

cent Health Committee) and M. N. Bhad (State Project Office, DPEP, Govt. of Gujarat), attended the workshop and delivered resource lectures on various scientific topics and also participated in various interactive sessions with the participants.

On the final day, the participants presented their group-wise puppet shows with titles like; *Tum bina jivan kanha*

(dealing with the importance of trees), *Kahi aapko hojate toa* (dealing with AIDS), *Jaduee sashalu* (dealing with science teaching of magnet), *Bigyan vani* (dealing with safe drinking water), *Anader ki hartal* (dealing with the understanding of the human body), etc. The puppet shows were interesting and exciting. As they progressed, they explored the science and technological issues with

messages mixed with a right blend of action and music.

NAROTTAM SAHOO

Gujarat Council of Science City,
Udyog Bhavan,
Gandhinagar 382 011, India
e-mail: narottam@scity.org

Nuclear terrorism perception: Some strategies and recommendations to handle a disaster scenario

The Indian Society for Radiation Biology (ISRB) organized a workshop, 'Radiation Risk in the Age of Nuclear Terrorism', in collaboration with Research Centre, Juelich (Germany), Health Canada, Ottawa (Canada) and School of Life Sciences, Jawaharlal Nehru University (JNU), New Delhi (India) on 16 November 2002 at School of Life Sciences, JNU, New Delhi. Forty participants, including thirteen invited speakers/panelists representing India, Germany, Canada, Japan and the USA, attended the workshop. The speakers covered various aspects of radiation risk assessment in a nuclear disaster scenario in the six technical sessions of the workshop. R. N. Sharan (NEHU, Shillong) in his opening remarks highlighted the need and urgency of the workshop and discussed its scope. The inaugural lecture was delivered by P. N. Srivastava (former Vice-Chancellor of JNU, Member of the Planning Commission and President of ISRB). Srivastava recalled the chronological events of the past where large segments of population across the globe were exposed to heavy doses of radiation. K. A. Dinshaw (Tata Memorial Center, Mumbai) delivered a thematic talk titled 'Managing radiation emergencies – a physician's view' covering all aspects of health management during and after a nuclear holocaust.

The next four sessions covered various aspects of consequences of radiation exposure, new approaches to biological dosimetry, biological responses and radioprotection strategies wherein nine invited speakers delivered their talks. A. Trivedi (Health Canada, Ottawa) presented new strategies for radiation risk

assessment in the moderate dose range of 1–10 Sv – doses that are not lethal but which can potentially cause acute effects as cells continue to survive. K. P. Mishra (BARC, Mumbai) detailed need of more extensive research to elucidate the role of free radicals in induction of membrane and DNA damages which may provide better understanding of apoptotic death and bystander effects. R. N. Sharan presented evidence of nucleotide sequence determined vulnerability of segments of genomic DNA, suggesting that genome instability or inherent radiosensitivity may, at least in part, be determined by the primary sequence of nucleotides. M. S. Sasaki (University of Kyoto, Kyoto) presented a new model of biological dosimeter for a non-homogeneous radiation exposure situation like the one during nuclear holocaust. The strategy is based on scoring chromosome aberrations in lymphocytes and spreading it over a mixed Poisson distribution into dose component to get most likely dose-response curve and a realistic biological dose assessment. F. H. A. Schneeweiss (Research Center Juelich GmbH, Juelich) offered an alternative to this approach, in which early cellular response could be assessed by analyses of lymphocyte proteins by two-dimensional differential gel electrophoresis and mass-spectrophotometer coupled with COMET-FISH analysis of DNA damage. P. Uma Devi (J. N. Cancer Hospital and Research Center, Bhopal) presented results of research involving prenatal exposures of mice and cancer incidence. Prenatal exposure was shown to significantly increase genome instability. R. K. Kale (JNU, New Delhi) presented evidence of

xanthine oxidoreductase system producing free radicals in post-irradiation period suggesting, thereby, that inhibition of the system may contain radiation damage in post-irradiation period. B. S. Dwarkanath (Institute of Nuclear Medicine and Allied Sciences, Delhi) discussed possible use of minor groove-binding DNA ligands, such as Hoechst 33258 and 33342, in protection of radiation-induced DNA damage. The Hoechst ligands were shown to scavenge free radicals as well as afford stabilization to DNA superstructure. A. Chatterjee (NEHU, Shillong) elaborated upon the use of endogenous radioprotector, GSH, in reducing post-irradiation damage to proliferating cells.

The final technical session of the workshop was in the form of a plenary discussion with panelists P. N. Srivastava, M. S. Sasaki, F. H. A. Schneeweiss, A. Trivedi and Vijayalaxmi. The session was initiated by a short presentation on 'Chemical, biological radiological and nuclear research and technology initiative' by A. Trivedi. The deliberation made several recommendations:

- International collaborations/partnerships, network and communication channels be initiated and strengthened for free exchange of information and for collaborative research.
- In the domain of preparedness, the following steps be initiated:
 - Public awareness initiatives for imparting correct perspectives on effects of radiation and perspective on nuclear disaster and its management.
 - School children awareness initiatives to foster and strengthen concepts and possibilities of peaceful

- uses of nuclear energy and alleviation of unfounded fear of the public on harmful effects of radiation.
- First response team be created and kept in readiness at various locations, especially in metropolis and big cities. Appropriate 'first action manual' should be prepared for the teams.
 - Existing hospitals in different metropolis and big cities may be categorized and equipped for handling various categories of patients and different degrees of emergencies.

- Specialized trauma control hospitals be developed for trauma control.
- Development of biological dosimeters with field applicability to assess the extent of biological damage in the disaster situation.
- Radiomodulatory drugs for post-exposure treatment needs urgent attention. Endogenous or exogenous radioprotectors, free radical scavenging drugs of high efficiency and nucleotide modifiers need to be developed and tested.

The recommendations are especially relevant to India due to its vulnerability, large population, geographical spread and largely inadequate medical infrastructure.

R. N. Sharan, Radiation and Molecular Biology Unit, Department of Biochemistry, North-Eastern Hill University, Shillong 793 022, India.
e-mail: rnsharan@nehu.ac.in

Beyond Gaussian: Theoretical chemistry in India comes of age

India has a reasonably strong theoretical chemistry community that has been growing steadily in the last 2–3 decades. The first formal discussion meeting in theoretical chemistry was organized by B. M. Deb of Panjab University in Chandigarh in October 1986. There were only a handful of theoretical chemists in the country at that time. They were in their prime and were raring to go. They needed a platform to come together and discuss the state of the art. The then President of the Indian Academy of Sciences, Bangalore, S. Ramaseshan came forward to fully support the discussion meeting in theoretical chemistry, so that the theoreticians did not have to run around seeking financial support. The meeting was a grand success and thanks to the continuing support of the Academy, the discussion meetings continued at intervals of 2 years for the next several years. Unfortunately, all good things must come to an end and they did. The Academy decided to stop the support. Fortunately, the theoreticians managed to continue to hold their meetings at regular intervals of 2 years, thanks to the support from DST, CSIR, BRNS and other such funding agencies and also due to the untiring efforts of colleagues in different academic institutions in the country.

The most recent meeting, *Trends in Theoretical Chemistry – 2002*, held at the Indian Association for the Cultivation of Science, Jadavpur, Kolkata, during 17–19 January 2003 was a big success. There were about 100 participants that included seven from outside India, giving the meeting the semblance of an international symposium. There was a total of thirty one half-hour talks, two 45 min evening lectures and about 50 poster pres-

entations. The subjects covered included various topics ranging from formal electronic structure theory and its application to statistical mechanics and chemical dynamics and their applications to a large number of systems including atomic and molecular clusters, proteins and other biomolecules in interfaces.

Not surprisingly, a good number of talks centered around electronic structure theory and its application to chemical and biological systems. While H. F. Schaefer III emphasized the importance of correlation methods, taking the example of silicon dicarbide, M. Nooijen illustrated the use of automatic program generators in implementing multi-reference coupled cluster theory. A set of lectures dedicated to B. M. Deb (as he has turned 60), understandably focused on density functional theory (DFT) – a subject close to his heart. H. Nakatsuji, highlighted the contributions of Deb and also spoke on SAC-CI theory, while P. Geerlings spoke on conceptual DFT. M. K. Harbola illustrated the use of hydrodynamic variation–perturbation method in calculating van der Waals coefficients and P. K. Chattaraj discussed chemical reactivity dynamics within a quantum fluid density functional framework. G. P. Das presented an overview of spintronics. While A. Perera spoke about the challenges faced by *ab initio* electronic structure theory, Jemmis illustrated its use in understanding planar tetracoordinated carbon and pyramidal tricoordinated boron. Narahari Sastry spoke on its application to Diels–Alder reactions and T. P. Radhakrishnan on modelling molecules in crystals. R. Chaudhuri discussed the use of effective Hamiltonian methods in studying excited electronic states of TiN. S. K. Pati

discussed nonlinear absorption in organic molecules and N. Sathyamurthy on the use of *ab initio* methods in studying intramolecular hydrogen atom transfer in ground and excited states of salicylic acid and related systems. S. R. Gadre illustrated the use of electrostatic potential maps in understanding the shape and reactivity of different chemical species. B. P. Das was more concerned with relativistic and correlation effects in atoms.

While one evening lecture by W. H. Miller concerned semiclassical methods, the other by S. Dattagupta focused on coherence versus decoherence. Adhikari spoke on the time-dependent discrete variable representation method. The only talk on quantum chemical dynamics was by V. Aquilanti, who spoke on tunnelling and resonance-enhanced chemical reactivity in (F, H₂) collisions. While M. S. Krishnan was concerned with computing vibration–rotation states accurately, K. Srihari concentrated on intramolecular vibrational relaxation in highly excited states. R. Ramaswamy illustrated the problem of structure optimization in large atomic clusters, and D. Maity discussed the structure of solvated electrons. The talk on blow torch and levitation effects by S. Yashonath was an illustration of how computer simulation could be gainfully employed in industry. S. Bandopadhyaya presented preliminary results from a simulation of surfactant aggregates. B. Bagchi demonstrated how folding of globular proteins could be studied with reasonable computational facility. S. Taraphder was concerned with proton transfer in protein–water systems. G. Gangopadhyaya discussed the use of dendrimers in light-harvesting systems. M. S. Gopinathan showed how