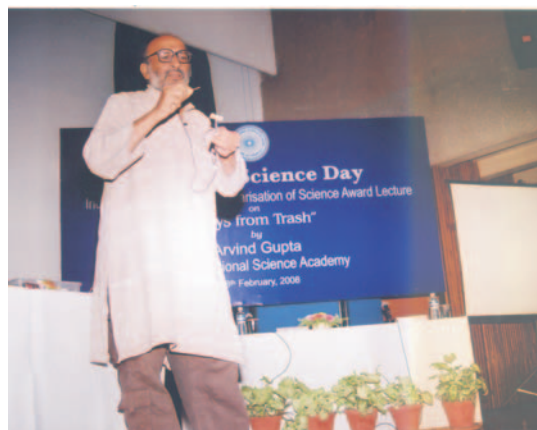




National Science Day Lecture

Shri Arvind Gupta, Inter-University Centre for Astronomy and Astrophysics, Pune was conferred on the Indira Gandhi Prize for Popularization of Science - 2008 on the National Science Day - 28 February 2008 after delivering the National Science Day Lecture entitled “*Toys from Trash*” in the Academy premises. Shri Gupta has been on science popularization activities since over 25 years after graduating in Electrical Engineering from Indian Institute of Technology, Kanpur. In fact, he worked tirelessly to make science interesting for school students through his innovative ideas producing toys made from inexpensive tools/teaching aids. Apart from this activity, he has been on the campaign for a long period creating/writing popular science articles published in Science Age, Science Reporter, Chakmak, Vigyan Pragati and several other magazines of popular interest. He has written a dozen books on low-cost innovative science experiments and toys primarily to generate interest in school children learning science as a fun. His debut book entitled “*Matchstick Models & Other Science Experiments*” was translated in thirteen Indian languages and widely appreciated.

Prior to the lecture on “*Toys from Trash*” a film created by Shri Gupta was screened. This was a live demonstration of the toys and experiments he developed for the school children. This was followed by the lecture by Shri Gupta who started with demonstration of experiments with simple toys made out of matchsticks, plastic sheets, straws, jute fibre, newspapers etc. and narrated several simple scientific principles underlying the working of these toys which we encounter during our daily life but these remain unnoticed. His created toys are extremely interesting to learn science and its principles for students at grass root level. Some of his toys and experiments are depicted in the following figures.



Shri Arvind Gupta delivering National Science day lecture on "Toys from Trash" in the Academy on 28 Feb 2008

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The lecture was well attended by a large number of school students from local public schools along with their teachers who took keen interest in observing the audiovisual live demonstration of experiments and toys developed by Shri Gupta for school students. Several distinguished Fellows of the Academy attended the lecture including Prof Yash Pal who has been a constant source of inspiration to him and was also his mentor when Shri Gupta was working with Hoshangabad Science Teaching Programme an innovative project to create science learning interesting among school students through inexpensive science teaching aids using locally available materials.

Shri Gupta's books and photos of "Toys from Trash" can be visited on his website <http://arvindguptatoys.com>.

Young Scientists Meeting

Department of Science & Technology organized a brainstorming meeting "Vision for Indian Science — Face to Face with Young Scientists" at INSA on March 15, 2008. About 100 Young Scientists Awardees/ Associates of all the National Science Academies and CSIR Young Scientist Awardees attended the meeting. Hon'ble Minister for Science & Technology and Earth Sciences. Shri Kapil Sibal and three Scientific Secretaries to the Government of India participated in the brainstorming discussion. The objective of the meeting was to brainstorm the young minds on various issues of S&T and seek suggestions for building a vision for our country. Hon'ble Minister, in his remarks, reiterated the Government's commitment to promote S&T and called for plans in connecting the "dreams of today" with "actions of tomorrow". Several suggestions were discussed with the young scientists. They were related to preparing a vision document; launching mission projects with superordinate goals; attracting talented youth to science and improving research in university sector; identifying performance measures for scientists; and improving delivery mechanism of S&T funding.

The issues deliberated at the meeting were divided into five groups, viz., (i) Vision (ii) Mission (iii) Grand Challenges (iv) Correction Systems and (v) Measurement Systems for S&T sector. The young scientists were requested to enroll into one or more of



(From left) Dr. T. Ramasami, Hon'ble Minister Mr. Kapil Sibal, Dr. M.K. Bhan and Prof. Surendra Prasad on the dais at the meeting "Vision for Indian Science - Face to Face with Young Scientists" held at INSA



Participants at the above meeting

these groups, and were requested to send suggestions on them. It is planned to take forward the suggestions for some concrete action in future.

Panel on Science and Technology in India's past – A Report

The 68th session of Indian History Congress (IHC) was organized during on December 28-30, 2007 at the University of Delhi, Delhi. The Congress was attended by over 1500 scholars from all over the country and a few from abroad. A large number of papers were presented on various sessions alongwith a few special lectures by renowned scholars on different themes like i) *D D Koshambi's Birth Centenary Celebrations on Reason in History*, ii) *60 years of Indian Independence*, and iii) *Forms of Anti Colonial Resistance to British Rule*.

The remarkable feature of this congress was a Special Panel devoted to Science and Technology in India's past. This two day session (December 29-30, 2007) was organized by the Aligarh Historian Society (AHS) under supervision of Professor Emeritus Irfan Habib, Aligarh Muslim University, who is also the Chairman of the AHS. Professor Habib's effort was greatly appreciated by the scholars for designing this special panel under the auspices of IHC to inculcate wide interest in India's rich scientific and cultural heritage. The Panel was divided into four sessions and were chaired by renowned Historians like Professors Suraj Bhan, Sabyasachi Bhattacharya and J V Nayak.

Eighteen papers covering Prehistoric Technology in India; The Drainage Systems at Mohenjo-Daro and Nausharo : A Technological Breakthrough or a Stinking Disaster; Bronze Age Craft Tools and Transfer of Technologies; Ayurveda : Origins and Evolution; Land Measurement in Medieval Tamilnadu – Ninth to Fourteenth Centuries; Statistics in Medieval Texts – Presentation and Use; Indian Textile Technology : Thirteenth-Fifteenth Centuries; Minting Technology in Mughal India; Applying Industrial Archaeology to Medieval India – Paper and Indigo Manufacture; Pre-Modern Indigo Processing Technology; Bengal Textile Industry and the Question of Technological Innovation; Technology Transfer and the Evolution of Ordnance Establishment in British India : 1700-1859; Botanical Explorations and the East India Company : Revisiting 'Plant Colonialism"; An Inclusivist Vision of History of Science : Readings from our Pioneers in the Late 19th and Early 20th Century; Bacteriology in Colonial India with Special Reference to Communicable Diseases; Development of Mathematics in India in the Twentieth Century; Science and the Freedom Movement; Research on Epilepsy in Modern India were presented and discussed in different sessions in which seven Project Investigators supported under History of Science programme also contributed research papers.

Prof. J V Naik in his concluding remarks appreciated Professor Habib for giving a chance to the Historians for gathering scientific knowledge from India's past which is a growing interest among scholars of History. Professor Irfan Habib extended his vote of thanks and expressed great satisfaction over the success of this panel and was pleased over the interest and enthusiasm

of a large number of participants who took part in the lively discussion besides the Science Historians. The proceedings to be edited by Prof. Habib and will be published as a book.

Science & Society Meet

INSA organized a one and half day meet on Science & Society during March 13-14, 2008 at the Academy premises. The purpose of the meet was to bring to the fore the role of science and technology in the societal and economic development of the society and to focus on the way ahead. Several eminent scientists, economists, educationists, environmentalist and representatives of NGO deliberated on different societal issues.

The speakers in the three sessions of the meet were S K Thorat, JPS Uberoi, M S Swaminathan, R Chidambaram, S K Brahmachari, T Ramasami, Kartikeya S Parikh, RR Navalgun, R Gadagkar, A R Vasavi, N Kochupillai, Arun Kumar, Ashok Jhunjhunwala, V N Shukla, P S Ramakrishnan, P Anandan and Ajay Chowdhry.

The meeting started with the presidential remarks by Prof M Vijayan, President, INSA and ended with a summing up by Prof N Balakrishnan, Vice-President (Science & Society), INSA.

The speakers in the three sessions of the meet included eminent agriculture scientists Professor M S Swaminathan on "Science for the betterment of rural population"; Professor S K Thorat, Chairman UGC, New Delhi spoke "On Challenges in Higher Education – Approaches and Strategy under XI Plan"; Professor J P S Uberoi, Former ICSSR National Professor, Delhi University on "Right Left and Centre in the Sciences of nature"; Dr R R Navalgun, Space Application Centre, Ahmedabad on "Space Technology for Societal Benefits"; and Dr R Gadagkar, Indian Institute of Science, Bangalore on "Integrating Natural and Human Sciences – The beginning of an experiment at Indian Institute of Science, Bangalore".

In the second Session, Dr A R Vasavi, NIAS, Bangalore spoke on "Equity and Excellence in Education"; Dr N Kochupillai, MSR Medical College, Bangalore on "Science in Preventive Health Care in India" and Dr T Ramasami, DST, New Delhi on "Process Innovation for inclusive Growth".



Dr. P. Anandan, MD, MRI, Bangalore delivering lecture on "ICT for Development" during Science & Society Meet on March 13-14, 2008



Dr Ajay Chowdhry, HCL, Noida delivering lecture on "ICT for rural development" during above Meet.

In the third session, Professor Ashok Jhunjhunwala, Indian Institute of Technology - Madras, Chennai has spoken on "ICT for the benefit of the poor – an Indian Review"; Professor R Chidambaram, Principal Scientific Adviser to Govt. of India, New Delhi on "Science and Technology as a vehicle for economic development"; Dr Arun Kumar, Development Alternatives, New Delhi on "Innovations for the Poor"; and Dr Samir Brahmachari, Director General, Council of Scientific and Industrial Research, New Delhi on "Taking Technology from Lab to people".

In the final part of the session Dr V N Shukla, Centre for Development of Advance Computing, Noida, spoke on "ICT for Empowering special Persons"; Professor P S Ramakrishnan, Jawaharlal Nehru

University, New Delhi on "Knowledge System: The basis for community participatory responses for climate change linked Vulnerabilities"; Dr Kartikeya V Sarabhai, Centre for Environment Education, Ahmedabad on "Development at Cross Road with Society"; Dr Jyoti Parikh, Integrated Research and Action for Development, New Delhi on "Economics & Science of Development"; Dr Ajay Chowdhry, HCL, Noida on "ICT for rural development" and Dr P Anandan, Microsoft, Bangalore "ICT for Development".

INSA Foreign Fellows inducted to the Fellowship

Professor S R Srinivasa Varadhan, FNA

A brief meeting was organized on February 5, 2008 by INSA Bangalore Chapter to induct Prof. S R Srinivasa Varadhan, Frank J Gould Professor of Science, Courant Institute of Mathematics, New York elected as INSA Foreign Fellow to the Fellowship of the Academy. The Induction Ceremony was held in the Department of Biochemistry, Indian Institute of Science, Bangalore. Prof K Muniyappa, Convener, Bangalore Chapter welcomed Prof Varadhan. Prof M Vijayan, President, INSA, Professors N Balakrishnan and A K Sood, Vice Presidents INSA, a few distinguished Fellows of the Academy and other faculty members were present and gave a brief background during the ceremony. Professor Muniyappa then requested Prof Vijayan to introduce Prof Varadhan and present the medallion and Fellowship scroll to him. In his response, Prof Varadhan thanked the Academy for having him elected to the Fellowship of the Academy.

Professor K R Sreenivasan, FNA

Professor K R Sreenivasan, INSA foreign fellow and Director, International Centre for Theoretical Physics, Trieste, Italy visited the Academy on January 4, 2008. Professor Sreenivasan was received by Professor T P Singh, Vice-President (International Affairs) and Professor N K Gupta, Vice-President (Resource Management). During this visit Professor Sreenivasan signed the Fellowship register and received the scroll from Professor Singh. Professor K R Sreenivasan is a distinguished scientist who has been contributing significantly in many areas of physical sciences,



Professor K R Sreenivasan (Centre) with Prof T P Singh and Prof N K Gupta



Participants of International Conference on Science Education in the Asia-Pacific at Bangkok, Thailand

particularly, fluid dynamics, condensed matter and statistical physics and allied areas. His recent work on the observation of superfluid vortex cores which appeared in Nature 2006 has attracted wide attention. Professor Sreenivasan is one of the international experts in the fluid mechanics and turbulence. He has been honoured with Professor B D Tilak distinguished fellowship by the Department of Chemical Biotechnology, Mumbai University. Professor K R Sreenivasan is a Distinguished Fellow at the JNCASR, Bangalore and interacted with a large number of Indian students and scientists.

International Activities

First International Conference on Science Education in the Asia-Pacific, November 28-29, 2007, Bangkok, Thailand

The first International Conference on “Science Education in the Asia-Pacific” in conjunction with the FASAS Council Meeting was held on November 28-29, 2007 in Bangkok, Thailand hosted jointly by the Science Society of Thailand, The Association of the Academies of Science in Asia (AASA) and Federation of Asian Scientific Academies and Societies (FASAS) with the support of the Inter Academy Panel. Scientists from 23 countries in addition to the FASAS Council Members and large number of scientists from Thailand participated in the Conference. Keynote presentations and plenary lectures were made on three themes namely: Best practices in science and mathematics

educational Innovation in Science, Mathematics and teacher educational and Role of science societies and academies in science & technology development. The Academy nominated Prof S C Lakhotia, FNA as a focal point person and Prof S Kesavan, from Institute of Mathematics, Chennai to attend the Conference and FASAS Council Meeting. Professor S C Lakhotia, FNA made a presentation on “What can Science Academies do to improve Higher Education in Science?” and highlighted the activities under taken by three Science Academies in India in promotion of teaching of science at school, college and university level. Professor S Kesavan during his participation in the Mathematics sessions made a presentation on “Mathematics Education in India-Efforts Outside the University System”.

INSA-CAS Workshop on “Structural Biology”

INSA-CAS workshop on Structural Biology was held at Indian Institute of Science, Bangalore from December 21-24, 2007 hosted by Prof. M. Vijayan the then Vice-President, INSA. A 15 member Chinese delegation led by Prof. Jinghai Li, Vice-President, Chinese Academy of Sciences in addition to large number of Indian scientists representing different areas of “ Structural Biology and Geographical locations in China and India” participated in the Workshop. The workshop was inaugurated on 21 December by Professor P Balaram, Director, Indian Institute of Science, at a function presided over by Professor N.



Prof Jinghai Li addressing Workshop on Structural Biology held at IISc, Bangalore

Balakrishnan, Vice-President INSA and Associate Director of the Institute. The gathering was addressed by Professor M Vijayan and Professor Jinghai Li, Vice-President of CAS. The function was followed by two keynote addresses, one by Professor S K Brahmachari, Director General, Council of Scientific and Industrial Research on “miRNA mediated novel regulatory networks: an *in silico* approach” and the other by Professor Rui-Ming Xu of Institute of Biophysics, Beijing on “Structural mechanisms of transcriptional silencing”. A third keynote address was delivered on the 22nd morning by Professor G Govil on “NMR studies on molecular details of intact spermatozoa”. Altogether 30 technical presentations, 20 by Indian scientists and 10 by Chinese scientists, were made at the workshop. They encompassed almost all aspects of structural biology. The programme also included a lively panel discussion on bioinformatics, involving six panelists and several participants from the floor. In addition, there were two discussion sessions, one on Indo-China interactions in structural biology and the other on the approaches and strategies in structural biology.

Indo-Korean Joint International Symposium on Geo-science and Technology: Utilization of Geospace as a Solution for Energy and Environment on February 12-14, 2008, IIT, Kharagpur

The Indo-Korean joint international symposium was organized jointly by the Mining Engineering Department, Indian Institute of Technology, Kharagpur, India and Geotechnical Engineering Division of Korea



Inauguration of Indo-Korea Symposium of Utilization of Geospace as a Solution for Energy and Environment

Institute of Geoscience and Mineral Resources (KIGAM), Korea under the bilateral agreement signed between Indian National Science Academy (INSA) and Korea Science and Engineering Foundation (KOSEF). Six delegates from Korea in addition to 44 Indian delegates from CIL, UCIL, NLC, SCCL, IMFA, DGMS, CFMRI and academic institutions and one from Brazil attended the Symposium. Overall, this symposium deliberated on the production, utilization and security of energy with due consideration to the environmental issues and focused light on the advances, challenges and issues related to the effective utilization of geospace for the production of affordable energy with definite measures for the clean environment. There were 8 sessions in the symposium including the 45 technical papers and 4 keynote papers covering the subject areas exploration, construction, rock mechanics applications, experimental and numerical methods, safety and hazards of geospace including environmental issues, geoinformatics and modern techniques. There was a strong impression among Koreans on the mining activities especially coal and uranium mines in India. The Symposium concluded with the hope that it will inspire geo-scientists to undertake some sustainable development of geo-space in their future research.

INSA-PAS Conference to Celebrate the 20th Anniversary of the Cooperation between Indian and Polish Medical Researchers on Lymphology, February 14-15, 2008, New Delhi

Professor Waldemar Olszewski, a renowned Lymphologist and Head of the Department of



**Prof. Z. Czernicki, Dir. Med. Res. Centre, Warsaw
in discussion with Professor M Vijayan the
President, INSA**

Transplantology, Medical Research Centre, Polish Academy of Sciences, Warsaw, Poland has been collaborating for the last 20 years with the Indian Lymphoedema Research group in Varanasi, Chennai and Thanjavur. A Conference to mark the 20th Anniversary of this cooperation between Indian and Polish Medical Researchers was held on February 14-15, 2008 at INSA. From the Indian side Prof. Pradeep Jain, from Department of Plastic Surgery, Institute of Medical Sciences, Banaras Hindu University, Varanasi, coordinated the organization of the Conference. Five Polish scientist led by Prof Z Czernicki, Director, Medical Research Centre, Warsaw attended the Conference. Around 18-20 Indian scientists also participated in the Conference. The event was inaugurated by Professor M Vijayan, President, INSA who gave an overview of the scientific cooperation established between the Indian and Polish scientists under the bilateral exchange programme. Keynote lectures and presentations were made by the Indian and Polish scientists covering a wide spectrum: Contemporary basics of human immunity, what is the lymphatic system, human limb infections, filariasis and bacterial infection in India and Europe, lymphoedema of limbs and organs a medical and social problem, treatment of lymphoedema, future trends in diagnosis and treatment. A full session of two hours was devoted to discussion on the consensus document on the Diagnosis and management of Filarial Lymphoedema, conducted by Prof. Jain. The delegates from both the countries took active participation and put forward their respective view. It was unanimously decided by

the members to have more time on discussion and also seek the view and consent of the members of the Lymphology society of India before publishing the consensus document.

India-UK Frontiers of Science Symposium March 4-7, 2008, Hyderabad

The Academy in association with the Royal Society, London organized a 4 day “*India-UK Frontiers of Science Symposium*” from March 4-7, 2008 at Ramoji Film City, Hyderabad. About 70 young post doctorate scientists both from India and UK in addition to Invited guests, official staff of INSA and the Royal Society, London participated in the symposium. Prof. R. Gadagkar, FNA, Indian Institute of Science, Bangalore on behalf of INSA and Prof. Anne Donaldson, University of Aberdeen, Foresterhill, Aberdeen on behalf of the Royal Society, London Co-Chaired the Symposium. The main objective of the symposium was to bring together outstanding early-career scientists to discuss cutting-edge research in a variety of disciplines and to build ties between future scientific leaders in both the countries.

Prof. M Vijayan, President, INSA and Prof. Lorna Casselton, FRS, Foreign Secretary, The Royal Society, London graced the Inaugural Session held on March 4, 2008. Prof. Vijayan gave an invited lecture on “*Half a Century of Molecular Structural Biology in India- A Personal Perspective*” which caught the attention of eminent scientists present there.

The Symposium had eight Sessions each of two hrs in different disciplines of Science having one Session Organiser, Introductory Speaker and two Session Speakers comprising of both Indian and British Scientists in each Session. The following subject areas were covered in the symposium.

1. Microbiology –Chromatin packaging in the cell nucleus
2. Geosciences-Crust-mantle interaction in tectonically active zones of the earth
3. Astronomy/Astrophysics – Fluctuations in the early universe
4. Macrobiology-“Listening in the dark” – *how crickets use song to attract and select mates*
5. Mathematics- Mathematical immunology



Participants of India-UK Frontier of Science Symposium

6. Chemistry- Organic photovoltaics
7. Neurosciences-Pattern formation in the central nervous system
8. Physics-Quantum Computing

The Symposium also had Poster Presentation/Session and discussion session at the end of each session.

The Symposium was a great success and it is hoped that this symposium, in which scientists from a wide range of disciplines were challenged to think about problems at the frontiers of fields other than their own, will stimulate everyone attended to consider new directions in their research and, perhaps, lead to productive longer-term interactions and collaboration between individuals trained in different disciplines who would not otherwise have become acquainted with one another's work.

Delegation from Abroad

Chinese Delegation

A five member delegation from the Chinese Association for Science & Technology (CAST) led by H.E. Mr Qi Rang, Vice-Chairman visited INSA on January 7, 2008 following their participation in the 95th Indian Science Congress and had discussions with the INSA officials to establish cooperative linkages and strengthen the exchange of Science and Technology between India and China. The CAST is a non-profit and non governmental organization for the scientific and technological personnel of China.

Japanese Delegation

A three member Japanese delegation led by Mr N Murata, Executive Director, Japan Society for the Promotion of Science (JSPS) visited INSA on January 31, 2008 and had meeting with Prof N K Gupta, Vice-President, INSA on the existing INSA-JSPS bilateral cooperation. On the invitation from JSPS, the Academy nominated six young scientists to participate in the First Hope Meeting with the theme "Advanced Courses on Nanoscience and Nanotechnology" held in Tsukuba, Ibaraki, Japan on February 24-29, 2008.



Prof N K Gupta, Vice President with Mr N Murata, Executive Director, JSPS

Indian Delegation visits abroad

Prof. N.K. Gupta, FNA, Vice-President visited Trinidad and Tobago, West Indies from February 9-15, 2008 and participated in the first Latin American and Caribbean Congress of Theoretical and Applied Mechanics (LACCOTAM). The Conference was organized jointly by the Department of Mathematics and Computer Science and the Department of Civil Engineering at the University of the West Indies, St. Augustine Campus, Trinidad, as well as the Institute of Theoretical Physics, State University of Sao Paulo (IFT-UNESP, Brazil) and the Centro Nacional de Calculo Cientifico of the Universidad de Los Andes (CeCALCULA). It was co-sponsored by IUTAM, the ICTP (Italy) and the University of the West Indies and was dedicated to the 65th year of Prof. Harold Ramkissoon, Past President of the Trinidad and Tobago Science Academy. Prof. Gupta delivered a keynote lecture in solid mechanics.



Inauguration of first Latin American and Caribbean Congress

In addition to his participation in the Conference, Prof. Gupta visited the Departments of Mechanical Engineering, Mathematics and Computer Science and other Departments and met senior Professors of the University of West Indies. He also had discussions with Prof. Ramkissoon, Former President, Caribbean Academy of Sciences, and Honorary President, LACCOTAM to foster the relationship of INSA and the Trinidad and Tobago Academy of Science.

Local Chapter Activities

KS Bilgrami Memorial Medal (2007)

Dr Shree Kumar Apte, FNA, Associate Director-Biomedical Group (B) and Head-Molecular Biology Division, Bhabha Atomic Research Centre, Mumbai, delivered the KS Bilgrami Memorial Medal (2007) lecture entitled “*Living dangerously : the Deinococcus way ...*” on October 28, 2007 at the Department of Biochemistry, Indian Institute of Science, Bangalore. The summary of the lecture is as follows:

Dr. Apte in his lecture elaborated the novel mechanisms underlying the impressive radioresistance of this superbug elucidated by his laboratory at BARC. He also presented highlights of the recent work by his colleagues to genetically engineer *D. radiodurans* to bioprecipitate uranium from dilute nuclear waste.

The award was conferred in recognition of Dr. Apte’s outstanding contributions to the elucidation of: (a) stress and adaptive responses of agriculturally important bacteria, especially cyanobacteria, to

environmental stresses, such as nutrient deficiency, soil salinity, desiccation, heat-shock and pesticides, and (ii) novel molecular mechanisms underlying the extreme radioresistance of *Deinococcus radiodurans* and biotechnological applications thereof.

Jawahar Lal Nehru Birth Centenary Lecture (2007)

Professor Biman Bagchi, FNA, Solid State & Structural Chemistry Unit, Indian Institute of Science, Bangalore, delivered the Jawahar Lal Nehru Birth Centenary lecture entitled “*From enzyme kinetics to protein diffusion along DNA: New Approaches to old unsolved problems*” on February 13, 2008 at the Indian Association for the Cultivation of Science (IACS), Kolkata. The summary of the lecture is as follows:

Professor Bagchi discussed the recent single molecule studies (SMS) by Professor S. Xie at the Harvard University, USA and showed how one can visualize the motion of a protein along DNA. Reactive oxygen species causes a lesion (oxoG) on guanine. The protein hOgg 1 moves along the DNA, finds the lesion and repairs the defect. Professor Bagchi developed a theory to describe the diffusion of the protein along the DNA. The existing model (van Hippel and Berg, Mirnyi and Stuzki) assumes a sliding motion of protein along DNA chain segments, mixed with three dimensional hops. Bagchi, Xie and co-workers studied in detail the effect of size and conformational dynamics and viscosity. The issue is whether the nature of the pathway of diffusion is linear, helical or spinning. They showed that for motion along a curvilinear path, the protein must break and form bonds/contacts. The activation energy involved may be small, but to translate it must rotate by the right amount. Thus at a molecular level diffusion is controlled by rotation.

In the second part of the talk, he discussed a microscopic model of enzyme catalysis. There are three different views of enzyme catalysis. Pauling proposed that an enzyme stabilizes the Transition State and thus lowers the activation barrier. According to Haldane, binding of the substrate produces a strain and the strain energy drives the chemical reaction. Koshland considered induced fit on substrate binding. Bagchi and Xie developed a theoretical formulation based on a two dimensional free energy surfaces spanned by the intrinsic reaction coordinate (IRC), denoted by X, and an effective enzyme conformational



coordinate Q , describing enzyme dynamics. Just as in the well known Marcus theory of electron transfer reactions, the free energy surfaces are determined by thermodynamics, while the reactions by the crossing-over surfaces. In particular, a funnel like catalytic zone is set up to describe the efficient catalytic conversion along IRC.

Nitya Anand Endowment Lecture (2007)

Professor Santanu Bhattacharya, FNA, Indian Institute of Science, Bangalore, delivered the Dr Nitya Anand Endowment Lecture entitled “*DNA and RNA as Drugs and their implications in Gene Therapy*” on February 13, 2008 at the S N Bose auditorium at Indian Institute of Technology, Kharagpur. The summary of the lecture is as under:

Professor Bhattacharya first introduced the topic by highlighting the fact that almost all diseases have a genetic component. In some cases, such as cystic fibrosis or hemophilia, mutations in a single gene result in disease. In other situations, such as hypertension or hyper lipid levels, certain genetic variations may interact with environmental stimuli to cause disease. Pathological conditions associated with aging frequently result from the loss of gene activity in specific types of cells. Even viral or bacterial infections have a genetic component—the genes of the invading pathogen. Thereafter he nicely described the fundamentals of Gene therapy which is the process by which DNA sequences encoding specific genes are delivered to cells with the goal of treating or curing disease, DNA transport through the cell membrane is an essential requirement for gene therapy, which utilizes oligonucleotides and plasmid DNA. However, membrane transport of external nucleic acid is an inefficient process. Although viral vectors are effective in gene therapy, the immune response elicited by viral proteins poses a major problem. Cationic lipids are attracting a lot of current attention owing to their applications in gene therapy. The functional group that links the backbone bearing the polar head group with the hydrocarbon chains of these lipid molecules play an important role in their utilisation in gene transfer events. For instance, DOTMA, which contains a hydrolytically stable ether linkage between the head group and the long alkyl chain, has been shown to have much greater *in vivo* transfection efficiency than the

corresponding cationic lipid with an *ester* linkage (DOTAP). Other instances are also known where the choice of linkage type between the head group with the hydrophobic segment is crucial for achieving efficient transfection. It is however, not clear why such small difference in the linkage region affects the gene transfer efficiency. One reason for lack of understanding of this difference in transfection activity at molecular level stems from the fact that membrane forming properties of cationic lipid molecules that differ at the linkage region are not known. For the last few years, we have been investigating the role of various molecular level modifications on the properties of membranes formed from different lipids. As concluding remarks, Professor Bhattacharya expressed the hope that some day, gene therapy will be available for the benefit of mankind. That day may not be very far.

Science Education Programme

Professor Santanu Bhattacharya, FNA, Indian Institute of Science, Bangalore, delivered the lecture under student’s science awareness programme under INSA Kharagpur Local Chapter entitled “*Chemistry and You*” on February 13, 2008 at the S N Bose auditorium at Indian Institute of Technology, Kharagpur. The summary of the lecture is as under:

Chemistry is the science of everyday life. Anything one is pursuing in daily life involves chemistry. Washing with soap is a chemical process. Cooking and eating food are chemical processes and even the food taken is chemical substances. The clothes are coloured by synthetic dyes. The medicine being taken was produced by chemists. The fuel used in train, bus or car for travelling was made by a chemist, and so was most of the material the vehicle was made of.

Chemistry controls the environment. Water has to be kept clean, the air has to be safe, crops must be kept clean, and the fertilizers and sprays must be safe for everyone except the pests. Chemists do the analysis which tell us how it is all happening, and chemists have to find solutions to the problems that come up.

MRN Prasad Memorial award Lecture (2007)

Prof. SK Saidapur, FNA, Vice-Chancellor, Karnatak University, Dharwad, delivered the MRN Prasad



Prof S K Saidapur delivering MRN Prasad Memorial Lecture

Memorial award Lecture (2007) entitled “*Reproduction: An Evolutionary Perspective*” on March 12, 2008 at Department of Zoology, University of Delhi, Delhi. The summary of the lecture is as under:

Darwin’s ideas on evolution were summarized by Herbert Spencer in the famous but often misunderstood statement “survival of the fittest”. The idea has no relevance to physical fitness of an organism. In fact, Darwin simply meant that those organisms which leave behind fertile offspring are the fit ones. Understandably, reproduction is a basis for perpetuation of their genes *vis-à-vis* species. But, survival of the species is hardly the concern of natural selection. Successful reproduction is a complex biological phenomenon that necessitates evolution of diverse patterns and reproductive modes (oviparity, viviparity, etc.), timing of reproduction with the season when food supply is abundant and environmental conditions are favorable for raising the offspring, synchronization of reproductive events between the sexes, mate selection and so on. Equally important is the strategy of energy allocation for reproduction and parental care. This involves energy trade-off between somatic growth and reproduction. The proximate factors governing reproduction such as gametogenesis, fertilization, development, pregnancy, parturition, lactation and so on are fairly well understood. The underlying principles of reproduction are understood by asking chiefly ‘what’ and ‘how’ questions. But, we know little about the ultimate factors governing reproduction. For instance, why females invest more energy in reproduction than

their male counterparts? Why most males develop features that appear to be handicaps (e.g. ornaments, horns and so on) at the cost of considerable energy? The force of natural selection becomes weak after reproduction and aging sets in human beings and domestic animals (in nature animals rarely live long enough to age!). Why aging should be related to reproduction? It is possible to ask numerous such ‘why’ questions. Examination in light of the evolutionary principles helps in answering such ‘why’ questions.

The lecture focussed on the evolution of reproductive strategies (e.g. manipulation egg and clutch sizes, egg retention, embryonic diapause, oviducal sperm retention, mate selection, nest building, guarding, evolution of viviparity and so on), energy allocation for reproduction and finally the role of natural selection. Evidently, for a greater appreciation it is necessary to understand both proximate and the ultimate factors governing reproductive processes and strategies in both animals and plants.

Darshan Ranganathan Memorial Lecture (2007)

Professor Maharani Chakravorty, FNA, National Institute of Cholera and Enteric Diseases, Beliaghata, Kolkata, delivered the Darshan Ranganathan Memorial Lecture (2007) entitled “*Bacteriophage MB78 : Genomics and Proteomics*” on March 03, 2008 at Jawaharlal Nehru University, New Delhi. The summary of the lecture is given below:

Narrating her research experiences, Professor Chakravorty recalled her memories about training in famous Summer Course of Cold Spring Harbor laboratory where she was introduced to bacteriophage P22, a temperate phage of *Salmonella enterica serovar typhimurium*. While working with bacteriophage P22 a few interesting and unique observations were made and she isolated a new virulent phage of *Salmonella typhimurium*, named it as MB78. It is morphologically, serologically and even physiologically quite different from P22 and related phages. It has 42 kb long, terminally redundant and circularly permuted DNA. It is a dominant phage and does not allow other phages like P22 and 9NA to grow in its presence. It cannot grow in rifampicin resistant mutant of the host (rif39), although the temperate phage P22 can. However, P22 can help MB78 to grow in rif39. A genomic library of the phage was made in M13mp11 and the detailed



Prof Maharani Chakravorty delivering Darshan Ranganathan Memorial Lecture

physical map of the 42 kb phage genome has been constructed. More than 80 % of the genome has been sequenced. To identify different phage genes and study regulation of their expression, the genomic fragments have been cloned, expressed and studied extensively. The phage MB78 uses various methods for regulation of its gene expression. Two late proteins are expressed from the same gene by ribosomal frame shifting. Presence of multiple copy of this gene (through plasmid) in a permissive host interferes with phage morphogenesis. Messages are mostly monocistronic but some proteins are expressed from polycistronic message without any intercistronic gap where stop and start codons overlap and rare initiation codons are used. One of the two proteins expressed from a 0.9 kb Sal I-Hind III fragment has 57% similarity with a structural protein of mycobacteriophage. Usually structural protein genes of bacteriophages are clustered. In MB78, however, location of the structural protein genes are scattered over the genome. A minor structural gene involved in phage morphogenesis could be identified and studied in detail.

Congratulation for completion of 50 years of INSA Fellowship

Professor Peringandur Venkiteswara Krishna Iyer, (b. 23 June 1909), Elected (1951).

Professor Gabor Dessau, (b. 27 June 1907), Elected (1952).

Professor Sripadrao Kilpady, (b. 13 November 1906), Elected (1954).

Professor Ram Prakash Bambah (b. 1925), Elected (1955)

Awards and Honours

Professor C N R Rao, FNA, FRS has been awarded the Nikkei Asia Prize for Science, Technology and Innovation by the Japanese Foundation. Professor Rao has also been invited to be a Distinguished Visiting Professor of the University of California, Berkeley.

Civilian Awards

The following scientists (Academy Fellows) received the Civilian Awards of the Government of India

Professor Asis Datta, FNA
Padma Bhushan (Science & Engineering-2008)

Professor Sukh Dev, FNA
Padma Bhushan (Science & Engineering-2008)

Professor Kasturi Lal Chopra, FNA
Padmashri (Science & Engineering-2008)

Obituaries

Gobinda Kisor Manna

(b October 10, 1926; d December 25, 2006)

Gobinda Kisor Manna did his D.Sc. in 1962 from University of Calcutta specializing in Animal C y t o g e n e t i c s , Environmental and Microbial Mutagenesis and Radiation Biology. Professor Manna started his research on cytotaxonomy and chromosomes in evolution in Arididae, Grylidae, Heteroptera, Homoptera, Coleoptera, fish, amphibia and mammals. His findings (1951), specially on Heteroptera, are quoted even today in books and papers. He pioneered development of mammalian and fish cytogenetics. His work on human cervix cancer and handling of chromosomes of solid tumour by a coumarin technique is a classic



contribution. In 1967 he switched over to the study of microbes as mutagens, an area newly added to the field of mutagenesis, showing that viruses, bacteria, lower fungi and parasitic protozoan are potential mutagens like chemical and physical ones.

Professor Manna was a Fellow of National Academy of Sciences (India), Indian Academy of Zoology, Indian Academy of Sciences and West Bengal Academy of Science & Technology, He was recipient of UGC National Fellow, Sir JC Bose Award (UGC) and President, Zoology Section, Indian Science Congress (1969). He was INSA Senior Scientist during the period 1991-95.

Professor Gobinda Kisor Manna was elected to the Fellowship of Indian National Science Academy in 1976 and served as its Council member during 1982-84.

Archana Sharma

(b February 16, 1932; d January 14, 2008)

Archana Sharma received her D.Sc in 1960 from University of Calcutta specializing in Cytogenetics, Human Genetics and Environmental Mutagenesis. She developed new techniques for studying chromosome structure applied throughout the world, and deduced evidences of a new concept of speciation in vegetatively reproducing plants. Her other studies relate to induction of division in adult nuclei and cause of polyteny in differentiated tissue in plants; cytotaxonomic investigation on flowering plants, assessment of chromosomal and genetical polymorphism in normal human populations in eastern India and their comparison with pathological conditions, differentiation patterns in human fibroblasts in relation to polyteny as a factor in ageing; genetic polymorphisms in relation to environmental agents on living systems; clastogenic and mutagenic effects of various pesticides and metals on multiple test systems. Professor Archana Sharma was a prolific writer. She authored eight books, edited other books



and the journal 'Nucleus'. She was on the editorial board of many leading journals.

Professor Sharma was a Fellow of Indian Academy of Sciences and National Academy of Sciences (India); Indian Botanical Society (President, 1989); Member, International Academy of Sciences (Germany). She was recipient of Shanti Swarup Bhatnagar Prize, JC Bose Award (UGC), UGC National Lecturer, FICCI Award, Birbal Sahni Medal (India Botanical Society), President, Indian Science Congress (1986-89) and Padma Bhushan.

Professor Archana Sharma was elected to the Fellowship of Indian National Science Academy in 1977 and served as its Council member during 1980-82 and Additional Member 1985-86.

Joseph Thomas

(b March 20, 1935; d January 30, 2008)

Joseph Thomas received his Ph.D. in 1962 from University of Bombay specializing in Biological Nitrogen Fixation and Biotechnology. Dr Thomas had established that heterocysts of cyanobacteria are the site of nitrogen fixation. He pioneered the use of radioactive nitrogen (^{13}N) and demonstrated the glutamine synthetase-glutamate synthase pathway in microbes and plants. His other major contributions relate to the mechanism of salt tolerance, sodium transport metabolism and organization of *nif* genes in cyanobacteria, biochemical characterization of glutamine synthetases as well as legume-*Rhizobium* interactions.



Dr Thomas was a Fellow of Indian Academy of Zoology, Indian Academy of Sciences, National Academy of Agricultural Sciences (India) and Member, Guha Research Conference. He was recipient of FICCI Award and served as Member, Governing Body of Council of Scientific and Industrial Research and its Society, Research Council of Centre for Cellular and Molecular Biology and International Advisory Committee on Biological Nitrogen Fixation. Dr



Thomas established the Centre for Biotechnology at SPIC Science Foundation.

Dr Joseph Thomas was elected to the Fellowship of Indian National Science Academy in 1984 and served as its Council member during 1993-94 and 2000-02.

Pushp Raj Gajri

(b September 17, 1944; d February 15, 2008)

Pushp Raj Gajri received his Ph.D. in 1981 from Punjab Agricultural University, Ludhiana specializing in Soil and Water Management, Tillage and Root Growth. Dr Gajri has made significant and original contributions in the domain of soil and water management. His well-hypothesized and meticulously-executive



researches have found place in the national and international journals of repute. His work on irrigation scheduling to crops employing the concept of pan evaporation and permissible water depletions, timing of small irrigation amounts, and later the use of water balance and crop growth modeling techniques are the pioneer efforts in managing on-farm irrigation water. He had conducted in-depth field studies for evaluating root growth responses to carefully chosen practices viz, irrigation, tillage, mulching and fertilization. These root growth manipulates have management implications for enhancing water and fertilizer use efficiency. Extensive field investigations by Dr Gajri on deep tillage responses of field crops had convincingly shown that tillage benefits are governed by the interplay of supply (water retentivity) and demand for water (evaporativity) and modified by other management practices. All these research activities were Dr Gajri geared towards achieving the twin objectives of conservation of production resources and increasing the agricultural productivity

Dr Gajri was a Fellow of National Academy of Agricultural Sciences and Member, Indian Society of Soil Science. He was the recipient of ICAR Team

Award, KRIBHCO Dryland Research Award and Rafi Ahmed Kidwai Award.

Dr Pushp Raj Gajri was elected to the Fellowship of Indian National Science Academy in 1999. At the time of Dr Gajri demise, he was the Convener of Ludhiana Chapter of the Academy.

Sibte Hassan Zaidi

(b 15 April 1918; d April 5, 2008)

Sibte Hasan Zaidi received his Ph.D. in 1954 from University of London, U.K. specializing in Toxicology and Pathology. Dr Zaidi had specialized in the field of 'dust diseases' and their relationship to respiratory infections. His research helped, for



the first time, to find the cause of coal-miner's lung disease, silicosis and pneumoconiosis in coal-miners, particularly the relationship between pneumoconiosis and tuberculosis. He had established in Sri Lanka an Environmental Toxicology Unit under ILO auspices and Laboratory of Industrial Toxicology and Occupational Health in Rangoon under WHO assistance.

Dr Zaidi was the Director, Indian Institute of Experimental Medicine, Kolkata, First Director (1965-78), Industrial Toxicology Research Centre, Lucknow and Deputy Director & Head, Department of Experimental Medicine, CDRI, Lucknow. He served as Vice-President, Expert Committee of International Register of Potentially Toxic Chemicals.

Dr Zaidi was a Fellow, Royal College of Pathologists (London), National Academy of Medical Sciences (India) and National Academy of Sciences (India), President, Asian Society of Environmental and Industrial Toxicology. He was recipient of Shanti Swarup Bhatnagar Prize, Sir Ardeshlal Dalal Memorial Gold Medal, Yant Memorial Award, USA, Physiology Society Gold Medal, Clinical Society Gold Medal and Padma Shri from Government of India.

Dr Sibte Hasan Zaidi was elected to the Fellowship of Indian National Science Academy in 1974.

Change of Address/Email**Professor Kalluri Subba Rao, FNA**

Academic Advisor & INSA-Senior Scientist

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Professor Ramesh Chander Mahajan, FNA

Email ID: indurc001@gmail.com

Professor Rajiva Raman, FNA

Email ID: rajiva.raman@gmail.com, rajiva.raman @yahoo.com

**Farewell**

Shri Jai Bahadur joined the Academy on June 6, 1986 and retired on February 1, 2008 as Helper III on VRS.

Announcements**Deputation of Indian Scientists Abroad under
Bilateral Exchange Programme 2009-2010**

Applications are invited from outstanding scientists/researchers holding Ph.D. degree and having regular positions in recognized S&T institutions/universities and actively engaged in research in frontline areas for deputation abroad during the year 2009-2010 in all fields of Science including Engineering, Medical & Agriculture for short term visits (2-4 weeks for senior scientists) and long term visits (3-6 months for junior/younger scientists) under the Scientific Bilateral Exchange Programme with overseas Academies/Organisations in Brazil, China, Czech Republic, Edinburgh (Scotland), France, Germany, Hungary, Japan, Kyrgyz Republic, South Korea, Nepal, The Netherlands, Philippines, Poland, Russia, Slovak Republic, Republic of Slovenia, Turkey, Ukraine and UK.

The detailed guidelines and Applications form may be obtained from the Academy by sending a self addressed stamped (Rs.10/-) envelope marked "Exchange Programme" to the Assistant Executive Secretary (Inter Academy) or may access from internet site <http://www.insaindia.org>. The application duly completed and endorsed by the Head of the Institutions should be submitted latest by October 15, 2008. Tel: 91-11-2322 1931-50 (20 lines); Fax: 91-11-23221959; e.mail: intacademy@insa.nic.in



Invitation for Contribution in the Proceedings of the Indian National Science Academy

Proceedings of the Indian National Science Academy is an inter-disciplinary journal devoted to publication of review papers, original research articles, short communications, commentaries, lateral thinking and emerging techniques in the areas of Physical, Biological, Applied Sciences and also Engineering. Four issues March, June, September and December are published.

Three copies of the manuscript complete with figures, tables and any other material (one original and two copies) may be submitted to the Editor-in-Chief, *Proceedings INSA*, Indian National Science Academy, Bahadur Shah Zafar Marg, New Delhi 110002. An advance copy of the manuscript may be submitted in the electronic form also at procinsa@insa.nic.in.

Invitation to Scholars for Research Proposal for support under History of Science Programme

Research proposals are invited from researchers interested in taking up source and theme oriented studies by compiling important sources for study, translation of important scientific and technical works and making critical assessment in the areas like mathematics, astronomy medicine, architecture, product, life and works of eminent scientists, institutions, science and societies etc. relating to Indian science and technology in proper historical perspective.

Application form can be obtained from History of Science Unit of the Indian National Science Academy.

Last Date for Making Nomination for Election of Fellows and Foreign Fellows

This is to draw attention of Fellows of INSA to the fact that last date for receiving nomination for election as Fellow and Foreign Fellow is 15 October 2008. The nominations received on or before October 15 will be included for consideration in the year 2009, while those received after October 15, will go to the year 2010.

The Fellowship Nomination Form will be made available only to Fellows of INSA on request.

INSA Medal for Young Scientists – 2009

Nomination are invited for INSA Medal for Young Scientists – 2009. The last date for receiving nominations in the Academy is, October 31, 2008. The awardee shall receive a certificate, a bronze medal and cash award of Rs. 25000/- and incentives in research work. A candidate may be proposed by a Fellow of the Indian National Science Academy or by earlier recipients of this award. Scientific societies of national standing, university faculty, post-graduate department or research institutions may also make nominations of eligible candidates. Nomination proforma can be downloaded from website www.insaindia.org.

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