

RESEARCH SCHOOL OF PHYSICAL SCIENCES & ENGINEERING

The School's research achievements and grant winning success in 2006 have been outstanding and exceeded the very high standards set in previous years. For example, there were more than 380 research papers published in high impact international journals in 2006 and external funding now accounts for more than 65% of the School's total income. The School continues to be the major contributor to physical sciences research in the country. In addition, our strong focus on fundamental research has directly contributed to some very significant applied research that has led to considerable industry interaction, commercialisation of our research and the spawning of now four spin-off companies. Indeed, a real strength of the School continues to be its balance between fundamental, strategic and applied research and the exceptional expertise and resources it has harnessed across this spectrum.

The School was extremely successful in 2006 in winning external grants and funding, with over \$21 million awarded. The Australian Research Council is the largest source of such funding, with more than \$14 million derived from a range of ARC schemes in 2006 alone. Included in the above total were the award of 24 new ARC Discovery grants (totalling \$8.6 million), extension of three Centres of Excellence in which the School plays a leading role, namely the Centre for Ultra-fast-bandwidth Devices for Optical Communications, the Australian Centre for Quantum Atom Optics and the Centre for Functional Nanomaterials, five LIEF grants and two Linkage awards. In addition, the School is a major partner in two of the successful NCRIS (National Collaborative Research Infrastructure Scheme) areas, Materials Characterisation and Materials Fabrication, where funding of \$14 million was awarded to the ANU for 2007 - 2011.

Several academic staff of RSPHysSE were recognised for the excellence of their research in 2006 by election to academies or the granting of prestigious awards. Professor David Hinde was elected to the Australian Academy of Science, Professors Yuri Kivshar and Jim Williams were elected to the Fellowship of the American Physical Society, Professor Barry Luther-Davies and Professor Wieslaw Krolikowski were elected as a Fellow of the Optical Society of America, Professor C. Jagadish was elected to the Fellowship of SPIE and Dr Ken Baldwin as a Fellow of the Institute of Physics (UK). In addition, Professor Yuri Kivshar won the 2006 Boas Medal, Dr Nanda Dasgupta the 2006 Pawsey Medal and Professor Barry Ninham the 2006 Craig Medal of the Australian Academy of Science. Our students also continued to win gold medals, society prizes for oral and poster presentations at international conferences and fellowship awards. The top ANU awards, the 2006 Peter Baume award for research excellence and the Chancellor's award for staff excellence were won by Professor C. Jagadish and Mr Kevin Lonsdale, respectively. In addition, the School's dedicated general staff, including our very talented technical staff, are acknowledged for their invaluable contributions to the School's research, with Ms Julie Dalco, Dr Tim Wetherell and Ms Wendy Butler receiving the Vice Chancellor's awards for general staff excellence in 2006.

The training of research students was again a high priority for the School in 2006, with around \$1.8 million invested directly into scholarships, recruitment, tuition and support of higher degree research (HDR) students, including various awards.

In 2006 there were 82 enrolled HDR students with 17 thesis completions and about 90 further research students from other Australian universities and from overseas who accessed unique facilities, expertise and programs in the School. There were also more than 60 undergraduate students (honours, PhB and final year project students) who undertook research projects in RSPHysSE.

In 2006, the School continued efforts to commercialise its research and to interact with industry. An external consultant undertook a review of the commercialisation potential of some of the School's research and this has led to steps for a fourth RSPHysSE spin-off company, Digicore P/L. The new company will focus on analysis of core samples from oil and gas industries and utilise unique X-ray CT imaging and analysis software to provide efficient and timely data. Other spin-off companies continue to progress well, with both RPO and WRiota undergoing further financing rounds in 2006. Overall, industry interactions, research contracts from the private sector and income through the School's spin off companies contributed more than \$6 million in external funds to the School during the year. In addition, the School has a growing number of industry interactions, with nine ARC Linkage grant applications submitted in 2006 and it is hoped that such collaborations will lead to further avenues for commercialisation of the School's research in the future.

The School's capital works program continued the refurbishment and upgrade of accommodation during the year, with the completion of the Le Couteur Building and a new two storey link building to join with the Oliphant Building. This has provided around 2000 sq metres of new space for the growing staff and student numbers in the School, including provision for a student common room. The plans for a nanofabrication facility called PicoFab on land adjacent to the University in the ANU Exchange Precinct are progressing and there is now a major electronics company that plans to co-locate in the facility. This new facility and further planned renovation and extension of laboratory space in the School will help alleviate a critical need for new laboratory space over the next several years in view of the School's success in winning major new equipment grants such as through NCRIS.

The School has continued to play a leadership role in shaping the physics and engineering research agenda nationally. In 2006, School staff played a leading role in framing the proposals for two of the NCRIS areas involving research infrastructure and equipment for materials fabrication (including nanofabrication) and characterisation. In addition, the School has taken the lead in lobbying for a significant Australian role in the International Thermonuclear Experimental Reactor (ITER) project, which has stimulated significant national debate on energy, as well as School personnel playing a lead role in debate and National committees related to nuclear power.

Finally, there have been many research highlights during 2006 that are outlined in this report. For example, some particular achievements that demonstrate the wide spectrum of the School's research from fundamental to applied/pre commercial research are: new approaches to the interactions of light with matter involving photonic crystals and meta-materials, the growth of novel semiconductor nanowires and their fabrication into nanowire lasers, the discovery and analysis of the only entire skull of one of the rarest fish found at Gogo in the Kimberley region of Western Australia, the production and characterisation of amorphous supermetals, the experimental demonstration of an excited helium Bose-Einstein condensate using a novel laser cooling technique, and imaging and analysis of mesoporous materials with X-ray CT that has major applications in oil and gas exploration.