



No. 56

September 2012

Newsletter of the Indian Academy of Sciences

TWENTY-THIRD MID-YEAR MEETING

JULY 13 – 14, 2012

The 23rd Mid-Year Meeting of the Academy was held at Bangalore during July 13 and 14, 2012. Since the past six years or so, it has been a tradition to invite selected college and university teachers to attend Academy meetings as its guests. Typically, about 70 to 90 invitations are sent, and about 30 are able to attend. At the Mid-Year Meetings, special programmes are organized on the day prior to the main meeting, for the benefit of teachers. In 2006, Vidyanand Nanjundiah took the initiative to organize special short talks on recent developments in the life sciences. In 2011, a half day seminar in the earth sciences was put together by Nibir Mandal and Vinayachandran, this year they enlarged it to cover the interface and overlaps between earth and life sciences. It resulted in a very educative experience, hopefully encouraging teachers to spread new ways of stressing interdisciplinary approaches.

The main meeting included two Special Lectures, one Public Lecture and twenty one short presentations by Fellows and Associates. Listening to them all, one picks up little bits and pieces of information which stay in the mind. A more detailed account than the present one has appeared in Current Science (Volume 103, September 25, 2012, page 616). **Ashutosh**



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Newsletter, please write to the
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Forthcoming Events

Seventy-eighth Annual Meeting, Dehradun 2 – 4 November 2012

Refresher Courses

Traditional and modern approaches in plant taxonomy 15 – 29 November 2012
University of Agricultural Sciences, Bangalore

Experimental physics – XLIII 15 – 30 November 2012
Jalahalli, Bangalore

Plant sciences 19 November – 3 December 2012
PSGR Krishnammal College for Women, Coimbatore

Experimental chemistry 3 – 16 December 2012
University of Pune

Experimental physics – XLIV 4 – 19 December 2012
VIT University, Chennai

Experimental biology 19 – 31 December 2012
IISER, Kolkata

Experimental physics – XLV 8 – 23 January 2013
Visva-Bharati, Santiniketan

Experimental physics – XLVI 1 – 16 February 2013
Christ Church College, Kanpur

Lecture Workshops

Tectonic geomorphology 30 October – 1 November 2012
HNB Garhwal University, Srinagar

Theoretical physics lectures 8 – 10 November 2012
University of Mysore, Mysore

Conservation and use of natural resources 17 – 18 November 2012
for sustainable development
Dayalbagh Education Institute, Agra

Emerging paradigms in life sciences 19 – 20 November 2012
Visva-Bharati, Santiniketan

Modern trends in chemistry and chemistry education 22 – 23 November 2012
University of North Bengal, Darjeeling

Neuroscience research: Translation to care and cure 23 – 24 November 2012
Sophia College for Women, Mumbai

Need of understanding the neglected tropical diseases 26 – 27 November 2012
*Chennai Medical College Hospital & Research Centre
Irungalur, Tiruchirapalli*

Recent developments in chemistry 29 November – 1 December 2012
Visva-Bharati, Santiniketan

Modern chemistry and biology 18 – 19 January 2013
Aurora's Degree & PG College

Advanced spectroscopic techniques 21 – 22 January 2013
HPT Arts & RYK Science College, Nashik

Sharma's special lecture was in the general area of new materials for device applications in the nanoscience domain. The processes involved are physically, not chemically, driven. Self-organization is to be



distinguished from self-assembly, they are opposites! **Chandrima Shaha's** special lecture was devoted to the subject of apoptosis or cell death. Of the nearly one hundred trillion cells

in our bodies, we lose some one hundred billion each day! Cell death is essential for life, strange as it may sound, and it has developed under the guidance of evolutionary forces. One was reminded that at the other end of the scale, even stars are born and eventually die!



Mahesh Rangarajan's public lecture carried the title 'Making spaces for nature: Science, politics and the environment in an emerging economy'. It dealt with the particularly difficult problems which a country like India has to

deal with in saving natural habitats while facing population and developmental pressures. On a world perspective, we have grown from some 50 nations in 1900 to about 200 now, thanks to the breakup of many empires. From 1900 to 2000 the global GDP has increased 14 fold. Somehow historians seem able to not lose heart in witnessing day-to-day tragedies which overwhelm most others, they seem to have the right perspectives on problems. As the speaker recalled, when Andre Malraux asked Chairman Mao for his assessment of the French Revolution, Mao replied that it was still too soon to decide! With eloquence and

insight, Rangarajan made us all believe that finally we may succeed in solving our environmental problems in our own muddled way.

Utpal Sarkar spoke about the now withdrawn reports that neutrinos travel faster than light, and commented that if true, these particles from the 1987 supernova event would have reached us four years before photons did! The talk by Balakrish Nair on the practical problems of creating and making available vaccines for major illnesses was quite heart rending. His subject was cholera, and this sentence stands out from his excellent talk: "Cholera is a classic example of the failure of translating information generated through basic scientific inquiry to the prevention, diagnosis, and treatment of human disease. How can this situation be reversed in India?" Even licensing of a vaccine is a new research beginning.

M Rajeevan's talk on 'Long-term variations of droughts over India' took us back to an ever-present problem we face in our country. For a long time, drought predictions were "kept secret", may be things are easing now. He contrasted statistical versus dynamical approaches to making reliable predictions; clearly, one has to move towards the latter in time. The earlier 16 parameter statistical model failed from 1994 onwards, and actually missed the droughts of 2002 and 2004. Normally, 70 to 90 per cent of the monsoon rainfall occurs during June to September, and a deficit of 10 per cent means a drought. Drought frequencies over parts of the country have been increasing. A new index proposed by Rajeevan and others may help follow and analyse events better.

The attendance at this Mid-Year Meeting was as always, encouraging, with about 230 Fellows and Associates, and many students and teachers from local institutions and the general public, present at the sessions.

* * * * *

SEVENTY-EIGHTH ANNUAL MEETING

Wadia Institute of Himalayan Geology, Dehradun

2 – 4 November 2012

Programme

2 November 2012 (Friday)

- 0930 – 1100 **Inauguration & Presidential Address**
A K Sood, IISc, Bangalore
Driven matter
- 1200 – 1300 **Lectures by Fellows/Associates**
- 1200 **Amita Aggarwal**, SGPGIMS, Lucknow
Immune mechanisms in juvenile idiopathic arthritis
- 1220 **A K Shukla**, IISc, Bangalore
Electric vehicles: Constraints, concerns and challenges
- 1240 **V Ravindran**, HRI, Allahabad
What is the Higgs Boson?
- 1400 – 1500 **Lectures by Fellows/Associates**
- 1400 **Anindya Sarkar**, IIT, Kharagpur
Evolution of the Ganges delta from ice age to 21st century and the endangered Sundarbans
- 1420 **V Ravi**, NIMHANS, Bangalore
A novel technology for simultaneous detection of multiple pathogens causing acute encephalitis in India
- 1440 **Samik Nanda**, IIT, Kharagpur
Scaffold oriented synthesis, a new strategy for accessing natural products and new chemotypes
- 1530 – 1730 **Symposium – ‘Science of the Himalaya’**
- 1530 **Pradeep Srivastava**, WIHG, Dehra Dun
Evolution of Himalaya: A look through Ganga river system

- 1600 **A K Jain**, CBRI, Roorkee
When did India-Asia collide and make the Himalaya?
- 1630 **Anil Kulkarni**, IISc, Bangalore
State of Himalayan glaciers
- 1700 **J R Kayal**, Jadavpur University, Kolkata
Himalayan tectonic model and the strong-great earthquakes
- 1800 – 1900 **Public lecture**
Mohan Agashe, Pune
Cinema for health

3 November 2012 (Saturday)

- 0900 – 0940 **Special Lecture**
Rohini Godbole, IISc, Bangalore
We have found a new boson, what next?
- 0940 – 1020 **Lectures by Fellows/Associates**
- 0940 **Pradip Dutta**, IISc, Bangalore
Multiphase convection during solidification of binary alloys
- 1000 **A R Rao**, TIFR, Mumbai
What happens close to a black hole?
- 1050 – 1300 **Symposium on ‘The computing legacy of Alan Turing’**
- 1050 **R K Shyamasundar**, TIFR, Mumbai
Computing legacy of Alan Turing
- 1120 **Ramesh Hariharan**, Strand Genomics Ltd., Bangalore
Patterns in biology and the program of life
- 1150 **V Arvind**, IISc, Chennai
Algorithmic randomness, real numbers and computability
- 1220 **Manindra Agarwal**, IIT, Kanpur
Turing machines and the development of complexity theory
- 1400 – 1540 **Lectures by Fellows/Associates**
- 1400 **Indranil Dasgupta**, Univ. of Delhi South Campus, New Delhi
Viruses as a tool for gene expression and silencing in plants
- 1420 **Abhishek Dhar**, ICTS, Bangalore
Levy walk description of anomalous heat transport

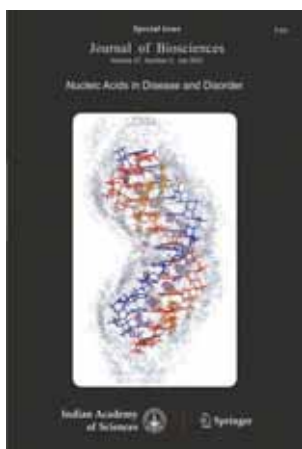
SPECIAL ISSUES OF JOURNALS

Nucleic acids in disease and disorder: Understanding the language of life emerging from the 'ABC' of DNA

Guest Editors: Manju Bansal, B Jayaram and Aditya Mittal

Journal of Biosciences, Vol. 37, No. 3, July 2012,
pp. 375 – 577

'Albany 2011: Conversation 17' was held in June 2011 at SUNY, Albany – a remarkable gathering in a series organized by Professor Ramaswamy Sarma since the first meeting held 39 years ago at SUNY, Albany. As with all Albany gatherings, the 17th Conversation had several elements of excitement in the discussions on biomolecular structure and dynamics.



One of the highlights of the 17th Conversation was the Beveridge celebration – to celebrate the achievements of the living legend Professor David Beveridge, a pioneer in computational biology, DNA structure and dynamics in particular. One of Beveridge's major contributions has been the monumental effort of setting up of the Ascona B-DNA Consortium (ABC) – a global collection of scientists working with a focus on an identified aspect of computationally understanding DNA structure and dynamics. This concept has been extremely successful in solving large computational problems, overcoming the limited computing capacities available with individual researchers, by dividing the problems into smaller sets that can be solved using local computing resources. It has not only 'networked' independent computing environments, but has created a growing global collaborative setup for research.

India has had, and continues to have, a rich history of contributions in the field of protein structure and dynamics, from collagen work of Ramachandran with Gopinath Kartha and subsequently Manju Bansal to crystallographic works of Vijayan and colleagues to the more recent work of Mittal and Jayaram – a

testament to which are the ongoing and planned Golden Jubilee celebrations for Professor GN Ramachandran's seminal work on protein conformations. A somewhat lesser appreciated fact in the Indian scientific community, however, is the role of Indian scientists, again initiated by Ramachandran's group, in contributing towards developing our current understanding of DNA structure. Somehow this has led to a slower growth in the number of researchers in India being interested in, and contributing towards, understanding the structure and dynamics of nucleic acids compared to the exponential increase in researchers working on protein structure and dynamics. In fact, the DNA community in India is relatively quite small, and has not met in years for a focused discussion – evidenced by the fact that most young researchers in India are not aware that first discoveries of the left handed DNA structure, while being simultaneously explored by American scientists, happened in India in the late 1970s. Further, several early efforts towards exploring structure and dynamics of nucleic acids have not been followed up. More recently, while contributions such as NuParm, Chemgenome, PreDDicta and PROMBASE have been received well internationally, they are yet to percolate into the Indian scientific community. Essentially there is a requirement to enthuse bright young investigators in India to pursue research in structural and functional aspects of nucleic acids.

Thus, an idea was mooted to host the next ABC meeting at IIT Delhi. The essential goal was to gather Indian scientists working on the structure and dynamics of nucleic acids and to provide a platform to invoke interest in young researchers. A key element was to also try to highlight the importance and imperative requirement of creating a collaborative network inspired by the success of ABC, especially within the Indian scientific community. A perfect avenue for executing the above plan was provided by the newly established Kusuma School of Biological Sciences at IIT Delhi. Thus evolved an international conference on 'Nucleic acids in disease and disorder', organized by the Kusuma School of Biosciences in association with Supercomputing Facility for Bioinformatics & Computational Biology, from 7 to 9 December 2011 at IIT Delhi. The programme provided an excellent opportunity to the students and the scientific community to discuss the latest developments in the diverse issues pertaining to the structure, dynamics, stability, interaction and function of nucleic acids.

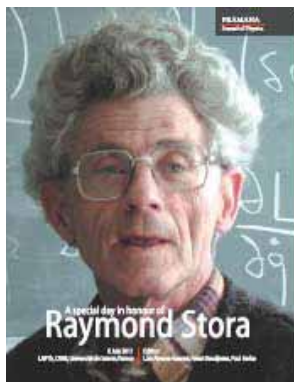
About 150 participants from all over India, in addition to the distinguished speakers from abroad, attended the meeting. This special issue comprises the proceedings of this conference.

Special Issue on Proceedings of the Conference on Symmetries in Gauge Theories – Pertaining to the work of Raymond Stora

Guest Editors: Luis Alvarez-Gaumé, Fawzi Boudjema, Paul Sorba

Pramana, Vol. 78, No. 6, June 2012, pp. 835–978

The event to celebrate the 80th birthday of Raymond Stora, the great physicist, the authentic humanist and a most honourable friend took place in Annecy-le-Vieux on 8 July 2011, a few months after the official date. About one hundred colleagues and friends were present on this special day.



This special issue comprises the scientific contributions presented on this occasion by some of Raymond's distinguished colleagues.

Raymond Stora has played a key role in the development of gauge theories, which are the pillars of our modern and most successful formulation of the fundamental interactions. The discovery of the BRS symmetry has had not only an impact on the renormalization of the standard model of particle physics but also repercussions on many other fields of theoretical physics. Raymond's genius is to be found also in his approach to a variety of subjects, ranging from their very formal and mathematical aspects to more down-to-earth phenomenology. Raymond has been awarded numerous honours in France and several international scientific prizes. He is truly a living encyclopedia we have been most fortunate to have around us, a scholar who has always provided help and advice to colleagues and students. So many theorists, of all ages, have been and still are amazed by his swiftness in grasping the problems submitted to him, by his *infrared* judgment in detecting an error, a misinterpretation or a bad formulation, as well as by his eagerness and skill in solving those problems.

These scientific and human qualities were also helpful and much appreciated in the many positions of responsibility Raymond occupied at various national and international levels. Some scientists deserve the term of humanists, and that is definitely the case of Raymond. Indeed, Raymond's interests are not limited to physics and mathematics: he reads Latin, he loves the arts, books – particularly those of the sixteenth century, as they were first published – but his main concern certainly lies in human beings and the realization of their potential.

* * * * *

ACADEMY PUBLIC LECTURE

Cancer suppressor mechanisms that guard the human genome

Jubilee Lecture by Professor Ashok R. Venkitaraman (Jubilee Professor) Medical Research Council Cancer Cell Unit, University of Cambridge, UK

2 August 2012
Indian Institute of Science, Bangalore



Chromosomes serve as the functional and physical containers for the information encoded in the human genome. Instability in chromosome structure and number is a hallmark of human epithelial cancers, which is triggered early in cancer development. What provokes chromosomal instability, and how it fosters cancer pathogenesis, remain major unresolved questions central to understanding carcinogenesis. Moreover, the near-universal occurrence of chromosomal instability in common epithelial malignancies offers important opportunities for devising new approaches to cancer therapy. Insights into these issues that come from our studies on the macromolecular interactions that control DNA replication, repair and mitotic progression, the key cancer suppressor mechanisms that maintain chromosome stability in normal cells will be discussed. To understand these processes at resolutions ranging from molecules to organisms, an integrative and interdisciplinary approach was used, combining somatic cell genetics, single-molecule biophysics, chemical biology and transgenic models.

* * * * *

SCIENCE EDUCATION INITIATIVES OF INDIA'S SCIENCE ACADEMIES*

I am grateful to Prof. Krishan Lal, President of INSA, for giving me an opportunity to speak briefly about the science education efforts and activities of the three national science academies of India, to such a distinguished audience.

First, a few words about our academies. We have three of them, all of a national character. The National Academy of Sciences was founded in 1930 and is based in Allahabad. The Indian Academy of Sciences was founded in 1934 and is based in Bangalore. The Indian National Science Academy – our host here – was founded in 1935 and since 1947 has been based in Delhi. Over the decades each of these Academies has acquired a distinctive character and undertaken particular functions and roles in serving the scientific community of the country. And each has played a role on the scientific education scene. Since 2007 they have come together and this has led to significant increases in scale and impact, and I will describe them briefly.

Going back a little bit in time, starting in 1995 the Indian Academy of Sciences initiated some programmes on a modest scale, for the benefit of science students and teachers all over India. The three main programmes were:

- Summer Research Fellowship Programme (SRFP)** for students and teachers to spend two months working under the guidance of a Fellow.
- Refresher Courses** for teachers, of two-week duration to help improve teaching skills and basic understanding.
- Lecture Workshops** of two or three days duration at research level meant for both students and teachers.

In the 12-year period from 1995 to 2006, the growth and scale of these activities is indicated by these figures:

SRFP: No. of applications from 5 in 1995 to 2500 in 2006

* Talk presented by N. Mukunda at the South Asian Science Academies Summit on 'Strengthening Science Education' at INSA, New Delhi held during September 6–8, 2012.

No. of Fellowships from 3 in 1995 to 240 in 2006

Total no. of Fellowships in 12 years: 1350

Refresher Courses for teachers: about 50

Lecture Workshops for students and teachers: about 70.

At this stage, looking at this experience, the other two Science Academies – INSA and NASI – came forward and joined in the efforts of the IASc. So since 2007, for the past six years, all these programmes are being jointly supported and they have grown in scale and impact and prestige. The growth has been really encouraging. Here are the salient features and figures.

a) SRFP for Students and Teachers

Year	No. of applications	No. of fellowships
2007	4200	400
2008	5600	470
2009	8000	700
2010	11000	1200

You can see the steady growth of about 30% or more from year to year. For the last two years, when things seem to be stabilizing, here are some further details:

Year	Applications	Fellowships	Guides	Institutions
2011	14,525	1256	1542	146
2012	14,810	1671	1690	181

Among institutions hosting the largest numbers of students and teachers as summer fellows, in Olympic style the gold medal goes to the Indian Institute of Science in Bangalore with about 250 summer fellows; the silver medal goes to Indian Institute of Technology (Bombay) with about 70 summer fellows; and the bronze medal to University of Hyderabad hosting 55 summer fellows.

The three Academies combined have about 2250 Fellows. This is the number of individuals. Some belong to two or all three Academies. Many of them act as guides, and in addition many scientists suggested by Fellows also act as guides. The overall experience is that most students benefit significantly from this two-month exposure and get a first exposure to

research. In some cases it even leads to a research paper. The large majority of students are very good and highly motivated. The selections are made by Committees of Fellows in each subject area, and on average about one in ten applicants gets a fellowship. The student community has come to look forward to this annual programme. In particular, students from smaller towns and institutions get opportunities otherwise not available to them, and also get to see and work in institutions often far from home. Of course there is a small number of disappointing cases, students with poor backgrounds but whose applications look impressive, thanks to cutting and pasting from the riches of the internet, but this is unavoidable.

b) Refresher Courses for teachers: Since 2007, the number of these held in each subject area are as follows:

Maths.	Phys.		Chem.		L. Sci.	Engg.	EPS
	Th.	Expt.	Th.	Expt.			
5	14	34	1	1	8	2	2

These courses are of two-week duration, and generally of an all India nature. At present the number of courses per year is about 20. The series of courses in experimental physics has been a particular success story, led by Professor R. Srinivasan. This year a similar effort in Chemistry and Life Sciences has been initiated.

c) Lecture Workshops: These are at research level, and addressed to both students and teachers. The numbers organized since 2007 are:

Maths.	Phys.	Chem.	L. Sci.	Engg.
27	28	59	72	10

These are also very beneficial to students as well as teachers, and on average about 50 such Lecture Workshops are organized each year. Comparing these two streams of activity you can see physicists like to teach in a sustained way giving long courses of lectures, while chemists and biologists can only give one or two lectures and then go home.

Within the resources of the Academies, these three kinds of activities, especially the SRFP, are having a

good impact at college and university levels. As I said, the student community has come to look forward with anticipation to the SRFP, and organizing it has become a year long activity.

Over several years now the science academies have been making recommendations to various agencies of the Government for improving science education at the higher levels. These have been to the Planning Commission, the Ministry of Human Resource Development and the University Grants Commission. Let me list some of the suggestions that have been made:

- Support to selected colleges to improve laboratories, libraries and research level activity
- Scholarships at both undergraduate and post-graduate levels in significant numbers
- B.Sc courses at more universities, integrated MSc and PhD programmes at more institutions
- New institutions to introduce these integrated programmes
- A new – for India – 4-year BS programme to lead one directly to Ph.D
- Continuous teacher training programme.

It does seem that, at least in spirit, quite a few of these suggestions have been and are being implemented.

Lastly, I would like to mention the ambitious INSPIRE programme of the Department of Science and Technology initiated in late 2008. Since mid-2009 the three Science Academies have been advising and assisting the Department in a coordinated manner in the details of some of the components of INSPIRE. This I believe has been possible just because they have been working together since 2007 in the field of science education. The Academies help in finding speakers at the 500 or so summer/winter camps for school students, as well as in selection of young scientists for faculty level appointments.

I hope I have given you a good idea of what the science academies of India are doing collectively in the field of science education over the past six years or so.

* * * * *

SUMMER RESEARCH FELLOWSHIP PROGRAMME FOR STUDENTS AND TEACHERS

The summer research fellowship programme (SRFP) for students and teachers has now become a major activity of the Academy under its Science Education initiatives. Started on a small scale in 1995, it has grown rapidly in size. This is particularly so since 2007, when the Indian National Science Academy (New Delhi) and the National Academy of Sciences, India (Allahabad) collaborated with this Academy in running this programme.

The following table gives information on the number of applications received and the number of fellowships offered and availed in 2012.

Subjects	No. of applications received		No. of fellowships offered		No. of fellowships availed	
	Students	Teachers	Students	Teachers	Students	Teachers
Life Sciences (incl. Agri. Sciences)	4165	248	536	64	482	53
Engg. & Tech.	5518	137	281	23	217	19
Chemistry	1675	114	217	48	189	38
Physics	1637	107	207	53	164	49
Earth & Planetary Sci.	622	14	141	04	126	03
Mathematics	533	40	101	16	85	10
Total	14150	660	1483	208	1263	172
Grand Total	14810		1691		1435	

Many institutions in the country helped the programme by hosting summer fellows and providing them the necessary facilities such as laboratory support, accommodation etc. The following tables give information on (a) the cities in which ten or more summer fellows were placed and (b) institutions which hosted ten or more summer fellows in 2012.

Sl. No.	Cities as hosts	No. of SRFs
1	Bangalore	344
2	Hyderabad	159
3	Mumbai	154
4	New Delhi	171
5	Kolkata	114
6	Chennai	74
7	Pune	70
8	Mohali	52
9	Thiruvananthapuram	38
10	Ahmedabad	25

Sl. No.	Cities as hosts	No. of SRFs
11	Manesar	23
12	Delhi	23
13	Dona Paula, Goa	21
14	Dehradun	18
15	Bhubaneswar	16
16	Lucknow	12
17	Kanpur	11
18	Guwahati	10
19	Tiruchirappalli	10
20	Nainital	10

Sl. No.	Institutions as hosts	No. of SRFs
1	IISc, Bangalore	247
2	IIT, Mumbai	69
3	University of Hyderabad, Hyderabad	50
4	BARC, Mumbai	48
5	IISER, Mohali	47
6	NII, New Delhi	31
7	IIT, Chennai	31
8	NCL, Pune	26
9	CDFD, Hyderabad	26
10	NGRI, Hyderabad	24
11	ICGEB, New Delhi	24
12	NBRC, Manesar	23
13	IISER, Kolkata	22
14	PRL, Ahmedabad	21
15	NIO, Dona Paula, Goa	21
16	NCBS, Bangalore	18
17	ISI, Kolkata	18
18	University of Delhi, Delhi (North/South campus)	31
19	IMSc, Chennai	17
20	NCCS, Pune	17
21	CCMB, Hyderabad	17
22	Bose Institute, Kolkata	17
23	AIIMS, New Delhi	17
24	TIFR, Mumbai	15
25	WIHG, Dehradun	14
26	SINP, Kolkata	14
27	JNCASR, Bangalore	14
28	IISER, Pune	14
29	University of Calcutta, Kolkata	13
30	IISER, Thiruvananthapuram	13

Sl. No.	Institutions as hosts	No. of SRFs
31	JNU, New Delhi	12
32	IIT, New Delhi	12
33	IACS, Kolkata	12
34	TIFR – CAM, Bangalore	11
35	ICT, Mumbai	11
36	IIT, Kanpur	11
37	RRI, Bangalore	10
38	RGCB, Thiruvananthapuram	10
39	IIT, Guwahati	10
40	IICT, Hyderabad	10
41	Bharathidasan University, Tiruchirappalli	10
42	ARIES, Nainital	10

Many institutions in the country were also benefited by the programme as several of their own students and teachers got selected under the programme and got an opportunity to work at institutions elsewhere. The following is a list of such institutions from where ten or more summer fellows got selected in 2012.

Sl. No.	Institutions benefited by SRFP	No. of SRFs
1	IIT, Roorkee	55
2	SASTRA University Thanjavur	47
3	BHU, Varanasi	43
4	IISER, Kolkata	38
5	NITK, Surathkal	33
6	IIT, Kharagpur	32
7	BITS – Pilani, Rajasthan	28
8	Pondicherry University Puducherry	27
9	University of Hyderabad, Hyderabad	27

SI. No.	Institutions benefited by SRF	No. of SRFs
10	CUSAT, Cochin	25
11	Bharathidasan University, Tiruchirappalli	24
12	MKU, Madurai	23
13	IIT, Kanpur	22
14	NIT, Warangal	22
15	College of Engineering, Chennai	20
16	IISER, Pune	20
17	NIT, Rourkela	20
18	IIT, Guwahati	19
19	IISER, Bhopal	18
20	IIT, Chennai	17
21	University of Calcutta, Kolkata	17
22	IISER, Mohali	16
23	St. Stephen's College, Delhi	15
24	Jadavpur University, Kolkata	14
25	IIT, Mumbai	12
26	NISER, Bhubaneswar	12
27	TNSU, Coimbatore	12
28	NIT, Tiruchirappalli	11
29	VIT, Vellore	11
30	IISER, Thiruvananthapuram	10
31	ISI, Kolkata	10
32	NIT, Calicut	10
33	SVNIT, Surat	10

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

As part of the Summer Fellowship Programme, a get-together of the students and teachers with mentors and Science Panel members was held on 1 June 2012

at INSA, New Delhi and on 15 June 2012 at IISc, Bangalore. At Bangalore the Academy also arranged two popular lectures for the benefit of students and teachers. G. Srinivasan [RRI, Bangalore (Retired)] spoke on 'The Mysterious Universe!' on 8 June 2012 and Raghavendra Gadagkar (IISc, Bangalore) spoke on 'What can we learn from insect societies?' on 15 June 2012.

REFRESHER COURSES

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

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

A. Refresher Courses in Experimental Physics

The Refresher Courses in Experimental Physics were held under the direction of R. Srinivasan who was instrumental in the conceptualisation and designing of the experiments. These experiments are useful for laboratory programmes at BSc and MSc levels and many universities in the country have adopted these experiments as part of their curricula. In order to conduct the Refresher Courses, a user-friendly kit containing several components has been developed and manufactured under licence by a company in Bangalore: M/s Ajay Sensors and Instruments. The experiments that can be done with the kit were listed in the earlier issues of *Patrika* including some of the new experiments that were added last year.

The following is a list of Experimental Physics Refresher Courses held with R Srinivasan as the Course Director. These form course numbers 37 to 41 in this series.

1. XXXVII. Institute of Technical Education and Research, Bhubaneswar (ITER)

15–30 May 2012

Co-ordinator: V Rama Rao (ITER)

2. **XXXVIII. B.S. Abdur Rahman University, Chennai (BSARU)**

5 – 20 June 2012

Co-ordinators: M Basheer Ahamed / GV Vijayaraghavan (BSARU)

3. **XXXIX. NIT Karnataka, Surathkal**

16 – 31 July 2012

Co-ordinator: KM Ajith (NITK)

No. of Participants: 31 participants from Davangere, Ernakulam, Hospet, Mangalore, Moodbidri, Palakkad, Shimoga, Surathkal, Thirthahalli, Ujire.



Special Lectures: TR Ramadas (Abdus Salam International Centre for Theoretical Physics, Italy).

5. **XLI. St. Xavier's College, Kolkata**

4 – 19 September 2012

Co-ordinator: Subhankar Ghosh (St. Xavier's College)

B. **Other Refresher Courses**

6. **Statistical Physics**

Nehru Arts and Science College (NASC), Kanhangad

30 April – 12 May 2012

No. of participants: 47 participants (26 faculty and 21 students) from Adipur, Calicut, Jaipur Town, Kanhangad, Kannur, Karaikudi, Kolkata, Kudal, Latur, Malappuram, Mumbai, Nagpur, Navi Mumbai, Palakkad, Pune, Salem, Thalassery, Thanjavur, Tiruchirapally, Thrissur.

Course Director: Deepak Dhar (TIFR)

Course Coordinator: KM Udayanandan (NASC)



Resource Persons: R Srinivasan (Mysore), CD Ravikumar (Univ. of Calicut), AV Alex (Union Christian College, Alwaye), JBC Efrem D'Sa (Carmel College for Women, Goa), SM Sadique (Goa), TG Ramesh (NAL, Bangalore).

Special Lectures: MN Satyanarayan and Madhu K (NITK, Surathkal).

4. **XL. Indian Academy of Sciences Annexe, Jalahalli, Bangalore**

16 – 31 August 2012

No. of Participants: 18 participants (5 students and 13 faculty) from Biratnagar, Cachar, Chandigarh, Davangere, Kanpur, Krishnagiri, Mandya, Mizoram, Pala, Patna, Thiruvannamalai, Tirupur, Varanasi

Resource Persons: R Srinivasan (Mysore), Seeta Bharati (Bangalore), Sarbari Bhattacharya (Bangalore University), TG Ramesh (NAL, Bangalore), Sarmishta Sahu (Maharani Lakshmi Ammani College, Bangalore).



Resource Persons: KPN Murthy (University of Hyderabad), Deepak Dhar (TIFR, Mumbai), Gautam I

Menon (IMSc, Chennai), Chandan Dasgupta (IISc, Bangalore), Abhishek Dhar (ICTS, Bangalore), Srikanth Sastry (JNCASR, Bangalore), Prabodh Shukla (NEHU, Shillong).

Extracts from the report:

The total number of invited participants to the Course was 60. Of these 50 were college teachers and 10 students of MSc or research scholars from nearby colleges. The aim of the refresher course was to improve the pedagogical skills of the participating college teachers, and not to introduce them to recent developments in the field. In the opening address, Deepak Dhar emphasized that the courses should not be aimed only at the top 5% of students, but that the teacher should aim that at least 50% of the material is understood by at least 50% of the students. Accordingly, the course was divided into 6 modules of 6 lectures (75 minutes each), which covered the basics of statistical physics syllabus, as covered in standard BSc level courses in most universities. The modules were as follows:

Module 1: Thermodynamics: notions of equilibrium, temperature, entropy, work. Zero, first, second, third law. Basic ideas of approach to equilibrium. Maxwell relations. Variational principles for equilibrium in statistical mechanics. Jarzynski equation. (KPN Murthy, Univ. of Hyderabad).

Module 2: Ensemble theory: Different ensembles, their equivalence, which is better for what. Derivation of different ensembles. Typical calculation of partition functions. Classical ideal gas, Virial expansion, Van der Waals gas. (Chandan Dasgupta, IISc, Bangalore).

Module 3: Ideal Fermi and Bose gases, density matrices, Bose Einstein condensation, cluster expansion for quantum mechanical systems, applications. (Gautam Menon, IMSc, Chennai).

Module 4: Phase transitions: notion of phases, examples of different phases, phase transitions, Ising model, simple mean-field theory of Van der Waals-Weiss. (Srikant Sastry, TIFR Centre for Interdisciplinary Sciences, Hyderabad).

Module 5: Markov Chains, Random Walks, Fluctuation dissipation theorem, Langevin and Fokker-Planck equations. (Abhishek Dhar, ICTS, Bangalore).

Module 6: In this module, it was initially planned to discuss the use of numerical techniques in statistical physics. However, based on feedback from participants, it was partially redesigned, and the first half discussed the basic notions of statistical physics, as covered in Reif, Berkeley Physics course, chapters 1 and 2. In

the second half of the module, techniques of molecular dynamic and Monte Carlo simulations were discussed, with examples of glasses, cars, and markets. (Deepak Dhar, TIFR, Mumbai).

All the resource persons gave a large number of problems that helped in making the concepts easier to grasp. Some of these were worked out in the tutorial sessions. There was a session of roughly one hour duration each day. For the first week, the tutorials were conducted by Deepak Dhar, and in the second week by Prabodh Shukla from NEHU, Shillong.

7. Motivational Bridge Course in Mathematical methods in Physics & Laboratory practices for I and II year B.Sc. Students

Yeshwant Mahavidyalaya, Nanded

14 May – 2 June 2012

No. of participants: 71 participants from different colleges in Nanded and surrounding areas.

Course Director: R Nagarajan (Mumbai)

Course Coordinators: S Ananthakrishnan / RH Ladda / AL Choudhari



Resource Persons: RH Ladda (Latur), AL Choudhari (Aurangabad), SH Patil (Mumbai), Arvind Kumar (Mumbai), R Nagarajan (Mumbai) and others.

8. Theoretical Physics

University of Mumbai

16 – 28 July 2012

No. of participants: 46 participants from Amravati, Bodhgaya, Chennai, Durgapur, Guntur, Karav, Karjat, Kattankulattur, Kumaracoil, Mumbai, Noida, Pedhambe, Raigad, Ratnagiri, Thane, Varanasi.

Course Director: HS Mani (Chennai)

Course Coordinator: Anuradha Misra (University of Mumbai)

Resource Persons: Amita Das (IPR, Ahmedabad), Arvind Kumar (UMDAE-CBS, Mumbai), HS Mani (CMI, Chennai), SH Patil (IIT Bombay), AA Rangwala (University of Mumbai).

The University of Mumbai is shifting to a new semester system from this academic year and for its effective implementation, four new post-graduate centres are being started. This will require many undergraduate teachers to be able to teach at the MSc level. The prime objective of this Refresher Course was to prepare these new teachers to teach at the MSc level.

The subjects covered in the Course consisted of classical mechanics, quantum mechanics, classical electrodynamics and mathematical methods in physics. There were 6-7 lectures in each of the topics and 3 tutorial sessions. The courses were taught at MSc level. Sufficient reading material and problem sheets were provided to the participants and the problems discussed in the tutorials. In addition, there was a popular lecture on Higgs Boson by Sreerup Roychoudhuri from TIFR.

9. Theoretical and Computational Fluid Dynamics

PSGR Krishnammal College for Women (PSGR KCW)

27 August – 8 September 2012

No. of participants: 32 participants from Chennai, Coimbatore, New Delhi, Phagwara, Shimla, Thiruvannamalai, Udumalpet, Vijayamangalam, Warangal.

Course Director: P Kandaswamy (Bharathiar University, Coimbatore)

Course Coordinator: K Sumathi (PSGR KCW)

Resource Persons: P Kandaswamy and S Saravanan (Bharathiar University), N Rudraiah and M Venkatachalappa (Bangalore University), NM Bujurke (Karnataka University, Dharwad), T Amarnath (University of Hyderabad), Maithili Sharan (IIT, New Delhi), M Subbiah (Pondicherry University), K Sumathi (PSGR KCW), N Mohan Kumar (IGCAR, Kalpakkam), S Sreenadh (Sri Venkateswara University, Tirupati).

10. Action Zoology: The Emerging Trends

University of Allahabad

5 – 19 September 2012

Course Director: UC Srivastava (University of Allahabad)

Course Coordinator: Niraj Kumar (NASI, Allahabad)



Refresher Course on 'Theoretical and Computational Fluid Dynamics'

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LECTURE WORKSHOPS

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

1. Transferable Skills – the successful scientist's other toolbox

(a) Manipur University, Canchipur
4 – 5 April 2012

(b) North-Eastern Hill University, Shillong
9 – 10 April 2012

Convener: S Mahadevan

Co-ordinators: Upendra Nongthomba/BB Gupta/
Debananda Ningthoujam

Speakers: S Mahadevan, Upendra Nongthomba (IISc, Bangalore), John Sparrow (University of York, UK), Debananda Ningthoujam (Manipur University, Canchipur), R Sharma and PK Gupta (NEHU, Shillong).

Participants: 55 participants from Manipur University and 52 participants from NEHU.

Topics of lectures: 50 years of the *Operon Model*; what are transferable skills; ethics in scientific research; nurturing science in Manipur: inspirations from biographies of trailblazers; evolution in the microbial world; connecting the dots: personal anecdotes about academic life; the journey is more important than the destination: random walks in science; proteins and proteomics; good teaching; *Drosophila* as model system for studying human muscle diseases.



Lecture Workshop on 'Transferable Skills – the successful scientist's other toolbox'

2. History, aspects and prospects of mathematics in India

(a) Institute of Mathematical Sciences,
Chennai

18 – 19 June 2012

Convener: KN Raghavan

Speakers: SG Dani (TIFR, Mumbai), Siddhartha Gadgil and Manjunath Krishnapur (IISc, Bangalore), Sheetal Dharmatti (IISER, Thiruvananthapuram), BV Rao (CMI, Chennai), Partha Sarathi Chakraborty, Jaya N Iyer, S Viswanath and S Kesavan (IMSc, Chennai), Rajeeva Karandikar (CMI, Siruseri).

Participants: 115 from various colleges in Chennai

(b) Indian Institute of Science, Bangalore
20 – 21 June 2012

Convener: G Rangarajan

Speakers: SG Dani (TIFR, Mumbai), Siddhartha Gadgil, MK Ghosh, G Rangarajan and Manjunath



Krishnapur (IISc, Bangalore), Sheetal Dharmatti (IISER, Thiruvananthapuram), BV Rao (CMI, Chennai), Partha Sarathi Chakraborty, Jaya N Iyer, S Viswanath and S Kesavan (IMSc, Chennai),

Participants: 150 from various colleges in Bangalore.

Topics of lectures: Trigonometry in ancient and medieval India; mathematics, recursion and complexity; non-colliding random walks; a mathematical tour of image processing; some elementary probability; Pontryagin duality for finite groups; topology of algebraic varieties; the Hardy-Ramanujan formula for the partition function; classical identities and Lie algebras; open discussion on job opportunities in mathematics.

3. Plane geometry to rubber-sheet geometry

Harish-Chandra Research Institute and NASI, Allahabad

29 – 30 June 2012

Convener: Satya Deo (HRI, Allahabad)

Co-ordinator: Niraj Kumar (NASI, Allahabad)

Speakers: V Pati (ISI, Bangalore), CS Arvinda (TIFR, Bangalore), SS Khare (NEHU, Shillong), Satya Deo (HRI, Allahabad), Ramji Lal (IIIT, Allahabad).

Participants: 88 participants from various colleges in Allahabad.

Topics of lectures: Quaternions and rotations in 3-space; Euclid, regular solids and a journey through to non-Euclidean geometry; from Euclidean geometry to non-Euclidean geometry with special focus on taxicab geometry; historical motivations of rubber sheet geometry; polygons in hyperbolic geometry.

4. Mathematics

Hans Raj College, Delhi

7 August and 13 August 2012

Convener: Ajit Iqbal Singh (ISI, New Delhi)

Co-ordinator: Mukund Madhav Mishra (Hans Raj College, Delhi)

Speakers: Gadadhar Misra (IISc, Bangalore); Manindra Agrawal (IIT, Kanpur); Alope Dey (ISI, New Delhi), Kapil H Paranjape (IISER, Mohali).

Participants: 150 participants from various colleges in and around Delhi.

Topics of lectures: Numbers; the P-NP problem; variance and existence of orthogonal arrays; modern geometry.

5. Modern trends in chemistry

Periyar University, Salem

13 – 14 August 2012

Convener: R Ramaraj (MKU, Madurai)

Co-ordinator: D Gopi (Periyar University, Salem)

Speakers: P Natarajan (University of Madras), S Chandrasekaran (JNCASR, Bangalore), N Sathya-murthy (IISER, Mohali), S Natarajan (IISc, Bangalore), D Ramaiah and MLP Reddy (NIIST, Thiruvananthapuram), V Subramanian (CLRI, Chennai)



Participants: 250 research scholars, students and teachers from various universities, colleges and institutes.

Topics of lectures: "Click" Chemistry and beyond: diverse chemical function from a few good reactions; structural motifs and shapes of atomic and molecular clusters; new acids in inorganic chemistry; designing of functional dyes for photodynamic therapy; versatile lanthanide – molecular chromophoric building blocks: from design to assembly and functions; molecular dynamics of collagen like peptides; solid state lighting devices.

6. New vistas on mathematical modelling

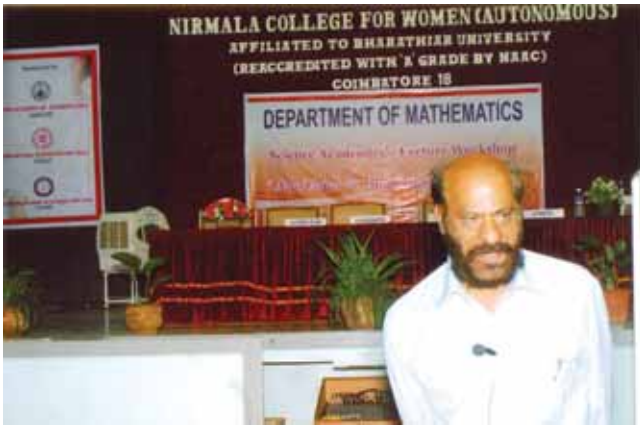
Nirmala College for Women, Coimbatore

13 – 14 August 2012

Convener: PV Arunachalam (Dravidian University, Kuppam)

Co-ordinator: I Arockiarani (Nirmala College, Madurai)

Speakers: PV Arunachalam (Dravidian University, Kuppam), E Balagurusamy (Anna University, Chennai),



P Kandaswamy (Bharathiar University, Coimbatore), BR Nagaraj (TIFR, Bangalore), P Balasubramaiam (Gandhigram Rural Institute, Dindugal), R Arumaganathan (PSG College of Technology, Coimbatore).

Participants: 218 from 31 colleges and 5 universities (Anna Univ., Avinashilingam Univ., Bharatiyar University, Karpagam University., Pondicherry University).

Topics of lectures: Mathematical modelling in human immunology; near boundary flow method for calderon problem in electrical conductivity; mathematical modelling for love and happiness; mathematical modelling of control systems using fuzzy logic approach; inventions through mathematical modelling; stability analysis of Takagi-Sugeno fuzzy time delay systems: LMI approach.

7. Photonics and radio universe

M.M.K. & S.D.M. First Grade College for Women, Mysore

17 – 19 August 2012

Convener: G Srinivasan (Bangalore)

Co-ordinator: PS Usha (MMK & SDM College, Mysore)

Speakers: Hema Ramachandran, Reji Philip, KS Dwarkanath and N Uday Shankar (all from RRI, Bangalore).

Participants: 99 participants (33 teachers and 63 students) in and around Mysore.

Topics of lectures: Laser cooling of atoms; nature of light; use of cold atoms; properties of light; nonlinear optics; intense field non linear optics; seeing through fog/imaging through turbid media; radio universe; basic concepts of radio telescopes; the hydrogen line — a powerful tool to explore the universe; the challenges of observing the invisible universe; important discoveries made from radio observations using the H1 line.



Lecture Workshop on 'Photonics and radio universe'

8. Experimental physics

St. Pious X Degree & PG College for Women,
Hyderabad

24 – 25 August 2012

Convener: SN Kaul (School of Physics, University of Hyderabad)

Co-ordinator: R Komala (St. Pious College)

Speakers: P Kistiah (Osmania University), SN Kaul, S Srinath, Nirmal K Vishwanathan and Ashok Vyudayagiri (all from University of Hyderabad).



Participants: 55 participants from different colleges in Hyderabad.

Topics of lectures: Ferromagnetic domain theory and magnetic hysteresis loops; basic theoretical concepts about electromagnetic induction and superposition of waves; wave optics – interference and diffraction; polarization of light.

9. The pathway to Higgs Boson: models, experiments and beyond...

The American College, Madurai

28 – 29 August 2012

Convener: MVN Murthy (IMSc, Chennai)

Co-ordinator: Richard Rajkumar (The American College, Madurai)

Speakers: G Rajasekaran, Prafulla Behera, Gagan Mohanty, D Indumathi and Naba K Mondal (IMSc, Chennai) and Vivek Datar (BARC, Mumbai).

Topics of lectures: Introduction to the standard model leading to Higgs discovery; precision test of standard model and discovery of Higgs boson; discovery of Higgs and future experiments at CERN; discovery of Higgs particle and its implications.

10. Biotechnology for sustainable development

S. V. University, Tirupati

29 – 30 August 2012

Conveners: Aparna Dutta-Gupta/S Dayananda (University of Hyderabad)

Co-ordinator: M. Rajasekhar (SV University, Tirupati)

Speakers: Aparna Dutta-Gupta, AS Raghavendra, S Dayananda and AR Reddy (University of Hyderabad), TJ Pandian (MKU, Madurai) and K Muralidhar (University of Delhi).

11. Frontiers of Science

Vivekananda College, Bangalore (VC)

3 – 4 September 2012

Convener: KJ Rao (IISc, Bangalore)

Co-ordinator: Chikkahanumantharayappa (VC)

Speakers: G Jagadish, BR Jagirdar, S Asokan, V Nanjundaiah, B Ananthanarayan, E Arunan, KJ Rao and B Gopal (all from IISc, Bangalore), Chikkahanumantharayappa (VC).

Topics of lectures: Shock pressures can do the impossible; for the future fuel go back to hydrogen; sensors are the key to chase the new science; evolution, how much do we know about it; what is the excitement about 'God particle'; hydrogen bond: a molecular beam microwave – spectroscopist's view; chemistry and consciousness; X-ray crystallography the tool which has always pushed the frontiers of science; luminescent materials.

12. Mathematics

B R Ambedkar College, Delhi (BRAC)

13 and 20 September 2012

Convener: Ajit Iqbal Singh (Delhi)

Co-ordinator: Sarla Bharadwaj (BRAC)

Speakers: Rahul Roy and Arunava Sen (ISI, Delhi), S Sivaramakrishnan and MS Raghunathan (IIT, Mumbai).



Topics of lectures: Random walks and electrical networks; an introduction to game theory; google's page rank algorithm; geometry's dictate to arithmetic: falting's theorem.

13. Linear algebra and applications

Lady Shri Ram College, Delhi (LSRC)
21 – 22 September 2012

Convener: Ajit Iqbal Singh (Delhi)

Co-ordinator: Sucheta Nayak (LSRC)

Speakers: MS Raghunathan (TIFR, Mumbai), S Sivaramakrishnan (IIT, Mumbai), Ujjwal Sen (HRI, Allahabad), Debasis Mishra and RB Bapat (ISI, Delhi).

Topics of lectures: Google's page rank algorithm; quantum information theory; exploring theorems in linear algebra using matlab; applications of farkas lemma; when is a tree nonsingular?

14. Emerging trends in chemical sciences

Central University of Tamil Nadu, Thiruvarur (CUTN)
21 – 23 September 2012

Convener: M Palaniandavar (CUTN)

Co-ordinator: V Rajendran (CUTN)

Speakers: M Periasamy (UOH, Hyderabad), PK Das, S Natarajan and S Ramakrishnan (IISc, Bangalore), R Murugavel and KP Kaliappan (IIT, Mumbai), V Subramanian (CLRI, Chennai), M Palaniandavar (CUTN, Thiruvarur).

Topics of lectures: Organometallics and materials chemistry; bioinorganic and biomimetic chemistry; main group chemistry; nanomaterials; organic and bioorganic chemistry; solid state chemistry; biologically active natural products; polymer chemistry; computational chemistry; spectroscopy.

15. Research issues in digital image processing

Dr NGP Arts and Science College, Coimbatore (NGPASC)

25 – 26 September 2012

Conveners: BL Deekshatulu (Hyderabad)/R Krishnan (Amrita Univ., Coimbatore)

Co-ordinator: N Ananthi (NGPASC)

Speakers: BL Deekshatulu (Hyderabad), R Krishnan (Amrita University), TGK Murthy (ARCI, Hyderabad), T Parthasarathy (ISI, Chennai), PVSSR Chandra Mouli (VIT, Vellore), T Senthilkumar (Amrita University, Coimbatore).

16. Thrust areas for future researches in biological sciences

PSGR Krishnammal College for Women, Coimbatore (PSGR KCW)

27 – 28 September 2012

Convener: G Marimuthu (MKU, Madurai)

Co-ordinator: N Ezhili (PSGR KCW)

Speakers: G Marimuthu (MKU), SK Saidapur and Bhagyashri Shanbhag (Karnatak University, Dharwad), S Mahadevan (IISc, Bangalore), A Shanmugam (Annamalai University, Chidambaram), Soundarapandian Kannan (Bharathiar University, Coimbatore).

Topics of lectures: Biology: the basics, complexities & prospects; evolution in the microbial world; scope of research in marine science; biology and behaviour of rats; role of natural selection in shaping organisms; evolution & human health; sexual selection: language of communication for mate selection; siRNA to target breast cancer.

17. Bioinorganic chemistry and its applications

Madurai Kamaraj University, Madurai (MKU)

28 – 30 September 2012

Convener: M Palaniandavar (CUTN, Thiruvarur)

Co-ordinator: R Mayil Murugan (MKU)

Speakers: PT Manoharan (IIT, Chennai), M Palaniandavar and V Rajendran (CUTN, Thiruvarur), AR Chakravarty (IISc, Bangalore), C Pulla Rao (IIT, Mumbai), R Ramaraj (MKU), Shyamalava Mazumdar (TIFR, Mumbai), Sankar Rath and A Raja (IIT, Kanpur), C Sivasankar (Pondicherry University).

REPOSITORY OF SCIENTIFIC PUBLICATIONS OF ACADEMY FELLOWS

The work of creating the Repository has been completed. At the end of September 2012, the essential statistics were as follows:

No. of past Fellows covered	: 627
No. of present Fellows covered	: 994 out of 995
No. of items of metadata	: 88745
No. of full text PDF's	: 20269

In achieving these contents, the major work was done by Messrs. Informatics Ltd., Bangalore.

Hereafter, to improve the collection of past publications and keep upto date with current ones, Fellows will receive requests twice a year to send their latest publication details. Efforts to trace remaining publications of past Fellows will continue. Repository work will be handled by Academy staff with external help when needed.

Indexing of this Repository by search engines worldwide is quite extensive.

It may be useful to look at some simple numbers that measure usage of the repository. In general the

accuracy of statistics of usage of Web content can be debatable for a number of reasons. And different usage analysis tools give somewhat different results depending on their default rules.

At the end of August 2012 there were close to six million page views (including lists, abstract views and full text files). Of these, the number of full text views/downloads were approximately 380,000. Approximately two-thirds (over 235,000) of the full text views/downloads were from outside India.

Other statistics can be generated, but some checks and evaluation of these are required before they can be made available,

The repository can be used in several ways. An obvious way is to go to the repository website (<http://repository.ias.ac.in>) and browse the content. Browsing is possible by name of Fellow, Academy Sectional Committee name and year of publication of paper. Each of these brings up lists of publications included in the repository. But the more interesting way in which the repository is used is when a user comes to the repository via a search engine (Google etc.) search result. This type of use underscores the value of searchable online repositories.

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HINDI WORKSHOP

The Academy jointly with Raman Research Institute had organized Hindi Week celebrations during 10-14 September 2012. Various competitions on areas such as Administrative Terminology, Noting & Drafting, Essay Writing etc. were organized.

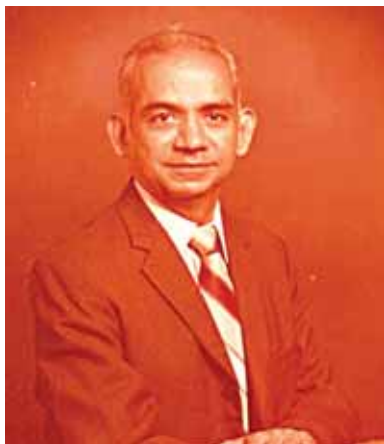
On the concluding day, a special lecture by Professor KS Valdiya, FASc was arranged. He spoke on "Himalaya Ki Teen Mahaan Nadiyaan".

Prizes were distributed to the winners of the several competitions held for the event.



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OBITUARIES



**Samavedam Laxmi Narasimha Gopala
Krishnamachari (elected 1975)**

Samavedam Laxmi Narasimha Gopala Krishnamachari, known as 'Chari' to his friends and colleagues, was born at Visakhapatnam on 20 September 1928. After a scientific career spanning more than 50 years, he passed away in Bangalore on 5 February 2012. Krishnamachari was a gentle and sensitive person, whose passing away is felt deeply by all who knew him, and especially by those who came into contact with him during his professional life.

After completing his high school education from Kandupuri Veeresalingam Pantulu High School, Rajamundry, Chari continued his graduate and postgraduate studies at Andhra University, Waltair, from where he obtained in 1956 a D Sc degree for his research on spectroscopic studies of substituted benzenes. During this time he carried out extensive studies on the ultraviolet, infrared and Raman spectra of many mono- and di-substituted benzenes, providing considerable amount of spectroscopic data on the ground and excited states of these molecular species, some of which have since been used by many groups for correct interpretations of related molecular species.

In 1958, the Atomic Energy Establishment, Trombay (AEET) of the Government of India (now the Bhabha Atomic Research Centre) was planning to set up a group, under the guidance of R. K. Asundi, for research in spectroscopic applications in nuclear energy programmes. Chari joined this group as a Scientific Officer and Head of the Molecular Electronic Spectroscopy group. Soon thereafter, he was deputed to the National Bureau of Standards

(present NIST), where he worked with Broida on the spectroscopy of free radicals and other transient species at very low temperatures, down to 4 K.

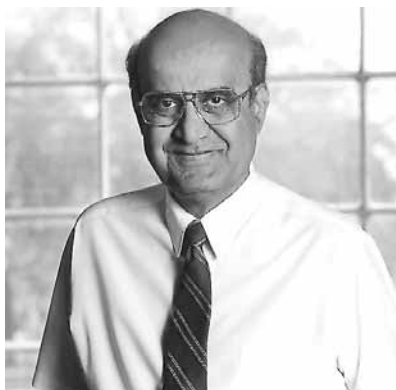
On returning to AEET, Chari continued his studies on transient species in discharges, in areas relevant to nuclear programmes. A method was developed for analysis of isotopic composition of boron using the spectrum of BO molecule produced in an electrical discharge. This was useful for quality control of BF₃ used in neutron counters. One of the most important results obtained by Chari and his colleagues in the course of these studies on molecular species in discharges, was the discovery of the xenon and krypton fluoride excimer molecules, interpreting their spectra as bound-free state transitions. As is well known, these transitions form the basis for the present day high-power, UV, rare gas excimer lasers. During this time, he also set up the *first* flash photolysis unit in the country, to study the spectra of free radicals and other transient species. In the next few years he carried out extensive studies in several media and the spectra of several new free-radical species like HCCO, HCCS, HCCSe, HNC, etc. were studied. The above researches were further augmented by Chari through the setting up of a pulsed laser flash photolysis system. Time-resolved spectroscopic studies on energy transfer processes in excited electronic states, excited state-reactions of pollutants with atmospheric molecular species, excited state reactions of hydrocarbon pollutants, etc., were some of the areas studied by Chari with the two flash photolysis units.

Around 1967-68, Chari went as a visiting scientist to the prestigious National Research Council of Canada (NRC), Ottawa, where he continued his studies on excited states of polyatomic molecules in the Physics Division with D. A. Ramsay and others. This was followed by a fairly long period in BARC, when substantial contributions were made by his group on excited state interactions, mercury-sensitized photochemical reactions, reactions of singlet oxygen, etc. In 1980, he again went to NRC, this time as visiting scientist at the Herzberg Institute of Astrophysics, where he continued his studies on time-resolved spectroscopy of polyatomic molecules. This was followed back home, with studies on new free radicals, time-resolved studies on photo-dissociation and photo-association of excited molecular species, spectra of free radicals with isotopic substitution, etc. Along with these studies, he also started what is today called laser-induced breakdown spectroscopy, for analytical applications.

Chari showed that a true scientist never retires from his passion for research, by continuing his research activities even after his retirement from BARC in 1988. He started the investigation of spectra of molecular species of astrophysical importance, in collaboration with scientists at the Indian Institute of Astrophysics, Bangalore. With his experience in the area of energy-transfer processes in molecular systems, during the last 2-3 years he also got involved in the processes that may improve the efficiency of existing solar-energy converters. He thought of investigating methods which can lead to conversion of the shorter wavelength UV and visible radiation to near infrared closer to the band gaps of the semiconductor materials used in solar cells. He started to investigate these possibilities in collaboration with scientists from BARC and suggested several configurations for this purpose. We hope that these ideas of Krishnamachari will be probed in detail by some of his younger colleagues, leading to the design of highly efficient solar-energy converters.

Chari was loved by all those who came into contact with him, for his gentle nature and the ever-pleasant attitude that he displayed and was respected by the spectroscopists of this country for the deep understanding he showed in the field of spectroscopy of polyatomic molecules. He will be truly missed by all his colleagues and students. He is survived by his wife, a son and a daughter.

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Lakshmangudi Krishnamurthy Doraiswamy
(elected 1974)

Lakshmangudi Krishnamurthy Doraiswamy, or LKD, as he was fondly referred to by his colleagues in India and LK by colleagues in America passed away at Danville in Pennsylvania, USA on 2 June 2012. He was born on 13 May 1927 in Bangalore. LKD was a gentleman scholar with a holistic vision and an eye for

minute details. No wonder he impacted the lives of numerous people who came within the sphere of his influence. Acclaimed worldwide for his contributions to engineering science, he was one of the founding fathers of modern chemical engineering research and practice in India. After receiving his BS from the University of Madras in 1946 and a Ph D in chemical engineering from the University of Wisconsin in 1952, he joined the National Chemical Laboratory (NCL), Pune in 1954 – the premier research institute of the Council of Scientific and Industrial Research (CSIR) in chemical sciences. LKD steadily rose from the position of a senior scientist to become the first non-chemist director of the laboratory. After retirement in 1989, he joined as Glenn Murphy professor of engineering (1989–92) at Iowa State University and continued in the chemical engineering department where his final position was the Anson Marston distinguished professor of engineering (Emeritus).

His work in theoretical and experimental catalytic reaction engineering, gas-solid non-catalytic reactions, phase-transfer catalysis, sonochemical reaction engineering, adsorption, solid-solid reactions, gas-liquid and slurry reactions, fluidization, stochastic modelling of reactions and reactors, thermodynamic and transport properties and strategies for rate enhancement led to seminal contributions. He was responsible for establishing organic synthesis engineering as a modern discipline. He developed a number of processes that have gone into commercial production. These include catalytic as well as non-catalytic processes in both batch and continuous modes. A novel catalytic process for dimethylaniline developed by him along with his team was applauded in the *Chementator* in the journal *Chemical Engineering*.

Half a dozen other processes developed by him as a leader have won awards of the Indian Chemical Manufacturers' Association (ICMA), the highest recognition for process development and engineering in India. LKD believed in bringing together groups of people who would cover the entire spectrum from the highly fundamental to development to design. LKD travelled extensively to deliver special, endowment, plenary and other notable lectures. He served as a member of various prestigious editorial boards, company directorships and several selection committees, including those for election to various scientific academies.

He is the recipient of numerous awards in India and internationally, including the Padma Bhushan,

the Jawaharlal Nehru Award for lifetime achievement in engineering and technology, the Diamond Jubilee Award of the Indian Institute of Chemical Engineers honouring the 'legends' of Indian chemical engineering, the Richard H. Wilhelm and William H. Walker Awards of the American Institute of Chemical Engineers, and honorary doctorates from the University of Wisconsin, USA and the University of Salford. He has published about 180 papers in international journals many of which are frequently cited and some of which are incorporated as standard methods in textbooks. Most recently, he was elected to the US National Academy of Engineering. True to his character, until the very end LKD was co-authoring a graduate-level textbook on reaction engineering and writing a 'non-engineering book' on the nature of time. His panoramic breadth of knowledge is reflected in his 2010 book 'Excellence in an Overlapping Culture: The Big History of India's National Chemical Laboratory'. To honour his remarkable career both in India and the US, the L. K. Doraiswamy lecture series was set up to enable an internationally recognized scientist or engineer to present seminars at both Iowa State University and NCL. His selflessness, penchant for impeccable English, sterling sense of ethics, gentle but strong guiding hand, whimsical humour and infectious enthusiasm will be irretrievably missed.

In the later part of his life LKD took to writing poems – although this part of his personality is not known to most people. Two things that especially distinguished LKD were: (a) his penchant for achieving excellence and a state of perfection, and (b) his ability to seek and identify people with talent. He always said that excellence is a state of mind, that you cannot be excellent in one thing and not in others, and that excellence can be gained by repeated improvement and performance. LKD also had a tremendous knack of identifying people with talent which helped strengthen NCL's place as a premier laboratory. He would recruit, encourage and create an empowering environment for them to flourish and help them rise to a level of leadership in the chosen areas of their profession.

His legacy will live on through his varied professional achievements, the institutions he has built, and the many students, colleagues and family members he has mentored. He is survived by his son, daughter and three grandchildren.

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Jagdish Chandra Bhattacharyya (elected 1979)

J. C. Bhattacharyya (JCB) passed away in Delhi on 4 June 2012. An eminent instrumentation scientist and observational astronomer, JCB is well known for his discoveries of the atmosphere of Jupiter's satellite Ganymede and of the ring system around Uranus. The next generation of scientists he had trained and encouraged added further discoveries that include outer rings of Saturn, and six main belt asteroids, one of which bears the name Bhattacharyya.

Born in a family of scholars and educationists, grandson of Mahamahopadhyaya Pramath Nath Tarkabhusan – an eminent Indologist and scholar of Vedantic Philosophy, and son of Mrinalini and Phatik Chandra Vidyabhusan – a Sanskrit and science teacher, JCB obtained his M Sc degree from the Institute of Radio Physics and Electronics at Calcutta University in 1951. After a brief stint at the Calcutta University as Ghosh Research Scholar, he joined the India Meteorological Department (IMD) as Assistant Meteorologist in 1953. Here he developed instruments for meteorology, and undertook some scientific studies in solar astronomy and ionospheric physics. Rising through the ranks, he was appointed Assistant Director of the Astrophysical Observatory at Kodaikanal in 1964, where he undertook research in the areas of solar and solar system astronomy using the state-of-the-art instruments that he himself designed and fabricated. In close association with the director, the late M. K. Vainu Bappu, he carved out the Indian Institute of Astrophysics (IIA) in 1971 and under the guidance of M. G. K. Menon nurtured it after the untimely demise of Bappu in 1982 until his own superannuation in 1990.

At Kodaikanal, JCB undertook more ambitious projects with encouragement and support from Bappu. The first of these, design and fabrication of a solar magnetograph, earned him the D Phil degree

of Calcutta University in 1971. He used this instrument to measure the small-scale velocity field in solar chromosphere. In the meantime, an opportunity was presented of observing the 1970 solar eclipse in Mexico. Earlier expeditions of the Kodaikanal Observatory had all failed mostly due to clouds. The funds sanctioned for the Mexican expedition were just enough for the travel of two persons with the equipment. Bappu and JCB could observe the eclipse successfully, and among other things, detect faint, low excitation emission lines in the solar corona. JCB later coordinated the national efforts to study the 1980 total solar eclipse in India.

By this time, Bappu was already developing a new observatory at Kavalur in Javadu hills of North Arcot district in Tamil Nadu. When Jupiter would occult the star β Scorpii in 1971, a 15-inch telescope fabricated at the Kodaikanal Observatory was in regular use with a photoelectric photometer. The chart recorder was too slow to record the occultation in detail, and JCB decided to record it by photographing an oscilloscope screen, which resulted in the discovery of stratification in Jupiter's atmosphere. Occultation of the star SAO186800 by Ganymede was observed with the Zeiss telescope in 1972 as part of an international collaboration. JCB could increase the time resolution to 0.1 sec, which helped in detecting the thin atmosphere around this Jovian satellite. Complex dark rings of Uranus were discovered in 1977 during an occultation of a faint star using the conventional chart recorder which sufficed as the event was a slow one. His student R. Vasundhara detected possible particulate matter in the magnetosphere of Saturn, through observations of an occultation in 1986. JCB continued to increase the time resolution of photoelectric photometers aiming to undertake fast recording of occultation of stars by the moon, which would help in estimating diameter of stars directly.

Apart from encouraging scientists to build instruments for their needs, JCB also recruited engineers and set up a team for technology development. Development of hardware and software controls of telescopes, dome and new generation detectors such as charge-coupled devices were a few of the areas where considerable capabilities could be attained in the country.

The 2.3 m telescope project was conceived and initiated by Bappu in the 1970s and JCB took full charge of its electronic control systems apart

from playing a supportive role in many other aspects. When Bappu passed away in 1982, the indigenous telescope was still under fabrication. Its successful completion, assembly and commissioning in 1985 was achieved through the untiring efforts and leadership of JCB. The telescope was inaugurated on 5 January 1986 by the then Prime Minister Rajiv Gandhi, who, along with his children, glimpsed the Comet Halley and several deep-sky objects directly at its prime focus. The telescope is India's largest facility in optical astronomy to this date, and has been serving national astronomers and students in their research programmes.

JCB provided strong support through IIA to the DST project of astronomical site survey in Leh, already initiated by Bappu for the next-generation telescope.

Opportunities for research in astronomy and astrophysics were extremely limited in the country before 1980. JCB devoted considerable efforts to establish graduate schools. In addition to guiding students working in the areas of astronomical techniques, Sun and solar system astronomy, JCB assumed the responsibility of supervision of Bappu's students. The Joint Astronomy Programme of the Indian Institute of Science, involving several astronomy institutions, was initiated during his tenure, where he taught a course on astronomical techniques for several years. He went on to lay a firm foundation of IIA's graduate school and encouraged younger colleagues to teach as also to supervise projects. As the President of the Astronomical Society of India (1986–1988), he energized its programme on popularization of astronomy, especially to train students and teachers in astrophysics. His popular articles in Bengali and English magazines, which were written from 1977 onwards, inspired many students to take up astronomy as a career.

The structure of IIA, as it exists today, owes itself fully to JCB. He had initiated the new campus of IIA in Bangalore, leading a small group and setting up an electronics laboratory in the space provided by the Raman Research Institute during the early 1970s. The Institute moved to its present Koramangala campus in 1975 and the infrastructure development continued for nearly a decade. With JCB taking the reins in 1982, one witnessed his skill in institution-building: setting up of the academic faculty, of departments named as Group Committees,

instrumentation division, administrative structure, various benefits to the employees – such as career development opportunities, medical scheme and arrangements for residential accommodation. He fostered an atmosphere of academic discussions, involved scientists in the management of the Institute, and provided adequate administrative support to the academic staff. He set an example of personal integrity in public service, understood and followed rules and regulations of the government in the spirit of promoting discipline, transparency and accountability. Though some of the activities and organizational structures he established at IIA have undergone changes with time, the Institute stands firmly on the foundation he had laid.

Those who worked with JCB, or only just met him, would remember his smiling face which he wore even while working on difficult problems of management. At home and elsewhere, he was a perfect host, entertaining his guests through his culinary skills, sense of humour, and his interest in music, history and literature. Though he conducted himself in appropriate reserve in matters personal to staff members, he was always ready to provide sincere advice if called upon.

Following superannuation, JCB continued to be associated with IIA, as CSIR Emeritus Scientist (1990–1993), Emeritus Professor (1993–1995), Honorary Professor (1995–1997) and Member of Governing Council (1997–2007). He served on many advisory committees and working groups at both national and international levels over the last two decades of his tenure. He was associated with the Jawaharlal Nehru Planetarium for over two decades. He was Editor of the Journal of Astrophysics and Astronomy published by the Indian Academy of Sciences from 1988 to 1991. He was elected Fellow of all the three national science academies, the Institution of Electronics and Telecommunication Engineers, and was President of the IAU Commission 9 on Instruments and Techniques (1992–1995).

With his passing away, India has lost one of its founding fathers of modern experimental optical astronomy and an exemplary head of a scientific organization. He leaves behind his wife, daughter and son.



Rajendra Nath Lakhanpal (elected 1976)

Rajendra Nath Lakhanpal passed away in Lucknow on 19 January 2012. He was a distinguished person known for his dedication as a scientist and his integrity and humanism as a person. He was a palaeobotanist of great distinction whose contributions gained international acclaim and recognition. Lakhanpal was born on 5 August 1923. He earned his Master's degree in botany from the University of Lucknow in 1944. His research career began in January 1945 when he joined Birbal Sahni in Lucknow University as a Research Fellow of the Burmah Oil Company to carry out research in palaeobotany. In 1947, he was appointed Senior Research Assistant under Sahni in a scheme on the Measurement of Geological Time sponsored by CSIR. When the Institute of Palaeobotany was founded in Lucknow in 1949, he was appointed Junior Scientific Officer in the Institute. His studies on Tertiary plant fossils of India and on microfossils of the Salt Range, Punjab, carried out under the supervision of Sahni earned for him the Ph D degree of the Lucknow University in 1952. This work also earned him in the same year a UNESCO scholarship to pursue palaeobotanical research with R. W. Chaney at University of California, Berkeley. The visit abroad gave him the opportunity to visit centres of palaeobotanical studies in USA, UK, France, Belgium and The Netherlands, and benefit from interactions with leading scientists in these centres. He then returned to the Institute (now the Birbal Sahni Institute of Palaeobotany [BSIP]) where he was promoted as Senior Scientific Officer. From then on Lakhanpal served as Scientist, Assistant Director, Deputy Director, Distinguished Scientist (1984) and finally Emeritus Scientist (1984–1988) at the Institute. He also organized the Fossil Plant Collection and was an active participant in the many activities concerned with the development of the Institute in its formative years.

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During his fruitful career as a scientist, Lakhanpal embraced three areas: palaeobotany, palaeoecology and palynology, a reflection of the breadth of his interests. His outstanding work was quite clearly on the floristic composition, palaeoecology and phytogeography of the Tertiary flora of India, and those of Central Africa and northwestern USA. Indeed, he is reckoned an authority on Tertiary floras. His division of the Tertiary floras into Palaeogene and Neogene is widely accepted.

Lakhanpal pioneered palynological studies in India and several students trained by him continued research on Recent and Quaternary palynology initiated by him at BSIP. Naturally, palynological research flourished.

Apart from his many original papers, Lakhanpal authored a book, 'The Antiquity of Angiosperms' (1979). He also co-authored the 'Catalogue of Indian Fossil Plants' published in 1975.

Lakhanpal was elected to the Fellowship of the Indian Academy of Sciences in 1976. He was also a Fellow of the Indian National Science Academy and the National Academy of Sciences, India. He led

the Indian team in the Indo-Japanese Expedition to Eastern Himalayas in the summer of 1960. He was President, Palaeobotanical Society (1983), was Editor-Secretary and Chief Editor, *Palaeobotanist* (1976–1984) and Chief Editor, *Geophytology* (1971–1973). He was a recipient of the Birbal Sahni Medal of the Indian Botanical Society (1983) and of the XII International Botanical Congress Medallion presented to him at the Congress in Leningrad in 1975.

Lakhanpal was highly regarded by the international community of botanists and palaeobotanists. He was a gentleman and scholar of dignity, modesty and friendliness. His long and classic innings at BSIP from the time he joined the Institute at the time it was founded (1949) until 1988, is a genuine measure of the beauty of interaction, of how well he got on with his colleagues. Interestingly, Lakhanpal was a Founder Member of the Society for Scientific Values, whose objective was to promote integrity, objectivity and ethical values in the pursuit of science. There is much to learn from the science and humanism of Lakhanpal for those in the pursuit of not only botany and palaeobotany but also other disciplines, many of which are closely related.

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