## Report of the C3 Commission of Statistical Physics (2004)

The major activity of the C3 Commission on Statistical Physics over the past year was the organization of STATPHYS 22, the 22nd IUPAP International Conference on Statistical Physics. STATPHYS is the major conference in the field, and is held every three years.

The conference, which was organized by Profs. T.V. Ramakrishnan, S. Dattagupta and R. Pandit, was held in Bangalore, India, from July 4-9, 2004. The venue of the conference was the National Science Seminar Complex, which is on the campus of the Indian Institute of Science, Bangalore. The conference drew approximately 600 participants from 47 countries.

The conference programme consisted of 2 Boltzmann Award Lectures and 9 plenary talks (of 45 minutes each), 54 invited talks (of 30 minutes each), 170 oral contributed talks (of 15 minutes each) and poster contributions which were presented in poster sessions held over 4 days. Invited and oral talks were held in four parallel sessions.
Scientific sessions were held in the halls of the National Science Seminar Complex, the nearby Centre for Scientific and Industrial Consultancy, and an additional temporary but air-conditioned, water-proof and sound-proof hall that was set up for STATPHYS 22. Areas were provided for frequent coffee breaks and discussion periods. Further, easy and free access to e-mail and internet facilities was available to all participants, and all registered participants were given free lunch and dinner. The efforts of the International Advisory Committee and the Steering Committee, made over the past two years, culminated in a programme of a very high scientific standard.

STATPHYS 22 covered major topics of current interest in Statistical Physics including:

(1) Rigorous results and exact solutions; general aspects of statistical physics; thermodynamics
(2) Phase transitions and critical phenomena (equilibrium and nonequilibrium)
(3) Nonequilibrium processes (transport theory relaxation phenomena, random processes)
(4) Pattern formation in systems out of equilibrium (growth processes, fracture, hydrodynamic instabilities, chemical reactions, granular flows, etc.)
(5) Dynamical systems and turbulence
(6) Liquid matter (atomic, molecular and ionic fluids, freezing; metastable liquids; granular matter)
(7) Soft condensed matter (colloids, polymers, liquid crystals, microemulsions, foams, membranes, etc.) (8) Interfacial phenomena and wetting; surface effects and confined systems
(9) Quantum-mechanical problems (quantum phase transitions; strongly correlated fermions; Bose-Einstein condensation; mesoscopic quantum phenomena, etc.)
(10) Disordered systems (random lattices, spin glasses, glass transition, localization, etc.)
(11) Biologically motivated problems (protein-folding models, dynamics at the scale of the cell; biological networks, evolution models, etc.)
(12) Other applications of statistical physics (networks, traffic flows, algorithmic problems, econophysics, astrophysical applications, etc.).
The broad sweep of topics reflects the breadth of statistical physics, which has natural linkages with many fields.

A highlight of the conference was the Boltzmann Session, which was chaired by Prof. Ben Widom. At this session, individual Boltzmann Medals were awarded to Prof. E.G.D. Cohen of Rockefeller University and Prof. H.E. Stanley of Boston University. Prof. Cohen was cited for his ``fundamental contributions to nonequilibrium statistical mechanics, including the development of a theory of transport phenomena in dense gases, and the characterization of measures and fluctuations in nonequilibrium stationary states", and Prof. Stanley for his ``influential contributions to several areas of statistical physics, including the theory of phase

transitions and critical phenomena in spin systems and the percolation problem, and the application of these ideas to interpret the anomalous properties of liquid water."

The plenary and invited talks focused on important recent developments in diverse areas. The plenary talks consisted of lectures on The scaling limit of 2-d critical systems (W. Werner), Fluctuations and large deviations in nonequilibrium systems (B. Derrida), Sheared solid materials (A. Onuki), Fluids near structured walls (A.O. Parry), Critical Casimir forces(S. Balibar), the Glass transition in simple liquids (C. Dasgupta), Dynamics in soft and granular systems (T.C. Lubensky), Active processes in living cells (F. Julicher), and The statistical mechanics of complex networks (A-L. Barabasi).

Twelve smaller, more focused, satellite meetings were held in the weeks just before and after STATPHYS 22. These meetings dealt with various subjects, including quantum systems, nonlinear dynamics, pattern formation, nonequilibrium statistical physics, complex fluids, disordered systems and glass physics. They were spread across several countries in Asia, namely, India, Singapore, China, Taiwan, Korea, Japan and Iran.

The meeting of the C3 Commission was held during STATPHYS 22. An important decision made was the endorsement of the proposal of Profs. L. Pietronero, G. Parisi and K. Sreenivasan to hold STATPHYS 23 in Genova, Italy, in July 2007.