ministry of Human Resource Development and others have made available generous financial assistance to the Academy and have thus contributed to the activities undertaken by the Academy. The local organizing committee at Varanasi and the Academy staff in Bangalore have ensured a large participation at the scientific meetings of the Academy.



TABLE 1

Information about published pages in journals (January to December 2003)

	Vol.No.	No. of issues	No. of papers	Total No. of pages 2004	**
1. Bulletin of Materials Science	7	6	121	578	(□ 196)
2. J. Astrophys. Astron.	25	4	12	224	(□ 110)
3. Journal of Biosciences	29	4	66	526	(□ 263)
4. Journal of Chemical Sciences	116	6	35	856	(□ 50)
5. Journal of Earth System Science	113	4	53	838	(□ 230)
6. Journal of Genetics	83	3	36	305	(□ 74)
7. Pramana	62,63	12	296	2741	(□ 213)
8. Proceedings (Math. Sci.)	114	4	32	428	(□ 36)
9. Resonance	9	12	148	1158	(□ 42)
10. Sadhana – Engg. Sci.	29	6	48	695	(□ 365)
11. Current Science	86,87	24	1513	3568*	(□ 42)
Total			2360	12100	(□ 183)

* including briefer items such as news, correspondence, etc.

** As compared to last year's figures

TABLE 2

Information on papers submitted for publication (January to December 2004)

	Accepted	Rejected	Pending	Total	**
1. Bulletin of Materials Science	94	66	46	206	(□ 29)
2. J. Astrophys. Astron.	15	19	6	40	(□ 12)
3. Journal of Biosciences	79	139	20	238	(□ 51)
4. Journal of Chemical Sciences	40	62	20	122	(□ 18)
5. Journal of Earth System Science	25	23	4	52	(□ 8)
6. Journal of Genetics	48	33	17	98	(□ 58)
7. Pramana	276	104	72	452	(□ 81)
8. Proceedings (Math. Sci.)	31	121	31	183	(□ 39)
9. Resonance	75	124	35	234	(□ 9)
10. Sadhana – Engg. Sci.	22	29	28	79	(□ 45)
11. Current Science	658	856	79	1593*	(□ 74)
Total	1363	1576	358	3297	(□ 280)

* including briefer items such as news, correspondence, etc.

** As compared to last year's figures

TABLE 3

Circulation details of journals (January to December 2004)

	Subscription		Complimentary		Fellows & Associates	Total
	India	Foreign	India	Foreign		
1. Bulletin of Materials Science	1515 ^a	31	73	26	130	1775 (□ 1072)
2. J. Astrophys. Astron.	586	120	66	24	92	888 (□ 73)
3. Journal of Biosciences	1302	56	75	108	287	1828 (□ 218)
4. Journal of Chemical Sciences	808	49	64	82	176	1179 (□ 108)
5. Journal of Earth System Science	580	52	65	99	95	891 (□ 68)
6. Journal of Genetics	902	103	68	56	185	1314 (□ 119)
7. Pramana	1085	44	80	47	235	1491 (□ 145)
8. Proceedings (Math. Sci.)	872	80	67	90	128	1237 (□ 166)
9. Resonance	4388 ^b	32	200	9	-	4629 (□ 42)
10. Sadhana – Engg. Sci.	728	20	64	29	147	988 (□ 79)
11. Current Science	4938 ^c	85	139	57	85	5304 (□ 99)

a. includes about 545 MRSI members in India and abroad down from 1339 last year

b. includes about 2102 personal subscribers

c. includes about 2277 personal subscribers



Annexure 1

NEW FELLOWS — 2004

(effective 1 January 2005)



1. Sher Ali

National Institute of Immunology,
New Delhi

Sp: Molecular genetics of human and animals, gene expression and genome organization, and genomics of endangered species



2. Baldev Raj Arora

Wadia Institute of Himalayan
Geology, Dehra Dun

Sp: Electromagnetic geophysics,
seismotectonics, and geomagnetism



3. Janendra K Batra

National Institute of Immunology,
New Delhi

Sp: Molecular biology, biochemistry,
and protein chemistry



4. Ramesh Chandra Budhani

Indian Institute of Technology,
Kanpur

Sp: Experimental condensed matter
physics, superconductivity, and
magnetism



5. Amalendu Chandra

Indian Institute of Technology,
Kanpur

Sp: Statistical mechanics of liquids
and interfaces, classical and quantum
simulations, and molecular modelling



6. Subhasis Chaudhuri

Indian Institute of Technology,
Mumbai

Sp: Image processing, and computer
vision



7. Atul H Chokshi

Indian Institute of Science, Bangalore

Sp: High temperature deformation
and failure, ceramics, and
nanomaterials



8. Shankar Prasad Das

Jawaharlal Nehru University, New
Delhi

Sp: Theory, statistical physics, and
complex systems



9. Suresh Das

Regional Research Laboratory,
Thiruvananthapuram

Sp: Photochemistry, photoresponsive
liquid crystals, photosensitizing dyes,
and photoinduced electron transfer



10. KT Joseph

Tata Institute of Fundamental
Research, Mumbai

Sp: Hyperbolic systems of
conservation laws, boundary layers,
and parabolic partial differential
equations



11. Durgadas P Kasbekar

Centre for Cellular & Molecular
Biology, Hyderabad

Sp: Neurospora genetics,
dictyostelium and plant
antimicrobials, and sterol reductases



12. K Krishnamoorthy

Vikram Sarabhai Space Centre,
Thiruvananthapuram

Sp: Atmospheric sciences



13. AN Lahiri Majumder
Bose Institute, Kolkata
Sp: Plant biochemistry, and molecular biology



14. Goutam K Lahiri
Indian Institute of Technology, Mumbai
Sp: Inorganic chemistry, organometallic chemistry, and catalysis



15. Gyan Chandra Mishra
National Centre for Cell Science, Pune
Sp: Immunology, and cell biology



16. Sunil Kumar Mukherjee
International Centre for Genetic Engineering & Biotechnology, New Delhi
Sp: Plant molecular biology, extra chromosomal DNA replication, and viral pathogenesis and RNA



17. PN Pandita
North Eastern Hill University, Shillong
Sp: Theoretical high energy physics, and astroparticle physics



18. VA Raghunathan
Raman Research Institute, Bangalore
Sp: Soft matter physics, and scattering techniques



19. Arnab Rai Choudhuri
Indian Institute of Science, Bangalore
Sp: Theoretical astrophysics, magnetohydrodynamics, and solar physics



20. CS Rajan
Tata Institute of Fundamental Research, Mumbai
Sp: Automorphic forms, arithmetic geometry, and representation theory



21. T Ramaswamy Raju
National Institute of Mental Health & Neuro Sciences, Bangalore
Sp: Developmental neuroscience, neurodegeneration, and neuronal plasticity



22. Shiv Kumar Sarin
GB Pant Hospital, New Delhi
Sp: Medicine, gastroenterology, and liver diseases



23. Chandrima Shaha
National Institute of Immunology, New Delhi
Sp: Cell Biology, reproductive biology, and biochemistry



24. Shyam Sundar
Banaras Hindu University, Varanasi
Sp: General medicine, infectious diseases, and Leishmaniasis



25. Vinod K Singh
Indian Institute of Technology, Kanpur
Sp: Synthetic organic chemistry, and asymmetric synthesis

NEW HONORARY FELLOW



Subra Suresh
Massachusetts Institute of Technology
Cambridge, MA 02139, USA

Annexure 2

FELLOWS DECEASED

(effective 1 January 2005)



1. SN Biswas
(b. 1-5-1926, d. 3-1-2005)
Elected: 1974
Sp: Theoretical physics



2. DP Burma
(b. 1-2-1925, d. 4-2-2005)
Elected: 1976
Sp: Biochemistry, and molecular biology



3. RR Daniel
(b. 11-8-1923, d. 27-3-2005)
Elected: 1966
Sp: Cosmic ray and high energy physics, space physics, infra-red astronomy, and environment science and policy



4. Joy C David
(b. 3-5-1927, d. 20-4-2004)
Elected: 1982
Sp: Neuropharmacology



5. K Ganapathi
(b. 18-8-1911, d. 15-10-2004)
Elected: 1951
Sp: Microbial biochemistry, fermentation technology, and chemotherapy



6. Parmatma Saran Goel
(b. 6-7-1930, d. 9-8-2004)
Elected: 1977
Sp: Nuclear cosmochemistry and geochemistry



7. S Kedharnath
(b. 10-10-1921, d. 6-12-2004)
Elected: 1984
Sp: Genetics, cytogenetics, and forest tree breeding



8. Anil Kumar Lala
(b. 13-1-1950, d. 18-7-2004)
Elected: 1993
Sp: Membrane biochemistry, bio-organic chemistry and protein chemistry



9. SL Malhotra
b. 5-12-1919, d. 10-9-2004)
Elected: 1966
Sp: Epidemiology, and internal medicine



10. RC Mehrotra
b. 16-2-1922, d. 11-7-2004)
Elected: 1974
Sp: Inorganic, organometallic chemistry, metal alkoxides, and sol-gel chemistry



11. AS Mukherjee
b. 1-10-1935, d. 15-11-2004)
Elected: 1988
Sp: Genetics, cell biology, and cytogenetics



12. B Nag
b. 1-10-1932, d. 6-4-2004)
Elected: 1984
Sp: Physics of semiconductors, solid state devices, and electronics



13. AS Paintal
b. 24-9-1925, d. 21-12-2004)
Elected: 1986
Sp: Physiology



14. Raja Ramanna
b. 28-1-1925, d. 24-9-2004)
Elected: 1966
Sp: Nuclear physics, reactor physics and design, European music, and philosophy



15. Ramachandran Srinivasan
b. 5-7-1933, d. 19-9-2004)
Elected: 1968
Sp: X-ray crystallography, molecular biophysics, wide line NMR, and informatics



16. SK Trehan
b. 4-4-1931, d. 9-9-2004)
Elected: 1978
Sp: Magnetohydrodynamics, plasma physics, and astrophysics

HONORARY FELLOW DECEASED



Francis Harry Compton Crick
(b. 8-6-1916, d. 28-7-2004)
Elected: 1985

Annexure 3

- Details of nominations received from 1967 to 2004 giving the subject-wise/department-wise classification (figures in brackets indicate the number elected)

Sl. No.	Category	Mathematics	Physics	Chemistry	Engineering	Medicine	Earth & Planetary Science	Animal Science	Plant Science	General Biology	Total Nominations Received	Number Elected
1.	Universities	43 (11)	113 (33)	129 (33)	28 (10)	25 (5)	80 (22)	97 (25)	130 (34)	72 (16)	717	189
2.	Colleges	4 (2)	4 (1)	8 (1)	5 (1)	43 (15)	6 (3)	5 (2)	8 (2)	5 (2)	88	29
3.	Autonomous Institutions	10 (4)	111 (34)	31 (12)	7 (1)	88 (35)	28 (9)	29 (8)	25 (6)	43 (12)	372	121
4.	IISc	10 (6)	32 (23)	43 (28)	68 (36)	—	4 (3)	6 (4)	4 (1)	45 (30)	212	131
5.	IITs	22 (3)	36 (11)	75 (35)	84 (27)	—	24 (5)	1	—	2 (1)	244	82
6.	ISIs	23 (17)	—	—	5 (1)	—	—	2 (2)	1 (1)	1	32	21
7.	TIFR	39 (35)	95 (51)	8 (4)	10 (6)	1	2 (1)	2 (1)	1	17 (9)	175	107
8.	ICAR	1	—	3	1	1	—	12 (3)	47 (15)	4 (1)	69	19
9.	CSIR	—	21 (4)	85 (25)	65 (21)	9 (2)	46 (12)	20 (3)	26 (4)	75 (31)	347	102
10.	ICMR	—	—	1	—	15 (6)	—	2	1	8 (4)	27	10
11.	Government Institutions	—	107 (27)	35 (5)	103 (35)	8 (4)	83 (23)	16 (2)	21 (4)	21 (5)	394	105
12.	Private/Public R&D Est.	2 (2)	1 (1)	22 (7)	24 (6)	35 (12)	2	1	5 (1)	9 (4)	101	33
13.	Inst. Abroad	8 (2)	15 (6)	4	4	7	6 (1)	1	4 (1)	3	52	10
14.	Unclassified	—	3	1	1 (1)	1	2	4 (2)	2	—	14	3
Total		162 (82)	538 (191)	445 (150)	405 (145)	233 (79)	283 (79)	198 (52)	275 (69)	305 (115)	2844	962

Annexure 4

NEW ASSOCIATES 2004



1. Chakrabarti Subhabrata

L.V. Prasad Eye Institute, Hyderabad

Sp: Molecular genetics of ocular disorders



2. Gupta, Anjan Kumar

Indian Institute of Technology, Kanpur

Sp: Experimental condensed matter physics



3. Patwardhan, AW

Univ. of Mumbai, Mumbai

Sp: Computational fluid dynamics, and multiphase reactors



4. Ramakrishna, S Anantha

Indian Institute of Technology, Kanpur

Sp: Nonlinear optics and quantum optics



5. Shankar, V

Indian Institute of Technology, Kanpur

Sp: Stability and rheology of complex fluids



6. Srinivasa Raghavan, NR

Indian Institute of Science, Bangalore

Sp: Decision sciences and technologies, manufacturing systems and grid computing

Annexure 5

FIFTEENTH MID-YEAR MEETING

(2–3 July 2004, Bangalore)

A. Special Lectures

1. Samir Bhattacharya, IICB, Kolkata
Insulin signalling defects and diabetes type-2
2. Satish R Shetye, NIO, Goa
Why the difference in climates of India and Arabia? an oceanographer's perspective

B. Public Lecture

1. C Ramachandra Guha, Writer and Historian, Bangalore
Redeeming the idea of India

C. Lecture Presentations by Fellows/Associates

1. AK Bachhawat, IMT, Chandigarh
Glutathione homeostasis in yeast
2. Debashish Chowdhury, IIT, Kanpur
Self-organized spatio-temporal patterns in biological systems: Common principles and generic features
3. TP Radhakrishnan, University of Hyderabad, Hyderabad
Molecules-to-materials and molecules-in-materials
4. Harini Nagendra, ATREE, Bangalore
Trees, pixels, people: Human-forest interactions in the tropics
5. Sabyasachi Sarkar, IIT, Kanpur
A replica of a fishy enzyme: Structure function analogue of trimethylamine N-oxide reductase
6. Bikash C Sinha, SINP, Kolkata
Dark matter as relics of the early universe—quark hadron phase transition
7. G Nageswara Rao, L V Prasad Eye Institute, Hyderabad
Eye care delivery model for developing countries
8. M Palaniandavar, Bharathidasan University, Tiruchirappalli
DNA binding properties of Ruthenium(II) polypyridyl complexes: Enantiopreferential DNA

- binding and ligand promoted exciton coupling*
9. Bhagyashri A Shanbhag, Karnatak University, Dharwad
Reproductive strategies in the lizard, Calotes versicolor
10. K Bhanu Sankara Rao, IGCAR, Kalpakkam
Processing and microalloying of intermetallics for achieving high fatigue resistance
11. Siva Athreya, ISI, New Delhi
Abelian sandpile model and the infinite volume limit
12. B Mohanty, VECC, Kolkata
Search for QCD phase transitions in high energy heavy ion collision experiments
13. Tarun Kant, IIT, Mumbai
On two-dimensional modelling of fibre reinforced composite laminates
14. Dhruvajyoti Chattopadhyay, University of Calcutta, Kolkata
Combating a deadly virus: The Chandipura virus case history
15. Jyotirnanjan S Ray, PRL, Ahmedabad
Evolution of the Indian sub-continental mantle: the story from carbonatites
16. Talat Ahmad, University of Delhi, Delhi
Connection of the Neo-Tethyan ocean to the rise of the Himalayan mountain belt
17. M Udaya Kumar, UAS, Bangalore
Relevance of stable isotope —A conceptual approach to improve plant physiological processes

Annexure 6

SEVENTIETH ANNUAL MEETING

(25–27 November 2004, Varanasi)

A. Presidential Address

1. TV Ramakrishnan, Banaras Hindu University, Varanasi
Many electrons together: strange new quantum worlds

B. (a) Symposium: A New Look at Traditional Medicine

1. MS Valiathan, Manipal Academy of Higher Education, Manipal
Evolution of Ayurveda
2. CK Ramachandran, Calicut Medical College, Calicut
Roots of Ayurveda in Indian philosophy
3. Ashok DB Vaidya, Bharatiya Vidya Bhavan's SPARC, Mumbai
Herbal and Ayurvedic products: Current status and reverse pharmacology
4. R. Kumar, JNCASR, Bangalore
Drugs from Indian medicinal plants
5. Bhushan Patwardhan, University of Pune, Pune
Tradition to transformation: Ayurveda, science and systems

(b) Symposium: Genetics and Health

1. R Pitchappan, Madurai Kamaraj University, Madurai
Genomics, immunology & infectious diseases
2. Chitra Kannabiran, LV Prasad Eye Institute, Hyderabad
TGFBI gene mutations in corneal dystrophies
3. Shahid Jameel, Int. Centre for Genetic Engineering and Biotech., New Delhi
Multi-tasking by small viral proteins
4. N Appaji Rao, Indian Institute of Science, Bangalore
Consanguinity, endogamy and community genetics
5. BK Thelma, University of Delhi, Delhi
Impact of single nucleotide polymorphisms (SNPs) in pharmacogenetics/personalized medicine—where are we

C. Special Lectures

1. Rajaram Nityananda, National Centre for Radio Astrophysics, Pune
High ambitions at low frequencies: the GMRT and beyond
2. SC Lakhota, Banaras Hindu University, Varanasi
Non-coding DNA: junk, or a necessity for origin and evolution of biological complexity?

D. Public Lecture

1. Veer Bhadra Mishra, Sankat Mochan Foundation, BHU, Varanasi
The Ganga at Varanasi and the travail to stop her abuse

E. S Ramaseshan Memorial Lecture

1. Montek Singh Ahluwalia, Deputy Chairman, Planning Commission, New Delhi
Globalization, and science in India

F. Lecture presentations by Fellows/ Associates

1. Akhilesh Kumar Tyagi, University of Delhi South Campus, New Delhi
Genetically anchored sequence of rice genome, gene discovery and functional analysis
2. S Umapathy, Indian Institute of Science, Bangalore
Capturing molecules in action by Raman spectroscopy
3. Siddhartha Gadgil, Indian Statistical Institute, Bangalore
Symmetries of spheres
4. Sudhanshu Vrati, National Institute of Immunology, New Delhi
Japanese encephalitis vaccine: moving away from mouse brain
5. G Ravindra Kumar, Tata Institute of Fundamental Research, Mumbai
A brief, yet intense affair with light
6. B Yegnanarayana, Indian Institute of Technology, Chennai
Person authentication from voice: The search for new features in speech
7. MVN Murthy, The Institute of Mathematical Sciences, Chennai
Fractional exclusion statistics: A generalized Pauli principle
8. Sreebrata Goswami, Indian Association for the Cultivation of Science, Kolkata
Carbon-nitrogen bond fusion reactions with metal mediation

Annexure 7

REFRESHER COURSE IN EXPERIMENTAL PHYSICS

(25 October – 7 November 2004,
Bhavnagar)

Extracts from the report:

This course was aimed at exposing teachers to some new low-cost and simple experiments. KR Rao's inaugural lecture on "Neutron diffraction and its applications" started with the basic concepts followed by instrumentation developed in BARC and the different facilities available for neutron scattering experiments in India. RV Mehta in his talk on "Magnetic fluids and their biological applications" showed a video clipping on "Fascinating magnetic fluids" explaining physical and magnetic properties of magnetic fluids and their applications.

KR Priolkar introduced the basic concepts of EXAFS and its experimental results. VN Potbhare talked on properties of sound waves in different matters and inter-stellar travel; and CSN Murthy on basics of nonlinear optics followed by few results of optics and methods to interpret these interesting phenomenon. HH Joshi discussed the physics and application of Mossbauer and some of the latest developments in understanding Mossbauer effect and extensive uses of this novel technique to characterize magnetic particles. S Kannan introduced the topic of X-ray diffraction at the basics making it simple for the participants.

The second half of the course was on neutron scattering and lectures in areas of experimental physics. VK Aswal spoke on scattering technique in the structural study of soft condensed matter, and A Mukhopadhyay on phase transition and dynamics in solids using neutrons. Alok Banerjee gave a lecture on the basics of magnetism followed by their design of low cost VSM and ac-susceptometer built at the Physics Department of Bhavnagar University. SP Bhatnagar's talk gave glimpses of astronomy research at Bhavnagar University.

There were special lectures and experiments in experimental physics by AW Joshi, VH Raybagkar and FI Surva.

RV Mehta explained the basic concepts behind this course exhorting teachers to popularise physics education through experiments. During the feed back session many participants were happy at the freedom and trustful atmosphere at the department.

Projects and experiments: Participants carried out assembling and testing of four electronic circuit projects developed at Goa University. (a) Capacitance meter for dielectric constant measurement, (b) constant current power supply (c) function generator and (d) temperature controller. Experiments were performed on optical fibers, fourier analysis, energy levels of iodine vapour, magnetism. Participants had an exciting experience and worked late in the evenings on all days. They were also given some mechanical workshop exposure during packing/mounting of the projects in the boxes and some participants found it difficult to finish all the projects.

Annexure 8

REFRESHER COURSE IN EXPERIMENTAL PHYSICS

(1 October – 15 November 2004,
Mysore)

Extracts from the report:

In his inaugural address R Srinivasan stressed the need for introducing innovative experiments in physics and to establish the links between theory and experiments at undergraduate and postgraduate levels. He then delivered a lecture on lock-in-amplifier and its usage in various experiments.

The schedule of the course included 18 lectures, 14 physics experiments and three projects. The lecture sessions covered topics on errors and measurements (AV Gopala Rao) and on computer interface experiments and experiments at IGCAR, Chennai (CS Sundar). MVN Murthy talked on neutrino puzzles and Indian neutrino observatory and Somnath Datta demonstrated experiments in physics. The participants carried out five MSc experiments and lock-in-amplifier experiments in batches.

There were four experiments on dielectric constant of benzene, thermal diffusivity, Stefan's constant and verification of Wiedemann-Franz law. Thermal diffusivity experiment involved taking readings at one-minute intervals. Fourier transform of experimental data and thermal diffusivity were computed by Fortran program developed by R Somashekar. These experiments were discussed threadbare during practical sessions. Participants were also engaged in project work on fabrication of dielectric constant, constant current source and function generator during afternoon and late evenings. There were seminars on research work on all days during the first half of the course. The following topics were discussed by the resource persons: Basics of X-ray crystallography, positron annihilation, nuclear experiments, liquid crystals, radon measurements, chaos, linux operating system and X-ray powder diffraction. Feedback sessions included (i) better design and PCB board for function generator; (ii) lectures to discuss the projects; (iii) project on lock-in-amplifier and (iv) inclusion of error analysis while doing experiments and projects.

The participants felt that this course helped them understand the basics of electronics and were keen to introduce these experiments in their syllabi.

Annexure 9

REFRESHER COURSE ON PLANT GENETIC ENGINEERING

(December 7–21, 2004, Madurai)

Extracts from the report:

The objective of the course was to provide practical training in a simple set of recombinant DNA and plant genetic engineering experiments to teachers in colleges and university departments so that they can be taught to students in their respective courses.

The topics covered included plant genetic engineering, bioinformatics, genomics, DNA microarray, functional genomics and proteomics.

Experiments: Cloning of a foreign in an *Agrobacterium* binary vector; introduction of a binary vector into *Agrobacterium* by triparental mating; PCR of transgenic rice; *Agrobacterium*-mediated transformation of tobacco leaf discs; Reporter gene expression in transgenic plants – GUS staining; plant DNA extraction and fluorometric DNA estimation; southern hybridization analysis of transgenic rice plants; western blotting (demonstration).

Participants were given a laboratory manual and the following text books:

(1) Plant Biotechnology by A Slater, N Scott and M Fowler (2) Principles of Gene Manipulation by Primrose and Old to carry out some course experiments. Participants were provided with an experimental kit which contained the following components. (a) Axenic Wisconsin 38 tobacco plant (b) control tobacco callus (c) transgenic tobacco callus with gus gene (d) X-gluc for GUS staining and (e) *Agrobacterium* and *E. coli* bacterial strains to perform the triparental mating experiment.

In general the participants showed keen interest to learn the theory behind the experiments.

Annexure 10

REFRESHER COURSE ON ANIMAL BEHAVIOUR

(December 8–21, 2004, Madurai)

Extracts from the report:

The lectures covered various behavioural aspects such as behaviour and conservation of birds at the Andaman & Nicobar Islands, behavioural ecology, biostatistics, chronobiology, evolutionary biology, plant–animal interactions, and sociobiology.

The participants were divided into four groups for conducting experiments and field studies. The experiments include circadian rhythms in the field mouse *Mus booduga*, electroretinogram of an insect, rectal temperature rhythm of human, and mark-recapture study. Field studies included visiting caves and observing out-flying bats using bat detector; erecting mist net in the botanical garden, capturing foraging bats and making measurements on them; radio-tracking bats in their foraging area; and recording the echolocation sounds of bats that flew in open space and analysing their characteristics using a software, to find out the frequency and duration of the sounds.

Each participant received a copy of the following books: (1) *Survival Strategies* (by R Gadagkar), (2) *An introduction to Animal Behaviour* (by A Manning/MS Dawkins) and (3) *Biostatistical Analysis* (by JH Zar). A statistical CD package was also given.

Annexure 11

REFRESHER COURSE ON DEVELOPMENTAL BIOLOGY

(14–20 December 2004, Bangalore)

Extracts from the report:

The aim of the workshop was to expose the teachers to recent advances in our understanding of the development of two model organisms in particular, *Drosophila melanogaster* and *Dictyostelium discoideum*, by way of direct observations and experiments. The lectures were used to expand on issues that were raised in the laboratory sessions. In addition, there were special lectures on nervous system development and cancer biology. The morning sessions were devoted to lectures and afternoons for practicals. NB Ramachandra and BV Shyamala spoke on how *Drosophila* throws light on the molecular mechanisms that control the early embryogenesis, axis and pattern formation, and segmentation. HA Ranganath talked about how *Drosophila* could be used to study the chromosomal basis of evolution and speciation in the laboratory using standard cytological methods and behavioural analyses. U Nongthomba discussed indirect flight muscle system in flies and how they could help in the study of human myopathies and neuromuscular disorders. He also discussed the currently available web-based resources that one can easily download for teaching developmental biology. Annapoorni Rangarajan talked about recent advances in our understanding of cancer, the status of the oncogene concept, and the new questions that are emerging. This was followed by two sessions on neurobiology. N Jain discussed the approaches used to study the basic principles of organization and functioning of the mammalian brain with special focus on the primate brain. He described how different sensory and motor systems develop, and how they collate and process information inputs coming from different tissues and organs and showed how an individual develops to adulthood; the brain remains plastic or malleable to a large extent, a feature that has both desirable and undesirable consequences. Shubha Tole spoke on early cellular and molecular mechanisms that give rise to the mammalian neural tube, how the spinal cord develops and what specifies the forebrain. She also talked about various evolutionary changes, developmental steps and

Annexure 12

REFRESHER COURSE ON PHOTONICS AND MATERIALS

(14–25 February 2005, Chennai)

molecular mechanisms underlying the control of cell identity and axon path-finding.

Laboratory exercises:

The *Drosophila* practicals included studies of different stages of the life cycle, morphological characteristics of male and female flies, different developmental mutant phenotypes, setting up of crosses, histochemical staining using reporter constructs and immuno-histochemical localization of gene products using developing embryos, larvae and dissected adult tissues. The *Dictyostelium* portion included the isolation of amoebae from soil samples, staining multicellular stages, observing how fluorescence could be used as a tool to distinguish between cell types and an experiment to test whether pre-aggregation nutritional biases could influence the developmental fate of an amoeba.

Extracts from the report:

Topics covered: Lasers, techniques and detection, spectroscopy, solvation dynamics, photonics materials, nonlinear optics, thin films, diode lasers, solar cells, pulsed laser deposition of materials, nano materials, photocatalysis, molecular devices, molecular motors, fluorescence behaviour of biomolecules and time resolved fluorescence spectroscopy applied to biomolecules, photodynamic therapy and medical applications.

There were 10 hours of practical session demonstrated by Indira Priyadharsini (NCUFP). The participants were given the following books:

(1) Optical fibre and laser: Principles and applications by Anuradha De, (2) Optoelectronics an introduction by J Wilson and JFB Hawkes, (3) Fundamentals of photochemistry by KK Rohatgi-Mukherjee and (4) Lasers: Principles, types and applications by KR Nambiar.



STATEMENT OF ACCOUNTS

APRIL 2004 - MARCH 2005



INDIAN ACADEMY OF SCIENCES, BANGALORE

RECEIPTS AND PAYMENTS FOR THE YEAR ENDED 31 MARCH 2005

RECEIPTS		(Amount in rupees)	
		2004-2005	2003-2004
I	Opening Balances:		
	a) Cash in hand	13,488	18,158
	b) Bank balances		
	Savings account	(-) 1,69,234	28,73,079
II	Grants received:		
	a) From Govt. of India	2,46,75,000	2,36,25,000
	b) From other sources	27,000	47,000
III	Income on investments from:		
	a) Own funds	51,87,406	38,98,215
IV	Interest received:		
	a) On Bank deposits (SB)	1,06,299	1,07,353
	b) Loans/advances etc.	-	30,488
V	Other Income	78,83,436	67,14,581
VI	Amount borrowed	NIL	NIL
VII	Any other receipts:		
	Contribution to corpus fund	1,52,872	4,18,070
VIII	Investments matured	1,46,05,000	1,82,00,000
TOTAL		5,24,81,267	5,59,31,944

PAYMENTS			
I	Expenses:		
	a) Establishment	82,14,799	89,44,943
	b) Administrative expenses	2,30,93,757	1,83,60,399
II	Investments and deposits made out of own funds	1,84,00,000	2,39,00,000
III	Expenditure on:		
	a) Fixed assets	18,01,750	13,73,879
	b) Capital work in progress	NIL	30,00,000
IV	Refund of surplus money/loans	NIL	1,94,100
V	Other payments	NIL	3,14,369
VI	Closing balances:		
	a) Cash in hand	1,130	13,488
	b) Bank balance	9,69,831	(-) 1,69,234
TOTAL		5,24,81,267	5,59,31,944

As per our report of even date annexed
For B R V GOUD & Co
Chartered Accountants

Place: Bangalore

Sd/-
(TV Ramakrishnan)
President

Sd/-
(N Balakrishnan)
Treasurer

Sd/-
(G Madhavan)
Executive Secretary

Sd/-
(BRV Goud)
Partner

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED
31 MARCH 2005

Particulars	(Amount in Rupees)			
	2004 - 2005		2003 - 2004	
A. INCOME	Plan	Non-Plan	Plan	Non-Plan
Grants/Subsidies	1,60,50,000	68,27,000	1,47,75,000	85,22,000
Fees/Subscriptions		57,17,513		48,12,305
Income from Royalty, publications etc		5,32,953		5,90,357
Bank Interest		1,06,299		1,37,841
Miscellaneous Income		74,043		3,08,313
TOTAL (A)	1,60,50,000	1,32,57,808	1,47,75,000	1,43,70,816
B. EXPENDITURE				
Establishment		77,31,799		57,29,245
Other Administrative expenses etc.	1,60,04,693	77,12,432	1,47,26,496	91,11,135
TOTAL (B)	1,60,04,693	1,54,44,231	1,47,26,496	1,48,40,380
SURPLUS/DEFICIT (A-B)	45,307	21,86,423	48,504	4,69,564

As per our report of even date annexed
For B R V GOUD & Co
Chartered Accountants

Place: Bangalore

Sd/-
(TV Ramakrishnan)
President

Sd/-
(N Balakrishnan)
Treasurer

Sd/-
(G Madhavan)
Executive Secretary

Sd/-
(BRV Goud)
Partner

BALANCE SHEET AS AT 31 MARCH 2005

SOURCES OF FUNDS	(Amount in Rupees)	
	31.3.2005	31.3.2004
Corpus/Capital fund	6,69,17,002	6,65,66,152
Earmarked/Endowment funds	1,19,90,377	1,06,77,337
Current Liabilities and provisions	68,59,763	65,14,981
TOTAL	8,57,67,142	8,37,58,470
APPLICATION OF FUNDS		
Fixed Assets	3,57,16,790	3,77,92,129
Investments-from Earmarked/endowment funds	1,12,00,000	1,00,05,000
Investments others	3,60,05,000	3,34,05,000
Current assests, loans, advances etc	28,45,352	25,56,341
TOTAL	8,57,67,142	8,37,58,470

As per our report of even date annexed
For B R V GOUD & Co
Chartered Accountants

Place: Bangalore

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Partner