



## INSA Medal for Young Scientists (2009)

INSA Medal for Young Scientists award, considered to be the highest recognition of promise, creativity and excellence in a young scientist, is given annually to those distinguished for these attributes as evidenced by their research work carried out in India. The award contains a medal, a certificate and a cash prize of Rs. 25000/-. In the year 2009, 28 young research workers were honoured with INSA Medal for Young Scientists. These young scientists are as follows:

1. **Dr V Govindan Anand** (b.18.07.1974), PhD, Assistant Professor, Department of Chemistry, Indian Institute of Science Education and Research, Pune.

For his original contributions on synthesis and supramolecular properties of isophlorins.

2. **Dr Hanudatta Sastry Atreya** (b.08.11.1974), PhD, Assistant Professor, NMR Research Centre, Indian Institute of Science, Bangalore.

For his innovative methodologies for analyzing NMR spectroscopic data for determining structures of proteins.

3. **Dr Anindita Bhadra** (b.07.05.1977), PhD, Centre for Ecological Sciences, Indian Institute of Science, Bangalore.

For her significant published work demystifying queen selection process in a primitively eusocial wasp.

4. **Dr Gautam Bharali** (b.13.05.1974), PhD, Assistant Professor, Department of Mathematics, Indian Institute of Science, Bangalore.

For his contributions to the field of several complex variables such as polynomial convexity, spectral Pick-interpolation problem and the controlled bumping of bounded pseudo-convex domains, to mention only a few.

5. **Dr Alok Chandra Bharti** (b.07.07.1974), PhD, Scientist D and Head, Division of Molecular

Oncology, Institute of Cytology and Preventive Oncology (ICMR), Noida.

For his contribution in showing that tumors actively release membrane gangliosides capable of inducing apoptosis in bone marrow cells both *in vivo* and *in vitro*. He further showed that the apoptosis is mediated by NFkappa B signaling.

6. **Dr KV Brinda** (b.19.10.1976), PhD, Post Doctoral Fellow, Department of Computer Science, Cornell University, Ithaca, New York.

For his insightful work for identifying interactions in protein networks using bioinformatics approaches.

7. **Dr Anirban Chakraborti** (b.10.02.1975), PhD, Charge de Recherche, Laboratoire de Mathematiques Appliquees aux Systemes, Ecole Centrale de Paris, Grande Voie des Vignes, Chatenay-Malabry, France.

For his pioneering studies on statistical models related to Econo-physics.

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8. **Dr Chandra Prakash Chaturvedi** (b.07.03.1975), PhD, Post Doctoral Fellow, The Sprott Centre for Stem Cell Research, The Ottawa Hospital (General Campus), Ottawa, Ontario, Canada.

For his contribution to the development of a novel two-component expression system involving a TGTA mutation in the TATA box and a mutated transcription factor TBPM3 to achieve a tight regulation of transgenes. The synthetic bi-directional promoter developed by him is another useful contribution to transgenics.

9. **Dr Onkar Jayant Dabeer** (b.15.09.1974), PhD, Reader F, School of Technology and Computer Science, Tata Institute of Fundamental Research, Dr Homi Bhabha Road, Mumbai.

For creating design of low-precision ADC to reduce cost and power consumption in, and development of uncoordinated access mechanism for wireless communication.

10. **Dr Archana Sunil Gandhe** (b.03.05.1976), PhD, Laboratory of Molecular Genetics, Centre for DNA Fingerprinting and Diagnostics (CDFD), Hyderabad.

For discovering novel molecules involved in innate immunity in insects and for publications in outstanding journals.

11. **Dr Anil Kumar Ghosh** (b.27.08.1974), PhD, Assistant Professor, Theoretical Statistics and Mathematics Unit, Indian Statistical Institute, Kolkata.

For his significant work on "Classification based on data" using a combination of parametric and nonparametric methods. Work includes rigorous asymptotic analysis as well as simulation based studies.

12. **Dr Rajesh Ghanshyam Gonnade** (b.21.03.1974), PhD, Scientist C, Center for Materials Characterization, National Chemical Laboratory, Dr Homi Bhabha Road, Pune.

For his wide-ranging studies on halogen bonding and crystal engineering of inositols.

13. **Dr Yamuna Krishnan** (b.25.05.1974), PhD, Fellow E, National Centre for Biological Sciences, TIFR, UAS-GKVK Campus, Bangalore.

For his pioneering work leading to an understanding of the formation of uncommon i-tetraplex structures of nucleic acids.

14. **Dr Amol Arvindrao Kulkarni** (b.03.12.1976), PhD, Scientist, Chemical Engineering Division, National Chemical Laboratory, Dr Homi Bhabha Road, Pune.

Design of microreactors for continuous flow synthesis and design of microdevices for carrying out exothermic reactions.

15. **Dr Brijesh Kumar** (b.01.06.1976), PhD, Assistant Professor, School of Physical Sciences, Jawaharlal Nehru University, New Delhi.

For developing a new and original approach to treat strongly correlated electron systems.

16. **Dr Manoj Kumar** (b.18.12.1974), PhD, Reader F, School of Mathematics, Harish-Chandra Research Institute, Allahabad.

For his significant contributions to the study of class preserving automorphisms of a finite p-group. He has found an optimal upper bound for the order of this group and moreover classified those p-groups for which the bound is attained. By solving an analogue of a famous problem of Burnside on the existence of a p-group which has non inner class preserving automorphisms, he generalized some well known results of Attan, Curran and McCaughan.

17. **Dr Namit Mahajan** (b.22.06.1975), PhD, Reader, Theoretical Physics Division Physical Research Laboratory, Ahmedabad.

For his excellent work on weak decays of B-mesons and CP violation.

18. **Dr Chandrashekara Mallappa** (b.22.03.1977), PhD, Postdoctoral Research Associate, UMass Medical School, Department of Cell Biology, Worcester, USA.

For his excellent research by studying light regulated plant gene expression and development. His work on ZBF1 transcription factor demonstrated for the first time that it acts as a factor at the cross-talk among three signal transduction pathways.

- 19. Dr Jajati Keshari Mohapatra** (b.12.06.1976), PhD, Scientist (Veterinary Microbiology), Project Directorate on Foot and Mouth Disease (ICAR), IVRI Campus, Mukteswar-Kumaon, Nainital, Uttarakhand.  
For using molecular tools to examine the diversity and genomic complexity of the Foot and Mouth Disease virus.
- 20. Dr Soumik Mukhopadhyay** (b.21.10.1976), PhD, Senior Research Fellow, Saha Institute of Nuclear Physics, Bidhannagar, Kolkata.  
For his original contributions to Tunnel Magnetoresistance in nanosystems and spintronics.
- 21. Dr Satish A Patil** (b.01.07.1974), PhD, Assistant Professor, Solid State and Structural Chemistry Unit, Indian Institute of Science, Bangalore.  
For his imaginative and innovative work on conjugated polymers for organic electronics and photo-catalysis.
- 22. Dr Beena R Pillai** (b.09.12.1974), PhD, Scientist, Comparative Genomics and Gene Expression, Institute of Genomics and Integrative Biology, CSIR, Delhi.  
Insightful work on relationship between polyglutamine expansions and neuro degenerative disorders.
- 23. Dr Kalika Prasad** (b.08.07.1974), PhD, Padualaan 8, Utrecht University, Utrecht, The Netherlands.  
Dr Kalika Prasad, has made critical contributions in understanding transcription regulation of rice flowering. His work on the RFL gene showed that RFL gene has acquired a unique pattern in all branching meristems. These RFL regulatory elements contribute to a function in plant architecture. Dr Kalika Prasad has also explored functions for two other rice transcription factors regulating rice organs: lemma, palea and lodicules. His approach of functional genomics has brought new knowledge on regulation of rice flowering and plant architecture.
- 24. Dr Mihir Kumar Purkait** (b.16.10.1974), PhD, Associate Professor, Department of Chemical Engineering, Indian Institute of Technology, Guwahati.  
For his contribution in the development of novel waste water treatment, membrane separation technologies and enhanced oil recovery technology.
- 25. Dr Paramel Pattathil Rajeev** (b.05.05.1976), PhD, Gemini Experimental Science Section Leader, Central Laser Facility, Rutherford Appleton Laboratory, Chilton, Didcot, UK.  
For his pioneering work on intense, Femtosecond, Laser-solid interactions in nanoscales.
- 26. Dr KV Ramesh** (b.12.07.1975), PhD, Scientist, CSIR Centre for Mathematical Modelling and Computer Simulation, Bangalore.  
For his significant contributions in understanding air-sea interactions on intraseasonal time scale over Indian monsoon region using global general circulation model and new oceanic data.
- 27. Dr Manish Tiwari** (b.26.11.1975), PhD, Scientist-B, National Centre for Antarctic and Ocean Research, Vasco-da-Gama, Goa.  
For using multiple proxies to decipher various aspects of past monsoon using sediments from the Arabian Sea, with high resolutions dating using radiocarbon, for the past 35Ka. He has provided quantitative climate data useful to test models.
- 28. Dr Ganesan Venkatasubramanian** (b.24.01.1975), MD, Assistant Professor of Psychiatry, Department of Psychiatry, National Institute of Mental Health and Neurosciences (NIMHANS), Bangalore.  
For his innovative use of quantitative and functional imaging of the brain in patients with schizophrenia and carefully matched controls and linking these data to clinical and epidemic logic parameters leading to a new hypothesis of a “neuro immuno metabolic model” for its etiopathogenesis. This model has been partially validated by available results and exciting work is continuing.

### **Anil Kumar Bose Memorial Medal - 2009**

- 1. Dr Joseph Selvin** (b.1972), Senior Lecturer, Department of Micrology, Bharathidasan University, Tiruchirappalli 620 024.  
For his paper on “Exploring the Antagonistic Producer *Streptomyces* MSI051: Implications of Polyketide Synthase Gene Type II and a Ubiquitous Defense Enzyme Phospholipase A2 in the Host Sponge *Dendrilla nigra*” published in *Current Microbiology (Springer)*, 2009, DOI 10.1007/s00284-008-9343-1.



## INSA Awards

During the Ordinary General Meeting of the Academy on August 06, 2009, the names of the awardees for various medals and lectures including the young scientists medal were announced.



Professor A K Sood, VP, INSA (Fellowship affairs) on the Dais during Ordinary General Meeting

### INSA Award Lectures/Medals Awardees (2009)

- 1. The Satyendranath Bose Medal to Professor Rohini M Godbole, FNA**  
For her landmark research contributions to High Energy Physics and for her role in the development of this field in the country.
- 2. The Darashaw Noshervanji Wadia Medal to Professor Ashok Sahni, FNA**  
For his outstanding contributions to Palaeontology and addressing seminal questions of significantly implications to geodynamics and biological evolution through a multifaceted approach and regirous research.
- 3. The Golden Jubilee Commemoration Medal to Professor TN Ananthkrishnan, FNA**  
For his life-long significant contributions to Chemical Ecology with special reference to Plant-Insect interactions and entomology education.
- 4. The Vishwakarma Medal to Shri E Sreedharan, Managing Director, Delhi Metro Rail Corporation, New Delhi**  
For his significant contribution in the area of Civil Engineering construction keeping in mind economy and safety.
- 5. Professor GN Ramachandran 60<sup>th</sup> Birthday Commemoration Medal to Professor DM Salunke, FNA**  
For his seminal studies that have resulted in elucadating diverse facets of the specificity of antigen recognition.
- 6. Professor TR Seshadri 70<sup>th</sup> Birthday Commemoration Medal to Professor D Basavaiah, FNA**  
For his pioneering contributions towards the development of the Baylis-Hillman reaction in the context of modern synthetic methodologies.
- 7. Professor Krishna Sahai Bilgrami Memorial Medal to Professor Bijay Singh, FNA.**  
For his excellent work in the area of soil-nutrient management and has come out with a number of recommendations having direct relevance to agricultural production, particularly in rice wheat system. His latest work in crop-residue management for nutrient cycling and improving soil productivity in rice-based cropping systems has proved useful for farmers growing rice.
- 8. Shree Dhanwantari Prize to Professor NP Kochupillai, FNA**  
For his outstanding contribution in the field of Endocrinology in India and the contributions he has made to developing national policies for the prevention and control of iodine deficiency.
- 9. Dr Nitya Anand Endowment Lecture to Professor V Nagaraja, FNA**  
For his contributions for understanding the mechanisms of microbial antibiotic resistance especially the gyrase of tuberculosis and for identifying potential drug target molecules in *M. Tuberculosis*.
- 10. Professor Vishnu Vasudeva Narlikar Memorial Lecture to Professor KB Sinha, FNA**  
For his sustained contributions of very high quality to functional analysis, operator theory and quantum probability. Recently he has been working on noncommutative geometry and its applications to quantum dynamics.

**11. Dr Jagdish Shankar Memorial Lecture to Dr Swapan K Ghosh, FNA**

For his outstanding contribution to theoretical chemistry, and in particular for contributions to the density functional theory of both quantum and classical systems.

**12. Professor Vishwa Nath Memorial Lecture to Professor Siddhartha Roy, FNA**

For his significant contributions that have resulted in insights into the structural and energetic bases of transcription regulation.

**13. Professor Rango Krishna Asundi Memorial Lecture to Professor N Periasamy, FNA**

For his outstanding contributions in laser spectroscopy, in particular the use of fluorescence anisotropy decay and in the development of strategies to identify the presence of more than one emitting, species.

**14. Professor Toppur Seethapathy Sadasivan Lecture to Professor DJ Bagyaraj, FNA**

For his pioneering contributions on arbuscular mycorrhizal fungi (AMF) and demonstration of their host preference. He has demonstrated synergistic interaction between AMF and the crop species. He proved the benefit from AMF for the improvement of plant performance and paved the way for use of AMF for low input sustainable agriculture.

**15. Dr Guru Prasad Chatterjee Memorial Lecture to Professor SC Dutta Roy, FNA**

For his research and scholarship in the area of Digital Signal Processing (DSP). He has made seminal contributions in DSP.

**16. LSS Kumar award to Dr Jajati Keshari Mohapatra** Scientist (Veterinary Microbiology), Project Directorate on Foot and Mouth Disease (ICAR), IVRI Campus, Mukteswar-Kumaon, Nainital, Uttarakhand.

Dr JK Mahapatra has used molecular tools to examine the diversity and genomic complexity of the Foot and Mouth Disease virus. Information generated through his work will be useful for diagnosis and management of this important disease through development of new vaccines.

**A Workshop-cum-Project Investigator's Meet**

A History of Science workshop-cum-Project Investigator's meet was organized during 13-15 April, 2009 at Jadavpur University, Kolkata, alongwith the meeting of Research Council and Indian National Commission for History of Science. The programme of open presentation of new Project proposals as well as progress reports of on-going projects were designed by the then Chairman, Research Council for History of Science, Professor Roddam Narasimha in 2005, to inculcate interest among scientists, historians and students of different faculties. The first three meetings were held at the premises of INSA, New Delhi and attracted a large number of scholars from different parts of the country. Since this programme got momentum in very short time, it was decided to organize it as an annual event in other parts of the country to make it more popular and informative. To begin with, the History of Science unit organized this meet cum workshop at the premises of IIT, Powai, Mumbai during 9-11 April, 2008 with the help of Dr K Ramasubramanian. In order to make it more interesting, a series of special invited lectures were also planned.

This fifth meet celebrated 50 years of History of Science research at the auspices of INSA was inaugurated at Triguna Sen Memorial Hall, Jadavpur University on 13-15<sup>th</sup> April, 2009. It was attended by a large number of distinguished scholars of science,



**Dr R Balasubramaniam delivering lecture during Workshop-cum-Project Investigator's Meet from 13-15 April 2009**



history, philosophy and literature. A souvenir was also published on this occasion. The welcome address was delivered by Professor Siddhartha Datta, Pro-Vice Chancellor of Jadavpur University. Professor Datta thanked INSA for selecting the venue of Jadavpur University for this exclusive programme. He highlighted the ethics of science and society and the role played by the social scientists in the area of history of science research in India. He also pointed out failures in this regard and hoped that the gap areas will be taken care of. The Inaugural address was delivered by Dr. Subimal Sen, Chairman, State Council of Higher Education, West Bengal. Dr Sen emphasized the role of younger scholars in collaborating science with history and hoped the Academy will take steps in this regard. He also highlighted the contribution of Indian scholars in Science during post independence period. He was overwhelmed to see the presence of a large number of young students and teachers during the programme. Dr A K Bag, spoke about the contribution of the Academy in History of Science researches. He discussed the methodology adopted by the pioneers like PC Ray, DM Bose, SN Sen, AC Ukil and TA Saraswati in teaching and promoting history of science at the auspices of the Asiatic Society in early years and shared his experiences during the time. Professor PN Ghosh, the Vice Chancellor, Jadavpur University applauded the efforts of INSA and analysed the role of historians and scientists in promoting scientific researches in India. He also discussed Science Policy of independent India and referred to the works of Joseph Needham and DD Kosambi in the context of social development and science for the common people. Professor R Gadagkar, Chairman, Research Council for History of Science, INSA in his introductory remarks expressed his desire to attract younger people to the history of science programme. He discussed the need for contemporary studies and planning to fill up the gap between science, society and humanities and appealed that a common goal of the scientists, historians and social scientists should be manifold in the context of interest of the society. He thanked Professor R Narasimha for initiating him to take interest in history of science programme of the Academy. He also informed that a biannual course in contemporary studies is being carried out at IISc, Bangalore under his supervision. Two special invited lectures were also delivered by Professors BC Sinha and Shyamal Chakraborty on trends in scientific

researches and contributions of PC Ray. The session was concluded with a vote of thanks to the University and INSA by the local coordinator, Professor Mahua Sarkar, Head, Dept. of History, Jadavpur University and the INSA coordinator Mrs. Shabnam Shukla.

The Project presentation programme, during which the progress of the projects and new proposals were evaluated by the Research Council, was divided in following three sessions under the Chairmanship of R Gadagkar at the Venue of K P Bose Memorial Hall, Jadavpur University.

### Session I – Ongoing Projects

Catalogue and technical analysis of forge welded iron cannons in Deccan Forts by Professor R Balasubramaniam and Dr. Jai Kishan, Kanpur.

Studies related to History of Astronomy by Dr. (Mrs.) B S Shylaja, Bangalore.

Anatomical Knowledge and the Anatomy of Medical Knowledge in India : Some Preliminary Inquiries by Dr. Jayanta Bhattacharya, West Bengal.

Catalogue of Forge Welded iron Cannons in Western Maharashtra Forts by **Dr P P Deshpande, Pune.**

English Translation of *Trimalla Bhatta's Brhad – Yogatarangini* by Dr. Nirmal Saxena, Rae Bareli

A Critical and Comparative Study of two Indian Astronomical texts (1) Siddhanta Shekaram of Sripathi of (11<sup>th</sup> Century) (2) Siddhanta Sarvabhowma by Munishwara (18<sup>th</sup> Century) by Dr. A Sripad Bhat, Tirupathi.

### Session II – On Going Projects

Technology of the Tribes of Northeast India with Special Reference to Arunachal Pradesh by Dr. A K Thakur, Meghalaya.

Minerals, Mining and Metal working crafts in medieval India. C 1600-1750 AD : A study based on Dutch sources by Dr. Ishrat Alam, Aligarh.

A Physical Survey of Irrigational Works in the Thar Desert of Medieval Times by Professor B L Bhadani, Aligarh.

Preparation of Translation and Mathematical Notes of the works of Nilakantha by Dr K Ramasubramanian, Mumbai.

History of Mutation Research – an Overview by Dr O S Vivekanandan, Chennai.

Calcuttan Science (1814-1914) and the Mini-renaissance in India by Professor Arun Kumar Biswas, Kolkata.

History of Development and progress in Cancer Research & Control in Post-Independent India : focus on Two Pioneering Institutes by Dr Sukta Das, Kolkata.

History of the Ordinance Establishment of British-India: 1700-1947 by Dr Kaushik Roy, Kolkata.

History of Technical Education in India: 1900-2005 by Professor Samir Kr. Saha, Kolkata.

Towards an understanding of indigenous knowledge system of the fishermen of Sundarbans in West Bengal and their approach to health, sanitation and climate by Prof. Mahua Sarkar, Kolkata.

### **Session III – New Proposals**

*Khagendra Mani Darpana* (KMD) World's first complete Text on Ancient Toxicology by Dr. Sathyanarayana Bhat, Bangalore.

Science and Nationalism in Bengal 1876-1947, Phase VII : P N Bose and Indian Geology (1855-1947) by Prof. C B Palit, Kolkata.

Communicable disease and germ theory by Dr (Mrs) Srabani Sen, Kolkata.

South Indian Metrological Traditions : A Critical Study by Dr. V Selvakumar, Thanjavur.

History of High Tin Bronze and Brass Technologies in Eastern India by Dr. Pranab K. Chattopadhyay, Kolkata.

The Pioneer mathematicians and their role in Calcutta University during nineteenth and twentieth century by Dr. (Ms.) Mala Bhattacharjee, Kolkata.

The Historical facts affecting the Climatic Changes in The State of Jharkhand by Dr Manoj Shekhar, Ranchi.

Electronics Education and Research in India : The Early History by Dr Meher Hoshang Engineer, Kolkata.

The Academic sessions were concluded with a vote of thanks to the Chair and distinguished members of the Commission/Council alongwith the local organizing Committee and participants by Mrs Shabnam Shukla on behalf of INSA.

To mark Fifty years of History of Science Research at the auspices of INSA, which was originally housed at the Asiatic Society Kolkata, the Asiatic Society, sponsored a Special Lecture on “*Astronomy in Medieval India Arabic and Persian Sources, their Translation into Sanskrit and Vice Versa*” by Professor S M R Ansari, Aligarh (in chair Professor Barun De), and screened a documentary on *History of Science and the Asiatic Society*, prepared by Shri Gautam Ghosh, a renowned film director alongwith an exhibition of rare manuscripts collected at the society.

A joint meeting of the National Commission and Research Council was held under the Chairmanship of Professor M Vijayan, President, INSA on 15<sup>th</sup> April, 09. Professor Vijayan expressed his happiness over the successful organization of the meet under the guidance of Professor R Gadagkar. Professor Vijayan also applauded the efforts of Professor R Narasimha, the former Chairman of Research Council for his wide vision in designing the Project Investigator's meet to make the History of Science research more popular and meaningful.

### **Symposium on "Nutrition Security for India - Issues and Way Forward"**

*Malnutrition in India is a silent emergency needing immediate attention if the country has to have inclusive and equitable growth and development.*

A symposium on *Nutrition Security for India- Issues and Way Forward* organized by INSA on August 3-4, 2009, at INSA auditorium. This symposium was convened to Dr M Bamji, Vice President, INSA and cosponsored by Science for Equity Empowerment and Development (SEED), Department of Science and Technology (DST), Government of India.

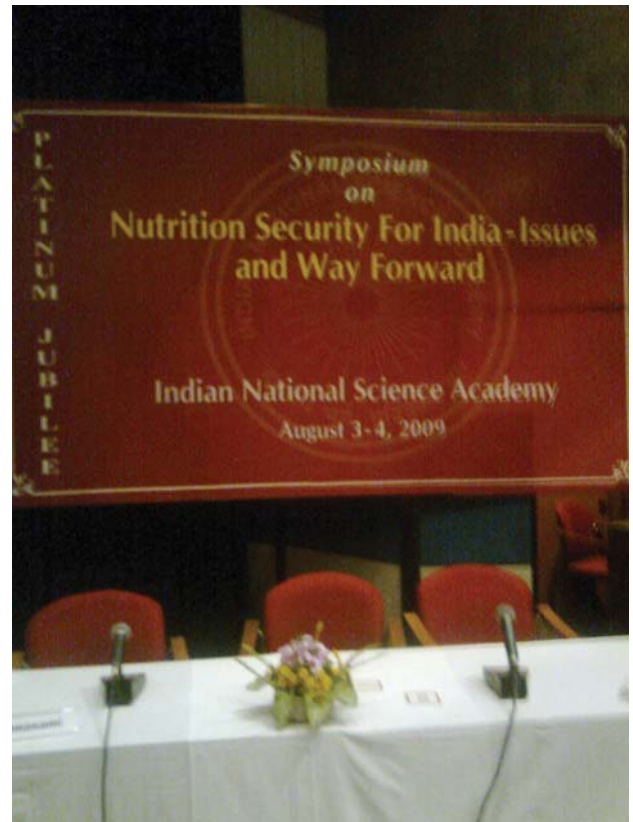
The purpose of the symposium was to examine the factors responsible for the high incidence of malnutrition in India, its consequences, the current response and identify the way forward. Professor MS Swaminathan, FNA, FRS, Chairman, MS Swaminathan Research Foundation, Chennai, and Member of the Parliament inaugurated the symposium. Professor M Vijayan chaired the inaugural session. The theme of Dr.Swaminathan's talk was: Achieving Sustainable Nutrition Security: A Road Map.



In the programme that followed, an overview of the problem and consequences of the double burden of disease that a country in transition like India faces, was given by Dr Kamala Krishnaswamy, former Director, National Institute of Nutrition (NIN), Hyderabad. Four presentations that followed dealt with dietary and non-dietary etiology of malnutrition. Dr GNV Brahmam (Scientist F, HoD, Division of community studies, NIN) discussed the qualitative and quantitative aspects of Indian diets as revealed by the surveys done by the National Nutrition Monitoring Bureau (ICMR) and their impact on nutrition status. The non-dietary factors in the aetiology of malnutrition discussed were: a) the vicious link between malnutrition and infections due to in-sanitary conditions and poor access to safe drinking water (Dr T Jacob John, former Professor and Head, Clinical Virology, Christian Medical College, Vellore), b) interplay of income and probably genetic factors as revealed by unexplained regularities in the anthropometric measures of preschool children, based on NFHS data (Dr Pronab Sen, Secretary, Ministry of statistics and programme implementation, New Delhi) and c) lifestyle, mostly in relation to growing problem of overweight and obesity in India (Dr Anura Kurpad, Dean St. John's Institute, and St. John's National Academy of Health Sciences, Bangalore).

The presentations that followed dealt with Government's response- programmes for nutrition security (Dr Prema Ramachandaran, Director, Nutrition Foundation of India, New Delhi), and Scientific response- transgenic technologies (Dr Deepak Pental, VC, Delhi University), food fortification (Dr V Prakash, Director, CFTRI, Mysore), and salt fortification for micronutrient security (Dr B Sesikaran, Director NIN and Dr S Ranganathan, Director R&D, Christy group of companies, Tamilnadu). The last speaker Dr Rama Narayanan, (Ford Foundation chair for Women and Food security) spoke on Gendered empowerment for nutrition security. Professor Mahtab Bamji, convener of the symposium, summarised the presentations. The sessions were chaired by eminent scientists like Drs. Indira Nath, Manju Sharma, S Varadarajan, RP Sharma, IP Abrol, T Ramasami and Anupa Sidhu who made valuable comments.

On the second day there was a panel discussion in which several scientists made valuable presentations. Almost 20 students of food and nutrition, and a few others from agriculture and medicine also participated.



The concluding remarks were given by Dr. T. Ramasami, Secretary DST. According to him, Security is proactive action against perceived threat- in this case malnutrition. It has to have strategy which can be developed at the top, based on inputs, but action has to be at the level of family, for which knowledge has to percolate. While government may be able to tackle generic issues, solutions for individual problems, often come from within the community. NGOs private sector and community can all play a role, in creating an enabling environment.

Considering the gravity of the problem it was felt that Nutrition should be the centerpiece of development and not a trickle down beneficiary of economic and industrial growth. That strategy has failed.

## **International Activities**

### **Scientists elected in various positions of ICSU Unions**

Dr. Ashima Anand, FNA has been elected as a Member of ICSU Policy Committee on Freedom and Responsibility in the Conduct of Science (CFRS).

Professor Harsh K. Gupta, FNA has been elected for the 2<sup>nd</sup> time as a member of ICSU Committee on Scientific Planning and Review (CSPR) and President, Asia Oceania Geosciences Society (AOGS).

Professor Debabrata Ghosh, Department of Physiology, AIIMS, New Delhi has been elected as a Member, IUPS Committee on Physiome and Bioengineering.

**Report on IUPS General Assembly and Satellite Symposium on Endometrial Receptivity and Blastocyst Implantation at Kyoto during August, 2009.**

The following delegation was sent by INSA to attend IUPS General Assembly :

1. Professor Jayasree Sengupta, Member, IUNS-IUPS-IUPHAR National Committee, AIIMS, New Delhi – Voting delegate.
2. Professor Debabrata Ghosh, AIIMS, New Delhi.
3. Professor Usha Singhal, Aligarh Muslim University, Aligarh.

The General Assembly ratified that the IUPS-2013 will be held in Birmingham, UK and the members gave the approval for the IUPS-2017 to be held in Rio de Janeiro, Brazil.

The IUPS Congress had a large number of symposia, workshops, luncheon meetings for closed group discussions on various aspects of physiological sciences. Professor Denis Noble from Oxford University initiated a whole day Symposium on *Challenging Roles of Physiome, VPH and in silico human in medicine* with the lecture entitled: *Principles of Systems Biology and the Future of Physiology*. The symposium and associated luncheon Seminar was aimed towards addressing the issues related to defining effective strategies and the road map for promotion of Physiome and Systems Biology through which from genomic and proteomic levels we can progress from cell, to organ to multi-organ networks in understanding the human body and how it functions.

Professor J Sengupta, Member, INSA-IUPS Committee had organized a Satellite Symposium on *Endometrial Receptivity and Blastocyst Implantation* that was held in Kyoto University on August 25, 2009. The symposium had an excellent panel of eminent speakers which included: Professor Lois Salamonsen, Australia, Professor Tadashi Kimura, Japan, Professor

Jeff Pollard, USA, Professor M Fukuda, USA, Professor John Aplin, UK, Professor Paul Bischof, Switzerland, Professor Debabrata Ghosh, India, Dr. Hiroshi Fujiwara, Professor Shigeru Saito and Dr. Tetsuo Maruyama, Japan. Professor Allen Enders, USA delivered the Valedictory address of the Symposium.

The highlight of Professor Ghosh's lecture on *Transcriptomics of endometrial receptivity* was the introduction of systems biology approach in elucidating the specific repression and derepression of a specific group of genes in a timed manner indicating that endometrial receptivity for blastocyst implantation is associated with categorical reprogramming of endometrial transcript expression. The lecture was in tune with the theme of the IUPS-2009 Congress that of Physiome and Systems Biology as the novel approach to study the functioning of the human body in a holistic manner.

The Satellite Symposium had a session of poster presentations that were also orally presented by the young scientists. A poster presented by Mr. Meraj Alam Khan from the laboratory of Professor Ghosh and Professor Sengupta on *cDNA based expressional array analysis of human placental villi during 6 to 8 weeks of gestation*, was awarded with a prize for best poster presentation.

**Meeting of Science Academies of G8 + 5 countries**

The Indian National Science Academy participated in the Joint Academy Panel of the science academies of the G8 countries and five others (Brazil, China, India, Mexico, South Africa) organized by the Accademia Nazionale dei Lincei held on 26-27 March 2009 in Rome. Fossil fuels being main source of energy the meeting discussed the science related issues required to address the greenhouse gas emissions concern. International collaboration in scientific research on low carbon and climate resilient technologies is crucial step towards a low carbon economy. The paper on Energy and Climate titled as *Joint Statement on Climate Change and the Transformation of Energy Technologies for Low Carbon Future* presented by the G8+5 Academies is accompanied by a document by the Network of African Science Academies (NASAC) entitled *Brain Drain in Africa* and released on June 11, 2009.



## G8+5 Academies' joint statement: Climate change and the transformation of energy technologies for a low carbon future

Climate change and sustainable energy supply are crucial challenges for the future of humanity. It is essential that world leaders agree on the emission reductions needed to combat negative consequences of anthropogenic climate change at the UNFCCC negotiations in Copenhagen in December 2009. At the same time, agreement is needed on actions to ensure basic energy services are available to all of the world's people.

These global challenges require solutions flexible and varied enough to meet the needs of a wide variety of specific energy resources and energy security circumstances.

### Reducing the human forcing of climate change

The IPCC 2007 Fourth Assessment of climate change science concluded that large reductions in the emissions of greenhouse gases, principally CO<sub>2</sub>, are needed soon to slow the increase of atmospheric concentrations, and avoid reaching unacceptable levels.

However, climate change is happening even faster than previously estimated; global CO<sub>2</sub> emissions since 2000 have been higher than even the highest predictions, Arctic sea ice has been melting at rates much faster than predicted, and the rise in the sea level has become more rapid. Feedbacks in the climate system might lead to much more rapid climate changes.

The need for urgent action to address climate change is now indisputable. For example, limiting global warming to 2°C would require a very rapid worldwide implementation of all currently available low carbon technologies. The G8+5 should lead the transition to an energy efficient and low carbon world economy, and foster innovation and research and development for both mitigation and adaptation technologies. Capitalizing on new technologies will require a major scientific effort and policy initiatives to accelerate adoption of new technologies. The need to find solutions to climate change presents a huge but as yet unrealized opportunity for the creation of new jobs and for the stimulation of new and emerging markets. The role of innovation in delivering energy efficiency and a low carbon world should become a major part of the efforts to rebuild the global economy.

### Adaptation to climate change

As the impacts of climate change begin to be realized, investment in adaptation technologies is becoming increasingly important and must be increased as a matter of urgency. Knowledge and technology transfer to the developing countries must also be accelerated.

Critical research areas include: increasing the resilience of urban and rural infrastructure and of natural areas (including watersheds and coastal areas); enhancing food and crop production; and water conservation technologies and methods.

### The energy agenda

Fossil fuel sources remain the predominant energy source for the near future in reducing energy poverty and satisfying growing energy demand, and their exploitation must be consistent with the objective of reducing anthropogenic impact on climate change. Continuous improvement in efficiency and emission standards are needed in the production and use of fossil fuels.

Economically viable low carbon energy technologies may contribute to the recovery and sustainability of the global economy. Diversification of energy sources can also mitigate the volatility of fossil fuel markets and increase energy availability and security.

A low carbon economy will require integrated systems, global collaboration, and concerted actions including:

- rapid and wide-spread energy conservation measures particularly for industry, transport, and building design, construction and operation. This will require the development and implementation of existing and new technologies, policy tools, monitoring and certification processes, and public education. Energy saving and energy efficiency should be a critical priority in the short term;
- an agreed international program to develop and deploy CO<sub>2</sub> capture and storage (CCS), and exploration of possible standards for CCS, with the objective of deploying CCS in as many coal power stations as possible;
- rapidly increased adoption of, and investment in, renewable energy technologies such as wind, geothermal, solar energy, biofuels and wave power. The development of standards and certification for the environmentally sustainable implementation of these technologies is essential;
- assured access to adequate supplies of natural gas, and promotion of the diffusion of efficient natural gas technologies;
- development and deployment of an innovative energy generation, transmission, storage and distribution infrastructure; and
- development of nuclear power plants that are safe and secure, and ensure the secure long-term management and disposal of waste. International collaboration in development of the next generation of nuclear reactors and in reducing the risk of proliferation is essential.



**Recommendations**

Recognizing the vital role that low carbon energy systems must play in facilitating a sustainable global economy, the G8+5 nations need to seize all opportunities to coordinate our simultaneous work on the climate and economic agendas, and to build global collaboration.

We call on all governments to:

- agree at the UNFCCC negotiations in Copenhagen to adopt a long-term global goal and near-term emission reduction targets that will deliver an approximately 50% reduction in global emissions from 1990 levels by 2050;
- significantly increase fundamental international research on the earth’s climate, on low carbon and climate resilient technologies, and on ways to protect and enhance the resilience of natural systems to climate change;
- identify the common strategic priorities for developing and implementing environmentally sustainable technologies for adaptation and mitigation;
- collaborate in the implementation of low carbon and climate-resilient infrastructure and technologies, and in the implementation of innovative incentives, through the use of economic and regulatory instruments, to accelerate adoption of clean “green” technologies;

- support and enable developing countries’ access to and use of the technologies needed to deliver a sustainable low carbon energy future;
- pursue the development, demonstration and deployment of economically efficient and technologically safe CCS, and explore the establishment of standards for CCS;
- pursue international cooperation on safe and secure nuclear power capacity, the safe disposal of nuclear waste, and the reduction of the risk of proliferation;
- substantially increase investment into the development and deployment of technologies for adaptation, and increase funding specifically for the most vulnerable countries.

Education and public awareness programmes will be essential as we pursue this agenda. We must build on the current enthusiasm and engagement of a younger generation.

Academia Brasileira de Ciências, Brazil

Indian National Science Academy, India

Academy of Science of South Africa, South Africa

Royal Society of Canada, Canada

Accademia Nazionale dei Lincei, Italy

Royal Society, United Kingdom

Chinese Academy of Sciences, China

Science Council of Japan, Japan

National Academy of Sciences, United States of America

Académie des Sciences, France

Academia Mexicana de Ciencias, Mexico

Deutsche Akademie der Naturforscher Leopoldina, Germany

Russian Academy of Sciences, Russia



As representatives of one of the most prominent organizations for the promotion of scientific and technological capacity building in Africa, we, the members of NASAC, are convinced that a sustainable economic future for Africa lies in strengthening the continent's S&T capacity. We believe, moreover, that this goal can only be met if African educators and retains a critical mass of world-class scientists and technologists with the knowledge and expertise to address the continent's key scientific, technological and economic problems.

One-third of all African scientists live and work in developed countries. This outflow represents a significant loss of economic potential for the continent, especially in today's global society where scientific and technological knowledge drive development.

In the 1960s and 1970s, Africa boasted some of the developing world's finest universities. But a steep decline in funding, political indifference and widespread conflict created conditions in which the opportunity to pursue professional careers was stunted.

Educational experts agree that higher education throughout Africa must be revitalized. Universities have been hollowed out by decades of brain drain and now face themselves severely handicapped by dilapidated facilities and inadequately trained staff. According to the Science Citation Index, Africa currently produces just 1.4 percent of the articles published in peer-reviewed international journals.

The migration of African scientists to developed countries represents a personal decision shaped in large measure by an individual's assessment of where the best career opportunities lie. Governments can help influence this decision by developing and implementing policies for African scientists that improve their living and working conditions at home and that offer realistic prospects for secure and rewarding professional careers in Africa.

By some estimates, Africa needs an additional one million researchers to address its critical needs. Despite Africa's predicament, it is important to note that

scientific progress depends on the free flow of information and individuals. It can be argued that the migration of African scientists has not only benefited those who leave their countries but global science as a whole. While Africa has paid a high price for the loss of its most educated and skilled citizens, denying talented individuals adequate education and training opportunities elsewhere carry significant costs too. As Rajiv Gandhi, former prime minister of India, once observed, "better brain drain than brain in the drain".

We believe that past experience calls for a new, more sophisticated approach to the brain drain challenge. This approach would recognize not just the obstacles but also the opportunities for S&T capacity building in Africa afforded by the migration to developed countries of well-educated, productive scientists with great drive and ambition.

Such an approach would acknowledge that global progress in S&T depends on international exchange and the ability of scientists and technologists to move freely across borders.

It would also recognize that even the poorest nations need a critical mass of talented scientists and technologists. Such well-educated citizens must not only possess a deep understanding of the science-based challenges that their nations face, but must also be able to participate fully and freely in global scientific initiatives as valued partners.

We appreciate the efforts taken by others to address Africa's brain drain challenge, including those by the UFR's African Millennium Initiative for Science and Technology, the G8's focus on S&T as fundamental building blocks in Africa's overall efforts to improve the economic and social well-being of Africans, funding strategies developed by the World Bank for the creation of centres of scientific excellence, and initiatives by the Inter-Academy Panel (IAP) to strengthen and expand merit-based science academies.

We also urge African countries to do all that they can to meet the challenges posed by the brain drain phenomenon. We are encouraged by the steps that a number

of African nations have recently taken to increase the percentage of the national gross domestic product (GDP) devoted to S&T, and by the ongoing efforts, for example, of the African Union (AU), the New Partnership for Africa's Development (NEPAD) and the African Development Bank (ADB), to place S&T at the centre of the continent's economic development agenda.

Yet, such efforts, whether led by African countries, pan-African organizations, international agencies or developed nations, continue to be insufficient. Africa remains the world's least scientifically proficient region and, not coincidentally, the world's poorest continent. We acknowledge that primary responsibility to address such critical problems rests with the governments of Africa. But external assistance will remain instrumental for poor countries that do not have sufficient resources to adequately invest in systems of higher education and research.



## INSA Jawaharlal Nehru Birth Centenary Visiting Fellowship

Professor SC Lakhota, FNA, Dean, Faculty of Science and Professor of Zoology, BHU visited Germany and Italy between May 24, 2009 and June 16, 2009 under INSA Jawaharlal Nehru Birth Centenary Visiting Fellowship. In Germany, he visited the Department of Developmental Genetics at the German Cancer Research Centre (Professor B Mechler) and the European Molecular Biology Laboratory (Dr Anne Ephrussi) at Heidelberg, Institute of Biology, Humboldt University (Professor H Saumweber) and Institute of Human Developmental Biology at Tuebingen. Professor Lakhota delivered lectures at each of these institutes on his current research work on the different Hsp60 genes and the non-coding hsr-omega gene of *Drosophila melanogaster*. His laboratory's findings that the different Hsp60 genes in *D melanogaster* have non-chaperoning roles in specific developmental pathways and that the Hsp60D gene can modulate apoptosis as well as polyQ damage in the fly models were widely appreciated. Likewise, his laboratory's pioneering studies on the non-coding hsr $\mu$  Gene of *D melanogaster* and his lab's recent findings, that RNAi for this non-coding RNA has widespread developmental consequences but at the same time it also suppresses induced apoptosis and polyQ damage, received wide applause since these provide some insights into the mysterious world of non-coding RNA's in eukaryotes.

Professor Lakhota visited Professor Davide Corona at the University of Palermo, Palermo and Professor M Gatti at the University of Rome in Italy. Dr Corona has an ongoing collaboration with Professor Lakhota on genetic and molecular studies on interactions of the ISWI chromatin modulator with the non-coding hsr $\mu$  genes. Following the visit to Palermo, Professor Lakhota went to Rome and exchanged research findings with Professor M Gatti and his colleagues there. He delivered a research seminar here also.

This nearly 3 week trip to several laboratories in Europe was academically very rewarding since it not only helped in renewing old scientific contacts but also provided opportunities for new contacts with several other younger scientists with common research interests. It also provided a good opportunity to share current research work with a large audience and receive



1. Invest in the rebuilding of universities and research centres in Africa. The brain drain phenomenon can only be overcome if Africa builds a research infrastructure that enables its native-born scientists to engage in world-class research without having to emigrate.
2. Extend financial support to young African scientists to pursue graduate and postdoctoral training in universities in Africa and other developing countries. To help ensure that these students do not become part of the brain drain, it is also important that funding be provided to young scientists at the beginning of their careers to help promote their research productivity in Africa.
3. Launch regional and international centres of excellence in Africa in areas of study of critical importance to Africa's development, especially in those areas related to advancing the Millennium Development Goals (MDGs): poverty alleviation, access to safe drinking water, improved public health and biodiversity conservation. These centres should provide incentives to attract the best scientists, both in and outside of Africa, and should promote international collaboration in solving global problems relevant to Africa.
4. Broaden efforts to encourage Africa's diaspora to participate in initiatives to address critical science-based issues on the continent and to engage Africa's scientists in joint projects. The brain drain phenomenon is well established. Tens of thousands of Africa's scientists now live and work in developed countries. Most will never return. It is important to recognize this reality and to devise policies that will allow Africa to take advantage of the knowledge and expertise of their emigrant citizens. One of the best ways to do this is to encourage short-term visits and to develop joint projects between Africa's scientific diaspora and scientists who have remained in their home countries. We call on the G8 + 5 countries to support initiatives that continue to expand North-South scientific exchange. Specific measures that might be taken include the development of a database of highly qualified Africans in the diaspora who have expressed an interest in collaborating with scientists in Africa.
5. Honour the commitments made by G8 + 5 countries at the 2005 G8 Summit and based on the recommendations of the Commission for Africa's publication, "Our Common Interest", which called on its members to provide US\$5 billion to help rebuild universities and US\$3 billion to help establish centres of scientific excellence in Africa. The solution to the brain drain challenge lies primarily with Africa. But G8 + 5 countries can help by financing improvements in Africa's S&T infrastructure, and by creating pathways for interaction that turn today's largely one-way flow of African scientists into a two-way flow of interaction between Africa's diaspora and home-based scientific communities. We urge the G8 + 5 countries to embrace S&T as a collaborative enterprise where national borders count but nevertheless remain open, and where S&T endeavours ultimately serve as bridges, not barriers, to social and economic progress.



NASAC members include: African Academy of Sciences, Cameroon Academy of Sciences, Ghana Academy of Arts and Sciences, Kenya National Academy of Sciences, Madagascar National Academy of Arts, Letters, and Sciences, Nigerian Academy of Sciences, Academie des Sciences et Techniques du Senegal, Academy of Science of South Africa, Sudan National Academy of Sciences, Tanzania Academy of Sciences, Uganda National Academy of Sciences, Zambia Academy of Sciences, Zimbabwe Academy of Sciences.

critical feedbacks. On the social cultural sides also, the visit was very rewarding since it provided ample opportunities for social visits with scientists and their families as also for visiting important centers of art and culture in each of the cities that were visited.

### INSA-HAS Joint Research

INSA-HAS Joint Research Project entitled “Identification, Biodiversity, Antifungal Susceptibilities and Mycotoxin Production of *Aspergilli*, *Fusaria* and Zygomycetous Fungi Isolated from Patients with Keratomycosis in South India” coordinated by Dr P Manikandan, Aravind Eye Hospital, Coimbatore supported under INSA Exchange Programme with the Hungarian Academy of Sciences (HAS) during 2007-2009.



Dr Csaba Vagvolgy, Assistant Professor had delivered a lecture at Aravind Eye Hospital

Ocular fungal infections are being increasingly recognized as important causes of morbidity and blindness worldwide. Corneal infections of fungal aetiology are very common and represent 30% to 40% of all cases of culture positive infectious keratitis in India. Diagnosis and treatment of fungal keratitis is one of the most difficult problems encountered by ophthalmologists because of its tendency to mimic other forms of infectious keratitis, worsening with inadvertent antifungal agents and recalcitrant course of the disease. Species of *Fusarium* and *Aspergillus* are widespread saprophytic fungi that have long been regarded as important pathogens in eye infections, especially keratitis. In India, *Fusarium* and *Aspergillus* species are being isolated from corneal ulcers in large numbers. Most of the fungal strains isolated from

keratomycosis are being identified and reported at the genus level only. Their identification at the species level would be of great importance, as the pathogenic potential may vary between different species of the genera. The limited availability of antifungal drugs and the lack of response lead to blindness in a high number of patients. The knowledge on antifungal susceptibilities is mainly based on the western literature. Because of the magnitude of the problem in India, a survey of the local susceptibility pattern would be vital.

Through this bilateral collaborative research project, 130 *Aspergillus* species isolated from corneal ulcer patients of Aravind Eye Hospital, Coimbatore were sequenced. All the *Aspergillus* strains are identified by morphologically as well as molecular techniques using ITS (Internal Transcribed Spacer Region) sequencing methods. Many new species were identified by molecular methods which were morphologically identified as different *Aspergillus* species. The identified new species are *Aspergillus tamari*, *A nomius*, *A pseudonomius*, *Eurotium* species, *tubingensis* and *brasilliensis*. It was found that the clinical outcome and antifungal susceptibility patterns are varying at species level. Hence, the identification of clinically important fungi at species level would be more helpful to the clinicians to treat the patients successfully. Similar studies with other fungi isolated from corneal ulcer should be performed to understand the pathogenicity at species level. From this project, four research articles, a chapter entitled *Aspergillus in the Genomic Era* in a book were published. The book is edited by Dr. Janos Varga and Dr. Rob Samosn (Wageningen Academic Publishers, The Netherlands). The INSA Exchange Programme with the Hungarian Academy of Sciences helped to establish a fruitful collaboration a strong base in basic research.

### “Ocean Acidification” statement – Inter Academy Panel Report

Indian National Science Academy alongwith 70 academies from all over the world endorsed to IAP statement an “Ocean Acidification” presented at the Copenhagen summit held in June 2009. The statement was widely disseminated among policymakers in India.



the  
**INTERACADEMY PANEL**  
on international issues

**iap**

a global network of science academies

Co-chairs  
**Chen Zhu**  
**Howard Alper**

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## IAP STATEMENT ON OCEAN ACIDIFICATION

### Headline messages

- Oceans play a critical role in the global carbon cycle by absorbing about a quarter of the CO<sub>2</sub> emitted to the atmosphere from human activities;
- The rapid increase in CO<sub>2</sub> emissions since the industrial revolution has increased the acidity of the world's oceans with potentially profound consequences for marine plants and animals especially those that require calcium carbonate to grow and survive, and other species that rely on these for food;
- At current emission rates models suggest that all coral reefs and polar ecosystems will be severely affected by 2050 or potentially even earlier;
- Marine food supplies are likely to be reduced with significant implications for food production and security in regions dependent on fish protein, and human health and wellbeing;
- Ocean acidification is irreversible on timescales of at least tens of thousands of years;
- Even with stabilisation of atmospheric CO<sub>2</sub> at 450 ppm, ocean acidification will have profound impacts on many marine systems. Large and rapid reductions of global CO<sub>2</sub> emissions are needed globally by at least 50% by 2050.

### 1. CO<sub>2</sub> and ocean chemistry

Over the past 200 years, the oceans have absorbed approximately a quarter of the CO<sub>2</sub> produced from human activities. This CO<sub>2</sub> would otherwise have accumulated in the atmosphere leading to greater climate change. However, the absorption of this CO<sub>2</sub> has affected ocean chemistry and has caused the oceans (which are on average slightly alkaline) to become more acidic. The average pH of oceanic surface waters has been lowered by 0.1 units since the pre-industrial period. This represents a 30% increase in hydrogen ion activity. Hydrogen ions attack carbonate ions which are the building blocks needed by many marine organisms, such as corals and shellfish, to produce their skeletons, shells and other hard structures. This loss of carbonate ions produce lower saturation levels for the carbonate minerals, aragonite and calcite, which are used in many shells and skeletons. Carbonate ion concentrations are now lower than at any other time during the last 800 000 years.

Global atmospheric CO<sub>2</sub> concentrations are now at 387 ppm. If current trends in CO<sub>2</sub> emissions continue, model projections suggest that by mid-century CO<sub>2</sub> concentrations will be more than double pre-industrial levels and the oceans will be more acidic than they have been for tens of millions of years. The current rate of change is much more rapid than during any event over the last 65 million years. These changes in ocean chemistry are irreversible for many thousands of years, and the biological consequences could last much longer.

### 2. Environmental damage from ocean acidification

Ocean acidification impacts on marine life will depend on the rate and magnitude of changes in ocean chemistry and biological responses. While the ocean chemistry changes are predictable with high certainty, our understanding of the impacts is still developing. Nevertheless, there is strong evidence emerging for a range of biological effects and changes in the marine biogeochemical processes that affect the carbon cycle. The long-term consequences of this are difficult to predict.

Impacts are already being observed in the polar and tropical regions. Coral calcification rates have declined in recent decades, although attributing causes for these impacts among multiple drivers (acidification, warming, pollution, etc.) is a challenge. Fundamental ecological ocean processes will be affected as many marine organisms depend directly or indirectly on calcium carbonate saturated waters and are adapted to current levels of seawater pH for physiological and metabolic processes such as calcification, growth and reproduction. The pH changes expected will exceed the seasonal and regional variations currently experienced naturally.

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Ocean acidification is a global issue. However, changes in ocean chemistry will be regionally variable with some regions affected more rapidly than others. The high CO<sub>2</sub> waters in polar and upwelling regions such as the eastern Pacific and Bering Sea for example, will experience low pH more rapidly than other regions. Tropical waters, such as those around the Great Barrier Reef will also experience rapid declines in the carbonate ions important for coral reef construction. According to recent model projections almost all tropical and sub-tropical coral reefs were surrounded by waters favourable to coral growth before the industrial revolution. If atmospheric CO<sub>2</sub> is stabilized at 450 ppm, only a very small fraction (~8%) of existing tropical and subtropical coral reefs will be surrounded by such water, and at 550 ppm, coral reefs may be dissolving globally. Cold water corals are also vulnerable and are likely to be affected before they have even been fully explored. By 2100, it has been estimated that 70% will be in waters unfavourable for growth.

In the polar regions, model projections using current CO<sub>2</sub> emission rates suggest that parts of the Southern Ocean will be undersaturated for aragonite by 2050. Aragonite undersaturation is projected for 10% of Arctic waters by around 2020, and by 2060, 80% of waters will be undersaturated for aragonite and calcite. This means the waters will be corrosive to Arctic calcifiers such as pteropods, and bivalves such as clams, which play a key role in Arctic food webs.

The ocean chemistry changes projected will exceed the range of natural variability, which is likely to be too rapid for many species to adapt to. Many coastal animals and groups of phytoplankton and zooplankton may be directly affected with implications for fish, marine mammals and the other groups that depend on them for food. Increased CO<sub>2</sub> may be particularly stressful for organisms with high metabolic rates such as squid. The impacts of these changes on oceanic ecosystems and the services they provide, for example in fisheries, coastal protection, tourism, carbon sequestration and climate regulation, cannot yet be estimated accurately but they are potentially large.

Although some species may benefit, most are adapted to current conditions and the impacts on ocean biological diversity and ecosystem functioning will likely be severe. Analysis of past events in Earth's geologic history suggests that chemical recovery will take tens of thousands of years – while the recovery of ecosystem function and biological diversity can take much longer.

#### 4. Mitigation

Ocean acidification is irreversible during our lifetimes and those of many generations to come. To minimise the risk of these large-scale and long-term changes to the oceans the increase in atmospheric CO<sub>2</sub> must be curbed by reducing emissions from human activities.

Recent scenario studies have estimated that stabilisation of atmospheric CO<sub>2</sub> concentrations at 550 ppm will produce enough acidification to be disastrous for sensitive oceanic ecosystems in many parts of the world. Even at 450 ppm, more than 10% of the world's oceans will be impacted including large parts of the Southern, North Pacific, and Arctic oceans.

Mitigation approaches such as adding chemicals to counter the effects of acidification are likely to be expensive, only partly effective and only at a very local scale, and may pose additional unanticipated risks to the marine environment. There has been very little research on the feasibility and impacts of these approaches. Substantial research is needed before these techniques could be applied.

#### 5. Conclusions and recommendations

Ocean acidification is a direct consequence of increasing atmospheric CO<sub>2</sub> concentrations. To avoid substantial damage to ocean ecosystems, deep and rapid reductions of global CO<sub>2</sub> emissions by at least 50% by 2050, and much more thereafter are needed.

We, the academies of science working through the InterAcademy Panel on International Issues (IAP), call on world leaders to:

- Acknowledge that ocean acidification is a direct and real consequence of increasing atmospheric CO<sub>2</sub> concentrations, is already having an effect at current concentrations, and is likely to cause grave harm to important marine ecosystems as CO<sub>2</sub> concentrations reach 450 ppm and above;
- Recognise that reducing the build up of CO<sub>2</sub> in the atmosphere is the only practicable solution to mitigating ocean acidification;
- Within the context of the UNFCCC negotiations in the run up to Copenhagen 2009, recognise the direct threats posed by increasing atmospheric CO<sub>2</sub> emissions to the oceans and therefore society, and take action to mitigate this threat;
- Implement action to reduce global CO<sub>2</sub> emissions by at least 50% of 1990 levels by 2050 and continue to reduce them thereafter;
- Reinvalidate action to reduce stressors, such as overfishing and pollution, on marine ecosystems to increase resilience to ocean acidification.

The following academies have endorsed this statement.

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- TWAS, the academy of sciences for the developing world
- Albanian Academy of Sciences
- National Academy of Exact, Physical and Natural Sciences, Argentina
- Australian Academy of Science
- Bangladesh Academy of Sciences
- The Royal Academies for Science and the Arts of Belgium
- Brazilian Academy of Sciences
- Bulgarian Academy of Sciences
- Cameroon Academy of Sciences
- RSC: The Academies of Arts, Humanities and Sciences of Canada
- Academia Chilena de Ciencias
- Chinese Academy of Sciences
- Colombian Academy of Exact, Physical and Natural Sciences
- Croatian Academy of Arts and Sciences
- Cuban Academy of Sciences
- Academy of Sciences of the Czech Republic
- Royal Danish Academy of Sciences and Letters
- Academia de Ciencias de la República Dominicana
- Academy of Scientific Research and Technology, Egypt
- The Delegation of the Finnish Academies of Science and Letters
- Académie des Sciences, France
- Georgian Academy of Sciences
- Union der Deutschen Akademien der Wissenschaften
- Deutsche Akademie der Naturforscher Leopoldina
- The Academy of Athens
- Academia de Ciencias Medicas, Fisicas y Naturales de Guatemala
- Indian National Science Academy
- Indonesian Academy of Sciences
- Academy of Sciences of the Islamic Republic of Iran
- Royal Irish Academy
- Israel Academy of Sciences and Humanities
- Accademia Nazionale dei Lincei
- Science Council of Japan
- Royal Scientific Society of Jordan
- Islamic World Academy of Sciences
- African Academy of Sciences
- Kenya National Academy of Sciences
- The Korean Academy of Science and Technology
- Kosovo Academy of Sciences and Arts
- National Academy of Sciences of the Kyrgyz Republic
- Akademi Sains Malaysia
- Mauritius Academy of Science and Technology
- Academia Mexicana de Ciencias
- Montenegrin Academy of Sciences and Arts
- The Royal Netherlands Academy of Arts and Sciences
- Academy Council of the Royal Society of New Zealand
- Nigerian Academy of Sciences
- Norwegian Academy of Sciences and Letters
- Pakistan Academy of Sciences
- Palestine Academy for Science and Technology
- Academia Nacional de Ciencias del Peru
- Academia das Ciencias de Lisboa
- Académie des Sciences et Techniques du Sénégal
- Serbian Academy of Sciences and Arts
- Slovak Academy of Sciences
- Slovenian Academy of Sciences and Arts
- Academy of Science of South Africa
- Royal Academy of Exact, Physical and Natural Sciences of Spain
- National Academy of Sciences, Sri Lanka
- Sudanese National Academy of Science
- Royal Swedish Academy of Sciences
- Academia Sinica, Taiwan, China
- Tanzania Academy of Sciences
- The Caribbean Academy of Sciences
- Turkish Academy of Sciences
- The Uganda National Academy of Sciences
- The Royal Society, UK
- US National Academy of Sciences
- Academia de Ciencias Fisicas, Matemáticas y Naturales de Venezuela
- Zimbabwe Academy of Sciences

## Awards & Honours

**Professor CNR Rao, FNA, FRS**, National Research Professor at Jawaharlal Nehru Centre for Advanced Scientific Research has been awarded the prestigious Royal Medal by the Royal Society, London, for his outstanding contributions to Solid State and Materials Chemistry. The Royal Medal, also known as the Queen's Medal, is awarded by the Queen upon recommendation of the Council of the Royal Society. This Medal to Professor Rao is especially noteworthy since he received the Hughes Medal of the Royal Society for physical sciences in 2000. Professor Rao will receive the award in London on November 30, 2009. Professor Rao has also been conferred the Order of Friendship by the President of the Russian Federation.

**Dr D Joseph Bagyaraj, FNA**, has been received Life Time Achievement award presented by National Centre of Organic Farming/Bangalore University/ National Horticulture Mission for contributions elucidating the role of mycorrhizal fungi in organic farming. He has been elected as a Fellow of the National Academy of Biological Sciences for contributions to Agricultural Microbiology.

## Obituary

### Tanjore Ramachandra Anantharaman



**Tanjore Ramachandra Anantharaman** (*b* 25 November, 1927; *d* June 19, 2009), did his D.Sc. in 1991 from University of Oxford, UK specializing in Physical Metallurgy and Materials Science. His research achievements were mainly in the area of structure, structural changes and

structural imperfections in metals and alloys, particularly in non-equilibrium conditions. He pioneered researches in India in rapidly solidified metals.

Professor Anantharaman was Fellow of Indian Academy of Sciences, Bangalore; Indian National

Academy of Engineering, Institute of Materials (London) and American Society of Metals. He was recipient of Kamani Gold Medal and Tata Gold Medal of Indian Institute of Metals; National Metallurgist's Day Award of Ministry of Steel & Mines; Shanti Swarup Bhatnagar Prize; FICCI Award; Homi J Bhabha Award of UGC; VASVIK Award; Shanti Swarup Bhatnagar Medal of INSA, INSA Prize for Materials Science and Distinguished Materials Scientist Award of Materials Research Society of India. He had been CSIR Emeritus Scientist, National Physical Laboratory, New Delhi; Director, Thapar Institute of Engineering & Technology, Patiala and Director, Institute of Technology & Rector, Banaras Hindu University, Varanasi.

**Professor Tanjore Ramachandra Anantharaman** was elected to the Fellowship of Indian National Science Academy in 1972 and served as its Council Member from 1979-81.

### Maroli Krishnayya Chandrashekar



**Maroli Krishnayya Chandrashekar** (*b* 04 January, 1937; *d* July 02, 2009), did his Ph.D. in 1964 from University of Madras and D.Sc. in 1985 from Madurai Kamaraj University specializing in Chronobiology and Animal Behaviour. During Ph.D. he studied the circadian and

tidal rhythms in the swimming activity and consumption in the crabs. Chandrashekar was the first Miller Invitation Fellow (1968-1970) to work in Berkeley, UC. He gave the first full account of the dependence of the phase shifts of the fly clock on the intensity of light of 1-10 lux. This important finding has implications in day length measurement (photoperiodism) regulating annual flowering of trees and bird migration. He returned to Tübingen and continued his work on *Drosophila* and demonstrated that the second half of the subjective night was ten-fold more sensitive to blue light of 480 nm and predicted that the several differences between early and late night phases may reflect deep seated differences in the kinetics as well as energy requirements of the oscillator. Chandrashekar



returned to India in 1975 and joined the Madurai Kamaraj University as Reader in Biology where he studied the biological clocks of insectivorous bats, working mainly with the cave-dwelling bat *Hipposideros speoris*. He discovered “Social Synchronization of Circadian Rhymes” in a colony of ca 600 bats living 40 m inside a cave, where bats told other bats time. He studied the light-sensitivity of the eyes of bats associated with dawn and dusk as well as colours and flashes. He built the “first human isolation facility” in the Third World and worked successfully on human circadian rhythms.

Professor Chandrashekar was Member of Guha Research Conference; Member, Indian Academy of Neuroscience; Member Society of Light Treatment and Biological Rhythms (USA), Fellow Indian Academy of Sciences and National Academy of Sciences (India). He was recipient of Shanti Swarup Bhatnagar Prize; UGC National Lecturer; Sir JC Bose Award (UGC-Hari Om Ashram Trust); UGC National Fellow; Jawaharlal Nehru Birth Centenary Lecture and Har Swarup Memorial Lecture of INSA, SERC Lecturer of DST. Chandrashekar was Professor, School of Biological Sciences, Madurai Kamaraj University, Madurai; Research Associate DFG, University of Tubingen, Germany; Miller Research Fellow, University of California, Berkeley, USA; Alexander von Humboldt Scholar, University of Tubingen, Germany.

Professor Maroli Krishnayya Chandrashekar was elected to the Fellowship of Indian National Science Academy in 1988 and served as its Editor of Publications in 1998-99 and Vice-President in 2000.

### Rajat De



**Rajat De** (b 18 November, 1925; d May 21, 2009), did his PhD in 1952 from Banaras Hindu University, Varanasi specializing in Agronomy and Rainfed Agriculture. His research had emphasized on enhancing the efficiency of fertilizer use through pot-culture diagnostic techniques for deficient nutrients; foliar

application of macro- and micronutrient elements and

quantifying the contribution of legumes in enhancing soil productivity; He had investigated soil moisture conservation through transpiration suppressants and soil mulching, besides intercropping cereals with legumes and development of techniques for placement of seed and fertilizer at proper depths of soil for improving rain-dependent crop production and environmental protection.

Professor De had served as Joint Director (Research) and Head Division of Agronomy at Indian Agricultural Research Institute, New Delhi and Dean, Postgraduate Studies, Andhra Pradesh Agricultural University, Hyderabad. He was recipient of CIMMYT (International Centre for Maize and Wheat Research, Mexico), award.

Professor Rajat De was elected to the Fellowship of Indian National Science Academy in 1986.

### Nripendra Chandra Ganguli



**Nripendra Chandra Ganguli** (b 01 August, 1927; d May 30, 2009), did his DSc in 1956 from University of Calcutta specializing in Biochemistry and Dairy Chemistry. Ganguli's researches relate to milk proteins and allied areas; and semen chemistry, biochemistry and

preservation. He has worked on biosynthesis of ascorbic acid in rats and of sucrose and shikimic acid in plants; development of analytical techniques like paper chromatography, paper electrophoresis and radio autography; structure and function of casein and its fractions; formulation of infant food through appropriate chemical and biochemical tailoring to simulate human milk and new extender for preservation and freezing of buffalo semen.

Professor Ganguli was Fellow of National Academy of Agricultural Sciences (India), Indian Chemical Society and Institution of Chemists (India); Vice-President of Indian Immunology Society and Indian Society of Agricultural Chemists. He was recipient of CSIRO (Australia) Dairy Research Jubilee Award; Professor SC Roy Commemoration Medal; P Bhattacharya Memorial Prize and Lecture and Rafi Ahmed Kidwai Memorial Prize. He had been

Professor of Eminence and In-charge, National Research Centre on Dairy Chemistry; Director, Head, Division of Dairy Chemistry and Principal, Dairy Science College, all at National Dairy Research Institute, Karnal and Consultant, Dabur India Delhi and KC Das Pvt. Ltd., Bangalore.

Professor Nripendra Chandra Ganguli was elected to the Fellowship of Indian National Science Academy in 1980.

**Peringandur Venkiteswara Krishna Iyer**



**PVK Iyer** (*b* 23 June, 1909; *d* not known), did his D Phil in 1948 from University of Oxford, UK specializing in Mathematical Statistics. Iyer applied statistical methods to improve the reliability of field experiments in agricultural research, particularly for testing :

(i) different varieties of sugarcane, wheat and pulses, (ii) manurial trials on different crops, (iii) breeding and selection of wheat, (iv) soil analysis, (v) biological

control of pests in sugarcane and other crops and (vi) analysis of data arising from long term breeding of Montgomery cows for milk yield. His extensive theoretical studies on probability distributions arising from random and correlated observations in linear, rectangular and three-dimensional lattices resulted in many new non-parameter procedures for testing both unvariable and multivariable samples. He has used maximum likelihood procedures for estimating the parameters of different populations from truncated and censored samples. He achieved improvements in quality control by using different sampling procedures and developed simplified procedures for evaluating product cumulants of multivariate populations.

Professor Iyer had been Visiting Professor, University of Queensland, Australia; Professor of Statistics, Panjab University, Chandigarh (till 1968); Visiting Professor, American University, Beirut, Principal Scientific Officer, Defence Science Laboratory, Delhi, and Professor of Statistics, Indian Council of Agricultural Research, New Delhi

Professor PVK Iyer was elected to the Fellowship of Indian National Science Academy in 1951.

**ANNOUNCEMENTS**

**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 2009. The nominations received on or before October 15 will be included for consideration in the year 2010, while those received after October 15, will go to the year 2011.

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

**INSA Medal for Young Scientists – 2010**

Nomination are invited for INSA Medal for Young Scientists – 2010. Only those born on or after January 1, 1975 are eligible for consideration in the year 2010.

The awardee shall receive a certificate, a bronze medal and cash award of Rs. 25000/- and incentives in research work and further overseas training. 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](http://www.insaindia.org). The last date for receiving nominations in Academy is October 31, 2009.



## Proceedings of the Indian National Science Academy Invitation to Authors

*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 of the Journal are published in March, June, September and December.

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 of Indian National Science Academy*, Indian National Science Academy, Bahadur Shah Zafar Marg, New Delhi 110002. A copy of the manuscript may also be submitted in the electronic form at [procinsa@insa.nic.in](mailto:procinsa@insa.nic.in).

## History of Science

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 may be obtained by sending a request to the History of Science Unit of Academy.

## Deputation of Indian Scientists Abroad under Bilateral Exchange Programme

Applications are invited from outstanding scientists/ researchers holding PhD degree and having regular positions in recognised S&T institutions/universities and actively engaged in research in frontline areas for deputation abroad during the year 2010-2011 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 and Ukraine.

The detailed guidelines and Application form may be obtained from the Academy by sending a self addressed stamped (Rs.10/-) envelope marked "Exchange Programme" to the Inter Academy Officer or may be downloaded from internet <http://www.insaindia.org>. The application duly completed and endorsed by the Head of the Institutions should be submitted latest by October 15, 2009. Tel: 91-11-2322 1931-50 (20 lines); Fax: 91-11-23221959; Email: [intacademy@insa.nic.in](mailto:intacademy@insa.nic.in)

## News about Secretariat

### Welcome

**Dr Seema Mandal** joined as Assistant Executive Secretary on 29<sup>th</sup> April 2009.

**Shri Madhvendra Narayan** joined as Assistant Executive Secretary on 30<sup>th</sup> April 2009.

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