

Second Platinum Jubilee Meeting of Indian Academy of Sciences*

The Indian Academy of Sciences celebrated 75 years of its contributions to the promotion of science in India with a three-day Platinum Jubilee Meeting. D. Balasubramanian (L. V. Prasad Eye Institute, Hyderabad) inaugurated the meeting with an overview of the Academy's achievements. He released two special publications – *Current Trends in Science* and *The Directory of Fellows*.

In his Presidential address, 'When science catches the eye', Balasubramanian focused on how polymer chemistry, optics, and materials and engineering sciences have come to the rescue of vision defects. He mentioned vision defects such as presbyopia, myopia and diabetic retinopathy, and two ways of correcting these – 'smart contact lenses' and 'bionic eye'. He stated that myopia could either be a genetic defect, or be due to 'near work' with computers/television/textbooks. 'Emerging India as a great centre of science' was the theme of C. N. R. Rao (Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bangalore), wherein he saluted the contributions of C. V. Raman and Sivaraj Ramaseshan to communication of science in India through publications. He highlighted a number of problems that scientific progress in India faces, such as the relatively low importance given to science in society, 'referee fatigue' when papers are published in international journals, and low output of research papers and PhD holders from India.

The symposium on 'Climate change: An Indian perspective' (Convenor – J. Srinivasan, Indian Institute of Science (IISc), Bangalore) cut across the subjects of policy, agriculture, health sciences and India's strategy in climate negotiations. Srinivasan questioned the connection of glacial melting to global warming, the idea that human actions are sole cause of global warming, and the reliability of climate change science. P. Aggarwal (Indian Agricultural Research Institute, New Delhi) highlighted the impact of

climate change on Indian agriculture and listed some steps that may be taken to protect our farmers' interests. M. Rao (Indian Institute of Public Health, Hyderabad) spoke on 'The health impacts of climate change in India', highlighting that the adverse health impacts of climate change would be greatest in South Asia, especially among low-income groups and children. N. Dubash (Jawaharlal Nehru University, New Delhi), in his talk 'What should be India's strategy in climate negotiations?', outlined the international and national debates over climate change. Indians agree that being labelled as a 'major emitter' is unreasonable as we contribute ~4.9% to global emissions (though this makes us the fourth largest emitter).

The second symposium, 'Navigation and communication – What we can learn from insects' (Convenor – R. Gadagkar, IISc, Bangalore), cut across the fields of neuroethology, aerodynamics, biophysics, behavioural ecology, communication and navigation. Gadagkar drew lessons from studies on the wasp *Ropalidia marginata* explaining how a queen rubs a non-volatile pheromone secreted by Dufour's gland on 'floor' of the nest to maintain her reproductive monopoly, and the intriguing behaviour of wasps which accept the successor to the queen's 'throne' without challenging it. Rüdiger Wehner (University of Zürich, Zürich), in his talk on 'A neuroethologist's look into the cockpit of an insect navigator', discussed the remarkable navigational capability of *Cataglyphis bicolor* ant that helps it return in a more or less straight line to its nest once it finds food.

Male crickets use distinct acoustic signals for attracting their mates; choice made by females was questioned by R. Balakrishnan (IISc, Bangalore). She mentioned the 'cocktail party effect' to describe the complexity in cricket communication. It is hard to predict whether a female would choose loudest or nearest male; choice seems more complex than the acoustics! Sanjay P. Sane (National Centre for Biological Sciences, Bangalore) talked about 'The aerodynamics of flapping flight'. Insect flight involves interactions between various parameters. In the past, study of insect flight aerody-

namics was limited by technology; now high-speed videography can film the speed of flapping flight. D. Chowdhury (Indian Institute of Technology, IIT, Kanpur) posed the question 'Ant traffic: Marching soldiers or disciplined drivers?'. Ants drop a volatile chemical (pheromone) as they move – 'smell' of the trail guides the 'sniffing' ants as long as the ants continue reinforcing the trail by laying fresh pheromone. He discussed two-lane and three-lane traffic in ants, concluding that ants are more like soldiers and their traffic rules are different from vehicular traffic rules.

Symposium on Raman Spectroscopy (Convenor – S. Umapathy, IISc, Bangalore) focused on versatility of the principle of Raman spectroscopy and diverse applications in research. Umapathy discussed the changing paradigm of Raman spectroscopy passing from physics to biology and chemistry including nonlinear spectroscopy, time-dependent dynamics and applications of biophotonics to brain cancer. Hiro-O Hamaguchi (University of Tokyo, Japan) highlighted the recent developments of Raman spectroscopy in enabling *in vivo* imaging of living cells with high time, space and molecular specificity. He mentioned it as a spatial boundary of living organism and called it the 'Raman spectroscopic signature of life'. V. Deckert (Friedrich-Schiller Universität Jena, Germany) dwelt on the evolution of Raman spectra applications on the sidelines of development of LASER and efforts in increasing the intensity of weak signals. A. W. Parker (Rutherford Appleton Laboratory, UK) dealt with the efficiency of Raman spectroscopy among different ways of molecular structure determination.

Two public lectures were held: the one by N. Nilekani (Unique Identification Authority of India, UIDAI, New Delhi) focused on Unique identification project, its issues and challenges. Another public lecture was given by Mark Tully (former Chief of Bureau, BBC, New Delhi) on 'The need for balance in an unbalanced world'. His argument centred on promoting more dialogue between sciences and non-sciences. Advocating a greater need to have liberal education for building bridges between these 'two cultures', he

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mentioned that balance comes when the mind is open to new ideas. He asserted that more space, tolerance and platform should be provided for greater dialogue, spirit of which is reflected in *The Argumentative Indian* by Amartya Sen.

Special lecture, given by M. R. S. Rao (JNCASR, Bangalore), provided an insight into the integrated approach of systems biology. He elucidated role of genes involved in *wnt* signalling of cell differentiation and cancer. Perturbation in *wnt* signalling promotes neurodegenerative disorders and cancer. Several biomarkers associated with cancers have been identified using systems biology approach.

H. Balaram (JNCASR, Bangalore) presented different aspects of purine nucleotide synthesis in *Plasmodium falciparum*, which has an incompletely functional TCA cycle and absence of de-novo pathways for amino acid and purine syntheses (adaptations to parasitic mode of life). It salvages pre-formed purines of the host. Enzyme adenylosuccinate lyase from the purine-biosynthetic pathway catalyses two reactions – cleavage of SAICAR to AICAR and fumarate (in de-novo pathway), and conversion of SAMP to AMP and fumarate (in both de-novo and salvage pathways). Conversion of SAICAR to AICAR kills the parasite, which could serve as a principal control measure for *Plasmodium* infection. C. C. Chitnis (International Centre for Genetic Engineering and Biotechnology, New Delhi) presented an idea for designing a vaccine against malaria. He concentrated on the possibility of developing a vaccine against the highly conserved binding site of the Duffy binding protein (DBP) of the pathogen which binds to the Duffy antigen chemokine receptor (DARC) on RBCs. This will inhibit RBC invasion by *Plasmodium* merozoites and might be an effective way of protecting people in regions where malaria is endemic.

J. S. Tyagi (All India Institute of Medical Sciences, New Delhi) spoke on 'Unravelling secrets of a sleeping microbe: the curious case of the TB pathogen'. India has the largest number of TB cases in the world. Exposure leads to infection, 10% of which is active TB

(responds to drugs) and rest, latent TB infection. When immunity wanes in certain conditions, reactivation of latent TB occurs. Active metabolic pathways can be targeted in dormant organisms. DevR–DevS/DosT signalling system has been identified by Tyagi's group.

In his talk on 'Prey–predator response: Current research and paradigm shift', J. Chattopadhyay (Indian Statistical Institute, Kolkata) examined a new solution for the classical ecological problem, 'the paradox of the plankton' (the driving force behind the ever-changing species abundance in plankton communities) and resulting non-equilibrium based on field experiments and mathematical modelling.

Glycosidase, an enzyme that cleaves glycosidic bonds, helps in the metabolism of starch, glycolipids and glycoproteins in most living cells. Diseases such as diabetes can be controlled using glycosidase inhibitors as drugs. In this context, D. D. Dhavale (University of Pune, Pune) presented his work on iminosugars as glycosidase inhibitors and immunomodulatory agents. A. Grover (University of Delhi South Campus, New Delhi) talked about heat-shock proteins that are produced in all organisms in response to stress and by their chaperone action, remove denatured proteins and help restore native conformation of proteins. In context of rising global temperature due to climate change, development of heat-tolerant rice varieties becomes important for rice-dependent countries.

A. K. Nandi (Indian Association for the Cultivation of Science, Kolkata) talked about 'Multifunctional poly-(vinylidene fluoride) using supramolecular interactions'. He mentioned that achieving enhanced physical–mechanical properties of commercial polymeric materials is the aim of polymeric materials research, and also discussed the improved properties of graft copolymers. S. Sampath (IISc, Bangalore) talked about interfacial electrochemistry of modified surfaces and discussed the possible applications of organic thin films in molecular electronics, chemical sensors, fuel cells, corrosion protection and studying novel surfaces.

V. Ramagopal Rao (IIT, Mumbai) gave a talk on 'Polymer-based sensor systems for healthcare and homeland security applications'. There are 1.5 million deaths worldwide every year as a result of cardiac ailments making it important to develop an affordable early detection device. V. Tripathi (TIFR, Mumbai) highlighted that with suitable adaptations, NMR can prove to be similarly useful for probing electrons in mesoscopic structures. He illustrated the advantages of NMR with respect to transport measurements. R. Srianand (Inter-University Centre for Astronomy and Astrophysics, Pune) talked about understanding of physical conditions in protogalaxies by analysing cold gas at high redshifts. A. Bhardwaj (Vikram Sarabhai Space Centre, Thiruvananthapuram) spoke about the basic design of the Sub-keV Atom Reflecting Analyzer (SARA; an experiment onboard Chandrayaan-I), and its recent findings. The main objective of SARA was to study the interaction of solar wind ions with lunar surface by measuring ENAs and ions.

S. Kesavan (Institute of Mathematical Sciences, Chennai) discussed the techniques of homogenization and its importance in studying global behaviour of heterogeneous bodies. T. Kavitha (IISc, Bangalore) talked about the use of 'Efficient graph algorithms' for graph problems such as computing connectivities between all pairs of vertices and optimal bipartite matchings. Many real-world problems can be posed as problems on graphs.

Overall, the meeting encompassed discussions on current research in various branches of science and was probably the most fitting way to celebrate a landmark in the history of an institution.

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