



## Editorial

# Atomic and Solid State Theory, Experiment and Application in X-ray Physics: Proceedings of the 20th International Conference on X-ray and Inner-Shell Processes, July 4–8 2005, Melbourne, Australia

The 20th International Conference on X-ray and Inner-Shell Processes, X05, was held at the University of Melbourne, Victoria 3010, Australia from July 4–8, 2005. This was the latest meeting in a long-standing series of conferences ‘X-ray and Inner-Shell Processes’ dedicated to X-ray science all over the world. The current series is a unification of the earlier separate series of ‘Conferences on X-rays’ started in 1965 (held both in Ithaca and Leipzig) and continued until 1976 (Washington), and the series on ‘Inner-Shell Ionisation’ (held 1972 in Atlanta and 1976 in Freiburg). The meetings in the joint series were held in Sendai, Japan (1978), Stirling, Scotland (1980), Leipzig, Germany (1984), Paris, France (1987), Knoxville, USA (1990), Eugene, USA (1992), Debrecen, Hungary (1993), Hamburg, Germany (1996), Chicago, USA (1999) and Rome, Italy (2002). The Local and International Committees of X05 gratefully acknowledge the State Government of Victoria for their sponsorship of this conference, and the support of The University of Melbourne, who have provided the resources to stage this event (Fig. 1).

The nature of the conference has naturally evolved over time, and in particular the insight and brightness of synchrotron facilities now play a major role in many of the plenary, invited and contributed presentations. However, accelerators, storage rings, fixed X-ray sources and novel sources such as Electron Beam Ion Traps play continuing and new roles in the development of the field. Additionally, some presentations relate to yet other sources, and in particular soft X-ray generation from high-power, high-brightness lasers and indeed the most powerful laser sources in the world. And other presentations relate more to an increased understanding of the processes involved in inner shells or solid state interactions than in areas of conventional X-ray energies alone. Indeed some use electrons or infrared radiation to elucidate structure and insights.

This has been the first international synchrotron science conference in Melbourne. Delegates have registered from over 27 countries and from all around Australia. The fundamental research drives exciting developments in synchrotron techniques. It underpins innovations in applied science from medicine to nanotechnology that benefit communities and industry. X05 has been an excellent opportunity to share insights with leaders in key emerging and developed fields.

Subjects that were once regarded as purely fundamental research in experimental and theoretical atomic and molecular physics now make vital contributions in these proceedings to the development of new materials, forensic sciences, pharmaceuticals and metrology standards. Emerging fields include the generation of intense X-ray sources, imaging techniques, and the design of instrumentation and synchrotron beamlines, as well as the detailed understanding that access to synchrotron light sources affords us in our efforts to elucidate the nature of fundamental electronic processes.

We received 250 abstracts and over 180 participants. The programme included 5 plenaries, 20 invited oral presentations, 56 other oral presentations, and 156 presentations in two strong poster sessions. A number of sessions were conducted in parallel. The invited speakers, chosen among the many suggestions from the members of the International Scientific Committee and the Advisory Committee, reviewed the latest developments in the fields.

A significant departure from past meetings is the decision to publish the X05 proceedings in a special edition of Radiation Physics and Chemistry, and to offer the opportunity for both oral and poster contributors to submit manuscripts to the volume. Past proceedings have often been in the AIP Proceedings series. This change has been made in response to feedback



Fig. 1. Attendees at the conference photograph in the main lecture hall.

from participants of earlier meetings. Radiation Physics and Chemistry is a particularly appropriate vehicle for the X05 proceedings, which will deliberate strongly on synchrotron research, and on both fundamental and applied areas of experimental and theoretical studies.

I would like to thank Harry Quiney, for his assistance in compiling the Book of Abstracts and the Website, and for the rest of the Scientific Programme Committee, Stephen Best, Robert Leckey and especially Frank Larkins, the conference Chair, for a careful reviewing process at all levels. These proceedings have been fully refereed and manuscripts have been revised accordingly. This issue contains 130 submissions, and shows many of the exciting developments discussed and presented during the conference. I thank the presenters and authors for their timeliness, and their diligence and care in responding to the referees' detailed comments. I also thank the referees for their careful work which has made this issue much more useful.

This issue is arranged thematically, with naturally some overlap as to content, as follows:

*Section A:* Atomic Physics of Inner-shell Transitions: Theory and Experiment

*Section B:* Atomic Physics of Photoionisation: Developments and Challenges

*Section C:* Condensed Matter Physics of Photoionisation: New Opportunities

*Section D:* Scattering of Atomic and Condensed Matter

*Section E:* Investigations of Few-Electron Systems and Tests of QED

*Section F:* Laser Plasma X-ray Sources and Studies towards higher brightness and flux

*Section G:* Novel and Critical Applications of Technology and insights for Biomedicine, Chemistry and Earth Science

*Section H:* New Detectors, Spectrometers and Instrumentation

*Section I:* Fragmentation and Related Studies

*Section J:* Hot Topics and Applications

With the strong thread of new exciting insights, technology, applications and science running through these presentations, it is clear that this series of conferences, and the fields that it represents, has a very strong and vigorous future. The next conference in this series will be held in Paris, France, July 2008.

*X05 International Scientific Committee:* S.O. Aksela (Finland), Y. Azuma (Japan), U.E. Becker (Germany), N. Berrah (USA), A. Bianconi (Italy), P. Beiersdorfer (USA), J.E. Burgdoerfer (USA), D.S. Gemmell (USA), A.N. Grum-Grzhimailo (Russia), J. Kawai (Japan), F.P. Larkins (Australia), A. Marcelli (Italy), N.O.T. Martensson (Sweden), P.H. Mokler (Germany), J. Mustre de Leon (Mexico), S. Scheinerman (Russia), M. Simon (France), S.H. Southworth (USA), B. Sulik (Hungary),

J. Tanis (USA), K. Ueda (Japan), J. Ullrich (Germany), E. Weigold (Australia), Z. Wu (China), Y. Yamazaki (Japan).

*X05 Local Organising Committee:* F.P. Larkins (Chair), C.T. Chantler (Scientific Program Chair), H.M. Quiney (Secretary), S. Best, R. Leckey, C. Kraina, K. Nugent, R. Lewis, G. Roe, S. Ross, F. Skrezenek.

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