

Experimental chemistry

University of Hyderabad, Hyderabad

November 27–December 10, 2006

No. of participants: 16



Course Director: A Samanta (University of Hyderabad)

Resource Persons: D Basavaiah, M Durgaprasad, KC Kumara Swamy, S Mahapatra, T Jana, Lalitha Guruprasad, DB Ramachary, R Nagarajan, P Raghavaiah, TP Radhakrishnan, A Samanta, MJ Swamy, AK Bhuyan and SK Das (all of University of Hyderabad).

The teacher participants were from Ahmedabad, Ankola, Annamalainagar, Bangalore, Channapatna, Jalandhar, Kolkata, Nandgaon, Nashik, Samastipur, Shillong, Thanjavur, Visakhapatnam, VV Nagar, Warangal.

Extracts from the report

This refresher course, which was the first of its kind in chemistry organized by the Academy was formulated keeping in view the need to strengthen the experimental chemistry programmes at the undergraduate and postgraduate levels in the country. The course involved experiments covering all major branches of chemistry. The course comprised 12 laboratory experiments, 13 lectures and a demonstration experiment. The laboratory experiments were in organic chemistry, inorganic chemistry, physical chemistry, materials chemistry and computational chemistry. Each participant was provided a book on experimental chemistry by Anil J. Elias, Universities Press, 2002.

The course began with a lecture by KC Kumara Swamy on laboratory safety in which he discussed at length incidents of common accidents in the laboratory, the precautions to be taken to avoid such accidents, practices desirable inside a chemistry laboratory and the need to maintain proper laboratory records. The lecture was followed by an out-door demonstration of the use of different types of fire extinguishers, blankets, etc. in extinguishing accidental fire in the laboratory.

The first day was devoted to demonstration experiment of the course in which the participants were acquainted

with a single crystal diffractometer. P Raghavaiah demonstrated the use of diffractometer and explained the key steps involved in crystal structure determination. He also showed specialized application such as determination of Miller indices of crystal planes, a concept familiar in undergraduate curriculum.

The experiments in organic chemistry included preparation, purification and characterization of organic compounds, preparation of 2-phenylpent-4-en-2-ol, synthesis of isoborneol and borneol by stereoselective reduction of D-camphor using NaBH_4 . Realizing the importance of computational tools in understanding chemical problems and interpreting the results, one day was devoted to computational studies using commercially available software.

T Jana designed an experiment on synthesis of polymeric materials where polystyrenes of three different molecular weights were synthesized by emulsion polymerization using different concentrations of sodium dodecyl sulphate as emulsifier in the reaction mixture. In a subsequent experiment, the first in physical chemistry, the molecular weights of synthesized polystyrenes were determined using viscosity measurements.

The inorganic chemistry experiments consisted of preparation of cis- and trans-bis(glycinato)copper (II) and tris(thiourea) copper (I) complexes. This experiment was introduced to highlight geometrical isomerism in coordination complexes, taking examples of simple square planar copper (II) compounds, synthesis of alum from aluminium foil.

The physical chemistry experiments included determination of the pK_a value of an indicator, methyl red, using colorimetric/spectrophotometric measurements, and principles of chemical kinetics. The other experiment was fabrication of silver nanoparticles by reduction of silver nitrate using glucose, followed by addition of starch as a stabilizing agent.

Although experiments involving titrations are in the syllabi of most undergraduate courses, precipitation titration as a method of quantitative analysis has not found its place in the college curricula. An experiment was introduced on the estimation of silver by this method.

The last day of the course was devoted to a morning lecture by A Samanta followed by an interaction session with the teachers.

Tensors and their applications in engineering sciences

Indian Institute of Science, Bangalore

December 11–23, 2006

No. of participants: 11



Course Director: CS Jog (IISc, Bangalore)

Resource Persons: CS Jog, Diptiman Sen, KS Gandhi and R Narasimhan (all of IISc, Bangalore)

Topics covered: Indicical notation; vectors; rigid-body dynamics; second-order tensors; orthogonal tensors and its properties; symmetric and skew-symmetric tensors and their properties; differentiation of Cartesian tensors; fluid mechanics of interfaces; covariant and contravariant components of tensors; differentiation of curvilinear tensor components; applications of tensors to problems in elasticity; solutions in linearized elasticity; applications of tensors to problems in fluid mechanics and classical plasticity.

The teacher participants were from Bhopal, Chandigarh, Jabalpur, Jalandhar, Kolkata, Manipal and Thiruvananthapuram.

LECTURE WORKSHOPS

Frontiers of organic chemistry

St. Pious College, Hyderabad

September 1–2, 2006

Convener: M Periasamy (University of Hyderabad)

Co-ordinator: Mala Das Sharma (St. Pious College)



Speakers: Ahmed Kamal and M Lakshmikantham (from IICT-Hyderabad), MS Shashidhar (NCL, Pune), KR Prasad (IISc, Bangalore), D Basavaiah, M J Swamy, KC Kumara Swamy and M Periasamy (all from University of Hyderabad)

Participants: 440 students and faculty from 22 colleges – affiliated to Universities of Osmania, Andhra and Kakatiya

Topics covered: Development of new drugs; transesterification reaction in crystals; chemistry of biomolecules; the Baylis–Hillman reaction; designing a green synthesis; chirality in industry; allenes and alkynes as substrates in homogeneous catalysis; and concepts of chirality in organic reaction mechanism and synthesis.

Frontiers in chemistry

Govt. Model Science College, Jabalpur

September 15–16, 2006

Convener: N Sathyamurthy (IIT, Kanpur)

Co-ordinator: Anil Kumar Bajpai (Govt. Autonomous Science College, Jabalpur)

Speakers: N Sathyamurthy, JN Moorthy, RN Mukherjee and YD Vankar (all from IIT, Kanpur)

Participants: 180 students and teachers from colleges in Jabalpur

Topics covered: Atoms; molecules and their interactions; molecular recognition and supramolecular chemistry; modelling hydrolytic enzymes; modern reagents in organic synthesis; and carbohydrates.

Frontiers of physics

University of Mumbai

October 9–11 2006

Conveners: Rohini M Godbole (IISc, Bangalore) and RV Gavai (TIFR, Mumbai)

Co-ordinator: Anuradha Misra (University of Mumbai)

Speakers: Rohini M Godbole and V Nanjundiah (IISc, Bangalore), Noba Mondal, Rajiv V Gavai, Sunil Mukhi, M Barma, Arnab Bhattacharya (all from TIFR, Mumbai), S Umasankar and UA Yajnik (IIT, Mumbai), R Nityananda (NCRA, Pune), Ajit Kembhavi and Varun Sahnii (IUCAA, Pune).

Participants: 170 students and faculty from university and colleges in Mumbai and Ratnagiri

Topics of lectures: High energy physics; astrophysics and cosmology; condensed matter physics.

Molecular endocrinology

Sree Narayana College, Kannur

October 26–27 2006

Convener: K Muralidhar (University of Delhi)

Co-ordinator: K Sudha (Sree Narayana College, Kannur)



Speakers: K Muralidhar, G Anilkumar (Sree Narayana College, Kannur)

Participants: 92 Post-graduate students and faculty from various colleges in Kannur and universities such as Calicut, Pondicherry, Bharathidasan, Mangalore and Vellore

Lectures delivered: Nature of reductionist biology and molecular endocrinology; structural basis of hormonal activity; biosynthesis and regulation of hormone secretion; mechanisms of hormone actions; nuclear receptors; steroid receptors and techniques in molecular endocrinology.

Modern biology

St. Pious College/Univ. of Hyderabad

October 27–28 2006

Convener: A S Raghavendra (University of Hyderabad)

Co-ordinator: Vindhya Vasini Roy (St. Pious College, Hyderabad)



Speakers: PM Bhargava, Ramesh V Sonti (both from CCMB, Hyderabad), AR Reddy, P Appa Rao, AS Raghavendra, M J Swamy (all from University of Hyderabad), D Balasubramanian (LVPEI, Hyderabad), J Nagaraju and Shekhar C Mande (from CDFD, Hyderabad)

Participants: 400 students and faculty from universities and colleges in Hyderabad

Topics covered: Attack and defense in pathogen plant interactions; how plants fight drought; bio-inoculants for sustainable agriculture; signal transduction in stomatal guard cells; DNA and its applications to fingerprinting; understanding biology through protein structures; lipid membranes; biotechnology.

Basic concepts in modern biology

Amrita University, Kollam

December 28–29, 2006

Convener: V Nagaraja (IISc, Bangalore)

Co-ordinator: G Anil Kumar (Amrita Vishwa Vidya Peetham, Kollam)



Speakers: V Nagaraja, D N Rao, R Manjunath (all from IISc), George Thomas (Interfield Laboratories, Kochi) and Martin Reick (Amrita University, Kollam)

Participants: 43

Lectures delivered: Regulation of gene expression; restriction enzymes and DNA repair; concepts of immunology; plant biotechnology; biological rhythm in metabolism.

Emerging trends in research in science

Christ College, Bangalore

January 12–13, 2007

Co-ordinator: Mayamma Joseph (Christ College, Bangalore)

Speakers: Vasant Natarajan, Rohini M Godbole, G Rangarajan, P N Rangarajan, S Umapathy, S Ramakrishnan (all from IISc), Sanjeev Jain (NIMHANS), and R L Karandikar (Cranes Software, Bangalore)

Participants: 90 students from 10 colleges in Bangalore

Lectures delivered: Ultra cold atoms near absolute zero; glimpses of physics at the heart of matter; traditional, modern and futuristic vaccines; the maddening hunt for madness genes; chaos; cryptography; laser spectroscopy; polymers as a unique class of materials.

Frontier lectures in biotechnology

St. Aloysius College, Mangalore

January 30–31, 2007

Convener: V Nagaraja (IISc, Bangalore)

Co-ordinator: Asha Abraham (St. Aloysius College), Mangalore



Speakers: V Nagaraja, P N Rangarajan, D N Rao, K Somasundaram and Utpal Nath (all from IISc).

Participants: 200 students and faculty from colleges in Mangalore

Lectures delivered: Regulation in gene expression; stem cell therapy; cancer diagnosis and therapy; gene therapy; abzymes and protein engineering; plant stem cells; affinity purification of enzymes and their kinetic properties; plant molecular genetics; restriction enzyme; vaccine design and development.

Frontier lectures in biology

Karnatak University, Dharwad

February 1–3, 2007

Convener: Bhagyashri A Shanbhag (Karnatak University)



Speakers: D P Kasbekar (CCMB, Hyderabad), Vinay Luthra, Bhagyashri A Shanbhag, S K Saidapur (all from Karnatak University), S Kartik (IISc, Bangalore), J Nagaraju (CDFD, Hyderabad), T Nandedkar (NIRRH, Mumbai), A P Gore and S A Paranjpe (Pune University).

Participants: 150 undergraduate and post-graduate students and faculty from life science departments and colleges in Dharwad

Topics covered: Conservation and biodiversity; evolutionary biology; genetics and molecular biology; nanotechnology; biostatistics.

Frontiers in animal sciences

Goa University, Goa

February 5–6, 2007

Convener: SK Saidapur (Karnatak University)

Co-ordinator: AB Shanbhag (Goa University)



Speakers: SK Saidapur, Ramesh Bhonde (NCCS, Pune), Mewa Singh (Mysore University), LS Shashidhara (CCMB, Hyderabad), and Victor Smetacek (Alfred Wegner Institute, Germany)

Participants: 120 students and teachers from departments of life sciences of Goa University and 6 other colleges in Goa

Topics of lectures: Natural selection in action; stem cells and regenerative medicine; distribution patterns of wild mammals; a fly's view of development; primate societies; comparative and functional genomics; islet neogenesis from stem cells; arms race in the plankton.

Nonlinear dynamics

Govt. Arts College, Coimbatore

February 9–10, 2007

Convener: M Lakshmanan (Bharathidasan University)

Co-ordinator: S. Vijayalakshmi (Government Arts College, Coimbatore)



Speakers: M Lakshmanan and S Rajasekar (both from Bharathidasan University), K Ganesan (VIT, Vellore), V M Nandakumaran (CUSAT, Cochin), K Murali (Anna University, Chennai), K Porsezian (Pondicherry University), V Selvarajan (Bharathiar University, Coimbatore) and P Rajasekaran (Government Autonomous College, Coimbatore)

Participants: 151 students and faculty from the home department

Topics of lectures: Solitons; nonlinear oscillators; chaos in technology and chaotic cryptography; laser systems; nonlinear electronic circuits; optical solitons in fibre communications.

Chemistry

Mangalore University
February 10–11, 2007

Convener: Uday Maitra (IISc, Bangalore)

Co-ordinator: A M A Khadar (Mangalore University)



Speakers: PK Das, Uday Maitra, G Mugesh, KR Prasad (all from IISc, Bangalore)

Participants: 115 students and faculty from various departments of the university and other colleges in Mangalore

Lectures delivered: Symmetry and spectroscopy; stereochemistry and conformation; bioinorganic chemistry; transition state theory; bio and medicinal inorganic chemistry; chirality and bio-active natural products in drug development; chromatography.

Frontier lectures in biology

Bangalore University
February 22–23, 2007

Convener: HA Ranganath (Bangalore University)

Co-ordinator: Geetha Bali (Bangalore University)

Speakers: T K Kundu (JNCASR, Bangalore), Gaiti Hasan (NCBS, Bangalore), Mewa Singh (University of Mysore),



V Nagaraja, Umesh Varshney, K Muniyappa, Utpal Nath and R Medhamurthy (all from IISc, Bangalore).

Participants: 400 students and faculty from Bangalore University

Topics of lectures: Gene expression; diseases and therapeutics; calcium signalling mechanisms; mechanism of protein biosynthesis; distribution and conservation of wild mammals in Karnataka; telomeres; genetics of organ development in plants; molecular aspects of hormonal action.

Frontier lectures in physics

Bangalore University
March 1–2, 2007

Convener: H A Ranganath (Bangalore University)

Co-ordinator: Ramani (Bangalore University)



Speakers: G S Ranganath and C R Subrahmanya (RRI, Bangalore), Vikram Jayaram, S V Subramanyam, T N Guru Row, and N Balakrishnan (all from IISc, Bangalore).

Participants: 150 Post-graduate students and faculty from Bangalore University

Topics covered: Phases of water; nanostructured mono and multilayered nitride hard coatings; the world of high pressure; charge density analysis in molecular crystals via x-ray diffraction techniques; satellites and navigation; trends in information technology.

Recent trends in chemistry

Avinashilingam University, Coimbatore
March 26–27, 2007

Convener: R Ramaraj (MKU)

Co-ordinator: R Shyamala (Avinashilingam University, Coimbatore)

Speakers: S Chandrasekaran, S Ramakrishnan (IISc Bangalore), A Ajayaghosh (RRL, Thiruvananthapuram), M Palaniandavar (Bharathidasan University, Trichy), P Ramamurthy (National Centre for Ultrafast Processes, Chennai) and MV Sangaranarayanan (IIT, Chennai).



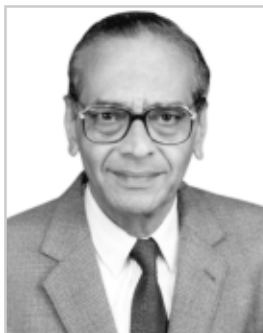
Participants: 140

Topics of lectures: Polymers and polymer science; rational design of molecular architecture; bio-inorganic chemistry; fluorescence spectroscopy; thermodynamic analysis of electron transfer process at electrode-electrolyte interface; structures and functions of certain copper containing molecules; time-resolved techniques in photochemistry.

OBITUARIES

Perdur Radhakantha Adiga

(elected 1982) was born on 5 May 1935, into a priestly, orthodox family, in a small village, Barkur, South Kanara, then part of Madras Presidency. He was one of ten siblings and had his early schooling in Udupi.



He obtained his M.Sc. from University of Kerala and his Ph.D. from the Indian Institute of Science, Bangalore in 1963, working at the Department of Biochemistry under the supervision of the late PS Sarma. He elucidated the inter-relationships of trace elements and metal toxicity on growth and intermediary metabolism of fungi and insects. During this time, he initiated work on the unusual amino acid, N-oxalyl-diaminopropionic acid, neurotoxin present in *Lathyrus sativus*. His group demonstrated by elegant experiments that this compound was responsible for the debilitating neurological disease, neurolathyrism, prevalent in large tracks of North India. This seminal contribution established the link between an unusual amino acid and brain function. He also discovered a new amino acid, homoarginine. LK Ramachandran and AN Radhakrishnan, both Fellows of the Academy, inspired and enabled Adiga to sharpen his experimental skills and scientific thinking. In recognition of his excellent contributions, he received the Giri Memorial

Medal for the best Ph.D. thesis submitted to IISc in 1963.

Adiga carried out his post-doctoral work at the University of Hawaii in Honolulu, with T Winnick and at the McGill University in Montreal. In Honolulu, he worked on the hormones of the anterior pituitary and at Montreal on the effect of thyroid-releasing hormone and LATS on the pituitary and of thyroid-releasing hormone on the thyroid. This led to elegant studies on the role of cAMP on hormone release as well in transcription and translation in target tissues on which the hormones act. This work made a significant impact on our understanding of the mechanism of hormone action.

Adiga returned to India when he accepted the position of a senior research fellow at the Department of Biochemistry in IISc where several of his contemporaries held faculty positions. The facilities available then were primitive and the financial support meagre. He accepted this challenge and initiated several innovative programmes. His early work on the biosynthesis and hormonal regulation of polyamines in plants reflected an incisive mind and an extensive knowledge on inter-relationships of metabolic pathways, laying the foundation of the area known today as metabolic engineering. His contributions are evident in the invited review he published in *J. Plant Growth and Regulation*.

Adiga and his small group recognized at that time the importance and national relevance of work on human reproduction and the valuable information that can be obtained using good model systems. There was an explosion of knowledge at that time on the regulation of gene expression by steroid hormones, especially the molecular aspects of the biosynthesis of estrogen-induced egg-protein in the chicken, vitellogenin. He was attracted by the observation that riboflavin-binding protein (RCP), present in both the egg white and yolk, may have a function in reproduction. This was indicated by the observation that hens deficient in this protein were able to lay eggs, but these eggs failed to hatch. Adiga was marvelled at the mechanism adopted by nature in providing all the nutrients required for developing the avian embryo, outside of the maternal system control. This problem appeared to pose many challenges; here was a protein, which was hormonally modulated, appeared to be essential for embryonic development, and importantly not in beaten track. For the rest of his life, he pursued his studies on RCP along the evolutionary tree — from the chicken to the mammal,

biochemical and biophysical properties, function in foetal development, structure correlated to immunological function, etc. He identified many other vitamin carrier proteins, elucidated their biological function and hormonal regulation.

In early 1980, he was posed a challenge, “chickens are chickens, move on mammals”. He rose to the challenge and characterized the protein in rodents and primates. He showed the requirement of RCP in mammalian reproduction and suggested the development of a novel immuno-contraceptive, using RCP as a vaccine for the development of antibodies in the female, which could effectively block the action of maternal protein. This led him logically into a study of the molecular immunology of these proteins using peptides and monoclonal antibodies. Formal retirement in 1997 from IISc did not deter him from continuing his research to define the immunotopology of RCP. Using modern molecular immunological and biological techniques, his group identified stretches of amino acid sequences that could effectively replace the entire molecule as contraceptive vaccine. Even with a reduced research group, his list of publications post-retirement is outstanding in terms of impact factor and numbers. He published over 150 papers in all high impact journals and guided over 20 Ph.D. students.

Adiga received several awards such as the Shanti Swarup Bhatnagar Award in 1980, the Sanjay Gandhi Award in 1982, Sreenivasaya Memorial Award of the Society of Biological Chemists in 1984, and the INSA M.R.N. Prasad Memorial Award Lecture. He was Vice-President of the Society of Biological Chemists and Indian Society for Human Reproduction. He was elected a Fellow of Indian National Science Academy in 1984.

Adiga died of a cardiac arrest on 13 September 2006. He leaves behind his wife and two daughters. ■

Vishnu Ganesh Bhide

(elected 1974) was born on 8 August 1925 to S Ganesh Trimbak Bhide and Shantabai in Darypur in the Amraoti District of Maharashtra. He did his B.Sc. in 1945 with a distinction in mathematics and a first rank and gold medal in M.Sc. in 1947, both from Nagpur University. His Ph.D. in 1953 was also from Nagpur on the topic of electrical discharges. He joined the Institute of Science, Nagpur



in 1947 as a faculty member. For further studies, he went to UK to gain first hand experience in the newly developing field of solid state physics and he obtained a second Ph.D. in 1955 from the University of London. On his return, he rejoined the Institute at Nagpur but was soon transferred to the Royal Institute of Science, Bombay where he became the Head of the Department of Physics from 1956 to 1966. In 1966, he joined the National Physical Laboratory as a Deputy Director. In 1982 he joined the University of Poona as a professor until 1984 when he was given the reins of the University as its Vice-Chancellor until 1988. During this period he took several initiatives to enhance the scientific and educational infrastructure in and around the university including the science and technology park. Between 1989 and 1990, he was the Director of the Inter-University Consortium.

Under extremely difficult circumstances, Bhide followed his dream of doing good experimental research in India. He developed a new method based on multiple beam interference technique to delineate ferroelectric domains and to study domain dynamics. His work on audio and radio frequency electroluminescence in ferroelectrics demonstrated domain switching and the existence of a very thin layer of low dielectric constant on the surface of ferroelectric BaTiO_3 crystals. Bhide pioneered research work on Mössbauer spectroscopy in the country, using the Mössbauer spectrometer that he himself made. Using this technique, he brought out the existence of temperature-dependent soft mode which disappears at about the Curie temperature and causes ferroelectric phase transition. Using Mössbauer spectroscopy, he investigated a number of ferroelectrics, ferromagnetics and antiferromagnetics. He developed a method to evaluate the lifetime of nonequilibrium charge states of Ni, Co ions formed as a consequence of electron capture decay of Co^{57} in CoO, NiO, and other lattices. He also investigated high spin–low spin equilibria in a variety of rare earth cobaltites. He demonstrated that localized electron–collective electron transition occurs in LaCoO_3 at 1210 K. Similarly, the itinerant electron ferromagnetism in $\text{La}_{1-x}\text{Sv}_x\text{CoO}_3$ was studied in its finer details using Mössbauer spectroscopy. Bhide also studied the effect of chemical binding in a large number of metal oxides, intermetallic compounds using X-ray spectroscopy, particularly the extended fine structure of absorption edges. Along with his students, he developed knowhow for making liquid

crystal displays. Bhide's reports 'Cryogenics: survey and outlook' and 'Solar energy: hope and challenge' not only initiated research in these two important fields in the country but formed the basis for subsequent developments. He developed a concept for structured selective coating for solar collectors. He also contributed to the development of amorphous silicon solar cells.

Bhide made many pioneering contributions to science education in the country. He was a member of the National Council of Science Education, editor of 'Physics Education', and Chairman of the physics study group which brought out text books and laboratory manuals for schools on behalf of the National Council for Educational Research and Training.

Bhide was greatly interested in popularizing science amongst masses. During his later years his special interest was in exposing children to the marvels of science and to make them interested in learning the basic concepts of science and to motivate them in becoming scientists. For this purpose he started the 'Bal Vigyan Chalwal' (Children's Science Movement) in Maharashtra with its headquarters in Pune. With the help of industries and like-minded people he established an institution called 'Exploratory' where school children can play with scientific gadgets and make learning an exploratory process. Now this establishment in a five-storey building is a unique centre of its kind in India. He was a member of the Panel on University Science Education of the Indian Academy of Sciences which in 1994 prepared a very useful document on the improvement of science education in the country. Several recommendations contained in that document now form part of the programmes of the Academy under its Science Education Panel.

Among the honours he received were fellowships of the Royal Astronomical Society, the Indian National Science Academy and the National Academy of Sciences, the presidentship of the Maharashtra Academy of Sciences, and membership of the International Commission on Applications of Mössbauer Spectroscopy. He was a recipient of the Sir CV Raman Award, the Saha Memorial Award, the K Ragadhama Rao Memorial Award of INSA, and Padma Shri in 1992.

Bhide passed away on 25 June 2006 leaving behind his wife Prabha, a son and a daughter. ■

Asima Chatterjee (elected 1975) the grand old lady of Indian science, passed away on 23 November 2006 in Kolkata.



Born on 23 September 1917, she showed early promise as a brilliant student. She obtained the M.Sc. degree from Calcutta University in 1938 and D.Sc. in 1944 from the same university under the guidance of PK Bose. Incidentally, she was the first woman to be awarded D.Sc. of any Indian university. In 1940, Chatterjee joined the Lady Brabourne College, Kolkata, as the Head of the Chemistry Department and in 1944 was appointed Honorary Lecturer in Chemistry, Calcutta University.

She worked with LM Parks, University of Wisconsin (1947) on naturally occurring glycosides, with L Zechmeister, California Institute of Technology, Pasadena (1948–49) on carotinoids and provitamins and with Paul Karrer, NL at the University of Zurich (1949–50) on biologically active alkaloids which became her life-long interest ever since. After her return to India in 1950 she vigorously pursued investigations on the chemistry of Indian medicinal plants, particularly alkaloids and coumarins.

In 1954, she was appointed Reader in the Department of Pure Chemistry of the Calcutta University and she never ever looked back. In 1962, she became the Khaira Professor of Chemistry, one of the most prestigious and coveted Chair of the Calcutta University that she adorned till 1982. She continued as the Honorary Coordinator of the UGC Special Assistance Programme to intensify teaching and research in natural product chemistry sanctioned in 1972 and promoted to the Centre of Advanced Studies on Natural Products in 1985 in recognition of her contributions to the Department.

Through her untiring efforts, she could fulfill her life-long dream to establish a Regional Research Institute for carrying out research on Indian medicinal plants for the development of Ayurvedic drugs along with an Ayurvedic Hospital for systematic clinical trials through a unique Centre–State collaboration under the aegis of the Central Council of Research in Ayurveda and Siddha in Calcutta. As the Honorary Principal Coordinator, she nurtured this Institute till the fag end of her life.

She successfully developed the anti-epileptic drug, Ayush-56 from *Marsilia minuta* and the anti-malarial drug from *Alstonia scholaris*, *Swertia chirata*, *Picrorhiza kurroa* and *Ceasalpinna crista* and the patented drugs

have been marketed by several companies. She was also associated with several pharmaceutical industries. She made significant contributions in the field of medicinal chemistry with special reference to alkaloids, coumarins and terpenoids, analytical chemistry, and mechanistic organic chemistry. She published around 400 papers in national and international journals, and more than a score of review articles in reputed serial volumes. Her publications have been extensively cited and much of her work included in several textbooks.

She edited and revised the 6-volume *Bharatiya Banoushodhi* (Calcutta University) and was the Chief-editor of the 6-volume series, *The Treatise of Indian Medicinal Plants* (CSIR).

She was elected a Fellow of the Indian National Science Academy (1960), received the Shanti Swarup Bhatnagar Award (1961) and was conferred the prestigious Padma Bhusan (1975) by the Government of India. Her many awards include the C.V. Raman Award of the Hari Om Ashram Trust by UGC (1982), Sisir Kumar Mitra Lectureship of INSA, Asutosh Mukherjee Gold Medal of Indian Science Congress Association (1989) of which she was the first lady scientist to be elected as the General President (1975), Goyal Award (1992) by the Goyal Foundation, Kurukshetra University, the Silver Jubilee Award (1995) of the Central Council of Ayurveda and Siddha, and the Eminent Teacher Award (1996), Calcutta University. She was conferred D.Sc. (Honoris causa) degree by a number of universities. As a scientist-academician, Chatterjee was nominated in 1982 by the President of India as a Member of the Rajya Sabha which she served till 1990.

Chatterjee achieved meteoric rise to celebrity against heavy odds by dint of her exemplary indomitable spirit, total commitment, iron will, hard work, insatiable urge for the pursuit of knowledge.

She was a religious lady passionately devoted to the ideals of Ramakrishna having implicit faith in the philosophy of Swami Vivekananda. She was interested in vocal music since her childhood. As a matter of fact, she received specialized training in classical music, specially in Drupad and Kheyal for fourteen years and stood second in the All Bengal Music Competition in 1933. She was a unique example of harmony and commitment between professional and domestic life.

Her husband, the late Baradananda Chatterjee, a renowned physical chemist and Vice-Principal of the Bengal Engineering College Sibpur, Howrah pre-deceased her in 1967. She is survived by her only child, Julie.

Asoke Gopal Datta (elected 1973) was born on 20 January 1928 in Kolkata to Satya G Datta and Kamal Bala. He completed his B.Sc. in 1948 and M.Sc. in 1950. He started his scientific career with the study of the biochemistry of malarial parasites and mode of



action of antimalarial drugs and demonstrated the presence of the atri-carboxylic acid cycle in malarial parasites. He further showed that antimalarial drugs of the quinoline group inhibit the oxidative decarboxylation of α -ketoglutarate in the parasites more efficiently than in host tissues and thereby exert their antimalarial activity. On the basis of these studies he got the D.Phil. (Sc.) degree from Calcutta University in 1954.

He proceeded to Ottawa, Canada with an NRC Post-Doctoral fellowship in 1955 and studied the carbohydrate metabolism of *Acetobacter melanogenum*. During his two years' stay at Ottawa, he isolated three enzymes from the above organism and showed that glucose is catabolized via a non-phosphorylated pathway to α -ketoglutarate which finally is oxidized to CO_2 and H_2O via the tricarboxylic acid cycle.

In 1957, he joined the famous enzymologist, Efraim Racker at the Public Health Research Institute of the City of New York to study various aspects of the mechanism of enzyme action.

Returning to India in 1960, he joined the Bose Institute where he studied the regulation of metabolic pathways in rice seedling during early developments. In 1964 he joined the Indian Institute of Experimental Medicine (IEM) and started work in three different directions: (a) biochemical studies on peroxidases and iodinas, (b) erythrose as an inhibitor of the growth of *Vibrio cholerae* and (c) carbohydrate metabolism of *Leishmania donovani*.

His group started the programme of investigations on peroxidases and iodinas in 1968 and made some interesting observation that the goat submaxillary gland contains an unusual enzyme which catalyses the formation of diiodotyrosine from monoiodotyrosine. Pursuing studies in this direction, his group was able to purify two peroxidases to homogeneity, one from goat sub-maxillary gland and the other from goat thyroid gland. On the basis of all these properties, the two enzymes were established as isoenzymes. Datta also carried out comparative studies of soluble and particle-bound

peroxidases and iodinas from mouse thyroid and submaxillary glands. He was also able to demonstrate that the submaxillary peroxidase is increased on surgical removal of thyroid gland and thyroxine acts as a repressor to the synthesis of peroxidase in submaxillary gland in rats.

Working from a different angle, he was able to show that application of cold stress to rats causes increased ^{14}C -phenylalanine incorporation into protein.

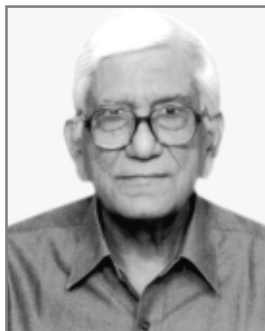
In 1971 Datta made the interesting observation that cobalt and vitamin B_{12} stimulate the peroxidase and iodinase activities of submaxillary gland and showed that vitamin B_{12} acts through cobamide coenzyme and cobalt through a humoral factor, erythropoietin.

Working on further aspects of erythropoietin, Datta and his colleagues showed that kidney slices can incorporate ^{14}C -phenylalanine into erythropoietin *in vitro* and cobalt increases 3 to 4-fold the rate of incorporation.

In 1973 Datta was invited by BL Horecker and S Udenfriend to the Roche Institute of Molecular Biology as a visiting scientist to work on a collaborative project on the participation of fructose bis-phosphatase in the regulation of gluconeogenesis. Here he was able to purify and crystallize rabbit muscle fructose bis-phosphatase to show that citrate and histidine are naturally occurring activators of the enzyme. He also made significant contributions to the structural study of this enzyme, crystallized from muscle, liver and kidney. Besides the above projects, Datta started working on a collaborative project with the physicians of Calcutta Medical College and Hospital to find out the biochemical etiology of a dreaded disease, Toxemia of Pregnancy, whose occurrence in India is very high.

Datta retired from IICB in 1988 but continued as an emeritus scientist until 1993. He passed away in Kolkata in December 2005 but this was known to the Academy only recently. He is survived by a son. ■

Indar Singh Luthar (elected 1977), an eminent mathematician, passed away at Chandigarh on 7 December 2006. Son of Ved Kaur and Hari Ram, Luthar was born on 31 March 1932 at Sialkot (now in Pakistan). He had his early education at Sialkot where his father was a Headmaster. He had a brilliant academic record. For his doctoral studies,



he went to the University of Illinois, Urbana where he was awarded one of the two prestigious pre-doctoral G.A. Miller Fellowships. After his Ph. D. in 1957, before returning to India, he spent a year at the Institute for Advanced Study in Princeton. He joined the Panjab University, Chandigarh in 1958, became a Professor in 1966 and worked at the University until his retirement in 1992. Along with R.P. Bambah, he played a leading role in shaping the Department of Mathematics into an internationally recognized Centre for Advanced Study.

During his career at the University, Luthar held many important academic positions: Chairman, Department of Mathematics (1974–81), Dean, Foreign Students, (1979–80); and Dean, University Instruction, (1982–84). He was Editor of *Mathematics Student* (1977–81). He also held several visiting assignments abroad: University of Illinois (Urbana), University of Northern Illinois (DeKalb), University of Colorado (Boulder), University of Oxford, Universidad des Los Andes (Merida), and the University of Bahrain.

Luthar worked in several areas of mathematics, including algebra, analysis and number theory. His work is published in international journals of repute. He was always keen to learn new subjects and, whenever he decided to do, so, he would invariably turn to the masters. He supervised the doctoral research of seven students. Luthar was a keen expositor of mathematics at all levels and wrote seven books at the graduate and postgraduate levels. His lectures were always meticulously prepared.

Luthar is survived by Jyoti, his wife, a son (Vineet) and a daughter (Meera). ■

Sumangali Kidambi Srinivasan (elected 1977) passed away in Chennai on 21 October 2006. He was a scholar and teacher of great repute.



Born at Kanchipuram on 16 December 1930, Srinivasan completed his high school education in Cheyyar. He joined the Vivekananda College at Madras and obtained his B.A. (Hons) degree in 1953. Later he worked with Alladi Ramakrishnan and received his M.Sc. degree (by research) in 1955 and Ph.D. in 1958, both from the University of Madras. After submitting his doctoral thesis

he worked with Messel for a year as a post-doctoral fellow at the University of Sydney. He returned to the University of Madras, accepting a senior research fellowship of the National Institute of Sciences of India.

Srinivasan joined the Department of Mathematics at the Indian Institute of Technology Madras in 1959 at its very inception and served till his superannuation in December 1990. He was appointed Professor in 1967 and Senior Professor in 1974. His contributions to IIT in general and to the Department of Mathematics in particular are too many to be enumerated. He was chiefly responsible for the development of the department and contributed immensely to course design and curriculum development. Although his research interests were in applied mathematics, he had been actively engaged in the teaching of pure mathematics to M.Sc. (mathematics) students. In fact, one of his important contributions was the incorporation and maintenance of a high percentage of pure mathematics courses in the M.Sc. curriculum programme. The phenomenal growth of advanced research in the field of stochastic processes and applications at IITM during 1960–1990 was due to his dynamic stewardship. He held various positions at IITM, as Head of the Department, Dean of Academic Research, Member of the Board of Governors (the topmost administrative body of IITM), each of these with a rare skill characteristic of him. In addition he served in a host of other important committees.

Srinivasan's research interests are in the field of stochastic processes and their applications, quantum mechanics and fields, statistical physics and fluctuation phenomena, mathematical biology and operations research. He published 150 papers in established journals. His major research contributions are: Development of the theory of point processes with special reference to modelling in the broad area of physical sciences; formulation of stochastic kinetic equations in the context of fluctuating phenomena; completion of the fluctuation problem of electromagnetic cascades; theory of production of multiple particles in electromagnetic phenomena; development of the theory of stochastic integrals and differential equations with special reference to stochastic modelling; development of a comprehensive stochastic model of a single neuron; determination of the photon counting statistics of Gaussian beams of arbitrary spectral profile; development of a unified approach to the theory of

queues and inventories; development of the theory of reliability of two-unit redundant systems.

His work in the 1950s with Alladi Ramakrishnan laid strong foundations for his work in cascade theory, stochastic integrals and differential equations dealing with noise phenomena. His familiarity with cascade showers motivated his investigations in high energy physics, pion physics and scattering theory. His contributions in the area of point processes are mainly the extension of the theory of product densities to multidimensional and non-Euclidean spaces on the one hand and irregular point processes, on the other. In the late 1960s he was attracted to the area of operations research due to the rich non-Markov structures present in the stochastic models of queues, inventories and reliability. His scientific curiosity and creativity seemed to increase with time. In the 1990s he switched back to physics and was interested in developing complex measurable processes with particular reference to modelling quantum phenomena. He continued to be very active in research till the end.

He is the author of several books such as: 'Stochastic theory and cascade processes' (1969), 'Stochastic point processes and their applications' (1974) and 'Stochastic point processes' (1974) co-author of 'Introduction to random differential equations and their applications' (1971), 'Stochastic processes and their applications' (1976), 'Stochastic models for spike trains of single neutrons' (1977), 'Probability and random processes' (1978) and 'Probabilistic analysis of redundant systems' (1980).

He was President of the Operations Research Society of India (1975–76). Apart from being an academician of rare order, Srinivasan was an individual with human values. He was also a great lover of music and liked gardening. He leaves behind his wife Vijayalakshmi and four sons. ■

Frank Albert Cotton Twentieth century dawned with a great legacy for inorganic chemists: the coordination theory of Alfred Werner. Lack of reliable structural tools and bonding theories did dampen this arousal in the following years but not for very long. By the



decade of 1950s the no-looking-back posture of inorganic chemistry was firmly in place. Quantum mechanical valence theories had arrived, ligand field theory has been rediscovered, mechanistic ideas were shaping up, spectral and magnetic (including resonance) tools were becoming available, X-ray crystallography was slowly coming nearer to chemists, ferrocene has been discovered and so has been titanium-catalysed olefin polymerization, proteins and metalloproteins were no longer mere fuzzy objects. For inorganic chemistry the 1950s defined a watershed, an era of unprecedented hope and promise. It was the best of seasons for young talents to arrive. Preeminent among the arrivals was Frank Albert Cotton.

Frank Albert Cotton (elected 1985) received his Ph.D. degree in 1955 from the Harvard University working on metallocenes in the laboratory of Geoffrey Wilkinson. In the same year he took up an instructorship at MIT and at 31 became the youngest full professor. In 1972 he moved to Texas A&M University where he held the positions of Doherty-Welch Distinguished Professor and Director of the Laboratory for Molecular Structure and Bonding. He became a legend and played a signal role in transforming Texas A&M into a world-class research institute.

Cotton was born on 9 April 1930 in Philadelphia where he attended public schools, Drexel University and Temple University from where he received a Bachelor's degree in 1951. He wanted to enjoy "the thrill of discovery and the challenge of finding out something that perhaps no one has yet."

Cotton's research spread its wings over many important phases of inorganic chemistry – those of *d*-block transition metal chemistry in particular. The findings of his vast activity spanning over fifty years and involving more than 100 Ph.D. students and 150 postdoctoral associates have been documented in about 1600 papers. Cotton had the foresight to consciously adopt the single crystal X-ray diffraction method as a structural tool from his early days at MIT. That was years before the technique was to become commercial and routine. He had an early and very successful stint with high-resolution three-dimensional structure determination and mode of action of an important enzyme — staphylococcal nuclease. But his true love was with inorganic molecules.

He made major contributions to the understanding of spectroscopic properties of metal carbonyls and dynamical behaviour of fluxional organometallic compounds. But his most important work concerned metal–metal bonding. Although a few isolated instances were known earlier, it was Cotton who beginning in early 1960s systematically brought to light how very widespread and fascinating such bonding could be in *d*-block chemistry – hardly any metal is now excluded. This journey was propelled by a remarkable symbiosis of skillful synthetic experiments with a panoply of physical methods and theoretical tools. Observed bond orders fell in the range 1–4 and thus the scientific community heard of double, triple and quadruple metal–metal bonds. Cotton's work in this area is correctly said to have "transformed our understanding of how the chemistry of about half the elements in the periodic table really works".

Cotton wrote or edited a large number of influential books. Two of these have become legends: *Advanced inorganic chemistry and chemical applications of group theory*. The former co-authored with G Wilkinson first published in 1962 is now in its sixth edition. It incorporates more than four thousand references to literature and is like a bible of inorganic chemistry. His second book in 1963 did the magic of instantly bringing the principles of group theory and its chemical use within the easy grip of every willing chemist for the first time. Cotton founded the important, annual series *Progress in inorganic chemistry* and edited the first ten volumes. The chemistry of metal–metal bonds has been chronicled in the major book *Multiple bonds between metal atoms* co-authored with RA Walton. Cotton invented the commonly used terms like 'metal cluster' and 'hapticity.'

Starting in 1962 when he received the ACS Award in Inorganic Chemistry, Cotton was honoured with many prestigious medals, awards, fellowships, honorary degrees and editorships. This includes the Wolf Prize, Lavoisier Medal, Priestley Medal, Robert A Welch Prize, Paracelsus Prize, King Faisal Prize and the National Medal of Science. The jury of the Wolf Prize identified him as the "preeminent inorganic chemist in the world." Two awards bearing his name – the FA Cotton medal and F Albert Cotton Award for Synthetic Inorganic Chemistry – have been instituted to honour distinguished chemists.

Cotton passed away on 20 February 2007. He is survived by his wife and two daughters. ■

Tentative Programme of 18th Mid-Year Meeting

13–14 July 2007

Venue: Faculty Hall, Indian Institute of Science, Bangalore

13 July 2007 (Friday)

- 0930–1030** *Session 1 – Special Lecture*
G. Sundararajan
*International Advanced Research Centre for Powder Metallurgy and New Materials (ARCI),
Hyderabad*

The indentation of materials to probe their mechanical behaviour
- 1030** **Tea break**
- 1100–1300** *Session 2 – Lectures by Fellows/Associates*
- 1100** **Sanjay Jain**
Delhi University, Delhi

Modelling the self-organization and collapse of complex networks
- 1130** **Musti J. Swamy**
University of Hyderabad, Hyderabad

*Biophysical investigations on the structure, phase behaviour and membrane
interactions of stress-induced lipids*
- 1200** **V. Sriram**
National Centre for Biological Sciences, Bangalore

Role of mitochondrial fission and fusion during programmed cell death
- 1230** **Yogesh M. Joshi**
Indian Institute of Technology, Kanpur

Rheological study of aging soft glasses of laponite
- 1300–1430** **Lunch break**
- 1430–1700** *Session 3 – Lectures by Fellows/Associates*
- 1430** **Rakesh Aggarwal**
All India Institute of Medical Sciences, New Delhi

Epidemiologic, clinical and laboratory aspects of hepatitis E
- 1500** **V. Balaji**
Chennai Mathematical Institute, Chennai

Holonomy groups of bundles on algebraic varieties
- 1530** **Tea break**

- 1600** **Anuradha Lohia**
Bose Institute, Kolkata
Endo-reduplication and irregular division lead to heterogeneity of genome content in Entamoeba histolytica
- 1630** **Amitava Raychaudhuri**
Harish-Chandra Research Institute, Allahabad
Let's talk about INO
- 1800–1900** *Session 4 – Public Lecture*
G. Madhavan Nair
Department of Space, Bangalore
Highlights of Indian space programme
- 1930** **Dinner**
- 14 July 2007 (Saturday)**
- 0930–1030** *Session 5 – Special Lecture*
E.D. Jemmis
Indian Institute of Science, Bangalore
A structural chemistry for boron
- 1030** **Tea break**
- 1100–1300** *Session 6 – Lectures by Fellows/Associates*
- 1100** **Raghavan B. Sunoj**
Indian Institute of Technology, Mumbai
Probing mechanism and selectivity in organic reactions through computational methods
- 1130** **Satheesh Chandra Sheno**
National Institute of Oceanography, Dona Paula, Goa
Why is the Bay of Bengal warmer than the Arabian Sea?
Role of ocean dynamics
- 1200** **Sandeep Sen**
Indian Institute of Technology, New Delhi
Geometric clustering in high dimensions
- 1230** **Dipak K. Palit**
Bhabha Atomic Research Centre, Mumbai
Ultrafast dynamics of intramolecular charge transfer and hydrogen bond