

Introduction

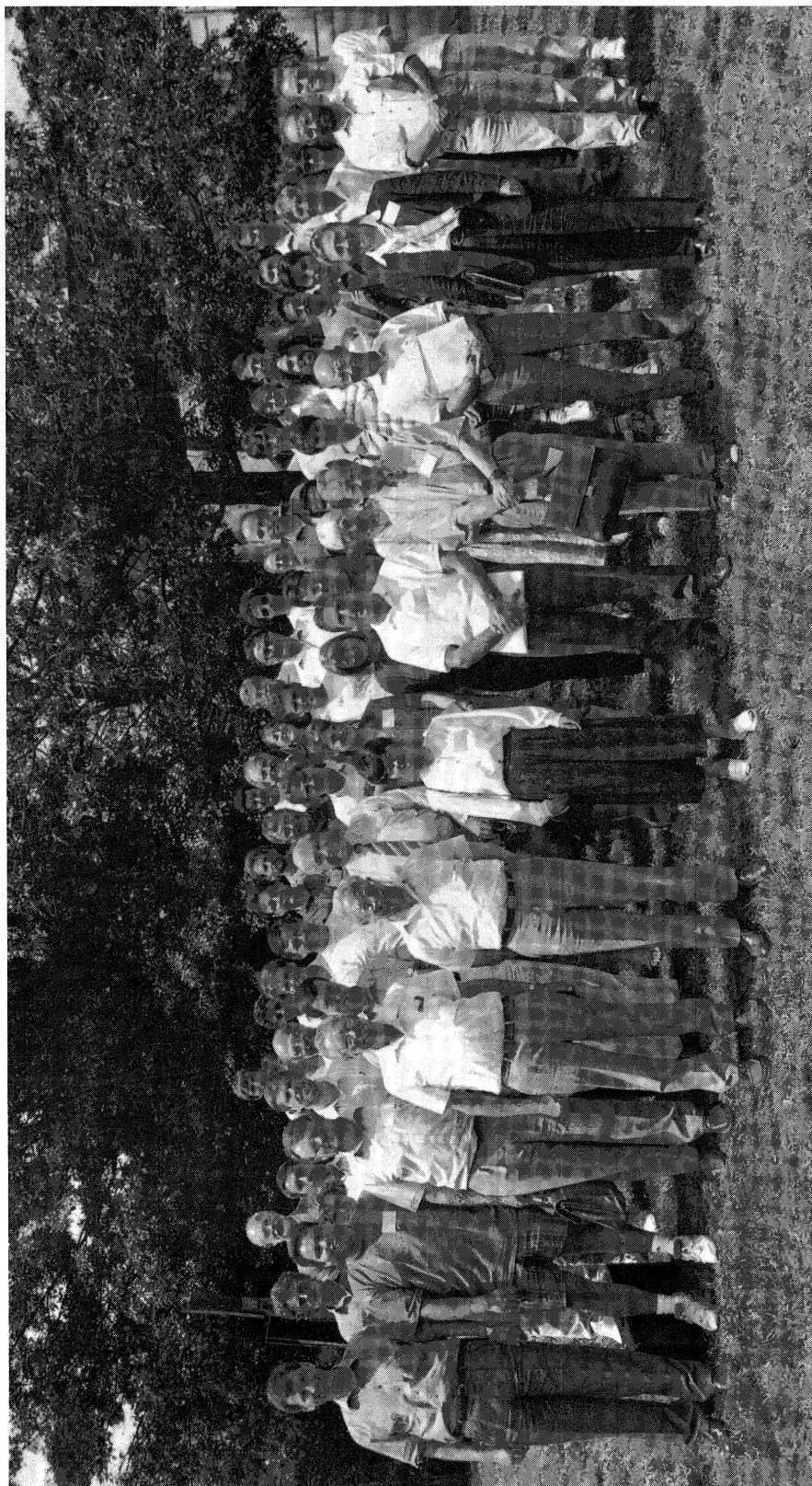
The Advanced Workshop on Atomic and Molecular Physics was held at the Research School of Physical Sciences and Engineering, Australian National University between February 13–15, 1995. The Workshop was a bilateral meeting involving physicists and chemists from Australia and the United States and the main goals were to bring together research workers in the field of low energy atomic and chemical physics to review recent advances and to chart possible directions for the future. The Workshop attracted 75 registrants. Of these, 20 eminent speakers in diverse areas of atomic and molecular physics were supported directly by grants from the Department of Industry, Science and Technology (Australia) and the National Science Foundation (USA). The remaining 55 attendees comprised 30 staff and, most importantly, 25 postgraduate students from Australian institutions.

The Workshop comprised presentations and discussion by 28 speakers arranged into 10 sessions with broadly unifying themes. The sessions varied between fundamental areas such as electron and positron scattering, scattering from excited species, coincidence studies, scattering theory and structure, the role of electron spin, to potentially more applied areas such as surface studies, molecules and clusters and atom optics. Each session concluded with a panel discussion where the three speakers involved, and the session chair, provoked discussion and fielded questions from the floor. This format proved extremely successful, so much so that most session chairs found it difficult to remain within schedule. In addition to the oral contributions a poster session, comprising 36 presentations, was held on the afternoon of the first day of the Workshop. This provided an extended, relaxed venue for detailed discussion between the delegates and proved enormously successful. It was a particularly useful exercise for the student delegates, many of whom had their own work on display and had the opportunity to defend and discuss it with senior people in their research field.

It was clear from the lively presentations and extensive discussion that followed each session that the field in general is active and productive. Amongst many lively discussion sessions, specific areas which were the focus of much attention regarding future directions included:

(1) The role of theory in predictions of low to intermediate energy scattering processes. Given the recent outstanding success of a new generation of close-coupling calculations for low and intermediate energy scattering from one- and two-electron targets, the role of theories such as distorted wave approaches was questioned repeatedly. Whilst in most cases such theories could not compete with the close-coupling approach it was generally agreed that the latter was not yet sufficiently utilitarian to warrant the abandonment of the former, particularly as an indicator for higher energy scattering processes.

(2) Improvements in experimental techniques for double- and triple-coincidence experiments. Such experiments, including $(e, 2e)$ and $(e, 3e)$ ionisation measurements, stepwise electron+photon excitation events and electron-photon coincidence experiments (and their time-reversed analogues) are pursuing increasingly difficult measurements. There was substantial discussion about the associated hardware developments that are required and the longer-term viability of these experiments. The Australian experimental atomic physics community is one of the main



Participants at the Advanced Workshop on Atomic and Molecular Physics held at the Australian National University in February 1995.

international players in this research area and the development of experiments with spin-polarised collision partners, higher energy resolution and innovative detector techniques will ensure that this profile is further strengthened.

(3) The possibilities that atom optical techniques offer to the atomic collisions community, spectroscopic studies and new technology. The relatively young research area of atom optics, in which the trajectories of individual atoms can be controlled and manipulated by laser light forces, was represented by a session in which technological prospects (parallel deposition of ordered structures of metal vapour atoms), fundamental techniques (manipulation of ultracold atoms with magnetic fields) and applications to atomic scattering and spectroscopy (production of high brightness atomic beams) were presented and discussed at length.

Low energy atomic physics is a research area in which Australia has an outstanding international reputation. The major outcomes from a bilateral workshop such as this are the establishment and maintenance of collaborative ties with colleagues both within Australia and overseas and the generation of new ideas for research and development. In this sense the workshop has continued the long standing level of collaboration that has existed in the field between Australian and American scientists. By its very nature, as a focussed workshop, it served to further enhance many of these established ties. It was also broad enough and involved the participation of many of the leading younger research workers in the field to enable many new collaborative research ties to be established.

Many people and organisations contributed to making this Workshop a success. It would not have been possible without the financial support of the Department of Industry, Science and Technology and the National Science Foundation, which was provided under the auspices of the Australia-USA Bilateral Science and Technology Program, and the infrastructure support provided by the Australian National University. It is a pleasure to acknowledge the efforts of Professor Don Madison, the Co-Chair of the Workshop, in his difficult role of coordinating the support and travel for the US participants. We also wish to thank the members of the local advisory committee (Bill MacGillivray, Jim Williams, Ian McCarthy, Frank Larkins and Peter Hannaford) for their assistance and advice on the Workshop program. Finally we wish to thank the *Australian Journal of Physics* and its editor Peter Robertson for supporting the meeting through the publication of these proceedings.

Stephen J. Buckman and Erich Weigold
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Electron Physics Group
Research School of Physical Sciences and Engineering
Australian National University

