in deference to the sacred cow. Despite the fact that vaccination was widely practised in the 1960s, smallpox still remained endemic in Chennai. As Pennington points out, the key to effective disease control is speed: speed of detection, speed of isolation of cases, and speed at which they are vaccinated. Today, we are as vulnerable to the pox as the Indians were when Columbus and his men descended on them. We live at a time when modern technology has made it possible to create mayhem where we least expect it. While we hope for the best, it looks as if we must prepare for the worst.

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NEWS

MEETING REPORT

The Academy Meeting 2002*

The 68th Annual Meeting of the Indian Academy of Sciences, Bangalore, was attended by about 130 Fellows out of the fellowship of nearly 860. After the formal introduction of Fellows of the Academy present at the meeting, K. Kasturirangan delivered his Presidential Address titled 'X-ray astronomy as a probe of the universe'. In this address, he noted that the Universe can be probed using particles (charged and neutral) or by electromagnetic radiation. The former, such as charged particles, has practical difficulties of loss of direction due to interactions with galactic and intergalactic magnetic fields. Neutral particles such as neutrinos are hard to detect. Whereas by using electromagnetic radiation, processes of particle interactions with fields and their spectra could be used to understand the universe. Both soft and hard X-rays could act as probes.

The history of X-ray astronomy dates back to the first X-ray view of the sun in 1949, followed by several X-ray missions and more recently, the Chandra and XMM Observatories for high angular resolution spectroscopy. With development of better imaging capabilities, recent missions have discovered X-ray emission from accreting binary systems. This has aided the discovery and detailed studies of neutron stars and black holes. X-rays form an ideal tool to study regions of strong gravity, strong magnetic field and high temperature. Kasturirangan detailed India's efforts in this important area of space research. ASTROSAT, India's space mission for probing the universe, scheduled for launch in 2006, is special because it would carry multi-wavelength on-board instruments. These instruments are capable of measuring the UV and X-ray energy range. In a combined effort involving several Indian institutions and the Indian Space Research Organization (ISRO), an Indian X-ray astronomy experiment for timing studies of X-ray binaries and gas-filled large proportional counters has been planned. The challenges are to be met with the indigenous designing and production of focusing X-ray mirrors, hard X-ray imagers, all-sky monitors, star sensors and soft X-ray telescopes with large-area, xenon-filled proportional counters, etc. ASTROSAT's contributions would be long-duration observations, high angular resolution UV survey, simultaneous broad-band spectrum and simultaneous timing at multi-wavelengths, according to Kasturirangan. The country is all set to take the next step in its efforts: a 'multi-wavelength observatory', he added.

In addition to several lecture presentations by Fellows and Associates, there were two public lectures, two special lectures and two symposia. In the following, a brief resume of these technical activities is given:

In his Public Lecture, Mohan Maharishi, Panjab University, Chandigarh, spoke on '*Rasa siddhanta*' and its social significance. Maharishi was worried about the yardstick used to recognize art forms. For example, an institute near Trichur, Kerala could not be given the status of a deemed university of the University Grants Commission for reasons such as inadequate basic qualifications, although this institute is an UNESCO Heritage Centre. Following this lecture was a rendering of Girish Karnad's *Agni aur Barkha* performed by Department of Indian Theatre, Panjab University.

The second public lecture was by M. S. Raghunathan, Tata Institute of Fundamental Research, Mumbai titled 'Artless innocents and ivory tower sophisticates: Some personalities on the Indian mathematical scene'. He laced his talk with anecdotes, lending a personal and human touch to mathematicians of the likes of S. Ramanujam, G. H. Hardy, K. Ananda Rau, S. S. Pillai, T. Vijayaraghavan, André Weil, Sarvadaman Chawla, Rev. Fr. C. Racine, S. Minakshisundaram, Harish Chandra, C. P. Ramanujam, Vijay Kumar Patodi and Komaravelu Chandrashekaran.

The special lecture by P. K. Kaw, Institute for Plasma Research, Gandhinagar, was entitled 'Collective modes in a strongly coupled dusty plasma'. The micrometre-sized particles contained in the dusty plasma feel both electron and ion flux and the ratio of coulomb interaction energy to thermal energy is large. The shielded Coulomb forces are the Yukawa forces, with the dust component in the plasma in a strongly coupled state. In this Yukawa fluid, dust interacts with strong correlation and the description of the dust component is of great interest. Experimental examples of dusty plasma are seen in processing plasma containing erosion of surface dust, plasma torches, edge plasma in fusion machines and in the near environment of planets.

Dust particles exhibit motion with low-frequency collective modes that are affected by strong correlation effects. Kaw has derived a dispersion relation for these modes using a generalized hydrodynamics model. A non-local viscoelastic operator using velocity in space and

*A report on the 68th Annual Meeting of the Indian Academy of Sciences, Bangalore held at Panjab University, Chandigarh during 8–10 November 2002.

time, by the memory effect, has been used for the description of these strong correlation effects. When the oscillating dust component loses memory, it behaves like a liquid and when it retains memory it acts like a solid. More recently, Kaw has identified new corrections to dispersion terms for longitudinal dust acoustic waves and the existence of transverse waves. Kaw has experimentally showed the presence of self-excited transverse shear modes when the dust component of the plasma is in a strongly correlated fluid-like state. It is possible to excite the dust plasma by external means, even though no natural oscillations are present and use this as a probe for strongly coupled matter. Strongly coupled matter is otherwise difficult to describe analytically, according to Kaw.

In the other special lecture of the meeting entitled 'Evolution of biology: Are we ready to play God?' S. E. Hasnain, Centre for DNA Fingerprinting and Diagnostics, Hyderabad, detailed the history of biology and what constituted life, namely reproduction, growth and metabolism. Beginning with cell theory and the elements that make up life, i.e. carbohydrates, lipids, proteins and nucleic acids, he explained the essentials of genetics and landmarks in the field of biology. Some of these are using X-rays for elucidating protein structures, structure of DNA double-helix, reverse transcription, cloning, restriction enzymes, DNA sequencing, genomics, recombinant DNA technology and use of fingerprinting or genomic profiling. The Human Genome Project would eventually lead to a better understanding of the disease process and pharmacogenomics, according to Hasnain. The sequencing of the human genome would lead the clinician to eventually analyse regions of an individual's specific genes to predict his susceptibility to a specific disease and his response to specific drugs.

Amongst about ten lectures from the Fellows and Associates, some are summarized below:

Y. D. Vankar, Indian Institute of Technology, Kanpur, spoke on 'Carbohydrates: Much more than mere sources of energy and their synthesis'. Carbohydrates supply energy to living systems. Molecules such as glycoproteins and glycolipids play metabolic roles such as in cell–cell recognition and adhesion, cell development, etc. Vankar has synthesized azasugars that act as potential inhibitors of carbohydrate-processing enzymes. S. Ramasubramaniam, Indian Statistical Institute, Bangalore, focused on 'Reflected Markov processes', with special reference to reflected Brownian motion which serves as a useful model in queueing networks, and applications in economics. Umesh Varshney, Indian Institute of Science (IISc), Bangalore, spoke on the subject of 'Ribosome recycling, the fourth step of protein synthesis in bacteria'.

Sunil Mukhi, Tata Institute of Fundamental Research, Mumbai, in his presentation 'The physics of branes' made string theory look simple. In string theory the fundamental string has a typical length scale. A string vibrating in its ground state appears like a point particle and the lowest oscillations of a fundamental string represent the elemental particles in nature. There are extra dimensions in string theory. Mukhi said that string theory is consistent in nine spatial dimensions; we live in three dimensions and the other six are compact. If strings could look like particles, could membranes look like strings? He then explained the membrane configuration in M-theory. Wrapping a string around a large compact spatial dimension leads to a membrane, and then this membrane could be described. A new paradigm has emerged in string theory: extended objects, similar to membranes with essential degrees of freedom, according to Mukhi. These objects are called branes. These branes would help in better understanding the relationship between gauge and gravitational fields. Acting as powerful handles on symmetries and dynamics of strings, applications of brane physics would be the key in particle physics, he added.

S. K. Satheesh, IISc, spoke on the topic 'Enhanced aerosol loading over Arabian Sea: Natural or anthropogenic'. Aerosols are particles of solid or liquid phase suspended in the atmosphere. Aerosols, by their radiative effects, influence climate, remote sensing, agriculture and health of the people. Their origins could be either natural such as soil, sea salt, volcanic dust, oceanic sulphates or man-made such as industrial sulphates, soot, organic particulates. Satheesh explained the usefulness of the ISRO Geosphere–Biosphere Programme (ISRO–GBP) in the monitoring of ground-based and balloon measurements of greenhouse gases and aerosols, as well as other studies related to land-use and land-cover change. Under the Aerosol Climatology and Effects Project, aerosol optical depths are being measured at many observation stations for over a decade now. Satheesh said that the source of aerosols during the period April–May was largely due to mineral dust transported by northwesterly winds from the Arabian and Sahara regions. Another cause was the sea-salt aerosols blown by sea-surface winds.

T. G. K. Murty, ISRO, Bangalore gave details about 'Optical technologies for space imaging'. Satellite-based remote sensing can image Earth resources with impact on agriculture, forestry, water resource management, etc. Space-based Earth imaging requires highest functional efficiency for minimal weight, volume and long-term functional reliability of satellites under adverse environs, according to Murty. Technology development includes design of multilayer optical coatings for light-weight mirrors.

K. Veluthambi, Madurai Kamaraj University, Madurai, gave his talk on 'Fine-tuning of *Agrobacterium* Ti plasmid system for efficient plant genetic engineering'. For transgenic plants under laboratory conditions, marker genes are selectively used for further growth of transformed tissues. The continued presence of the marker gene when the transgenic is released into the field is an environmental safety concern. It is important to remove this marker gene before the transgenic is released to the environment. *Agrobacterium tumefaciens*, as a single strain is used for generation of selection marker-free transgenic plants. Veluthambi has succeeded in doing so by cotransformation of cointegrate vector T-DNA and a binary vector T-DNA into this strain. The *A. tumefaciens* Ti plasmid-based vectors have the utility of transferring accurately a specific DNA sequence into the plant genome. Veluthambi has been able to make rice plants as hosts for the *Agrobacterium*, that had earlier proved difficult. He did this by inducing *vir* genes and generating T-DNA transfer intermediates. This was then used to design vectors that assisted in generating selection marker-free transgenic plants.

Speaking on his experiences while researching unexplored bacteria, research in a college and response of funding agencies were of concern to Milind G. Watve. His talk was titled 'Science where culture matters: A neoclassical approach to explore untapped bacterial diversity'.

Watve works on his research at the Abasaheb Garware College, Pune. According to Watve, there are about 4000 types of soil bacterial DNA in 1 g of soil. Molecular techniques indicate that a large part of the natural environment contains bacterial species that still are unknown. Why has this remained so? Bacteria having been 'missed' because a variety of aquatic and terrestrial habitats have oligophilic bacteria that grow only on dilute nutrient media and form small or microscopic colonies. Classical microbiology is done using 'pure culture techniques'. There have been attempts to find out bacterial species independent of culture methods and this has resulted in an assessment that 99% of bacteria remain uncultured and unknown.

Watve's premise is that if it occurs and grows in nature, then it should be possible to grow bacteria under a carefully selected set of conditions in a laboratory. Watve, with the help of mainly undergraduate students, has developed a procedure to grow oligophilic bacteria in his college laboratory in a special dilute culture medium. He has isolated 90 cultures. Among these, twelve bacterial cultures were studied and characterized. These showed high growth yield at low substrate concentration and were determined to be new types. He has identified at least one signal molecule that could coax the 'growth-stubborn' oligophilic bacteria to grow. According to Watve, exploring untapped bacterial diversity would give the edge and open the gates to new, useful bioactive molecules. He posed the question that if we could obtain several thousand antibiotics, enzymes and other interesting molecules from 1% bacteria, how much more would we be able to obtain from the remaining 99%? Watve has shown by means of a mathematical model that *Streptomyces* alone has greater than 100,000 secondary metabolites. Armed with his successes in studying oligophiles and trying to understand growth and energetics in dilute environments, Watve approached the Department of Biotechnology for funding. Watve does research in his college in collaboration with the National Centre for Cell Science, Pune and the National Centre for Biological Sciences, Bangalore. In reply to his request for funds, the funding agency said that this landmark research is not possible in a college and is too open-ended, and turned down his request. Watve set up his own company and is currently looking out for venture capitalist funding. There needs to be a rethink on funding policy for researchers from universities and colleges.

Symposia

1. *Quantum computing and quantum information*: In his overview to the symposium, Anil Kumar, IISc, spoke about the 'exciting possibilities that quantum computation offers in solving complex computational problems using algorithms'. Applications of quantum computation are in the area of cryptography, secure banking and computations based on quantum algorithms for use in the Internet. The idea was first proposed by Feynman in 1982 and several quantum algorithms have since been developed, such as Shor's factorization algorithm, Deutsch–Jozsa algorithm and Grover's search algorithm, the latter creating a new facet to 'unsorted' database search, e.g. a telephone directory. Other developments in this area are in quantum cryptography, teleportation, error correction and quantum computing. Experimental quantum computing is trying hard to keep pace with theory. Techniques include cavity quantum electrodynamics, trapped ions, quantum dots and use of nuclear magnetic resonance. Experiments in the area have proved a challenge, with work being carried out on less than seven quantum bits or qubits. More than seven qubits are still proving difficult for experimentalists and progress is slow in the area. Presently, all classical computers, such as supercomputers and parallel computers use binary (0,1) logic. So, Anil Kumar posed the question 'Can real quantum mechanical systems be used to build computers that operate in the quantum mechanical regime?'

Anil Kumar also elaborated on 'Experimental realizations of quantum computing' using ion traps, cavity quantum electro-dynamics, quantum dots and nuclear magnetic resonance. For ion traps, a linear Paul-trap is used where ions such as calcium could be trapped for a few days and multi-qubit operations could be made. Any application would require larger numbers of both ions and laser pulses than those used presently, he added. Larger ion traps could be the answer in the future, but are experimentally difficult. While ion traps use ion–phonon coupling, cavity quantum electro-dynamics involves atom–phonon coupling for understanding decoherence and entanglement. Quantum dot approach has to contend with manufacturing challenges, according to Anil Kumar. He has used nuclear magnetic resonance in the preparation of pseudo pure states and quantum logic gates. The laboratory has achieved many-in-one gates, one-to-one 2-qubit gates, 3-qubit 2D gates and quadrupolar coupled spin encased in liquid crystals. NMR has advantages of long coherence times and known experimental techniques. However, mixed initial states and scalability beyond 10 qubits are drawbacks, according to Anil Kumar. Maximum number of qubits through NMR technique in the world is seven, and at his laboratory four qubits has been achieved, he added.

R. Simon, The Institute of Mathematical Sciences, Chennai, described classical information theory used extensively by communication engineers and physicists, while Subhash Chaturvedi, University of Hyderabad, Hyderabad, gave insights about quantum information theory. According to Simon, classical data could be read and copied. It is robust and possible to store locally, whereas quantum data are fragile and are stored non-locally (entanglement). The world owes a lot to C. E. Shannon whose paper of 1948 set the groundwork for future information theory, according to Simon. Chaturvedi discussed qubit measurements that are comprised of non-unitary operations. He highlighted areas of research such as teleportation and various features of quantum computations and algorithms. K. R. Parthasarathy, Indian Statistical Institute, New Delhi, delved on the compositions of unitary matrices and their relevance to elementary quantum gates. These, in turn, could be expressed in the 'language of quantum circuits' such as 'NOT, AND, NAND and FANOUT gates', the latter two when repeated in a circuit could in principle do any computation, according to Parthasarathy.

2. *From mantle to monsoon: Himalayan geodynamics and climate change*: What is the connection between geology, i.e. the Earth's mantle and the monsoon's arrival over the Indian subcontinent? What part does the geology of the Himalayas play in climate change? The speakers of the symposium elaborated upon this interplay between 'mantle and mon-

soon', and some interconnections that could influence the Indian monsoon system. The monsoons over India are regulated by many climatic variables and are also influenced by the Himalayas and the Tibetan Plateau.

Vinod K. Gaur, Indian Institute of Astrophysics, Bangalore, while introducing the symposium said that Earth's interactive system of rock, water and air created the biosphere, whose networking and interconnections led to diversity in the system, of structural forms and behaviour. During Earth's formation, an initial mass of heterogenous aggregates turned to a central core made up of mainly iron and an outer crust of lighter aluminium silicates. Then while the Earth cooled, there was the formation of thermal boundary layers between its outer fluid envelope and the warmer interior, part of the mantle's convection cells. According to Gaur, these rocky spherical caps that grow by the solidification of hot upwelling material between some of their boundaries, called spreading axes, then move outwards to subduct under lighter continental edges and thus close the convective cycle. Thus, there is a state of constant flux of material and energy distribution that on geological timescales changes the shapes of continents and oceans. This is the basis of plate tectonics, peculiar to the Earth. The Earth's plate tectonics in turn constantly creates new dimensions to the chemical make-up and thermal capacities of both the atmosphere and the oceans. Gaur felt that sometimes these perturbations could become strong enough to lurch the Earth system from one of its two widely separated stable states to the other, modifying the environment and the ecology. This is exactly what the Earth had experienced about a few million years ago, when the climate changed to temperate after having remained warmer in the previous 250 million years. The Earth's mean temperature has changed a few degrees every few thousand years creating alternate cycles of glaciation, added Gaur. It was during one of the retreats of the ice age that human civilization grew.

The Tibetan Plateau has been elevated and affected by tectonic movements of the Earth, with convective flow beneath Tibet being vigorous. What process has led from North–South to East–West extension of Tibet? Penetration of India into the Eurasian plate at the rate of 40 mm per year has resulted from active deformations dominated by an East–West extension, without obvious change in convergence between continents. There has been a folding of the Indian Ocean lithosphere and an uplift of the Tibetan Plateau that has increased the pressure applied by Tibet to its surroundings. So, is mantle dynamics key to climate change? Can we understand the ocean floor from plate tectonics? Can we relate the 1000–2000 m increase in height of the Tibetan Plateau to have such a large effect on the Indian monsoon? Since the collision and convergence have taken place about 45 million years ago, there is a huge lateral variation in the mantle structure implying ongoing dynamics, with the Tibetan Plateau collapsing in an East–West direction.

Peter Molnar, University of Colarado, Boulder, USA, gave details about the following: 'From the mantle to the monsoon, manifested in the growth of the Tibetan Plateau'. About 80 million years ago, Tibet lay at the sea level. Then approximately 8–10 million years ago, due to several reasons there were changes in Tibet's configuration. Molnar gave insights into some geological events that took place around that time. Examples of these were the sudden uplift of the Himalaya and the Tibetan Plateau, and modifications in the Arabian Sea and the Bay of Bengal. It was around this time that there was a strengthening of the Indian monsoon over the subcontinent, while large parts of China turned to more arid land due to lack of moisture-laden winds. The plateau rose by 1000–2000 m abruptly, by convective removal of cold, dense mantle lithosphere beneath the plateau and its replacement by hotter, lighter asthenosphere that led to the surface uplift, according to Molnar. It was this greater elevation of the plateau that affected atmospheric circulation, including a strengthened monsoon, he added.

The formation of alluvial sediments on the Indo-Gangetic plains of the Indian subcontinent was the subject of the lecture by V. Rajamani, Jawaharlal Nehru University, New Delhi, on 'Geochemistry of Ganga/Yamuna alluvium – Changing Himalayan provenance'. Could these alluvial plains that have supported human civilization over the centuries yield information on the climate and tectonic history of the region? In an attempt to provide an answer, samples of the sediments in regions around Ganga, Yamuna, Ghaggar and Satluj river banks and deposited loess from between Bikaner and Garmukteshwar have been studied. During the summer months, large quantities of dust are carried by winds from the Thar desert in Rajasthan. Near the Delhi ridge, the Aravalli rock is covered by a layer of aeolian-silt and another layering of alluvial material from the Yamuna river. Glacio-fluvial sediment deposits from extinct rivers of the Thar desert, during the last uplift of the Himalayas and its attendant glaciation got transported by winds to the Indo-Gangetic plain. These sediments have been studied using a combination of particle-size analysis, mineralogy, trace-element chemistry, etc. By a detailed study of Delhi ridge sediments, Rajamani has shown a possible genetic link between loess formation, Himalayan orogeny and Pleistocene glaciation. The silty, cation-rich loess sediment brought by winds from the Thar desert has contributed to the greening of Delhi's quartzitic ridge.

R. R. Yadav, Birbal Sahni Institute of Palaeobotany, Lucknow, in his talk on 'Climate variability in the Indian region: High resolution proxy records' showed how the Himalayan cedar (*Cedrus deodara*) from the western Himalayan region could be used to obtain valuable records of climate such as reconstructing mean spring (March–May) temperature variations back to 1600 AD. Records of up to 800 years of temperature and precipitation patterns have been obtained from information in old tree species. By a careful selection of location of tree-ring samples from the western Himalayas and using cross-correlation procedure of ring-width chronologies to identify climatic factors influencing tree growth, tree growth–climate relationships were obtained. Himalayan cedar chronology observed from 12 sites showed a link to climatic factors. According to Yadav, 'cool springs were observed relative to 1951–80 mean temperature punctuated by brief intervals of warm epochs'. For the study of summer monsoons, Yadav picked on the ring widths of *Tectona grandis*. However, teak has been so much exploited that it was difficult to find old trees in the peninsula region of India. More recent studies on old *Juniperus tibetica* trees found in the Tibet region have found a strong correlation with Indian summer monsoon rainfall. Yadav feels a lot more work is needed

for obtaining temperature and precipitation records for looking at long-term climatic variability.

B. N. Goswami, IISc, spoke on 'The Himalayan mountains and predictability of the Indian summer monsoon'. He showed the importance of various forcing factors in modelling the Indian SW monsoon. Predicting the monsoons has proved difficult due to 'internal' low frequency oscillations in the atmospheric general circulation model. Goswami has investigated the factors responsible for these oscillations using a theoretical model. According to Goswami, 'the interaction of the monsoon subseasonal variations, i.e. intraseasonal oscillations with a timescale of 10–70 days leads to the "internal" low-frequency variability of the monsoon'.

S. Krishnaswami, Physical Research Laboratory, Ahmedabad, in his talk 'Contemporary silicate weathering ratios in the Himalaya: Impact on carbon-dioxide consumption' elaborated on chemical weathering, especially silicate weathering in the Himalaya to understand its linkage with tectonics and climate. He has also looked at the silicate and carbonate weathering effect on carbon-dioxide budgets. Krishnaswami has carried out chemical and isotopic studies of the source waters of the rivers Ganga, Ghaghara and Indus. Krishnaswami found the headwaters of the Ganga and the Yamuna to have a wide range of dissolved solids with a concentration of about 30–600 mg/l, comprising mainly, of alkaline calcium and magnesium. The major contributors of cations in the river waters are the carbonates, with silicates making up 25% of cations on molar basis. Gypsum and pyrite weathering also contributes towards the cations found. A comparison of silicate and carbonate weathering rates indicates that the former is lower and depends on temperature and erosion. The carbon-dioxide consumption by silicate weathering in the headwaters of the Ganga and its tributaries when compared with other major global river systems, was found to be 0.5–0.8% of the global value. Krishnaswami said that 'this supports the idea that young and high mountains consume carbon dioxide by silicate weathering in excess of the global average'. A look at the high strontium isotope ratios of the Ganga and Yamuna headwaters indicates silicate weathering, according to Krishnaswami.

A highlight of this meeting was the launch of the 'Academy Digital Journal Archive' by K. Kasturirangan. The paper by C. V. Raman published in *Current Science* titled 'The origin of colours of plumage birds' was projected in its original form. All eleven journals of the Academy are now freely available on the Web. The initiative for this project was taken by N. Balakrishnan, IISc, who is also the Secretary of the Academy. With the Academy going digital, there is a 'legacy of information and individual styles of presentation to be preserved from the best of Indian science', said Balakrishnan.

At the invited teachers' meeting, integral to Science Education Panel activities, concerns were expressed that there was no provision for 'leave' from parent organizations, e.g. universities and colleges, for attending refresher courses organized by the Academy. Another concern was that biotechnology in a few States lacked experimental facilities and trained teachers. A few teachers having gained from carrying out summer projects in institutions, now looked forward for a scheme 'for identifying teachers with research potential' to access funding. Teachers also hoped for an increased 'contact' with local Fellows.

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MEETING REPORT

Neem for the industry or for the common man: Where does India stand?*

The multitudinal backlash of synthetic insecticides and the need for ecologically safe pest-control alternatives for agriculture have led pest-control experts to revert to and intensively explore plants as sources of pesticides. Neem leads the list of plants with the highest potential for this purpose. Worldwide attention and a realization of the long-term benefits that neem promises, both in agriculture and in health care, have resulted in a surge of commercial interest. It is also being realized that neem has much wider applications than just in pest control or health care. The potential for industrial applications has, in part, triggered feverish research and our understanding of neem chemistry has nearly reached V_{max}. Biologists, on the other hand, seem to have taken a more measured and slower approach towards unmasking the biological effects of neem and its derivatives. If and when the insights gained by chemists and biologists converge, what bounties will neem yield for mankind? This precisely was the focus of the Fourth World Neem Conference 2002 held at Mumbai.

As many as 350 delegates, including 50 from abroad, debated a wide gamut of issues regarding neem, neem industry, benefits to common man, conservation of neem and the future of neem in India. Fourteen invited and 141 contributed papers were presented in 16 technical sessions. Not surprisingly, the role of neem in insect control dominated the conference with 25 papers. Other issues covered were environment and socio-economic issues (9), animal and human health (12), chemistry (9), nematode control (3), fungus control (4), processing and product development (14), genetic improvement and afforestation (8), and miscellaneous topics (6).

*A report on 'Neem 2002: World Neem Conference' held at the Taj Lands End, Mumbai from 27 to 30 November 2002 and organized by Neem Foundation, Mumbai.