

Research School of
Physical Sciences & Engineering

Annual Report 1999

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Contents

4	Director's Report
7	1 Research Accomplishments
8	Applied Mathematics
16	Atomic and Molecular Physics Laboratories
23	Electronic Materials Engineering
31	Laser Physics Centre
39	Nuclear Physics
46	Optical Sciences Centre
50	Plasma Research Laboratory
58	Theoretical Physics
65	2 Commitment to Teaching
65	Introduction (Associate Director [Students])
66	Degrees Awarded and Destinations
68	Postgraduate Students
70	Honours Students
70	Summer Scholars
71	Winter Scholars
71	Visiting Scholars
72	Science Schools
73	Outreach Activities
75	3 National and International Links
75	Introduction [Associate Director (Resources)]
76	Commercialisation
79	Collaborative Ventures, Agreements and MOUs
85	Outside Grants and Contracts
87	Australian Photonics CRC
89	Centre for Theoretical Physics
90	Centre for the Mind
92	Service to Outside Organisations
95	Workshops and Conferences
96	Visitors
98	Postdoctoral Fellowship Completions and Destinations
99	4 Interactions Across the University
99	Introduction (Editor)
100	Interaction with The Faculties
102	University and School Service
104	5 Major Awards and Publications
104	Introduction (Editor)
105	Honours and Awards
107	Publications
117	Invited Conference Presentations and Lectures
121	6 Internal Management
121	Administration
122	Policy and Public Relations
123	Technical Support
125	Equal Employment Opportunity Issues
127	School Committees
130	7 Staff and Student Statistics

Director's Report



Professor Erich Weigold

- Director

It was the best of years, the worst of years. Worst in the sense that necessary salary increases and the tightening of government block funding to the Institute of Advanced Studies (IAS) have resulted in the significant downsizing of the School, with 1999 staff levels supported on recurrent funds being approximately 20 percent below those of 1995-1996. Since research is carried out by people, this has its inevitable consequences on Australia's research capabilities in the physical sciences and engineering. It was the best of years in the sense that School staff are continuing to go from strength to strength, amassing a great number of achievements on many fronts. Researchers in the School have been outstandingly successful in using their intellectual potential to attract funds from within the University, local and international industry, other government sources and granting agencies. What this means is that approximately one third of the School's total budget comes from external sources. This success in winning "research input" is matched by the School's success in "research output". Much of this is detailed in the rest of this report. Nevertheless it is worth noting that based on the University's DETYA publication data for 1997 and 1998, the School produced 31% of the refereed journal publications by the Science Research Schools in the IAS but received only 18% of the IAS "Science" budget.

The School is continuing to manage change and to set new research directions. It has the scientific strength and infrastructure to continue along its path of excellence as we enter the new century.

As part of the process of ensuring strategic change in the IAS and in rewarding excellence, the Director of the Institute, Professor Frank Jackson, established the Institute Planning Committee and the Performance and Planning Fund. Funds for the latter were obtained from taxes applied to the Research Schools and from the University's General Contingency Fund. The School was most successful in its bids to the fund. Of the five successful Institute-wide initiatives, two were from the School. The first of the two successful bids was an initiative in mesoscale physics, based on the world-leading research strengths in the Department of Applied Mathematics. Its success was largely based on the visions of its current and former heads, Professors Stephen Hyde and Barry Ninham, on their department's expertise and research successes and their host of national and international collaborations. This initiative involves theoretical and experimental studies of the structure of condensed matter at all relevant scales. The intermediate length scale, or mesoscale, is emerging as an exciting frontier for physics research, and is germane to processes geological and biological. The goals include studies of disordered materials and self-assembly in biological, geological and synthetic materials. The work is interdisciplinary in nature and also involves researchers from the Research School of Earth Sciences, the Department of Forestry, the ANU Supercomputer Facility, and external collaborators. It has direct relevance to soils, sedimentary rocks, minerals, foams, wood, bone, polymer composites, catalysts, gels, coatings, concrete, ceramics and more.

The second successful bid was based on the research activities in nonlinear physics of staff in the Optical Sciences Centre (OSC) with support from the Laser Physics Centre (LPC). This initiative, entitled Nonlinear Science and Solitons, from Optics to Biophysics, will allow the staff to extend their research beyond optics and light-guiding-light concepts to nonlinear concepts in biophysics, photonic crystals, Bose-Einstein condensates and organic nanostructures.

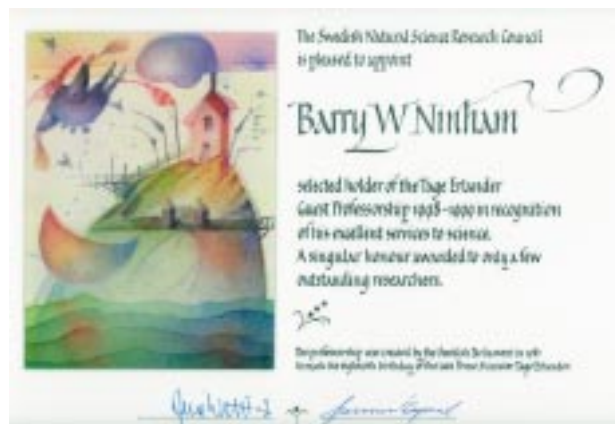
Finally the Atomic and Molecular Physics Laboratories (AMPL) were successful in winning one of the few IAS-wide postdoctoral fellowships funded by the Performance and Planning Fund.

A most exciting development was the decision by a major Taiwanese semiconductor manufacturer (LEDEX) to establish a research and development laboratory "BlueLab" on the campus. The proposed investment is around \$11M and the laboratory will concentrate on the growth and processing of GaN and related materials. A major reason

for establishing the BlueLab here was the high international reputation of the Department of Electronic Materials Engineering's (EME) optoelectronic devices program under Professor Jagadish, and the School's unique cluster of growth, processing and characterisation facilities. Links have already been established between EME and LEDEX, with two LEDEX engineers visiting EME for three months. Further, Government funding of more than \$1.8M was received for two new major facilities for EME. These facilities, to be installed early in 2000, are a MOCVD reactor for growth of indium phosphide-based structures with applications in advanced fibre optics communications, and an ion accelerator for ion beam analysis.

The Australian Photonics Cooperative Research Centre received renewed Commonwealth funding of \$27.4M with significant other (mainly industry) funding for a further seven-year period early in the year. One of the major nodes of the CRC is in the School under the direction of Professor Barry Luther-Davies, Head of the School's Laser Physics Centre. Professor Luther-Davies was reappointed as Research Director for the CRC and as one of the Directors of Australian Photonics Pty Ltd, which is the commercial and management agent for the CRC. I continue to serve on the Board of Governors of the expanded CRC.

The School again excelled in senior promotions of its academic staff, the highlight being the promotion of Stephen Buckman, Chennupati Jagadish and Yuri Kivshar to Professorships. It must be remembered that in the IAS there is a quota of approximately six for such promotions of recurrently funded academic staff. Some other noteworthy honours include the election of Professor Rod Boswell to the Fellowship of the Australian Academy of Technological Sciences and Engineering. Professor Barry Ninham, who had been awarded the Tage Erlanger Guest Professorship 1998-1999 by the Swedish Natural Science Research Council in recognition of his excellent services to science, was appointed to the UNESCO World Commission on Ethics of Scientific Knowledge and Technology. Professor Stepjan Marcelja, also from the Department of Applied Mathematics, was appointed a Sackler Scholar at the Mortimer and Raymond Sackler Institute of Advanced Studies, Tel Aviv University. Professor Yuri Kivshar from the Optical Sciences Centre became the first Australian (and only second non-American) Editor of the Physical Review on his appointment during the year as Associate Editor of Physical Review E.



Certificate of the Tage Erlanger Guest Professorship of the National Research Council of Sweden, awarded to Professor Barry Ninham



(Above) Presentation of the Director's Award for the year's best published student paper, to Marcus Kohonen

(Below) Presentation of Director's Prize for best experimental seminar to Wayne Solomon



The year also produced some noteworthy awards to students. Elena Ostrovskaya (OSC) was awarded the inaugural biennial Jagadishwar Mahanty Prize for the best PhD thesis in 1998/1999 and also won the T.M. Cherry Prize for best student presentation at the Annual Applied Mathematics Conference of the Australian Mathematical Society. Marcus Kohonen, a graduate student in the Department of Applied Mathematics, was the winner of the inaugural Director's Award for best student paper published over the past year. Keith Gaff, from OSC, won the Dean of the Graduate School's Prize for best theoretical paper at the graduate seminar competition series, while Wayne Solomon, a graduate student in the Plasma Research Laboratory, won the Director's Prize for best experimental seminar. Wayne also won the Best Student Talk Prize at PLASMA99, the 22nd AINSE Plasma Science and Technology Conference, whilst Horst Punzmann (also from PRL) won the Best Student Poster Prize at the same conference. Two students who did their honours year research projects in the School were awarded with University Medals at the Conferring of Degrees Ceremony in April. They were Tessica Weijers (EME and Nuclear Physics) who won the University Medal for Honours in Physics, and Felix White (Applied Mathematics) who won the University Medal for Honours in Biochemistry and Molecular Biology.

Following the review and successful restructuring of the administrative support for the School in 1998, I instigated a review of the School's technical support early in the year. The review committee, under the chairmanship of Professor Stephen Buckman, came out with a number of important recommendations. Their main finding was that the technical support to the School was of the highest quality and that it should not be allowed to be cut any further, the central mechanical workshop in particular being under severe stress. A highlight in the technical support area was the Council's Medal for General Staff Excellence Team Award to Owen Kershaw and Miroslav Peric of the Mechanical Workshop. Their awards were presented to them by the Chancellor at the October Conferring of Degrees ceremony.

To complete the review of all of the areas supporting the School's research and research training missions, I put in place a review of Stores and Purchasing Functions late in the year. The timing of this review was somewhat dependent on the completion of the installation of new relevant software by the University. Reviews to take place early in the new year were also set up for two of the School's academic areas, namely the Departments of Applied Mathematics and Theoretical Physics. The latter departmental review will take place in the context of theory in the whole School since much theoretical work is done in other parts of the School.

During the year the Nuclear Physics Office Building was completely refurbished. Funding for this, and for some improvements to the Accelerator Building, was provided through the University's Capital Management Plan. The next stage of this process is the refurbishment of other parts of the School in urgent need of upgrading, with the Cockcroft Building high on the priority list.

Two members of the academic staff with long service to the University retired at the end of the year: Professor Trevor Ophel and Dr Brian Robson. Both have provided very valuable service to the School and the University and fortunately both will continue to work in the School on important research projects.



The Medal struck in the School's Mechanical Workshop to accompany the Jagadishwar Mahanty Prize, awarded to Elena Ostrovskaya, OSC

Professor Robert Crompton, a retiree and an active member of the Atomic and Molecular Physics Laboratories, was honoured by being made a Member of the Order of Australia in the New Year's Honours List.

Despite the increasing difficulties due to funding constraints, the School has once again distinguished itself and made an increasing number of outstanding contributions to the advancement of knowledge in the physical sciences and engineering. The School can enter the new century with growing confidence. I congratulate all staff and students on the efforts they have made. The results of those efforts, summarised in this report, speak for themselves.



The newly refurbished Nuclear Physics building