

# National and International Links



*Professor Jim Williams*  
- Associate Director (Resources)

The School has a strong focus on external interactions that cover national and international collaboration, securing funding support for its programs from external sources, encouraging staff to play leading roles in professional societies, activities and outreach programs and in exploring opportunities for commercializing its research. This section summarizes such activities in 2001.

Domestic and international collaborations continue to be a major ingredient in the success of all of the major School research programs. We had approximately 200 collaborative projects in 2001 that have either resulted in joint publications or have attracted external funding support. We also report many national and international Collaborative Agreements or MoUs. Such collaborations have brought a large number of visitors to the School. For example, in excess of 100 of these visitors have either presented departmental seminars or have participated in joint research projects. Another important collaborative function for the School is the support of major national experimental facilities that would not otherwise be viable at regional universities. These facilities include the H-1 National Plasma Fusion Research Facility in the Plasma Physics Laboratory, which has received funding under the National Major Research Facilities scheme, and the Heavy Ion Accelerator Facility in the Department of Nuclear Physics that is also unique nationally and attracts a large number of international scientists. Together with major suites of laboratories supporting semiconductor optoelectronic device and photonic components programs, such facilities provide a focus for students and researchers (from ANU and other institutions) to participate in large-scale physics research. The School's research centres are also a focus for collaboration and we report the activities of the Australian Photonics Cooperative Research Centre, the ANU Centre for Theoretical Physics (now the Centre for Complex Systems) and the Centre for the Mind in this section.

The School has placed an increasing emphasis on attracting external funding in recent years, particularly with progressive entry into the Australian Research Council (ARC) programs and the consequential withdrawal of 20% of the School Block Grant by 2003. One quarter of the academic cohort of the School was eligible to apply for ARC Discovery Grants in 2001 for funding in 2002. The School's success rate of 29% was well above the program success rate of 20%. In terms of overall external income, the School was the recipient of more than 80 R&D grants (from various government and non-government sources) or industry contracts, amounting to more than \$7.5 million in 2001. The range of industrial funding support covered direct project funding and service contracts by industry, support of PhD students and postdoctoral fellows, funding for equipment and facilities in lieu of industry access, partners in government grants and centre funding. Interactions with industry not only bring income into the School but are important precursors to commercialization of the School's intellectual property. Some of the commercialisation ventures pursued by the School in 2001 are outlined in this section.

Strong involvement in professional societies, demonstrating international leadership in the profession and outreach activities are also important School priorities. It is noteworthy that academic staff of the School serve on the editorial boards of over 30 domestic and international journals, a similar number of international advisory committees, have organized (and chaired) four international conferences/workshops and acted as international proposal reviewers for several organisations in 2001. Outreach activities include strong involvement with high schools, summer school programs, public lecture series and the Australian Science Festival.

# Collaborative Ventures, Agreements & Memoranda of Understanding



## Applied Mathematics

### Dr A. Christy

**Project:** Mesosstructure of Framboidal Sulphide Mineral Aggregates

**Partners:** Dr D.J. Large and coworkers, University of Nottingham, UK

**Project:** Modelling Incommensurately Modulated Crystal Structures of Non-Stoichiometric Apatites

**Partners:** Professor S.A. Lidin and Dr P. Alberius-Henning, Stockholm University, Sweden

### Dr V. Craig

**Project:** Nanomechanical Measurements with AFM

**Partner:** Dr S. Biggs, University of Newcastle

**Project:** Surfactant Adsorption: Kinetics & Equilibrium Excess

**Partner:** Dr S. Biggs, University of Newcastle

### Professor E. Gamaly; Dr A. Rode and Professor B. Luther-Davies (LPC)

**Project:** Deposition of Diamond-Like Films by Powerful UV Femtosecond and Nanosecond Laser Ablation combining Deposition and Ion Implantation Modes

**Partners:** Professor C. Fotakis, Foundation for Research and Technology – Hellas, Greece; Professor A. Perrone and Dr A. Zocco, University of Lecce, Italy

**Project:** Excitation of Solids by Femtosecond Lasers: Non Equilibrium Phenomena, Phase Transitions and Ablation of Metals and Dielectrics

**Partner:** Professor V.T. Tikhonchuk, University of Bordeaux, France

**Project:** Formation of Nanoclusters by Femtosecond Laser Ablation

**Partners:** Professor M. Santis and Dr O. Uteza, University of Marseille, France; Professor V.T. Tikhonchuk, University of Bordeaux, France

**Project:** Transient Optical Properties and Phase Transition in Solids induced by Femtosecond Lasers

**Partners:** Professor M. Santis and Dr Olivier Uteza, University of Marseille, France; Professor V.T. Tikhonchuk, University of Bordeaux, France

### Professor S. Hyde

**Project:** Solid State Networks

**Partners:** Professor M. O'Keeffe, Arizona State University, USA; O. Yaghi, Michigan State University, USA

**Project:** The Computational Surface Geometry of Proteins

**Partner:** Professor Y. Nagai, Kokushikan University, Tokyo

### Professor S. Hyde, Dr M. Knackstedt, Dr A. Sheppard and Mr S. Ramsden

**Project:** Mesoscale Physics Program for Software Development of Fluid Transport and Complex Disordered and Ordered Morphologies

**Partner:** The Australian Partnership for Advanced Computation

### Dr M. Knackstedt

**Project:** CT Imaging of Sedimentary Rock

**Partner:** Professor W.V. Pinczewski, University of New South Wales

**Project:** Interpretation of Laboratory Core Measurements

**Partners:** Professor W.V. Pinczewski, University of New South Wales; Mr C. Balnaves, BHP Petroleum

### Professor S. Marcelja

**Project:** Gaussian Random Fields with Two Level Cuts

**Partners:** Ms L. Arleth, Risø National Laboratory, Denmark; Professor Th. Zemb, CE Saclay, France

### Mr R. Roberts, Dr T.J. Senden and Dr M. Knackstedt

**Project:** Fluid Penetration into Paper Products

**Partner:** Dr B. Lyne, International Paper, Tuxedo Park, USA

### Dr A. Sakellariou

**Project:** High-Speed Data Acquisition Systems

**Partner:** Micro-Analytical Research Centre, University of Melbourne

### Dr T.J. Senden

**Project:** Novel Radio-Therapeutic Products

**Partner:** ANSTO

**Project:** Development of Novel Radio-Diagnostic Nanoparticles

**Partner:** Vimed Biosciences Inc.

**Project:** FDA Approval of Technegas in the USA

**Partner:** Vita Medical Pty Ltd.

### Dr R.M. Sok and Dr A. Sheppard

**Project:** Parallelisation of 3dma Skeletonisation Software

**Partner:** Dr B. Lindquist, State University of New York, Stony Brook, USA

### Dr R.M. Sok, Dr A. Sheppard and Dr M. Knackstedt

**Project:** Network Modelling of Multiphase Flow

**Partners:** Professor W.V. Pinczewski, University of New South Wales; Dr B. Lindquist, State University of New York, Stony Brook, USA

### Dr V. Yaminsky

**Project:** Dynamic Wetting

**Partners:** The Institute for Surface Chemistry, Stockholm, Sweden

**Project:** Water Structure

**Partners:** The Departments of Bioengineering and Materials Science and Engineering, Pennsylvania State University, USA

## Atomic and Molecular Physics Laboratories

### Professor S.J. Buckman

**Project:** Low Energy Electron-Molecule Scattering

**Partners:** Dr M.J. Brunger and Professor P.J.O. Teubner, Flinders University

**Project:** Electron Scattering from Molecular Radicals

**Partners:** Dr M.J. Brunger and Professor W. Lawrance, Flinders University

**Project:** Electron Scattering from Metal Vapours

**Partners:** Professor P.D. Burrow, University of Nebraska, USA; Professor K. Bartschat, Drake University, USA

**Project:** Electron-Molecule Scattering

**Partners:** Professor H. Tanaka, Sophia University, Japan; Professor H. Cho, Chungnam National University, Korea

**Project:** Positron Scattering from Atoms and Molecules

**Partners:** Dr J. Sullivan and Professor C. Surko, University of California, USA

### Professor S.J. Buckman and Professor L.T. Chadderton

**Project:** Rainbows in Scattering of Electrons from Molecules

**Partner:** Professor S.A. Cruz, Metropolitan Autonomous University, Mexico

### Professor L.T. Chadderton

**Project:** Phase Changes in Transition Metal Dichalcogenides due to GeV Heavy Ion, and MeV Fullerene Ion Bombardments: Transmission Electron Microscopy and Surface Force Microscopy

**Partner:** Dr A. Dunlop, SESI, École Polytechnique, Paliseaux, France

**Project:** Radiation Effects on Polymers; Semiconductors

**Partner:** Dr D. Fink, Hahn-Meitner Institute, Berlin, Germany

**Project:** Theory and Practice of Organic Radical Formation and Motion in GeV Ion-Irradiated Polymers

**Partner:** Professor S.A. Cruz, Metropolitan Autonomous University, Mexico

**Project:** (e,2e) Primary Current Electron Spectroscopy and other Surface Technical Investigations of the Graphite/Fullerene Radiation-Induced Phase Change  
**Partner:** Professor P.B. Möller, Niels Bohr Institute, Denmark

**Project:** GeV Ion Tracks in Alkali and Alkali Earth Halides  
**Partner:** Dr C. Trautmann, GSI, Germany

**Project:** Annealing of Fission Tracks in Apatite: Kinetics, Effects of Pressure and Applications in Geothermometry  
**Partners:** Dr R. Jonckere, Max-Planck Institute, Germany; Dr A. Wendt, British Antarctic Survey, UK

**Project:** Radioactivity in the Fine Structure of Precious Opal; Exploration and Artificial Opal Synthesis  
**Partners:** Dr B. Senior, Senior and Associates, Canberra; Dr R. Jonckere, Max-Planck Institute, Germany

**Professor L.T. Chadderton; Professor E. Gamaly (AM)**

**Project:** Studies of Electronic and Nuclear Vicinage Effects in the Stopping of Swift Clusters in Solids  
**Partner:** Professor S.A. Cruz, Metropolitan Autonomous University, Mexico

Professor R.W. Crompton and Dr R.E. Robson; Dr K. Kumar (TP)

**Project:** Quantum Statistics and Boltzmann's Equation  
**Partner:** Professor M.A. Morrison, University of Oklahoma, USA

**Dr A.S. Kheifets (also in TP)**

**Project:** Convergent Close-Coupling Theory of Double Ionization by Photon and Electron Impact  
**Partner:** Dr I. Bray, Flinders University

**Project:** Electron Momentum Density Studies in Metals and Metal Oxides  
**Partner:** Dr M. Ford, Flinders University

**Project:** Electron Impact Double Ionization of the Helium Atom  
**Partners:** Professor A. Lahmam-Bennani, Université de Paris-Sud (Orsay), France; Dr A. Dorn, University of Freiburg, Germany

**Project:** Multiple Atomic Photoionization of Metal Vapours  
**Partner:** Professor Y. Azuma, Photon Factory, Tsukuba, Japan

**Project:** Theoretical and Experimental Studies of Double Photoionization of He  
**Partners:** Dr T. Reddish, University of Newcastle; Dr L. Avaldi and Dr T. Dörner, University of Frankfurt, Germany

**Dr B.R. Lewis and Dr S.T. Gibson**

**Project:** Analysis of EEL Spectra  
**Partners:** Dr M.J. Brunger, Flinders University; Dr M. Allan, University of Fribourg, Switzerland

**Project:**  $^3A_1$  States of  $O_2$   
**Partners:** Dr R.A. Copeland, Dr R. Robertson and Ms A. Tucay, SRI International, USA

**Project:** Quantum-Mechanical Interference between Interacting Resonances in Molecular Predissociation  
**Partners:** Professors R.J. Donovan and K.P. Lawley, Dr P. O'Keeffe and Dr T. Ridley, University of Edinburgh, Scotland

**Project:** Analysis of REMPI Spectra  
**Partners:** Professor M.L. Ginter, University of Maryland, USA; Dr J.S. Morrill, Naval Research Laboratory, USA; Dr R.A. Copeland, SRI International, USA

**Project:** Coupled-Channel Calculations of Linewidths for the  $b$  state of  $N_2$   
**Partners:** Professor H. Lefebvre-Brion, Université de Paris-Sud, France; Professor J.-M. Robbe, Université de Lille, France

**Project:** Anomalous Isotopic Predissociation  
**Partners:** Professor G. Stark, Wellesley College, Massachusetts, USA; Dr J.B. West, Daresbury Laboratory, UK

**Project:** Coupled-Channel Calculations for Atmospheric Photochemical Models  
**Partners:** Dr L.W. Torop and Dr F.T. Hawes, University of Adelaide

**Dr B.R. Lewis; Dr K.G.H. Baldwin (LPC)**

**Project:** Development of Ultra-High Resolution VUV Laser Sources  
**Partner:** Professor B.J. Orr, Macquarie University

**Dr M. Vos**

**Project:** Comparison of High-Energy Electron Scattering with Neutron Compton Scattering  
**Partners:** Professor E. Gray, Griffith University; Professor Dr C.A. Chatzidimitriou-Dreismann, Technical University, Berlin

**Professor E. Weigold**

**Project:** Electron Momentum Spectroscopy of Atoms and Molecules  
**Partners:** Dr M.J. Brunger and Professor I.E. McCarthy, Flinders University

**Project:** Correlations in the He Asymptotic Wavefunction  
**Partner:** Professor H. Schmidt-Böcking, University of Frankfurt, Germany

**Professor E. Weigold, Dr A. Kheifets and Dr M. Vos**

**Project:** Electron Momentum Spectroscopy of Solids  
**Partners:** Professor I.E. McCarthy and Dr M. Ford, Flinders University

**Professor E. Weigold and Dr J. Lower**

**Project:** (e,2e) Processes with Polarized Electrons and Targets  
**Partners:** Dr J. Berakdar, Max Planck Institut für Mikrostruktur Physik, Germany; Dr S. Mazevet, Los Alamos National Laboratory, USA

## Director's Unit

**Professor Y.S. Kivshar**

**Project:** Nonlinear Modes in Quasi-Drac Photonic Structures  
**Partners:** Dr O. Bang, Technical University of Denmark; Professor C. Soukoulis, Ames Laboratories, USA

**Project:** Fourth-Harmonic Generation in Nonlinear Photonic Crystals  
**Partners:** Dr M. de Sterke, University of Sydney; Professor S.M. Saitel, University of Sofia, Bulgaria

**Project:** Nonlinearity-Induced Conformational Dynamics of Biopolymers  
**Partner:** Professor P.L. Christiansen, Technical University of Denmark

**Project:** Optical Solitons: From Waveguides to Photonic Crystals  
**Partner:** Professor G. Agrawal, University of Rochester, USA

**Project:** The Frenkel-Kontorova Model: Concepts and Methods of Nonlinear Physics  
**Partner:** Professor O.M. Braun, Institute of Physics, Kiev, Ukraine

**Project:** Stability Analysis of Solitary Waves  
**Partner:** Professor D.E. Pelinovsky, McMaster University, Canada

**Project:** Nonlinear Aharonov-Bohm Effect for Optical Vortices  
**Partner:** Professor A. Nepomnyashchy, Technion, Israel

**Project:** Parametric Optical Conversion due to Cascaded Nonlinearities  
**Partner:** Professor S.M. Saitel, University of Sofia, Bulgaria

**Project:** Self-Written Optical Waveguides in Polymerized Materials  
**Partner:** Professor S. Kawata, Osaka University, Japan

**Project:** Nonlinear Photonic Crystals: Concepts and Applications  
**Partner:** Dr M. Scalora, US Air Force Research Laboratories, USA

**Project:** Nonlinear Localized Spin Waves  
**Partner:** Professor H. Benner, Technical University of Darmstadt, Germany

**Professor Y.S. Kivshar and Dr E. Ostrovskaya**

**Project:** Dynamics of the Dispersion-Managed Solitons in Fiber Transmission Systems  
**Partners:** Professor D. Anderson and Professor M. Lisak, Chalmers University of Technology, Sweden; Dr A. Bertson, Ericsson, Sweden

**Project:** Topological States in Atomic-Molecular Bose-Einstein Condensates  
**Partner:** Dr P. Julienne, National Institute of Standards and Technology, USA

**Project:** Multimode Spatial Optical Solitons  
**Partner:** Professor C. Denz, University of Münster, Germany

**Professor J.D. Love**

**Project:** Depressed-Cladding Optical Fibres  
**Partner:** Professor R.H. Stolen, Virginia Tech University, USA

**Project:** Multimode Fibres & Devices  
**Partner:** Dr J. Ockendon *et al.*, University of Oxford, UK

## Electronic Materials Engineering

**Dr M. Buda**

**Project:** DFB Lasers  
**Partners:** Dr T.G. van de Roer and Professor Dr G.A. Acket, Eindhoven University of Technology, Netherlands

**Ms C. Carmody and Professor C. Jagadish**

**Project:** Self-Assembled Monolayers for Semiconductor Devices  
**Partners:** Dr V. Braach-Maksyvytis and Dr B. Raguse, Telecommunications and Industrial Physics, CSIRO

**Dr Y. Chen, Professor J.S. Williams, Mr M. Conway and Ms Y. Jun; Professor L. Chadderton (AMPL)**

**Project:** Synthesis of C and BN Nanotubes using Mechano-Thermal Process  
**Partner:** Dr J. FitzGerald, Research School of Earth Sciences, ANU

**Dr Y. Chen**

**Project:** H Storage by C and BN Nanotubes  
**Partner:** Professor H.M. Cheng, Institute of Metal Research, Chinese Academy of Science

**Project:** Optical and Electronic Properties of BN Nanotubes  
**Partners:** Dr M. Golden and Xianjie Liu, IFW, Dresden, Germany

**Project:** Microanalysis of Nanotube Materials  
**Partner:** Dr Jin Zou, University of Sydney

**Project:** Mossbauer Study of Metal Catalysts for Nanotube Formation  
**Partners:** Professor G. Le Caer, LSG2M, Ecole des Mines, France; Professor S. Campbell and Dr K.D. Jayasuriya, ADF, University of New South Wales

**Mr M.I. Cohen, Dr H.H. Tan and Professor C. Jagadish**

**Project:** Novel Processing of Vertical Cavity Surface Emitting Lasers  
**Partners:** Dr A. Allerman, Sandia National Labs; Professor K. Choquette, University of Illinois, USA

**Dr P.N.K. Deenapanray and Professor C. Jagadish**

**Project:** Analysis of Semiconducting and Insulating Thin Films by XPS  
**Partners:** Bin Gong and R.N. Lamb, University of New South Wales

**Professor R.G. Elliman**

**Project:** The Effect of Impurities on Light Emission from Si Nanocrystals  
**Partner:** Dr G. Ross, INRS – Energie et Matériaux, Canada

**Project:** Ion Beam Mixing: Metal Films on Ceramic Substrates  
**Partner:** Dr A. Balogh, Darmstadt University of Technology, Germany

**Professor R.G. Elliman and Ms T.D.M. Weijers**

**Project:** Materials Analysis with High-Energy Heavy Ions  
**Partner:** Dr H. Timmers, ADF, University of New South Wales

**Professor R.G. Elliman, Dr H. Timmers and Ms T.D.M. Weijers**

**Project:** Heavy-Ion Stopping in Solids  
**Partners:** Professor H. Whitlow, University of Lund, Sweden; Dr D.J. O'Connor, University of Newcastle

**Project:** Pulse Height Deficits in Surface Barrier Detectors  
**Partner:** Professor J.A. Davies, Chalk River, Canada



**Professor N.J. Fletcher**

**Project:** Flute Acoustics  
**Partners:** A/Professor J. Wolfe and Dr J. Smith, University of New South Wales

**Project:** Vibrating Reed Valves and Rotational Aerophones  
**Partners:** A/Professor J. Lai and Dr A. Tarnopolsky, ADFA, University of New South Wales

**Project:** Biological Acoustics  
**Partners:** Professor W. Bailey, University of Western Australia; Dr H.C. Bennet-Clark, Oxford, UK

**Ms L. Fu, Dr H.H. Tan and Professor C. Jagadish**

**Project:** Optical Spectroscopy Studies on Semiconductor Quantum Wires and Dots  
**Partners:** Professor S.C. Shen *et al*, Shanghai Institute of Technical Physics, Chinese Academy of Sciences, PR China; Dr Ying Fu and Professor M. Willander, Chalmers University of Technology, Sweden

**Mr Q. Gao, Ms L. Fu, Ms P. Lever, Mr S.O. Kucheyev, Ms J. Hay, Ms C. Carmody, Dr P.N.K. Deenapanray, Dr M. Buda, Dr H.H. Tan and Professor C. Jagadish**

**Project:** Optical Spectroscopy of Semiconductor Quantum Structures and Devices  
**Partners:** Dr B.Q. Sun, Dr M. Zhang, Mr P. Reece and Professor M. Gal, University of New South Wales

**Ms J. Hay, Dr M. Buda, Dr H.H. Tan and Professor C. Jagadish**

**Project:** Dry Etching of GaN  
**Partner:** Dr F. Karouta, Eindhoven University of Technology, Netherlands

**Professor C. Jagadish, Dr H.H. Tan, Mr S. Kucheyev and Professor J.S. Williams**

**Project:** Processing of GaN and Related Compounds for Blue Light Emission  
**Partner:** Dr A.G. Li, Ledex Corporation, Taiwan

**Mr S.O. Kucheyev**

**Project:** Molecular Effect in Semiconductors under Heavy-Ion Bombardment  
**Partners:** Professor A.I. Titov and Dr V.S. Belyakov, St. Petersburg State Technical University, Russia

**Mr S.O. Kucheyev, Professor J.S. Williams and Professor C. Jagadish**

**Project:** Cathodoluminescence and Environmental SEM Studies of Ion-Implanted GaN  
**Partners:** Mr M. Toth and Dr M. Phillips, University of Technology, Sydney

**Ms P. Lever, Dr H.H. Tan and Professor C. Jagadish**

**Project:** Cathodoluminescence Imaging of Quantum Wires and Dots  
**Partners:** Dr M.R. Phillips and Dr M.A. Stevens Kalceff, University of Technology, Sydney

**Project:** Optical Spectroscopy of Quantum Dots  
**Partner:** Professor J. Wolter, Eindhoven University of Technology, Netherlands

**Dr M. Petravic**

**Project:** Characterisation of Standards for Surface Composition and Sputter Depth Profiling  
**Partner:** Dr D.W. Moon, Korean Research Institute of Standards and Science, Korea

**Project:** Surface Analysis using a Free Electron Laser  
**Partners:** A/Professor B.V. King, University of Newcastle; Professor R. Clark, University of NSW; Dr M.J. Pelin, Argonne National University, USA

**Dr M. Petravic and Dr P.N.K. Deenapanray**

**Project:** Photon-Induced Fabrication of Atomic Scale Structures on Semiconductor Surfaces  
**Partner:** Dr G.Comtet, University Paris-Sud, France

**Project:** Selective Photon Stimulated Desorption of H from GaAs Surfaces  
**Partners:** Dr B. Usher, LaTrobe University; Dr J.M. Chen, Synchrotron Radiation Research Center, Hsinchu, Taiwan

**Project:** Roughening of Si Surface under Oxygen and Nitrogen Ion Bombardment  
**Partner:** Dr D.W. Moon, Korean Research Institute of Standards and Science, Korea

**Dr M.C. Ridgway, Dr G. Azevedo and Mr C.J. Glover**

**Project:** EXAFS Characterisation of Amorphous Semiconductors  
**Partners:** Dr G. Foran, ANSTO; Dr K.M. Yu, Lawrence Berkeley National Laboratory, USA

**Dr M.C. Ridgway**

**Project:** Formation of Dilute GaAs<sub>x</sub>N<sub>1-x</sub> and Ga<sub>x</sub>Mn<sub>1-x</sub>As Alloys by Ion Implantation  
**Partners:** Dr O. Dubon, University of California (Berkeley), USA; Dr K.M. Yu, Lawrence Berkeley National Laboratory, USA

**Dr M.C. Ridgway and Professor J.S. Williams**

**Project:** Nanocavity Evolution in Si under Ion Irradiation  
**Partners:** Dr X. Zhu, University of Illinois, USA; Dr H. Bernas, Dr M.-O. Ruault and Dr F. Fortuna, Centre Nationale Recherche Scientifique (Orsay), France

**Dr M.C. Ridgway; Dr A.P. Byrne and Professor N.M. Rao (NP)**

**Project:** Irradiation-Induced Defect Characterisation with Perturbed Angular Correlation  
**Partner:** Dr R. Vianden, Universität Bonn, Germany

**Dr H.H. Tan and Professor C. Jagadish**

**Project:** Thermionic Cooling in Semiconductors  
**Partner:** A/Professor R. Lewis, University of Wollongong

**Project:** POLIS Structures and Hot Electron Injection Lasers  
**Partners:** Dr J. Van der Tol and Dr T. Van de Roer, Eindhoven University of Technology, Netherlands

**Dr H.H. Tan, Mr M.I. Cohen, Ms L. Fu, Dr M. Buda and Professor C. Jagadish**

**Project:** Design, Fabrication and Testing of High-Power and Multi-Wavelength Lasers  
**Partner:** Dr F. Karouta, Eindhoven University of Technology, Netherlands

**Professor J.S. Williams and Ms J.E. Bradby**

**Project:** Microindentation of Semiconductors  
**Partner:** Professor M.V. Swain and Dr P. Munroe, University of Sydney

**Professor J.S. Williams, Dr J. Wong-Leung, Dr M. Petravic and Mr M.J. Conway**

**Project:** Metal Gettering to Cavities  
**Partner:** Dr A. Kinomura, ONRI, Japan

**Professor J.S. Williams, Dr J. Wong-Leung, Dr M. Petravic and Mr M.J. Conway**

**Project:** Open Volume Defects in Silicon  
**Partner:** Professor B. Stritzker and Dr J. Lindner, University of Augsburg, Germany

**Dr J. Wong-Leung, Dr H.H. Tan, Ms C. Carmody, Professor C. Jagadish and Professor J.S. Williams**

**Project:** Electron Microscopy Study of Defects in Ion Implanted Semiconductors  
**Partners:** Dr J. Zou, University of Sydney; Dr J. FitzGerald, Research School of Earth Sciences; Professor D.J.H. Cockayne, Oxford University, UK

**Dr J. Wong-Leung, Dr P.N.K. Deenapanray and Professor C. Jagadish**

**Project:** Defects and Electron Microscopy of Semiconductors  
**Partners:** Professor B.G. Svensson, Dr M. Linnarsson, Dr A. Kuznetsov, Dr A. Hallen, Mr M. Janson and Dr P. Leveque, Royal Institute of Technology, Sweden

**Dr J. Wong-Leung and Professor C. Jagadish**

**Project:** Defects in Ion Implanted Silicon  
**Partner:** Professor G. Davies and Ms R. Harding, King's College, London, UK

**Dr J. Wong-Leung, Professor J.S. Williams, K. Stewart and Dr M. Petravic**

**Project:** Removal of Metals from Solar Materials  
**Partners:** Dr A. Kinomura, ONRI, Japan; Mr D. Macdonald and Dr A. Cuevas, FEIT

**Laser Physics Centre****Dr K.G.H. Baldwin**

**Project:** High Resolution XUV Laser Spectroscopy  
**Partners:** Dr W. Ubachs and Professor W. Hogervorst, Vrije Universiteit Amsterdam, Netherlands

**Project:** Ultracold Atomic Collisions  
**Partner:** Dr I. Whittingham, James Cook University

**Dr K.G.H. Baldwin; Dr B.R. Lewis (AMPL)**

**Project:** Development of Ultra-High Resolution VUV Laser Sources  
**Partner:** Professor B.J. Orr, Macquarie University

**Dr W. Krolkowski**

**Project:** Solitons in Nonlocal Nonlinear Media  
**Partners:** Dr O. Bang and Professor J. Rasmussen, Technical University Denmark; Professor J. Wyller, Norwegian Agricultural University, Norway

**Project:** Composite Solitons  
**Partner:** Professor C. Denz, University of Muenster, Germany

**Dr M. Lederer**

**Project:** Ultrafast Nonlinear Optical Absorption in Ion-Implanted and Be-doped GaAs  
**Partners:** Mr M. Haiml, Dr U. Siegner and Professor U. Keller, Swiss Federal Institute of Technology, ETH Zuerich, Switzerland

**Project:** Ultrabroadband Output Coupling Mirrors for Octave-Spanning Frequency Comb Generation in a Kerr-Lens Mode-locked Titanium Sapphire Laser  
**Partners:** Mr R. Ell, Dr U. Morgner and Professor F.X. Kärtner, Universität Karlsruhe (TH), Germany

**Project:** Passive Mode-Locking of the Novel Yb:YAB Laser Crystal  
**Partner:** Dr J. Dawes, Macquarie University

**Dr A. Rode and Professor B. Luther-Davies; Professor E.G. Gamaly (AM)**

**Project:** Deposition of Diamond-Like Films by Powerful UV Femtosecond Laser Ablation  
**Partner:** Professor C. Fotakis, Foundation for Research and Technology – Hellas, Greece

**Project:** Subpicosecond Laser Deposition of Optical Films  
**Partner:** Dr B.N. Chichkov; Laser Zentrum Hannover e.V., Germany

**Project:** Subpicosecond Laser Ablation of Dental Enamel  
**Partners:** Ms B.T. Taylor and Dr J. Dawes, Macquarie University; Mr A. Chan, Dental Practice, Canberra; Dr R.M. Lowe and Professor P. Hannaford, Swinburne University of Technology

**Project:** Excitation of Solids by Femtosecond Lasers: Non Equilibrium Phenomena, Phase Transitions and Ablation of Metals and Dielectrics  
**Partner:** Professor V.T. Tikhonchuk, University of Bordeaux, France

**Project:** Formation of Nanoclusters by Femtosecond Laser Ablation  
**Partners:** Professor M. Santis and Dr O. Uteza, University of Marseille, France; Professor V.T. Tikhonchuk, University of Bordeaux, France

**Project:** Transient Optical Properties and Phase Transition in Solids Induced by Femtosecond Lasers  
**Partners:** Professor M. Santis and Dr O. Uteza, University of Marseille, France; Professor V.T. Tikhonchuk, University of Bordeaux, France

**Dr A. Samoc, Dr M. Samoc and Professor B. Luther-Davies**

**Project:** Nonlinear Optical Properties of Substituted Poly(phenylenevinylenes)  
**Partner:** Professor H.-H. Hoerhold, University of Jena, Germany

**Project:** Nonlinear Optical Properties of Soluble Oligomers of PPV  
**Partner:** Dr M.S. Wong, Baptist University, Hongkong

## Nuclear Physics

### Dr R.A. Bark and Professor G.D. Dracoulis

**Project:** Intrinsic and Rotational Bands in  $^{180}\text{Ta}$   
**Partners:** G. Sletten, Niels Bohr Institute, University of Copenhagen, Denmark; Euroball Collaboration, Strasbourg, France

**Project:** Very High Spin States in  $^{174}\text{Os}$  Populated with Cold Symmetric Reactions  
**Partners:** H. Hübel, University of Bonn, Germany; R. Julin, University of Jyväskylä, Finland

### Dr A.P. Byrne

**Project:** Development of an Ion Implanter for Radioisotopes  
**Partners:** A/Professor D.H. Chaplin and Dr H. Timmers, ADFA, University of NSW

**Project:** Superallowed Fermi Decays  
**Partner:** A/Professor P.H. Barker, University of Auckland, New Zealand

### Dr A.P. Byrne and Professor N.M. Rao; Dr M.C. Ridgway (EME)

**Project:** Diffuse Damage in Semiconductors  
**Partners:** Dr R. Vianden and T. Dessauvagie, Universität Bonn, Germany

### Dr M. Dasgupta and Dr D.J. Hinde

**Project:** Fusion and Breakup of Light Ions Near the Fusion Barrier  
**Partner:** Professor P.R.S. Gomes, Universidade Federal Fluminense, Brazil

### Professor G.D. Dracoulis

**Project:** High-K Isomers  
**Partners:** Professor P.M. Walker, University of Surrey, UK; Dr D.M. Cullen, University of Liverpool, UK

**Project:** High-K Isomers in Hafnium  
**Partners:** Dr F.G. Kondev and Dr R. Janssens, Argonne National Laboratory, USA

**Project:** Spectroscopy of Very Heavy Nuclei  
**Partners:** Professor J.F. Sharpey-Schafer, National Accelerator Centre, South Africa; Professor P.A. Butler, University of Liverpool, UK

**Project:** Systematics of Isomer Structure in the N = 74 Region  
**Partner:** Dr A.M. Bruce, University of Brighton, UK

### Professor G.D. Dracoulis, Dr R.A. Bark and Dr A.P. Byrne

**Project:** Deep-Inelastic Excitation of High-K States  
**Partner:** Dr S.M. Mullins, National Accelerator Centre, South Africa

### Professor G.D. Dracoulis and Dr A.P. Byrne

**Project:** Laser Spectroscopy of Deformed Isomers  
**Partners:** Dr J. Billowes, University of Manchester, UK; Professor J.A.R. Griffith, University of Birmingham, UK; Dr P. Dendooven, University of Jyväskylä, Finland

**Project:** Spectroscopy of Heavy Nuclei  
**Partner:** Professor A.R. Poletti, University of Auckland, NZ

### Professor G.D. Dracoulis, Dr G.J. Lane and Dr A.P. Byrne; Dr A.M. Baxter (Faculties)

**Project:** Spectroscopy of Neutron Deficient Lead and Thallium Nuclei  
**Partner:** Dr A.O. Macchiavelli, Lawrence Berkeley National Laboratory, USA

### Professor G.D. Dracoulis, Dr G.J. Lane and Dr A.P. Byrne

**Project:** Neutron Rich Translead Nuclei using Radioactive Beams  
**Partner:** Professor P.M. Walker, University of Surrey, UK

### Dr L.K. Fifield and AMS Group

**Project:** Dating of Marine Cores with Carbon-14  
**Partners:** Dr P. De Deckker and Dr B. Opydyke, Geology Department, Faculties

**Project:** Measurement of Erosion Rates at a Range of Scales in the Australian Landscape using *in situ* Produced  $^{10}\text{Be}$   
**Partner:** Professor J. Chappell, Research School of Earth Sciences

**Project:** Landscape Evolution in the Southern Highlands Region of NSW, using  $^{10}\text{Be}$  Deposited from the Atmosphere  
**Partner:** Professor R. Wasson, Centre for Resource and Environmental Studies

**Project:** The Terrestrial Age of the Canyon Diablo Meteorite from Measurements of  $^{59}\text{Ni}$ ,  $^{36}\text{Cl}$ ,  $^{10}\text{Be}$ ,  $^{26}\text{Al}$  and  $^{41}\text{Ca}$  in Fragments from a Range of Depths  
**Partners:** Professor G. Herzog, Rutgers University, USA; Dr C. Schnabel, ETH, Switzerland

**Project:** Dating of Ice in Temperate-Region Glaciers with  $^{32}\text{Si}$   
**Partners:** Dr U. Morgenstern and Dr A. Zondervan, Geological and Nuclear Sciences, Lower Hutt, New Zealand

**Project:** Tracing Releases of Plutonium from the Mayak Production Plant, Southern Urals, Russia  
**Partner:** Dr D. Oughton, Agricultural University of Norway, Norway

**Project:** Uptake by Humans of Plutonium Following Inhalation  
**Partner:** Professor N.D. Priest, Middlesex University, UK; Dr N. Stradling and G. Etherington, National Radiation Protection Board, UK

**Project:** Long-Term Retention and Excretion of Plutonium by the Human Female  
**Partners:** Dr D. Newton and Dr R.J. Talbot, AEA Technology, Harwell, UK

**Project:** Plutonium in the Deep Ocean  
**Partner:** Dr P. Povinec, IAEA Marine Research Laboratory, Monaco

**Project:** Tracing of Groundwater Flow and Mixing in the Temora and Broken Hill Areas of New South Wales  
**Partners:** Dr R.G. Cresswell and Dr P. de Caritard, Bureau of Rural Sciences

**Project:** Tracing of Groundwater Flow in a Natural Analogue of a Nuclear Waste Repository using  $^{36}\text{Cl}$   
**Partners:** Dr Y. Mahara, Geosphere, Abiko Research Laboratory, Japan; Dr R. Habermehl and Dr R.G. Cresswell, Bureau of Rural Sciences

**Project:** The Origin of Brines from a Geothermal Area in Mexico  
**Partners:** Dr P. Birkle, Instituto de Investigaciones Electricas, Mexico

**Project:** Dating Archaeological Sites in Brazil  
**Partners:** Dr N. Added, Sao Paulo, Brazil; Dr C.I. Parellada, Paranense Museum, Argentina

**Project:** Quaternary Evolution of the Parana Coastal Plain, South Brazil  
**Partners:** Dr N. Added and Dr P.C. Giannini, Sao Paulo, Brazil

### Dr D.J. Hinde, Dr M. Dasgupta and Dr I.I. Gontchar

**Project:** Surface Diffuseness Anomaly in Heavy-Ion Fusion Potentials  
**Partner:** Dr K. Hagino, Kyoto University, Japan

### Dr A.E. Stuchbery

**Project:** Measurement of Nuclear g-Factors and Investigation of Transient Magnetic Fields  
**Partner:** Professor H.H. Bolotin, University of Melbourne

**Project:** Nuclear Moments and Structure Changes in Exotic Nuclei  
**Partner:** Dr P.F. Mantica, Michigan State University, USA

**Project:** Nuclear Structure through Measurements of g-factors in even Xe Isotopes by Projectile Excitation  
**Partners:** Professor N. Benczer-Koller, Rutgers University, USA; Professor K.-H. Speidel, University of Bonn, Germany; Dr A. Dr A. Pakou, Ioannina, Greece; Dr A. Macchiavelli, Lawrence Berkeley National Laboratory, USA

**Project:** Evaluation of the Quadropole Moment of  $^{59}\text{Fe}$  and Applications to Solid-State Physics  
**Partners:** A/Professor D.H. Chaplin and Dr W.D. Hutchinson, ADFA, University of New South Wales

**Project:** Single Particle Degrees of Freedom in Transitional Nd Nuclei from Projectile-Excitation g-factor Measurements  
**Partners:** Professor N. Benczer-Koller, Rutgers University, USA; Professor K.-H. Speidel, University of Bonn, Germany; Dr A. Macchiavelli, Lawrence Berkeley National Laboratory, USA; Dr W. Rogers, Westmont College, USA

**Project:** Hyperfine Interactions Spectrometer  
**Partners:** A/Professor D.H. Chaplin, ADFA, University of NSW; Professor H.H. Bolotin, University of Melbourne; Dr A. Byrne, Department of Physics, The Faculties

### Dr H. Timmers

**Project:** Stopping and Energy Straggling of Heavy Ions in Technologically Relevant Materials  
**Partners:** Professor H. Whitlow, Lund University, Sweden; A/Professor J. O'Connor, University of Newcastle

**Project:** Elastic Recoil Detection Analysis of GaN Films  
**Partners:** Dr S. Butcher, Macquarie University

## Optical Sciences Centre

### Professor N. Akhmediev

**Project:** Observation of Soliton Explosions  
**Partners:** Professor S.T. Cundiff, JILA, National Institute of Standards and Technology and University of Colorado, USA; Dr J.M. Soto-Crespo, Instituto de Optica, Spain

**Project:** Interaction of Pulses in Dispersion-Managed Fiber Systems  
**Partners:** Dr F. Zen, Institute of Technology, Bandung, Indonesia; Professor P.L. Chu, City University of Hong Kong, Hong Kong

**Project:** Pulse Propagation in Optical Fibers with Random Dispersion  
**Partners:** Dr I. Gabitov, Los Alamos National Laboratory, USA; Dr G. Kovacic, Rensselaer Polytechnic Institute, USA

**Project:** Soliton States in a Nonlinear Directional Coupler with Intermodal Dispersion  
**Partners:** Dr V. Rastogi and Professor K.S. Chiang, City University of Hong Kong, Hong Kong

**Project:** Linear Guidance Properties of Solitonic Y-junction Waveguides  
**Partners:** Dr J.A. Besley, Racal Research Ltd., UK; Dr P.D. Miller, University of Michigan, USA

**Project:** Multi-Frequency Pulsations in Mode-Locked Fiber Lasers  
**Partners:** Dr J.M. Soto-Crespo, Instituto de Optica, Madrid, Spain; Dr G. Town, University of Sydney

### Professor A.W. Snyder

**Project:** What Makes a Corporate Champion?  
**Partners:** Professor J. George, University of Sydney; McKinsey & Company, Sydney

**Project:** The Physics of Network Computation  
**Partner:** Professor T. Bossomaier, Charles Sturt University

## Plasma Research Laboratory

### Dr B.D. Blackwell and Dr J. Howard

**Project:** Soft X-ray Measurements on H-INF  
**Partner:** A/Professor A.D. Cheetham, University of Canberra

### Dr G.G. Borg, Dr I.V. Kamenski and Dr D.G. Miljak

**Project:** RF Plasma Wave Studies in H-INF  
**Partner:** Dr T. Seki, National Institute for Fusion Science, Japan

### Dr G.G. Borg and Professor J.H. Harris

**Project:** Plasma Antenna Concept Demonstrator  
**Partner:** Dr N.M. Martin, Defence, Science and Technology Organisation

### Dr G.G. Borg and Mr P. Linardakis

**Project:** Plasma Switches for Mobile Phones  
**Partner:** Dr R. Scheer, Motorola, USA

### Professor R.W. Boswell and Mr O. Sutherland

**Project:** High Brightness Ion Source  
**Partner:** FEI Company, USA

### Professor R.W. Boswell and Dr C. Charles

**Project:** Helicon Assisted Reactive Evaporation (HARE)  
**Partners:** Professor D. MacKenzie, Dr B. James and Dr I. Falconer, University of Sydney

### Dr C. Charles and Professor R.W. Boswell

**Project:** Plasma Deposition of Palladium  
**Partner:** Dr P. Brault, University of Orleans, France

### Dr J. Howard

**Project:** Fibre Optic Probes for Plasma Diagnostics  
**Partners:** Mr V. Everett and Professor G. Woolsey, University of New England

**Project:** Measurement of Electric Field in H-INF using Laser Induced Fluorescence Techniques  
**Partners:** Mr P. Feng and A/Professor B.W. James, University of Sydney

#### Dr M.G. Shats

**Project:** Electron Cyclotron Heating of Plasma in Stellarators  
**Partner:** Dr K. Nagasaki, Kyoto University, Japan

**Project:** High Confinement Studies in Stellarators  
**Partner:** Professor K. Toi, National Institute for Fusion Science, Japan

**Project:** Turbulent Transport in Tokamaks and Stellarators  
**Partner:** Dr J. Boedo, University of California (San Diego), USA

## Theoretical Physics

#### Dr M.P. Das

**Project:** Electron Correlation and Metal-Insulator Transition  
**Partner:** Professor D. Neilson, University of New South Wales

**Project:** Fluctuations in Mesoscopic Systems  
**Partner:** Dr F. Green, CSIRO/ University of New South Wales

**Project:** Two Dimensional Interacting Coulomb Systems  
**Partner:** Professor K.I. Golden, University of Vermont, USA

#### Professor R.L. Dewar

**Project:** Anderson Localization of Ballooning Modes, Quantum Chaos and the Stability of Compact Quasially Symmetric Stellarators  
**Partner:** M.H. Redi, Princeton University, USA

#### Dr M. Gulacsi

**Project:** Effects of Phonons on Magnetic Impurities  
**Partners:** Dr A.R. Bishop, Los Alamos National Laboratory, USA; Dr A. Bussmann-Holder, Max-Planck Institute, Germany

**Project:** Metal-Insulator Transition in Strongly Correlated Electron Systems  
**Partners:** Professor K.S. Bedell, Boston College, USA; Dr J. Gubernatis, Los Alamos National Laboratory, USA

**Project:** Cluster Formation in Random Spin Systems  
**Partner:** Professor Zs. Gulacsi, University of Debrecen, Hungary

**Project:** Impurity Effects in Mesoscopic Systems  
**Partners:** Professor A. Rosengren and Mr A. Juozapavicius, Royal Institute of Technology, Sweden

#### Dr A.S. Kheifets (also in AMPL)

**Project:** Convergent Close-Coupling Theory of Double Ionization by Photon and Electron Impact  
**Partner:** Dr I. Bray, Flinders University

**Project:** Electron Momentum Density Studies in Metals and Metal Oxides  
**Partner:** Dr M. Ford, Flinders University

**Project:** Electron Impact Double Ionization of the Helium Atom  
**Partners:** Professor A. Lahmam-Bennani, University of Paris (Orsay), France; Dr A. Dorn, University of Freiburg, Germany

**Project:** Multiple Atomic Photoionization of Metal Vapours  
**Partner:** Professor Y. Azuma, Photon Factory, Japan High Energy Accelerator Research Organization, Japan

**Project:** Theoretical and Experimental Studies of Double Photoionization of He  
**Partners:** Dr T. Reddish, University of Newcastle; Dr L. Avaldi and Dr R. Dörner, University of Frankfurt, Germany

#### Dr S.Yu. Kun

**Project:** Experimental Test of Slow Phase Randomisation and Quantum Chaos in Finite Highly Excited Many-Body Systems  
**Partners:** Professor W. Qi, Dr W. Tian, Dr S. Li and Dr Z. Jiang, Institute of Modern Physics, China; Professor L. Li, Dr X. Lu, Dr K. Khao, Dr C. Fu, Dr J. Liu, Dr H. Jiang and Dr G. Hu, Chinese Institute of Atomic Energy, China

**Project:** Critical Phenomena in Microscopic and Mesoscopic Complex Collisions  
**Partners:** Dr L. Bennet, Max Planck Institute for Nuclear Physics, Germany; Professor T.H. Seligman, University of Mexico and Cuernavaca International Center of Science, Mexico

**Project:** New Method to Probe Coherent Many-Body Dynamics: Concept of Nonergodic Molecules in Continuum  
**Partners:** Professor W. Greiner, Johann Wolfgang Goethe University, Germany; Dr A.V. Vagov, University of Sheffield, UK

#### Dr B.A. Robson

**Project:** Antiproton Scattering  
**Partner:** Professor Zhang Yu-shun, Institute of High Energy Physics, P.R. China

**Project:** Fusion and Fission Reactions  
**Partner:** Professor G. Do Dang, Université de Paris Sud, France

#### Dr W. Woolcock

**Project:** Electromagnetic Corrections to Hadronic Processes  
**Partners:** Dr A. Gashi, Dr E. Matsinos and Professor G. Rasche, University of Zürich, Switzerland; Professor G.C. Oades, University of Aarhus, Denmark

## International Collaborative/Cooperative Agreements

The School holds collaborative/cooperative agreements and/or memoranda of understanding with the following institutions and organisations:

- Samsung Electronics Co. Ltd, Korea
- Shanghai Institute of Technical Physics (SITP), Chinese Academy of Sciences
- The Physics Department, University of Pretoria
- Institute of Advanced Energy, Kyoto, Japan
- Tsinghua University, Beijing, China
- The European Union-Australia Science & Technology Agreement, DIST
- Deutscher Akademischer Austauschdienst (DAAD) Exchange Service
- ANU-Engineering & Physical Sciences Research Council Agreement (ANU-EPSRC), UK (The ANU-EPSRC agreement in effect covers a range of UK universities)
- Beijing University, China
- National Institute for Fusion Science, Nagoya, Japan
- Lockheed Martin Energy Research Corporation, Oak Ridge National Laboratory, USA
- L'Ecole Polytechnique, Paris, France
- Royal Institute of Technology, Stockholm, Sweden
- Ericsson Components AB, Stockholm, Sweden
- British Telecom Laboratories, UK
- Cambridge University, UK
- Telecom Korea, Seoul
- OFT Associates, USA
- Department of Communications, Ottawa, Canada
- ATLAS Accelerator Facility, Argonne National Laboratory, USA
- Physics Division, Lawrence Berkeley Laboratory, USA
- HHRIF, Oak Ridge National Laboratory, USA
- Physics Department, University of Jyväskylä, Finland
- National Accelerator Facility and FRD, South Africa
- GANIL IN2P3, France
- Hahn-Meitner Institute, Berlin, Germany
- RCNP, Osaka, Japan
- Institute of Nuclear Physics, Leuven, Belgium
- Ericsson Fibre Optic Research Centre, Stockholm, Sweden
- British Telecom Research Laboratories, UK
- Bell Laboratories, USA
- Lucent Technologies (an offshoot of Bell Labs), USA
- Princeton Plasma Physics Laboratory, Princeton University, USA
- Stanford Linear Accelerator Center, Stanford Sychrotron Radiation Laboratory, USA
- Institute of Mathematics Modelling, Technical University of Denmark

- COBRA Inter-University Research Institute on Communication Technology, Eindhoven UTech, The Netherlands
- National Laboratory for Infrared Physics, Shanghai Institute of Technical Physics, Chinese Academy of Sciences
- Lightwave Microsystems Corporation, USA
- Oxford University, UK

## National Collaborative Agreements

The School holds the following collaborative agreements under the IAS/Other Australian University Collaboration Scheme and has various independent agreements with Australian industries:

- Royal Melbourne Institute of Technology
- Macquarie University
- La Trobe University
- University of Newcastle
- The University of Canberra
- The University of Wollongong, NSW
- University of Queensland
- The University of South Australia
- Griffith University
- Curtin University of Technology, Western Australia
- University of New England
- University College, Canberra, University of New South Wales
- Monash University, Victoria
- James Cook University, Queensland
- University of Melbourne
- University of New South Wales
- University of Sydney
- Central Queensland University
- Flinders University of South Australia
- University of Western Australia
- Faculty of Business and Technology, University of Western Sydney
- AGEN Pty Ltd
- Ericsson Australia Pty Ltd, Melbourne
- ADC Australia, Canberra (AOFR Pty Ltd)
- Siemens Ltd, Sydney
- Photonic Technologies Pty Ltd, Sydney
- Hypatia Analytic Thought Pty Ltd, Melbourne
- The Powerhouse, Museum of Applied Arts & Sciences, Sydney
- JDS/Uniphase, Sydney



## The Australian Photonics Cooperative Research Centre (Canberra Division)

The Australian Photonics Cooperative Research Centre (CRC) is in its tenth year of operation. It is an unincorporated collaborative venture that was established in 1992 under the Commonwealth Government's Cooperative Research Centre scheme. The following organisations are current partners in the APCRC: The Australian National University, the Universities of Melbourne, Sydney, and New South Wales, RMIT, TAFE NSW, ABB Transmission and Distribution Ltd, ADC Australia Ltd, Allen and Buckeridge Pty Ltd, Australian Electrical and Electronic Manufacturers Association, Australian Photonics Pty Ltd, BAE Systems Australia Limited, Bishop Innovation Pty Ltd, CEOS Pty Ltd, Coherent Australia Scientific Pty Ltd, Defence Science & Technology Organisation, Ericsson Australia Pty Ltd, Filtronic Components Pty Ltd, Future Fibre Technologies Pty Ltd, JDS Uniphase Pty Ltd, Macquarie Photonics Pty Ltd, Nextrom OY, Nortel Networks (Photonics) Pty Ltd, Nufern Inc, Redfern Photonics Pty Ltd, Telstra Corporation Ltd, Electricity Transmission Authority (Transgrid), Tenix Systems Pty Ltd, VPISystems Inc. (Following the closure of Nortel's Australian operations, Nortel formally withdrew from the CRC at the end of the 2001).

The objectives of the CRC include:

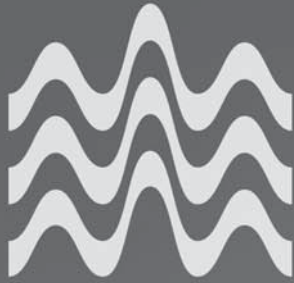
- To enhance the Centre's status as Australia's centre of excellence in photonics with an internationally recognised, commercially relevant basic, strategic and applied research program that integrates research strengths from enabling technologies to applications
- To improve the international competitiveness of Australian industry through transfer of photonic technology through a commercialisation program that enables established firms to access technology and skills while creating new firms, through access to technology, markets, skills and finance

The past twelve months have become particularly challenging for the Centre following the downturn of the telecommunications industry world-wide. From the dizzying heights of 60% growth per annum the industry looks set for a 20% contraction this year. Whilst this has caused large numbers of job losses from the production facilities of major companies, and failure of some new ventures, including the Nortel operation in Botany, New South Wales, the record of the electronics industry demonstrates that boom and bust cycles are quite characteristic of high technology sectors. The present downturn is probably the first such cycle that the photonics industry has had to bear, and it has impacted the cash flow to the CRC through loss of industry contracts. Nevertheless, one should never waste a good recession, and CRC management have maintained the view that now is not the time to slow down the R&D program, rather there exists an opportunity to position new technology for rapid uptake once the demand for photonic components again takes off.

In spite of the industry downturn, the CRC and its spin off ventures in the Redfern Photonics group had a rather successful year. Towards the end of 2000 a new company, Redfern Polymer Optics (RPO), was created to commercialise hybrid glass technology developed at the ANU for the production of next-generation planar lightwave circuits. During 2001, RPO has established its prototyping facility in the Innovations Building at the ANU, in two laboratory areas. The first of these contains a class 100 clean room with facilities for spin coating and patterning glass films to create photonic integrated circuits. This area also includes wafer dicing and environmental testing facilities. The second laboratory will be used to scale up hybrid glass production to commercial quantities. The RPO project involves several ANU staff in the role of consultants assisting a team directly employed by RPO.

Redfern Photonics received a considerable boost early in 2001 through an investment of over 54M\$ from a consortium consisting of Deutsche Bank's private equity investment group, DB Capital Partners, GE Equity, Citicorp Equity Capital, Ericsson Deutsche Technology Fund, the Australasian Technology Fund and Temasek Capital. This was a considerable achievement bearing in mind the state of the industry at that time and will be used to develop new commercial opportunities in photonics.

During the year, the CRC received funding of 9.5M\$ from the MNRF competitive grants scheme augmented by a 3M\$ cash contribution from the NSW government to



build a facility to be known as the Bandwidth Foundry at the Australian Technology Park, Eveleigh. The Bandwidth Foundry will focus on the production of advanced photonic devices such as planar integrated circuits and photonic bandgap structures as well as developing manufacturing technology for photonic components. Dr François Ladouceur, who completed his PhD at ANU in 1992 with John Love, has been appointed Director of the Bandwidth Foundry and will return to Australia in 2002 from his current position with VPI Systems, Germany.

In May, the ACT Government launched a new policy aimed at developing Photonics as a major industry within the ACT over the next decade and provided 600k\$ over three years to help establish the Photonics Institute in the ACT. The Photonics Institute, a CRC initiative focussing on education and training programs, opened its offices at Bruce CIT on 5 September. The Institute aims to support the development of new photonics courses at Australian Universities and TAFE Colleges as well as having roles in community education and providing consultancy services. The Institute received support from both the Federal Government Science Lectureship Initiative round of competitive grants in 1999 and from the ACT Government. In 2001, funding was provided to Qwestacon for educational programs in photonics. In addition resources were allocated for the production of photonics teaching modules that will be made available to higher education institutions.

On 20 September, the ANU with the support of CRC members officially launched its new Photonics Degrees at a ceremony involving ACT Chief Minister Gary Humphries at Regatta Point.

In another boost the CRC will be pleased to welcome the return of one of its students with support of a Federation Fellowship. Dr Ben Eggleton will return from his position at Bell Laboratories next year to rejoin the University of Sydney and provide invaluable expertise in photonic crystal fibres and nonlinear fibre optics.

## Research

CRC research in Canberra is focussed on the development of planar integrated circuits, future photonic technologies and optical signal processing.

The creation of RPO has led to a large boost in interest in hybrid glasses and ANU CRC researchers continue to work in parallel with the RPO team. Whilst RPO is operating a focussed program

aimed at the production of commercial prototypes by mid next year, the CRC programs are focussed more on developing hybrid glasses with improved optical properties or functionality. There have been a number of very promising materials developments that should yield reduced loss glasses for the next generation of devices.

The APCRC also supports work on the HARE PECVD system in the Plasma Research Laboratory. A new team is now in place and has focussed on the development of hydrogen-free, low-loss silica films using the HARE process. A new clean room facility has been installed around the HARE reactor to reduce wafer contamination. Good progress is being made.

Another film-forming technology supported by the CRC is the unique ultra-fast pulsed laser deposition facility in the Laser Physics Centre. CRC supported activities include the production of low-loss chalcogenide glass films as a basis for nonlinear optical processors. Most work so far has focussed on the production of  $As_2S_3$  films and containing photo-defined waveguides. This year we obtained a number of new glasses from overseas collaborators including Gallium Lanthanum Sulphide (GLS) from the University of Southampton and As-S-Se from the University of Central Florida. We have also established facilities to make GLS glass in the future. Full characterisation of the optical nonlinearity of these materials is underway.

In other projects within the School the CRC contributes to work on Silicon Photonics in the Department of Electronic Materials Engineering; nonlinear optical materials in the Laser Physics Centre; 4D holography for photonic signal processing in the Laser Physics Centre; spatial solitons and other nonlinear guided waves in the Director's Unit, Optical Sciences Centre and Laser Physics Centre; polymer optical fibres for voltage sensing in the Laser Physics Centre (with support of a contract from ABB and Transgrid); and optical waveguide theory in the Director's Unit.

During the year three new patents have been filed, making a total of nine patents from ANU APCRC research under prosecution.

The Canberra Division received \$784,092 of Commonwealth and \$78,409 of ANU funding in 2000/2001. The budget for 2001/2002 is set at \$1,093,578 Commonwealth and \$100,000 ANU funding. Contract funding in place from 2000 through to 2002 totals \$1,028,100.

## RSPHYSSE APCRC Staff

**Group Head (ANU); Director of Research; Director of Australian Photonics Pty Ltd**  
Professor Barry Luther-Davies

### Researchers

Professor Nail Akhmediev (Key Researcher)  
Dr Adrian Ankiewicz  
Professor Rod Boswell  
Dr Rob Elliman  
Dr Anke Freydank  
Dr Reiner Friedrich  
Mr Keith Gaff (until May)  
Dr Eugene Gamaly  
Ms Ruth Jarvis  
Professor Yuri Kivshar (Key Researcher)  
Dr Wieslaw Krolikowski

Professor John Love (Program Manager, Key Researcher)  
Professor Neil Manson  
Dr Elena Ostrovskaya  
Dr Andrei Rode  
Dr Anna Samoc  
Dr Marek Samoc (Key Researcher)  
Dr Matt Sellars  
Dr Congji Zha (until September)

### Technical Officers

Mr Peter Alexander  
Ms Maryla Krolikowska  
Ms Lily Luo  
Mr Craig Macleod  
Mr Ian McRae  
Ms Therese Martin (until January)  
Ms Anita Smith

### Office Manager

Ms Helen McMartin

### Administrative Assistants

Ms Cindy Bradley (until September)  
Ms Kristina Milas (from September)

### Postgraduate Students

Mr Tristram Alexander  
Ms Sam Ashby  
Mr Keith Gaff (until May)  
Ms Ruth Jarvis  
Mr Glen McCarthy (from October)  
Ms Yinlan Ruan  
Mr Darryl Scott  
Mr Andrey Sukhorukov  
Ms Snjezana Tomljenovic-Hanic



*Theoretical Studies: From the Cosmos to quantum systems, from statistical mechanics to biophysics.*

The Centre for Complex Systems (formerly the ANU Centre for Theoretical Physics) is based within the National Institute for Physical Sciences, administratively supported by the Department of Theoretical Physics. The aims of the Centre for Complex Systems are:

- to provide a framework for bringing researchers together and stimulating interaction and synergy between them
- to promote innovative, interdisciplinary research through seminars and topical workshops
- to foster graduate education and research through summer schools

The theoretical activities in the Department and School overall are focused on such fields as condensed matter and materials physics, biophysics, surface physics, plasma physics, photonics, molecular, atomic and nuclear physics. In most of these areas there are many particles interacting collectively and the emphasis is on the emergence of behaviour beyond the elementary laws of interaction. The unifying theoretical and mathematical tools include statistical mechanics, many body theory and nonlinear dynamics, as well as numerical simulation.

A meeting of senior theorists convened by the Director of the Research School of Physical Sciences proposed the name *Centre for Complex Systems (CCS)* in place of *ANU Centre for Theoretical Physics*. The CCS is to continue the outreach activities of the ANU CTP while fostering innovative application of the powerful tools of modern theoretical physics and applied mathematics to a wide range of problems in the physical and biological sciences. This name was approved by a meeting of the ANU CTP Board, which has representatives from across campus, on 31<sup>st</sup> of August 2001.

The main activities of the CTP this year were the 14<sup>th</sup> Canberra International Physics Summer School on *Biophysics: From Proteins to Cells* (15–26 January, convenor: Dr S. Kuyucak), a Mini Summer School on *Plasma and Gaseous Electronics* (29 January – 2 February, convenor: Dr H.J. Gardner), and the 25<sup>th</sup> International Workshop on *Condensed Matter Theories* (3–8 December, convenor: Dr M.P. Das). The CTP was also one of the sponsors of the Australian Workshop on Nanotubes and Fullerenes AWNF2001, Canberra 3–4 May.

The Condensed Matter workshop was partially funded as an External Activity of the Asia Pacific Center for Theoretical Physics (US\$5,000) and other sources.

A significant part of the CTP effort in 2001 was preparation for the 2002 Summer School on *Topics in Nonlinear Dynamics, Collective Phenomena and Complexity* (January 21 to February 1 2002, convenor: Dr R. Ball).

## **The 14th Canberra International Physics Summer School in Biophysics: From Proteins to Cells, ANU, January 15-26**

Convenor: Dr Serdar Kuyucak

The purpose of the School was to provide physics perspectives on the emerging molecular structure of biosystems for a broad audience with backgrounds in physics, chemistry and biology. The lecturers and topics were:

**Robert Austin** (Physics, Princeton)

*Energy and population landscapes in biology: a physics perspective*

**Avinoam Ben-Shaul** (Physical Chemistry, Hebrew University)

*Interaction mechanisms and phase transitions in membrane-macromolecule systems*

**Ken Dill** (Pharmaceutical Chemistry, UC - San Francisco)  
*The statistical mechanics of protein folding*

**Peter Kollman** (Pharmaceutical Chemistry, UC - San Francisco)  
*Structures and free energies of proteins and nucleic acids from molecular dynamics simulations*

**Jack Tuszynski** (Physics, Alberta)  
*Models of the collective behavior of proteins in cells: actin, tubulin and motor proteins*

**David Adams** (Biomedicine, Queensland)  
*Expression and function of membrane ion channels*

**Serdar Kuyucak** (Theoretical Physics, RSPHYSSE, ANU)  
*Theories of ion permeation in membrane channels*

**Hans Coster** (Biophysics, UNSW, Sydney)  
*Physics of cell membranes*

**Paul Gooley** (Biochemistry, Melbourne)  
*Analysis of proteins and their complexes by nuclear magnetic resonance*

**Michael Parker** (St. Vincent's, Melbourne)  
*Protein structure from x-ray diffraction*

**Ron Pace** (Chemistry, Faculties, ANU)  
*Biosensors*

**Tim Senden** (Applied Mathematics, RSPHYSSE, ANU)  
*Atomic force microscopy*

**Edith Sevick** (RSC, ANU)  
*Optical tweezers*

**Fred Chow** (Photobioenergetics, RSBS, ANU)  
*Photosynthetic systems*

The School was attended by 60 participants. The proceedings of the School will be published by World Scientific.

### Mini Summer School Plasma Physics, ANU, 29 January - 2 February

(Supported by the Australian Institute for Nuclear Science and Engineering (AINSE))

A Summer School for senior undergraduates, graduate students and academic staff with interests in plasma science and technology.

Plasma physics underlies much of our understanding of stellar and galactic structure; it determines the magnetospheric environment of the earth and other planets; it forms the research frontier in areas such as nuclear fusion, advanced accelerators and high frequency lasers and is being increasingly used in industry – notably in the fabrication of computer chips. This course emphasised the intrinsic scientific interest of the plasma state of matter and attempted to develop an understanding on plasma behaviour in a thorough and systematic fashion.

Based on the recent text, “The Framework of Plasma Physics” by Richard Hazeltine and Francois Waelbroek, lectures were presented by Professor Hazeltine with the assistance of ANU staff.

There was also a series of experimentally oriented lectures given by

**Professor I.H. Hutchinson** (MIT, Author of “Principles of Plasma Diagnostics”)

**Dr B. James** (U. Syd)

**Dr J. Howard** (ANU)

**Professor J. Harris** (ANU)

The “Framework of Plasma Physics” contains the following chapter headings

The Nature of Plasma  
Charged Particle Motion  
Fluid Description of a Plasma  
The Cold Plasma Model and Waves  
MHD and the Drift Model  
Vlasov Description of a Plasma  
Binary Collisions  
Collisional Transport  
Turbulent Transport

### 25th International Workshop on Condensed Matter Theories and 11th Gordon Godfrey Workshop on CMP

The 25th International Workshop of the Condensed Matter Theories was held in conjunction with the 11th Gordon Godfrey Condensed Matter Research Workshop in Belconnen during 3-7 December. The Workshop was an external activity of the Asia-Pacific Centre for Theoretical Physics. Dr Mukunda Das was the Chair of the Organising Committee.

The general orientation of these Workshops has been interdisciplinary, with emphasis on the common concerns of theorists applying advanced many-particle methods in areas as diverse as solid state and low temperature physics; atomic, sub-atomic and statistical physics. Within the framework of this tradition, the primary topics of CMT25 were planned to emphasise Physics of Novel Materials with exotic properties. The topics covered were in the currently researched areas of mesoscopic and strongly correlated systems including quantum liquids, boson condensates, superconductivity, superfluidity, and Monte Carlo simulations etc. Forty one invited talks were presented covering the above topics.

The Workshop was financially sponsored by the US Army Research Office, Asia Pacific Centre for Theoretical Physics, University of NSW, University of Melbourne, University of Wollongong, RSC (ANU) and RSPHYSSE (ANU).

## Cooperative Research Centre for Functional Communication Surfaces



The CRC FCS began operations on July 1, 2001, following funding from the Australian Government. Principal academic partners are located in Chemical Engineering, Monash University, Applied Mathematics Department, RSPHysSE and the CSIRO Divisions of Forestry and Forest Products and Molecular Sciences (Clayton, Vic.). Industrial partners include AMCOR Packaging (Australia) Pty Ltd, Carter Holt Harvey Tissue Pty Ltd, Norske Skog Paper Mills (Australia) Ltd, Note Printing Australia Ltd and PaperlinX Pty Ltd (Australian Paper). Total Commonwealth funding over a seven year period is ca. \$14 m, to be distributed among the various research groups.

The brief of the CRC is to advance Australia's printing and packaging technology and expertise, with particular emphasis on advanced papers and polymeric materials (including banknotes), smart packaging indicators, improved recycling of paper and enhancement of cardboard packaging. Unglamorous though these areas sound, they are major industries in the Western world, and even minor incremental improvements in these areas are of major benefit to consumers and producers. A number of research areas are covered by the CRC partners, including extensional rheology, surface chemistry and energy, polymer rheology, colloid science, three-dimensional imaging of microstructures, and print quality analyses. The ANU node is focussed on providing accurate microstructural data of relevant materials, analysing the surface physics of imbibition of e.g. inks into papers, developing accurate mechanical models and measures of mechanical properties of various printing substrates. A novel feature of our contribution is the insistence that Applied Mathematics focus on the fundamental aspects of research. This tack has been welcomed by our industrial partners, who recognise the dearth of fundamental understanding of many processes associated with printing and paper and board production. The industry remains largely empirical, despite its enormous economic importance, and the group in Applied Maths are ideally equipped to investigate a number of important and interesting questions from our fundamental research perspective. While the issues are industrial in motivation, a number of fascinating problems that call on our skills are to be tackled. The work is experimental, theoretical and computational, in keeping with the philosophy of Applied Maths. Projects will make extensive use of the new X-ray CT machine, the Surface Forces Apparatus, Atomic Force Microscope and Ellipsometer.

In the first year of the Center, the ANU program was refined to address 4 projects of fundamental science to be undertaken and a fifth, strategic project aimed at addressing specific industry problems. Three of the four fundamental projects that have commenced and some research highlights from these projects are outlined below.

### CRC STAFF

#### Program Manager

Mark Knackstedt

#### Program leaders

Tim Senden

Vince Craig

#### CRC Administrator

Ray Roberts

#### Researchers

Rob Sok

Arthur Sakellariou

Adrian Sheppard

Vassili Yaminsky

Stuart Ramsden

Barry Ninham

Stephen Hyde

#### Technical Staff

Tim Sawkins

Anthony Hyde

#### • Structural characterisation of Paper and Coatings:

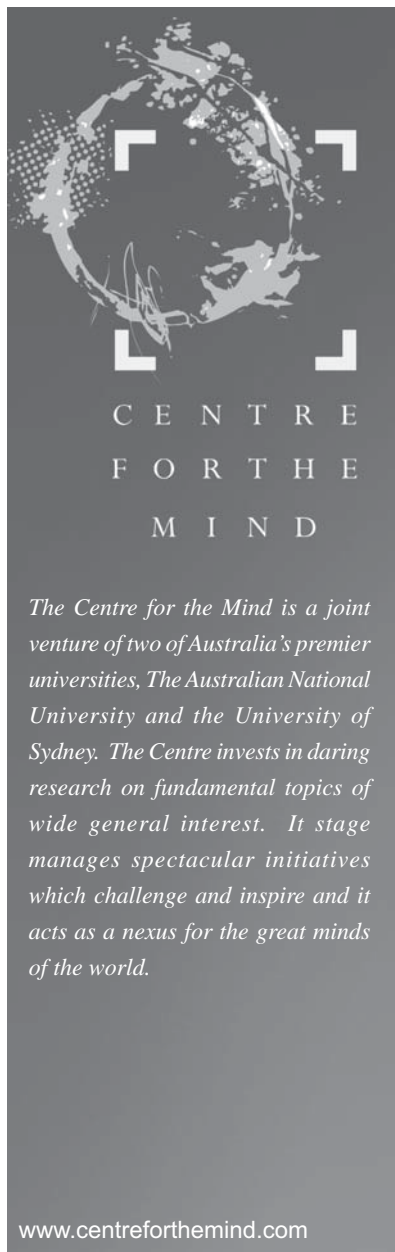
In this program we aim to experimentally image and characterise the morphology of paper and coatings in three dimensions. We have utilised the Applied Maths X-ray micro-CT facility along with two-photon confocal facilities overseas. A limitation of X-ray CT techniques to paper science has been the poor contrast of different soft (lower x-ray dense) materials. Phase contrast tomography has been proposed as a method to quantitatively image samples consisting of lighter elements. We have shown the feasibility of using x-ray phase contrast tomography for paper samples.

#### • Dynamic behaviour in paper and coatings:

In this program we aim to experimentally study fluid wetting phenomena in fibre webs and porous coatings. The structure of the pore space together with local surface energy considerations are the chief determinants of fluid penetration processes. In the first year we have conducted experiments visualising the penetration of a wetting fluid into paper fibre webs. To date, industry has characterised fluid flow by an advancing wetting front moving through the bulk of the pores. Experiments on saturating papers has shown that the fluid movement is instead in the form of bulk liquid films moving along channels formed by fibre overlaps. The implications of this observation to printing interactions and production of décor paper is being considered.

#### • Force measurements applicable to papermaking and paper performance:

In this program we aim to experimentally determine fundamental surface properties of papers and pulps and evaluate their role in paper performance. Work in the first year includes the development of an chamber to perform environmentally controlled experiments and a capacitance sensor to measure the mechanical properties of paper fibres. Other work involves characterisation of surface defects and pigment morphology in polymer bank notes.



The Centre for the Mind is a joint venture of two of Australia's premier universities, The Australian National University and the University of Sydney. The Centre invests in daring research on fundamental topics of a wide general interest. It stage manages spectacular initiatives which challenge and inspire and it acts as a nexus for the great minds of the world.

## Research Summary

The Centre's research is primarily concerned with scientific ways to enhance creativity and "What makes a Champion" in the broadest sense of the word, and exceptional creativity and performance in all domains of human endeavour.

## Commercialisation

Professor Snyder received an ARC Linkage-Project grant this year, in which he is Chief Investigator on the project "What Makes a Corporate Champion?" Professor Janet George from the University of Sydney is a partner investigator in this project.

The world's largest consultancy company, McKinsey & Company, have joined this proposal which aims to assist realising this goal by developing a framework to identify and replicate championship in individuals and organisations. A multi-disciplinary team will apply quantitative and qualitative measures to address issues raised from the Centre for the Mind's existing research. Findings will contribute significantly to the social and economic benefit of private and public sector organisations. We envisage that learnings from this joint effort will lead to an exciting program of research and application that will positively impact the many thousands of people in businesses in Australia and globally.

## The Physics of Network Computation

Professor Snyder was also successful in obtaining an ARC Discovery Project Grant and is Chief Investigator on "The Physics of Network Computation". Professor Terry Bossomaier from Charles Sturt University is partner investigator on this project.

This project combines the expertise in nonlinear soliton physics and computational sciences in order to provide new insights into the physics of network computation. The proposal addresses the mathematics and computer modelling underlying nonconscious problem solving. We will develop a new template concept, the meta-mode, which embodies the network structure of knowledge and the linking mechanisms, which underpin human creativity. We will establish the optimal connectivity distributions to preserve distinct pattern classes yet allow model radical shifts in paradigms, and develop algorithms for autonomous connectivity optimisation. We investigate nonlinear processes such as solitons and random Boolean.

## Publications

Snyder, A.W. and Thomas, M.  
The Paradox of Autistic Art  
Artlink Magazine, Volume 21, No 2  
(2001) 48-50

Snyder, A.W.  
Paradox of the Savant Mind – The  
provocative exceptions to our  
understanding of intellectual ability  
Book review on Bright Splinters of the  
Mind by Beate Hermelin  
Nature Vol 413 (2001) 251-252

## Staff (ANU & University of Sydney)

**Director**  
Professor Allan Snyder FRS

**Researchers**  
Professor John Mitchell  
Dr Elaine Mulcahy

**Visiting Fellows**  
Professor Terry Bossomaier  
Dr Michael Djordjevic  
Mr Andrew Meikle  
Dr John Merson  
Dr Timothy Thompson

**Executive Officers**  
Mr Stuart Stark  
Mr Doug Thompson

**Project Officer**  
Ms Katy Ayoub

**Administrator**  
Ms Cheryl Morse

**Web Designer**  
Mr Matthew Immonen (part-time)

**PhD Student**  
James Moody





The School recognised during the year that it needed a more proactive and professional approach to commercialisation. A School Commercialisation Committee has been set up to: i) establish a set of guidelines and procedures within the School for protecting and exploiting its intellectual property (IP), ii) provide advice to School staff on commercialisation matters, iii) maintain a register of the School's IP, including know how, disclosures and patents, and iv) make sure the School's approach to commercialisation conforms with the ANU's procedures. As well as five academic members with experience in commercialisation, the committee has members from Anutech and the general staff. The committee's first task has been the preparation of a set of draft procedures for adoption by the School to guide staff, students and visitors in their responsibilities and obligations regarding the IP generated by the School's activities. It is expected that, after harmonization with the IP policies of the University, the School will adopt these procedures. The procedures will be used as the basis for staff training in IP management and will be included in new employee and departmental visitor orientation and during induction of new students to the School. The School was particularly active in 2001 with a range of projects that were at various stages of commercialisation. In addition, the School was determined to work more closely with Anutech, Mr Tony Cooke, in its attempts to exploit its IP. This section reports on commercialisation ventures and also projects showing promise for commercialisation. Some of these activities are contained in the report of Anutech.

### RPO Pty Ltd

A new start-up venture has been established to commercialise organically modified silicate glasses developed by the Laser Physics Centre with support from the Australian Photonics CRC. ANU developed IP has been transferred to RPO, the newest member of the Redfern Photonics group of companies with headquarters in Sydney. RPO has established clean room facilities in the Innovations Building at ANU for device fabrication and characterisation. RPO was awarded a 2.7M\$ START grant to support work on Advanced Polymer Switching Devices. A number of RSPHYSSE staff are contracted to assist the commercialisation process. These include Professor Barry Luther-Davies, Dr Wieslaw Krolikowski, Dr Reiner Friedrich, Dr Anke Freydanck, Ms Ruth Jarvis, Professor John Love, Dr Congji Zha, Mr Ian McRae and Ms Maryla Krolikowska.

### Acton Semiconductors

This spin-off company was established in late 2000 to commercialise novel semiconductor laser technology that was developed in the Electronic Materials Engineering Department. A detailed Business Plan was developed for manufacture of high power lasers for the global telecommunications market in early 2001. Venture capital and corporate funding was explored and term sheets were signed for a multi-million dollar investment in May 2001. However, before the deal was concluded the Telecommunications sector suffered a major downturn and all parties decided that to put the venture on hold. Subsequently the ANU decided to forgo venture funding for the time being and reassess commercialisation options. A \$350,000 grant was obtained from the ACT government to keep the R&D on track and to explore alternative funding options. Recently, considerable interest has been shown by an Australian company in the technology and in the Acton Semiconductors opportunity. The current direction, while the telecommunications market remains depressed, is to pursue and consolidate semiconductor laser IP and to further develop novel prototype components. Indeed, considerable new IP has been generated and consolidated in this laser area, comprising two full patents and five provisionals. Professor C Jagadish and a large team from EME and the School have been involved in this project.

## **The Plasma Antenna and the BushLAN Project**

The Plasma Research Laboratory, the University of Canberra, CEA Technologies Pty Ltd and the DSTO are collaborating to produce a Plasma Antenna whip for radar and communications applications. The project is driven by a SPIRT grant. Several applications are being considered for continuously adaptive arrays for radar and low radar cross-section antennas for communications. Investigations are continuing into the plasma lens for beam steering of high power microwaves developed under a contract from the DSTO. The project is also being partly funded by Motorola USA to develop small switches for antenna taps in multi-band mobile phones, which is the subject of a PhD thesis.

Recently a new project has commenced to investigate how to improve Internet connectivity in regional and central Australia. The project, BushLAN, anticipates the use of the VHF TV band I (45 – 70 MHz) spectrum which will be decommissioned after the uptake of digital TV. These frequencies have many advantages over UHF and microwave wireless networks such as satellite and WIFI for the provision of data services to remote areas where high infrastructure costs cannot be justified. BushLAN connects the Internet Service Provider and the Customer with a low powered wireless link operating in the frequency bands currently occupied by analog TV. Typically, people living within major regional centres have access to copper telephone lines that can provide dialup connections to the Internet with reasonable access speed. The main exchange in such towns is often connected to the Internet with high speed connection and a good service can be supplied simultaneously to the town as a whole. However, as the distance from the exchange increases there is a tendency for the telephone service to deteriorate and customers, if they can get an Internet connection at all, experience frequent drop outs. Moreover, in central Australia there are no telephone lines at all and so BushLAN could provide VoIP telephone services.

In the current project, the feasibility of transmitting signals in this bandwidth has been demonstrated up to 40 kms at 250 kbps and wireless modems and other devices have commenced development. The project work for BushLAN is being carried out by seven students from the FEIT Engineering Department who are developing the different components for their fourth year theses. Preliminary cost studies indicate that BushLAN is considerably cheaper than the satellite and WIFI services.

BushLAN has been demonstrated at the ACT "Focus on Business" exhibition during March and has generated substantial interest. Funding is now being sought to carry the development forward. Visit the BushLAN web site <http://www.rspshysse.anu.edu.au/bushlan/>.

(Dr. G Borg, Prof J. Harris, Mr L. Lungu, Ms L. Caillault, Mr P Linardakis, ANU and Dr. A Cheetham, J. Rayner (University of Canberra) and Dr. N. Martin (DSTO)).

## **Deep Vein Thrombosis (DVT) and Blood Clot Detection**

Through a collaboration of over 8 years with Vita Medical Pty Ltd, an ANU owned medical diagnostic technology is to be commercialised via the start-up Vimed Biosciences, Inc. Already tested in the clinical setting, this technology has the capability of pinpointing in 3 dimensions the location of blood clots, or thrombi which may be life threatening. Early detection, assessment and treatment of this condition could drastically reduce the incident of fatalities caused by strokes, cardiac disease and pulmonary emboli, the later being a direct result of DVT. The agreement funds lab space in the Innovations Building, staff and considerable capital equipment. An office in Boston has been established to direct the FDA submission. All work done at the ANU will be at a cGLP level. Dr T Senden and a team from the Applied Mathematics Department have driven this project.

## **Anutech Report**

To facilitate closer interaction between Anutech Pty Ltd and the School to facilitate industry interaction and commercialization, the School has provided an office for Anutech within the School. This office was opened in January 2002 and is presently manned approximately 50% of the time by Mr Tony Cooke, Technology Manager - Physical Sciences and Engineering. Anutech have been actively involved in assessing and negotiating the commercial potential of a number of the School's projects. These include the Plasma Antenna/BushLAN and DVT ventures reported above as well as projects outlined below.

## **High Brightness Helicon Plasma.**

FEI Corporation of Massachusetts USA approached Prof Rod Boswell to assist their development of a high brightness plasma source for use in their machines that make repairs to optical lithographic masks. A research contract resulted from this inquiry that has so far generated over \$100,000 in research funds to the School.

## **Emissivity Independent Infrared Thermography.**

Dr John Howard has developed a means of determining temperature by measuring the shape of the black body radiation curve. This approach avoids the need to know the emissivity of the object whose temperature has been measured. He has developed a non-contact optical instrument based on this principle that can be used like a thermocouple to measure the temperature at a point on an object or can be used with a telescope and charge coupled array to provide a measurement of the temperature of an imaged surface. The instrument equals the performance of double beam instruments, which do the same job, but with much greater simplicity and reduced cost. A provisional patent application has been lodged for the concept. Considerable interest has been expressed by BHP Steel for the use of such an instrument in their steel making operations – it is potentially very useful for determining the temperature of streams of molten metal or the surface of billets about to be rolled. A prototype instrument will be funded and made for them and trialed in their steel-making facilities. Invetech (a company specialising in contract research and development) has indicated an interest in the rights to manufacture instruments using this principle when the prototype has reached a more advanced state of development. This project has also formed the basis for a further development of the principle to spectroscopically detect

the difference between a rocket engine and a jet engine and has attracted a research contract from DSTO.

### **Visualisation of Pore Structures and Modeling of the properties of Porous Structures.**

Dr Mark Knackstedt's group in the Department of Applied Mathematics have developed high resolution x-ray based computerised scanning tomography to visualise the pore structure of porous materials. The equipment was developed jointly with the University of NSW Oil and Gas Petrology Group to study porous oil bearing rocks for the oil and gas industry, which requires knowledge of the properties of oil bearing rocks to determine the yield and rate of extraction of oil or gas from those rocks. Normal practice takes core samples of rocks from exploratory drill holes and determines their extraction properties from a variety of physical tests. This is a costly procedure because complete core samples must be retrieved from the drill hole that can only be done by removing the drill pipes and then reinserting them in the hole. Testing is also costly and time consuming taking up to 2 weeks to complete. Models of the pore structure at various levels of resolution can provide more information than conventional testing of the rocks and it appears that the same results can be obtained from rock fragments eliminating the need to obtain complete cores. Thus there is significant commercial potential for the provision of rock analysis samples. In addition the technique is applicable to any porous material and contracts have been obtained with BASF Germany to study polymer foams. In addition the group is involved with the CRC for Paper Technology and is engaged in a study of wetting of papers with inks and resins. Clearly there is potential for the study of many porous materials and the ability of the group to visualise the internal pore structure of such materials will provide both fundamental and applied researchers with many new insights into their structure and properties. The commercial application of this equipment beyond the research projects within the

department will be investigated and the possibility of supplying instrumentation and computer programs for other groups is under consideration.

### **Array Optical Devices.**

Array optical devices were developed by Dr Andre Rode of the Laser Physics Department in the early 1990's. Several attempts have been made to interest commercial companies in their use as they offer the advantages of lenses for solar energy collection without the disadvantage of having to track the sun as in conventional trough and dish collectors. The technology has been promoted at the ACT "Focus on Business" Exhibition and the Bench to Business forum jointly run by UNSW, ANU, UTS and University of Sydney.

### **Carbon and Boron Nitride Nanotubes.**

Dr Ying Chen of Electronic Materials Engineering has developed a method of producing large quantities of either Carbon or Boron Nitride nanotubes. This has generated many requests for samples of these materials for testing by other laboratories and has prompted a review of the prospects for commercialising the technology.

### **Surface Forces Apparatus.**

The Applied Mathematics Group has developed additional equipment for the surface forces apparatus to measure friction. Several papers will shortly be published on the measurement of friction and this provides a means to measure friction not previously available. The publication of these papers provides and opportunity to re-market the basic apparatus and to attempt to market the friction add-on to existing customers. It is expected that this will be of interest to tribologists and lubricant manufacturers who may not have been targeted in previous marketing.



*The Surface Forces Apparatus.*



In 2001, the School's annual recurrent grant of \$14.789M was supplemented by additional income from University Major Equipment Committee funds (\$1.074M), from full fee paying students (\$109k) and by a significant number of outside grants from a variety of sources. These grants, which are shown below, reflect the School's income opportunities and some of its collaborative activities.

**Applied Mathematics****CRC for Functional Communication Surfaces**

The Department is one of three academic nodes for the new CRC for Functional Communication Surfaces, to be funded for seven years from July 2001. The ANU portion of the budget is ca. \$2.7M.

**Australian Partnership for Advanced Computing**

Dr M. Knackstedt, Dr A.P. Sheppard and Professor S.T. Hyde  
July 2000 – March 2003 \$250,000

**DETYA (Australian Research Council)**

Dr V.S. Craig  
Australian Postdoctoral Research Fellowship  
February 1999 – February 2002 \$177,000

**Vice Chancellor's Plan for Growth**

Professor S.T. Hyde  
January 2001 – December 2003 \$287,000

**Atomic and Molecular Physics Laboratories****Australian Academy of Science**

Dr A. Kheifets (jointly with TP)  
Travelling Fellowship to Germany  
July 2001 – December 2002 \$9,000

**Australian Fulbright Association**

Professor S.J. Buckman  
Senior Scholarship  
September 2000 – September 2001 \$28,500

**CSIRO**

Professor L. Chadderton  
Swift Ions Project  
August 1998 – August 2003 \$150,000

**DETYA (ARC Fellowships)**

Dr R.J. Gulley  
Australian Postdoctoral Research Fellowship  
March 1998 – February 2001 \$187,000

Dr S.J. Cavanagh  
Australian Postdoctoral Research Fellowship  
May 2001 – April 2004 \$195,000

**Dr M. Vos**

QE II Research Fellowship  
November 1996 – June 2001 \$308,000

**DETYA (ARC Large Grants)**

Dr K.G.H. Baldwin and Dr B.R. Lewis  
Pulsed Nonlinear-Optical Spectroscopic Sources: Tunable  
Narrowband and Multiwavelength Applications  
(Held jointly with Macquarie University)  
January 2000 – December 2002 \$153,000

**DETYA (RIEF)**

University of Western Australia  
(ANU participant)  
Dr M. Vos and Professor E. Weigold  
National Facility for Electron Spin-Correlations &  
Spintronics  
January 2001 – December 2001 \$450,000

**DISR and Institution of Engineers**

International Conference Support Scheme  
Dr B.R. Lewis  
14<sup>th</sup> International Conference on Vacuum Ultraviolet  
Radiation Physics  
July 2001 \$2,500

**University of Adelaide**

Australian-German Joint Research Co-Operation Scheme  
Professor E. Weigold and Dr J. Lower  
Investigations into Atomic Collisions through the  
Development of Advanced Technologies  
January 2001 – January 2003 \$19,380

**Director's Unit****Australian Academy of Science**

Professor Yuri Kivshar  
Research visit to Japan  
April 2001– March 2002 \$ 1,800

**DETYA (Australian Research Council)**

Professor J.D. Love and Dr M.C. Elias (ADC Australia Pty  
Ltd)  
Australian Postgraduate Award (Industry)  
Mr K.W. Gaff  
February 1997 – May 2001 \$86,598  
ADC contribution \$15,000

Professor J.D. Love & Dr M.C. Elias (ADC Australia Pty  
Ltd)  
Australian Postgraduate Award (Industry)  
Ms S. Tomljenovic-Hanic  
June 1999 – May 2002 \$86,598  
ADC contribution \$15,000

Dr S. Huntington (Uni of Melbourne), Professor J.D. Love  
& Dr A. Carter (Nufern Inc)  
Australian Postgraduate Award (Industry)  
Mr P. Pace  
December 2001 – November 2004 \$86,598  
Nufern contribution \$15,000

**DISR**

Professor J.D. Love & Dr A. Ankiewicz  
Support from Australian Photonics Cooperative Research  
Centre  
May 1999 – April 2005 \$700,000

**Japan Society for Promotion of Science**

Professor Yuri Kivshar  
Nonlinear Photonic Crystals  
April 2001– March 2002 \$10,000

**University of Adelaide**

Australia-German Joint Research Cooperation Scheme  
Professor Y. Kivshar  
Generation, Dynamics, and Interaction of Solitary Waves in  
Photorefractive Crystals and Magnetic Films  
August 2001 – December 2002 \$14,948

**Electronic Materials Engineering****ACTON LASERS**

ANU Commercialisation (Venture Capital) Fund  
General Contingency Fund  
Professor C. Jagadish  
Develop Stage 1 of Acton Lasers  
March 2000 onwards \$500,000

**ACT R&D Grant**

ACT Chief Minister's Department  
Professor J.S. Williams  
Developing Technology Prototype Products & Markets for  
Semiconductor Lasers  
September 2001 – September 2002 \$350,000

**ANSTO**

Dr M.C. Ridgway  
Access to Major Research Facilities Program  
EXAFS Characterisation of Implantation-induced Disorder  
in Compound Semiconductors  
April 2001 \$7,470  
December 2001 \$10,300

Dr M.C. Ridgway  
Australian Synchrotron Research Program  
Diffraction and EXAFS Measurements of Metal-decorated  
Nanocavities in Si  
May 2001 \$6,870  
EXAFS Measurements of Amorphised Compound  
Semiconductors and Nanocrystals in SiO<sub>2</sub>  
October 2001 \$6,690



**DETYA (ARC Fellowships)**

Dr H.H. Tan  
QEI Research Fellowship  
Growth, Characterisation and Fabrication of GaInNAs Lasers  
May 2001 – May 2006 \$357,590

Dr Y.J. Wong-Leung  
Australian Postdoctoral Research Fellowship  
January 1998 – December 2001 \$164,000

Dr H. Timmers (jointly with NP)  
Australian Postdoctoral Research Fellowship  
June 1999 – June 2002 (resigned in July 2001) \$174,576

Dr P.N.K. Deenapanray  
Australian Postdoctoral Research Fellowship  
July 2001 – June 2004 \$168,702

**DETYA (ARC Large Grants)**

Dr Y. Chen  
Formation Mechanism of Boron Nitride Nanotubes produced by Reactive Ball Milling  
2000 – 2002 \$210,563

**University of Newcastle**

(ANU participant)  
Dr M. Petracic  
Surface Analysis using a Free Electron Laser  
1999 – 2002 \$120,000

**University of New South Wales**

(ANU participant)  
Professor C. Jagadish  
Quantum Well Intermixing in InP Based Optoelectronic Materials & Devices  
1999 – 2001 \$223,000

**University of Sydney**

(ANU participant)  
Professor J.S. Williams  
Characterisation of Structural Defects in Ion-beam processed III-V Nitrides  
2001 – 2003 \$208,126

**DETYA (SPIRT)**

Professor J.S. Williams  
Indentation Studies of Semiconductor Thin Films  
January 1999 – January 2002 \$62,268  
Australian Scientific Instruments contribution \$15,000

**DISR**

Professor J.S. Williams  
Technology Diffusion Program  
Harnessing Materials Research & Development Resources  
2000 – 2001 \$113,000

Dr M. Petracic  
Access to Major Research Facilities Program  
Selective Photo-desorption of Hydrogen from Hydrogenated GaAs Surfaces  
August 2001 – September 2001 \$5,120

**DSTO**

Dr H.H. Tan & Professor C. Jagadish  
*Optoelectronic Device Processing*  
1999 – 2002 \$50,000

**French Embassy, Canberra**

Dr M.C. Ridgway  
*Nanocavity Evolution under Ion Irradiation* in collaboration with CNRS, France  
2001 \$3,685

**Stanley Melbourne Bruce Science & Industry Fund**

Professor J.S. Williams  
Protection of IP in respect of an Optoelectronics Materials Opportunity  
February 2000 – February 2002 \$60,000

**University of Adelaide**

Australian-German Joint Research Co-Operation Scheme  
Dr M.C. Ridgway  
Application of the Perturbed Angular Correlation Technique for the Microstructural Identification of Implantation Induced Disorder in Compound Semiconductors  
July 2001 – December 2002 \$10,920

**Laser Physics Centre**

**ABB Transmission and Distribution Pty Ltd & Transgrid**  
Professor B. Luther-Davies *et al*  
High Voltage Optical Fibre Sensing  
April 2001 – March 2002 \$120,000

**Defence Advanced Research Project Agency, USA**

Professor N. B. Manson, Professor M.S. Scully and Dr P. Hamer  
Texas A & M University

Spin –Based Lattice –Gas Quantum Computers in Solids  
Using Optical Addressing  
October 2001 – October 2004 US\$80,000

**DETYA (ARC Fellowship)**

Dr M.J. Sellars  
Australian Postdoctoral Research Fellowship  
February 1998 – January 2001 \$164,000

**DETYA (ARC Large Grant)**

Dr. K.G.H. Baldwin and Dr. B.R. Lewis (AMPL) (Also listed under AMPL)  
Pulsed Nonlinear-Optical Spectroscopic Sources: Tunable Narrowband and Multiwavelength Applications  
January 2000 – December 2002 \$153,000  
(Held jointly with Macquarie University)

**DETYA (ARC IREX)**

Dr Olivier Uteza  
Ultrafast Laser Ablation & Deposition of Thin Films  
June 2001 – May 2002 \$63,000

**DETYA (SPIRT)**

Dr M Lederer  
Short Pulse Laser for Ranging Applications Incorporating Semiconductor Saturable Absorber  
June 1999 – June 2002 \$151,223  
(ElectroOptic Systems Pty Ltd contribution) \$45,000

**DISR**

Professor B. Luther-Davies *et al*  
Grant for Australian Photonics Cooperative Research Centre  
April 1992 – June 2001 \$3,906,390  
July 2001 – March 2002 \$75,244  
(with further funds until June 2006)

**DISR (Scientific Visits to Europe)**

Dr. K.G.H. Baldwin  
High Resolution XUV Laser Spectroscopy  
July 2000 – June 2001 \$7,850

**DSTO**

Dr M. Sellars  
Real-time Optoelectronic Spectrum Analyser System  
April 2001 – May 2001 \$36,000

**Redfern Polymer Optics Pty Ltd**

Professor B. Luther-Davies *et al*  
Polymer Waveguides & Integrated Optics  
May 2001 – June 2002 \$746,100

Professor B. Luther-Davies *et al*  
Industry funded PhD scholarship  
October 2001 – October 2004 \$90,000

**University of Adelaide**

Australian-German Joint Research Co-Operation Scheme  
Dr A. Rode  
Sub-Picosecond Laser Deposition of Optical Films  
July 2001 – December 2002 \$18,000

**Nuclear Physics****DETYA (ARC Fellowships)**

Dr M. Dasgupta  
QEI Research Fellowship  
April 1998 – March 2003 \$360,000

Dr C.R. Morton  
Australian Postdoctoral Research Fellowship  
June 2000 – June 2003 \$179,769

Dr H. Timmers (jointly with EME)  
Australian Postdoctoral Research Fellowship  
June 1999 – June 2002 (resigned in July 2001) \$174,576

**DETYA (RIEF)**

Dr A.E. Stuchbery  
Partners: A/Professor D.H. Chaplin (University of New South Wales), Dr A.P. Byrne (ANU, The Faculties), Professor H.H. Bolotin (University of Melbourne)  
Hyperfine Interactions Spectrometer for Probing Dynamic and Static Atomic Environments  
March 2001 – March 2002 \$200,000

**Optical Sciences Centre****News LTD**

Professor A W Snyder  
*Contribution to Research* (Centre for the Mind)  
July 1998 – June 2001 \$150,000

**US Army Research Office (Far East)**

Professor N. Akhmediev  
Four Wave Mixing in Dispersion Managed Optical Fiber Links  
March 2001 – February 2002 \$20,000

**Plasma Research Laboratory****Australian Academy of Sciences**

Dr M.G. Shats  
Comparative Studies in Stellarator Transport  
July 2000 – June 2001 \$5,225

**ADEFA**

Professor R. Boswell  
Wedge Contract  
January 2001 – December 2001 \$13,750

**DETYA (ARC Large Grant)**

Associate Professor B. James (U. Sydney), Dr J. Howard and Professor S. Buckman  
LIF Measurement of Plasma E Field  
2000 – 2002 \$250,000  
(Held jointly with University of Sydney)

**DETYA (RIEF)**

Professor J.H. Harris and Dr G. Borg  
Development of Novel Systems for Wireless Communications and Radar  
January 2001 – December 2001 \$150,000

**DETYA (SPIRT)**

Dr G. Borg, Professor J.H. Harris, Dr N.M. Martin, Dr D. Thorncraft and Mr L. Lungu  
CEA Technologies and Neolite Neon  
The Application of Plasma Antennas to Communications and Radar  
June 2000 – May 2002 \$62,466  
CEA Technologies Pty Ltd component \$15,000

**DISR (MNRF)**

Professor J.H. Harris *et al*  
National Plasma Fusion Research Facility  
December 1995 – December 2001 \$8,700,000

**DSTO**

Dr G. Borg, Professor J.H. Harris, and Dr N.M. Martin  
Research Agreement  
Production of a Demonstration Plasma Antenna  
May 2000 – March 2001 \$37,000

**MOTOROLA Inc (USA)**

Professor J.H. Harris and Dr G. Borg  
Application of Plasma Switches to Mobile Personal Communication Systems  
June 2000 – June 2002 \$27,413  
MOTOROLA Postgraduate Scholarship  
Professor R. Scheer and Mr P.Linaridakis  
June 2000 – June 2002 \$30,000

**Theoretical Physics****Australian Academy of Science**

Dr A. S. Kheifets (jointly with AMPL)  
Travelling Fellowship to Germany  
July 2001 – December 2002 \$9,000

**Australian Partnership for Advanced Computing**

Dr C.H. Chung  
Modelling Biological Ion Channels  
March 2001 – March 2002 \$71,428

**DETYA (ARC Fellowships)**

Dr R. Ball  
Australian Postdoctoral Research Fellowship  
June 2000 – June 2003 \$177,009

Dr M. Hoyles  
Australian Postdoctoral Research Fellowship  
June 2000 – June 2003 \$166,131

**Japan-Australia Collaboration Fund**

Dr R. Ball  
Visit to National Institute for Fusion Science, Japan  
March 2001 \$3,970

**School Services****Vice Chancellor's Plan for Growth**

Recruitment and Training of Technical Staff  
January 2001 – December 2003 \$157,500

**General Endowments**

*Donation from Personal Estate*  
June 1997 – indefinite \$183,000

**Named Scholarships and Prizes**

*Jagadishwar Mahanty Prize* \$14,500



## Applied Mathematics

### Dr A. Christy

Editorial Board, *Mineralogical Magazine*, UK

### Dr T. Senden

Member, Board, Australian Science Olympiads

### Dr A. Stewart

Vice President (Academic), Treasurer, ANU Branch, National Tertiary Education Union

Member, ACT Division Council, National Tertiary Education Union

**Professor S. Marcelja** spent two months at the Rudjer Boskovic Institute, Zagreb, Croatia, as a guest of the Ministry of Science and Technology, in order to help with science policy formulation.

As member of the UNESCO World Commission on Ethics of Scientific Knowledge and Technology, **Professor B. Ninham** attended the second meeting of the Commission in Berlin from 19–20 December, and the inaugural meeting of the Nordic Countries Node point of the RENEW (Research and Education Network on Ethics of Water) in Bergen in August. (The first Node point of this world network which deals with the problems of the world in water was set up by Ninham at ANU). During his invited stay at Malmö University, he set up the Swedish contribution to RENEW called SWEDEN (Sciences of Water, Education, Development and Ethics Now). This is a completely different concept in international university education focussed entirely on water. It is expected that the ANU will exchange students within this program.

## Atomic and Molecular Physics Laboratories

### Professor S.J. Buckman

Member, General Committee, International Conferences on the Physics of Electronic and Atomic Collisions (ICPEAC)

Member, Organising Committee, 12<sup>th</sup> Gaseous Electronics Meeting, Murrumbidgee Resort, NSW

Member, International Scientific Committee, International Symposium on Electron-Molecule Collisions and Swarms, Nebraska, USA

Member, Executive Committee, Gaseous Electronics Conferences, USA

Member, International Scientific Committee, Symposium on the Physics of Ionized Gases, Yugoslavia

### Professor L.T. Chadderton

Founding Editor, *International Journal of Radiation Effects and Defects in Solids*

Member, Editorial Advisory Board, *Nuclear Tracks and Radiation Measurement*

Member, Editorial Advisory Board, *International Materials Science Forum*

Member, Steering Committee, Bilateral Science & Technology Agreement, Mexico and the Federal Government of Australia

Member, United Nations Committee on Photovoltaic Applications in Less-developed Countries, UN Centre for Science & Technology for Development

Member, International Committee, Biennial Conference Series on Radiation Effects in Insulators

Member, International Committee, Biennial Conference Series on Particle Tracks in Solids

Member, International Committee, Biennial Conference Series on Quantum Electrodynamics and Statistical Physics

Member, Advisory Committee, 1st Australian Workshop on Nanotubes and Fullerenes

### Professor R.W. Crompton

Convenor, ACT Chapter, Australian Fulbright Association

Member, International Advisory Board, International Conferences on Atomic and Molecular Data and their Applications

Chair of Board, National Youth Science Forum

### Dr S.T. Gibson

Honorary Member and Web Membership Database Administrator, Australian Optical Society

### Dr B.R. Lewis

Member, International Advisory Board, International Conferences on Vacuum Ultraviolet Radiation Physics

Chairman, 14<sup>th</sup> International Conference on Vacuum Ultraviolet Physics, Cairns, 2004

Associate Editor, *Journal of Quantitative Spectroscopy and Radiative Transfer*

### Professor E. Weigold

Member, Board, Australian Photonics CRC

Member, Board, CRC for Functional Communication Surfaces

Member, International Scientific Committee, International Conferences on X-Ray and Inner Shell Processes

Member, International Scientific Advisory Committee, International Symposium on (e,2e) Double Photoionization and Related Topics, Rolla, USA

Member, International Organizing Committee, Sagamore (International Conference on Charge, Spin and Momentum Densities)

Member, Nominating Committee, American Physical Society Few-Body Topical Group

Member, Australian Academy of Science Committee, Major National Research Facilities

Director, Acton Lasers

Member, Advisory Committee, LPMC, Institut de Physique

## Director's Unit

### Professor J.D. Love

Senior Vice-President Education, Photonics Institute

Member, Council, Australian Optical Society

Member, ACT Government Information Industry Development Board

Honorary Ambassador for Canberra

Program Manager, Photonic Integrated Circuits, Australian Photonics CRC

Deputy Chair, 2002 Congress of the Australian Institute of Physics, Sydney

Member, Executive Committee, Australian Photonics CRC

Member, Executive Committee, Photonics Institute

Director, Siemens Science & Engineering Experience ANU

Chair, Program Reference Group, Canberra Institute of Technology

Co-Chair, Opt-Electronics Communications Conference, Integrated Optics & Optical Communications Conference and Australian Conference on Optical Fibre Technology, Sydney, 2001

### Professor Yu.S. Kivshar

Associate Editor, *Physical Review E*

Member, Advisory Board, *CHAOS: An Interdisciplinary Journal of Nonlinear Science*

Guest Editor, *Special Issue of CHAOS: Nonlinear Localized Modes: Fundamental Concepts and Applications*

Guest Editor, *IEEE Journal of Selected Topics in Quantum Electronics on Nonlinear Optics*

Member, Advisory Board, Fitzroy Dearborn Encyclopedia of Nonlinear Science

Member, Program Committee, International Workshop on Optical Solitons: Theory and Experiment, Chennai, India, January 2002

Reader and Referee, Australian Research Council

Co-chair of Program Committee, OSA Topical Meeting on Nonlinear Guided Waves and Applications, Clearwater, Florida, USA, April 2001

General Co-chair, OSA Topical Meeting on Nonlinear Guided Waves and Applications, Sresa, Italy, September 2002

Member, Technical Program Committee, SPIE Symposium on Optical Pulse and Beam Propagation, San Jose, January 2001

Chair and Organizer, International Workshop and Winter School: Photonic Crystal Down Under, Canberra, August 2002

## Electronic Materials Engineering

### Dr R.G. Elliman

Vice-President, Australian Institute of Physics

Member, International Committee, International conference on Ion Beam Modification of Materials

Member, International Committee, International conference on Ion Beam Analysis

Member, International Committee, International conference on Atomic Collisions in Solids

Chair, International Conference on Ion Beam Analysis, 15–20 July 2001

Chair, AINSE National Conference on Nuclear Techniques of Analysis, 2001

Member, Editorial Board, *Nuclear Instruments and Methods B*, Elsevier, Amsterdam

Member, ACT Branch Committee, Australian Institute of Physics

Member, Governing Council, Electronic Materials and Processing Division, International Union of Vacuum Science Techniques and Applications

Member, AINSE Accelerator Science Specialist Committee

Member, Program Review Committee, ANSTO Accelerator Applications Affinity Area

Member, External Advisory Committee, Microanalytical Research Centre (MARC), School of Physics, Melbourne University

### Professor N.H. Fletcher

Editor, *Acoustics Australia*

Associate Editor, *Journal of the Acoustical Society of America*

Member, Editorial Board, *Journal of Sound and Vibration*

Member, Editorial Board, *Applied Acoustics*

Member, Editorial Board, Institute of Physics/Springer-Verlag Monograph Series, *Modern Acoustics and Signal Processing*

Member, Scientific Advisory Committee, Australian National Acoustic Laboratories

Member, International Scientific Advisory Board, International Symposium on Musical Acoustics (Perugia, Italy, September 2001)

### Professor C. Jagadish

Member, Editorial Board, *Journal of Nanoscience and Nanotechnology*

Member, Review Committee, Gigatech Facility, CSIRO Telecommunications & Industrial Physics

Chair, IEEE Australian Chapter, Electron Devices and Lasers & Electro-Optics Societies

Chair, Optoelectronic Devices Technical Committee, IEEE Electron Devices Society, USA

Member, Elected Member of Administrative Committee, IEEE Electron Devices Society, USA

Member, IEEE Compound Semiconductor Devices and Circuits Technical Committee, Electron Devices Society, USA

Member, IEEE Electron Devices Society Meetings Committee, USA

Member, Nanotechnology Technical Committee, IEEE Electron Devices Society, USA

Member, International Scientific Committee, Symposium on Materials for Opto-electronics and High Frequency Electronics, International Conference on Materials for Advanced Technologies (ICMAT-2001), 16 July 2001, Singapore

Member, Program Committee, Optoelectronic Materials and Processing, The 14<sup>th</sup> Annual Meeting of the IEEE Lasers and Electro-Optics Society, San Diego, USA, 12–15 November 2001

Member, Advisory Board, Australian Workshop on Nanotubes and Fullerenes, Canberra, 3–4 May 2001

Co-Chair, Optoelectronic Devices Technical Committee, The 11<sup>th</sup> International Workshop on Physics of Semiconductor Devices, New Delhi, India, 11–15 December 2001

Member, Program Committee, Symposium on Quantum Dot Sources and Detectors, SPIE International Symposium on Optoelectronics 2002, San Jose, USA, 20–25 January 2002

Member, Steering Committee, The 23<sup>rd</sup> International Conference on Microelectronics, Nis, Yugoslavia, 12–15 May 2002

Member, Program Committee, The 8<sup>th</sup> International Conference on Electronic Materials, Xian, China, 10–14 June 2002

Co-Chair, Symposium on Materials and Technologies for Electronic and Optoelectronic Devices, The 8<sup>th</sup> International Conference on Electronic Materials, Xian, China, 10–14 June 2002

Chair, International Advisory Committee, 12<sup>th</sup> International Semiconducting and Insulating Materials Conference, July 2002, Bratislava, Slovakia

Member, Program Sub-Committee on "Active and Compound Semiconductor Devices", The Integrated Photonics Research Conference (IPRC 2002), Vancouver, Canada, 17–19 July 2002

Member, Scientific Advisory Committee, 2002 Conference on Optoelectronic and Microelectronic Materials and Devices, Sydney, Australia, 9–13 December 2002

Member, International Advisory Committee, COBRA, Inter University Research Institute for Communications Technology, Eindhoven University of Technology, The Netherlands

Member, Advisory Committee for the Centre for Materials Technology, University of Technology, Sydney

Member, Program Committee, 12<sup>th</sup> International Semiconducting and Insulating Materials Conference, July 2002, Bratislava, Slovakia.

Professional Adviser, LEDEX Corporation, Taiwan

Director, Acton Semiconductors Pty Ltd

### Dr M. Petracic

Member, Program Committee and Organising Committee, 15<sup>th</sup> International Conference on Ion Beam Modification of Materials, Cairns, 2001

### Dr M.C. Ridgway

Member, Organising Committee/Program Committee, 15<sup>th</sup> International Conference on Ion Beam Analysis

Member, Organising Committee/Program Committee, 14<sup>th</sup> International Conference on Vacuum Ultraviolet Radiation Physics

Member, Photon Factory Specialist Committee, Australian Synchrotron Research Program

Member, National Scientific Advisory Committee, Australian Synchrotron Project

Evaluator, Foundation for Research Development (South Africa) – Evaluation of Research Outputs of Principal Grant Holders

### Dr H.H. Tan

Vice Chair, IEEE ACT Section

Treasurer, IEEE ACT Section

### Dr N.J. Welham

Associate Editor (Metallurgy), *Proceedings of the Australasian Institute of Mining and Metallurgy*

Committee Member, Canberra Branch, Australasian Institute of Mining and Metallurgy

Program Director, Canberra Branch, Australasian Institute of Mining and Metallurgy

Returning Officer, IEEE (ACT)

Consultant to Gold Mines of Sardinia, Intec Ltd, Metal Mining Agency of Japan, Pasminco and Queensland Tantalite

### Professor J.S. Williams

President, Australian Materials Research Society

Member, International Advisory Committee, International Conference Series on Ion Beam Analysis

Member, International Advisory Committee, International Conference on Ion Implantation Technology

Member, Adhering Body Commission, International Union of Materials Research Society

Member, Editorial Board, *Radiation Effects and Defects in Solids*

Member, Advisory Board, *Applied Physics Reviews*

External Member, Advisory Board, Strategic Program in Functional Materials, ANSTO

Professional Advisor, LEDEX Corp, Taiwan

Director, Acton Semiconductors Pty Ltd

## Laser Physics Centre

### Dr K.G.H. Baldwin

Member, International Council on Quantum Electronics

Member, General Organising Committee, International Conference on Laser Spectroscopy 2003

Chair, Australian Conference on Optics, Lasers and Spectroscopy Liaison Committee

Member, National Committee for Spectroscopy, Australian Academy of Science

Member, National Committee for Physics, Australian Academy of Science

Chair, Science Policy Committee, Federation of Australian Scientific and Technological Societies

Member, ACT Branch Committee, Australian Institute of Physics

Member, Science Policy Committee, Australian Institute of Physics

Member, Australasian Council on Quantum Electronics

### Dr M. Lederer

Member, ACT Section Committee, IEEE

### Professor B. Luther-Davies

Director, Research, Australian Photonics CRC

Member, Executive and Board, Australian Photonics Pty Ltd

Member, DISR Australian Nanotechnology Delegation to Japan and Korea, 8–16 July 2001

Member, Organizing Committee, LEOS 2001

### Professor N. B. Mansson

Member, International Advisory Committee, International Conference on Luminescence

Member, International Advisory Committee, International Conference on Dynamical Processes in Excited State of Solids

**Dr M. Samoc**

Member, Editorial Board, *Photonics Science News*

## Nuclear Physics

**Dr A.P. Byrne**

Member, ACT Branch Committee, Australian Institute of Physics

Member, Committee (Sec/Treasurer), Nuclear and Particle Physics Group, Australian Institute of Physics,

Participant, Adopt-a-Physicist Program, ACT Branch, Australian Institute of Physics

Member, Organising Committee, 19<sup>th</sup> AINSE Nuclear and Particle Physics Conference, Sydney, July 2002

**Dr M. Dasgupta**

Member, ACT Branch Committee, Australian Institute of Physics

Participant, Adopt-a-Physicist Program, ACT Branch, Australian Institute of Physics

Member, Committee, Nuclear and Particle Physics Group, Australian Institute of Physics

**Dr L.K. Fifield**

International Member, AMS Strategy Group, UK Natural Environment Research Council

Member, ACT Radiation Council

**Professor G.D. Dracoulis**

Member, Committee, Nuclear and Particle Physics Group, Australian Institute of Physics

Member, 19<sup>th</sup> AINSE Nuclear and Particle Physics Program Committee, (in association with the AIP Congress), Sydney, July 2002

Member, International Advisory Committee, Conference on Nuclear Structure, Crete, July 2001 & 2002

Member, North America Committee, Australian Academy of Science, International Program of Scientific visits

Member, Program Advisory Committee of the 88-inch Cyclotron (including Gammasphere), Lawrence Berkeley National Laboratory, May 2000 – 3-year term

Member, International Scientific Advisory Committee, International Nuclear Physics Conference INPC 2001, Berkeley, July 2001

ANU Representative, Engineering and Physical Sciences Research Council (UK), ANU-EPSRC Agreement: Beam Time Allocation

Referee, Engineering and Physical Sciences Research Council (UK), Senior Research Fellowship Scheme

Expert Referee, Engineering and Physical Sciences Research Council (UK), Research Grants; Nuclear Physics Programme

Expert Reviewer, University of Sydney, ARC Small Grants

Evaluator, Foundation for Research Development (South Africa) – Evaluation of Research Outputs of Principal Grant Holders

Reader, Physical and Earth Sciences, Australian Research Council

**Dr D.J. Hinde**

Member, International Advisory Committee, Eighth International Conference on Nucleus-Nucleus Collisions, Moscow, 2003

**Dr A.E. Stuchbery**

Member Committee and Social Secretary, ACT Branch, Australian Institute of Physics

Chair, Nuclear and Particle Physics Group (NUPP), Australian Institute of Physics

Member, 19<sup>th</sup> AINSE Nuclear and Particle Physics Program Committee, (in association with the AIP Congress), Sydney, July 2002

Supervisor, student projects, CSIRO Student Research Scheme

Reader, Physical, Chemical and Earth Sciences, Australian Research Council

**Professor S.R. Taylor**

Associate Editor, *Meteoritics and Planetary Science*

Member, Publications Committee, The Meteoritical Society

Member, Planning Committee for exhibition "Journeys into Space", National Museum of Australia, December 2001

Member, House Committee, Australian Academy of Science

## Plasma Research Laboratory

**Dr G.G. Borg**

Editor, *Czech Journal of Physics*

**Professor R.W. Boswell**

Vice-President, Member, Committee for the Gaseous Electronics Meeting

Member, Asia Pacific Conference on Plasma Science and Technology

Co-Chairman, 12<sup>th</sup> Gaseous Electronics Meeting

Member, Forum for Europe and Australian Science and Technology.

**Mr S. Collis**

Participant, Adopt-a-Physicist Program, ACT Branch, Australian Institute of Physics

**Mr F. Glass**

Participant, Adopt-a-Physicist Program, ACT Branch, Australian Institute of Physics

**Professor J.H. Harris**

Member, Stellarator Physics Advisory Committee, Princeton Plasma Physics Laboratory, Princeton, USA

Member, Plasma Specialist Committee, AINSE

Member, Executive Committee for the International Energy Agency Implementing Agreement for Research on Stellarators

Chairman, 13th International Stellarator Workshop, Canberra, Australia

**Dr J. Howard**

Member, Plasma Specialist Committee, AINSE

**Dr M.G. Shats**

Member, 11<sup>th</sup> International Congress on Plasma Physics, Program Committee

## Theoretical Physics

**Dr R. Ball**

Committee Member, Minutes Secretary, ACT Branch, Australian Institute of Physics

**Professor R.J. Baxter**

Member, Editorial Board, *Journal of Geometric and Functional Analysis*

Member, Advisory Board, *Physica A*

Member, Editorial Board, *Annals of Combinatorics*

Member, Editorial Board, *Theoretical Physics and Related Mathematics*

Chair, Board, Australian National University Centre for Complex Systems

Senior Fellow, Asia-Pacific Center for Theoretical Physics, Seoul, Korea

**Dr M.P. Das**

Member, Editorial Board, *Condensed Matter and Materials Communications*

Co-Convenor, Annual Gordon-Godfrey Research Workshop on Condensed Matter Physics

Co-Convenor, International Conference on Science and Technology of Nanostructured Materials, Puri, India

Chair, Organising Committee, The 25<sup>th</sup> International Workshop on Condensed Matter Theories and 11th Gordon Godfrey Condensed Matter Workshop, Canberra

**Professor R.L. Dewar**

Member, Commission 16, International Union of Pure and Applied Physics

Member, National Committee for Physics

Member, Editorial Board, *Australian Journal of Physics* (now defunct)

Member, ACT Branch Committee of the Australian Institute of Physics

Associate Editor, *The Physicist for the ACT*

Chair, International Congress on Plasma Physics, July 2002

Member, Local Organising Committee, World Space Environment Forum, July 2002

**Dr H.J. Gardner**

Australian Representative, IUPAP Commission on Computational Physics (C20)

**Dr M. Gulacsi**

Associate Editor, *Philosophical Magazine*

Deputy Director General, International Biographical Center, UK

**Dr K. Kumar**

Member, Editorial Board, *The Journal of Transport Theory and Statistical Mechanics*

**Dr S. Kuyucak**

Convenor, Physics Summer School on Biophysics, 15–26 January 2001, ANU

**Dr B.A. Robson**

Member, Organising Committee, 19<sup>th</sup> AINSE Nuclear and Particle Physics Conference, Sydney, 7–11 July 2001

**Dr M. Walker**

Participant, Adopt-a-Physicist Program, ACT Branch, Australian Institute of Physics





**Founder's Day** was held on 12 October with invited guests from the ANU, government organisations, industry and the media, as well as former employees. It is a day of celebration of our Founder, Sir Mark Oliphant. The following members of staff were Founder's Day speakers:

**Professor Allan Snyder**, Centre for the Mind and Optical Sciences Centre

*Switching on Hidden Skills by Turning off Part of the Brain*

**Mr Tony Cullen**, Electronics Unit

*Coping with Noise by Visiting a Tropical Island*

**Dr Anatoli Kheifets**, Theoretical Physics

*Reaction Microscope, Photon Factory and Few Simple Formulas*

**Dr Wayne Solomon**, Plasma Research Laboratory

*Fluctuations: The Bigger they are the Harder they Fall*

**Dr Andrew Stewart**, Applied Mathematics

*Why doesn't the Universe Collapse into a Black Hole?*

**Dr Nanda Dasgupta**, Nuclear Physics

*Spiralling into the Future*

**Dr Julian Lower**, Atomic and Molecular Physics Laboratories

*Probing the World of Atoms*

**Ms Jodie Bradby**, Electronic Materials Engineering

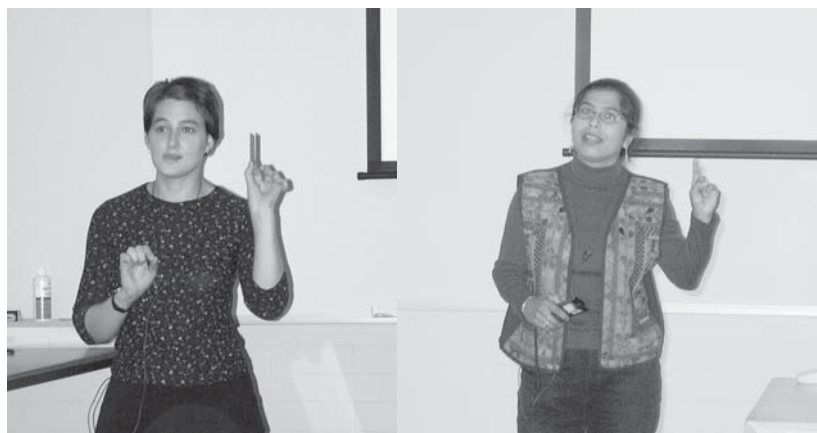
*Silicon under Stress*

**Dr Elena Ostrovskaya**, Director's Unit

*On Solitons, Necklaces and Propellers*

**Professor Neil Manson**, Laser Physics Centre

*Superman v Diamond*



Jodie Bradby and Nanda Dasgupta present Founders Day talks

**The Australian Institute of Physics "Adopt-a-Physicist" Program.** Now in its fourth year of operation, the ACT AIP "Adopt a Physicist" program visited ten ACT Secondary Colleges. Dr Ken Baldwin (LPC) who implemented the program was assisted by Dr Aidan Byrne (NP) and Dr Nanda Dasgupta (NP). Students participating in the program included Elliot Fraval (LPC), Vanessa Leung (AMPL), Penelope Lever (EME), Ed Roberts (AMPL) and Anthony Searle (Physics, Faculties)

### **The Australian Industrial Development Corporation Forum**

The Plasma Research Laboratory hosted a visit by a number of students attending the Australian Industrial Development Corporation Forum from 6–21 January. Students undertook hands-on experiments in both the Toroidal and Space Groups of the Laboratory.

### **The Australian Nuclear Science and Technical Organisation**

The Plasma Research Laboratory hosted a visit by a group of twelve engineers from The Australian Nuclear Science and Technical Organisation in January. During this visit, the engineers were taken on a tour of the H-1 Facility and took this opportunity to have discussions with Plasma Research Laboratory academic and technical staff.

## Wedge

Following an invitation by the Conference organizers, Peter Alexander, Orson Sutherland, James Constable and Rod Boswell demonstrated the WEDGE at the OZeCulture Conference in the Sofitel, Melbourne, 13–14 June.

Peter Alexander and Rod Boswell (PRL) demonstrated the WEDGE at the Apple Users Consortium, Academic and Developers Conference 2001, held in Townsville from 23–26 September

## National Youth Science Forum

The Forum provides a unique experience for year-11 students to visit the School and meet with leading scientists and tour the laboratories and major national research facilities. This year 160 students visited the School in two sessions from 8–11 and 22–25 January, and tours were conducted by Dr Tim Thompson, PR Unit. The help of the following staff members and students from various departments was very much appreciated: Dr Vince Craig (AM); Dr Maarten Vos (AMPL); Dr Mladen Petracic, Dr Jenny Wong-Leung, Mr David Brett, Mr Sanju Deenapanray and Mrs Lan Fu (EME); Dr Aidan Byrne, Dr Nanda Dasgupta and Dr Greg Lane (NP); and Professor Jeff Harris (PRL).

## National Science Week

Professor J.D. Love of the Director's Unit gave a talk on photonics entitled *The Future is Bright* at the National Science Festival, Canberra Convention Centre, on 5 May. He also gave promotional talks about photonics to: 25 fourth year Electrical Engineering students at Curtin University of Technology in Perth on 14 May; 50 graduate students at the Gwangju Institute of Science and Technology, Korea, on 11 September; 85 year-9 students at ANU during the Siemens Science & Engineering Experience, and 50 first year Physics students in the Faculties at ANU on 18 October. He was a member of the adjudication panel at Lidcombe TAFE judging presentations by final year students in telecommunications.

## Siemens Sciences and Engineering Experience

The 2001 Siemens Sciences and Engineering Experience was conducted for students entering Year 10 in 2001. See page 75 for details.

## Australian Science Festival.

The School was, as usual, a contributor to the ANU stand at the Australian Science Festival. The ANU theme this year was DNA and genetics so the School developed a display based on the theoretical DNA packing work done by Dr David Williams of Applied Maths. The Display consisted of two lengths of flexible tube of differing stiffness, that students attempted to wrap around pegs. The flexible tube curls into a ball like flexible polymers such as polystyrene. The stiffer tube, like DNA, forms a torus or doughnut shape.

## Other Outreach

Interaction with local schools has continued this year with Dr Aidan Byrne (NP) presenting several tours of the School's Heavy-Ion Facility to a group from Narrabundah College. He also presented a talk to the Wanniasa School on *Crystals* designed for younger students and supervised a student project for the Narrabundah College IB program.

Dr Keith Fifield organised and presented a 3-hour laboratory session on *Accelerator Mass Spectrometry* for the Australian Defence Force Academy's (ADFA) Environmental Physics course. He also gave a guest lecture on the nuclear fuel cycle as part of the ADFA third year Nuclear and Particle Physics course.

Dr Andrew Stuchbery gave a seminar at University College ADFA, UNSW on *Hyperfine Interactions in Ion-implantation and Nuclear Physics* on 30 April.

Dr S. Kuyucak gave a 12-lecture course on *Ion-channels* in Okazaki National Research Institutes, Japan.



Students explore the implications of stiffness in polymers such as DNA at the Science Festival

## Workshops and Conferences

### Applied Mathematics

**Applied Mathematics Kioloa Workshop**, 24–28 October, 2001. Three days of talks by all Department staff and students, plus invited guests from Sydney and Melbourne.

### Electronic Materials Engineering

**Australian Workshop on Nanotubes and Fullerenes (AWN2001)**, 3–4 May, ANU, Canberra. The workshop received sponsorships from the Department of Theoretical Physics, the Electron Microscopy Unit, the Department of Engineering, ANU, and Particle and Surface Sciences Pty Ltd, NSW.

Dr Y. Chen was the Workshop Chair. Topics covered theory, synthesis, property and application of nanotubes and fullerenes. Invited international speakers included Professor D. Tomanek (USA), Professor H.M. Cheng (China) and Dr D. Golberg (Japan). The workshop attracted 50 participants and 35 presentations.

### 15<sup>th</sup> International Conference on Ion Beam Analysis, Incorporating the 12<sup>th</sup> AINSE Conference on Nuclear Techniques of Analysis, 15–20 July, Cairns

The 15th International Conference on Ion Beam Analysis (IBA) was held in Cairns between 15-20 July 2001. The conference was chaired by Prof. Rob Elliman and was extremely successful with over 230 participants and an additional 40 accompanying persons. The conference ran over 5 days during which 290 scientific papers were presented in oral and poster sessions. The conference proceedings contained was subsequently published in the Elsevier journal: Nuclear Instruments and Methods in Physics Research.

### Laser Physics Centre

**Quantum Optics and Bose Einstein Condensation Workshop**, ANU Field Station, Kioloa, December 9 - 11

The second in a series of workshops on Atom and Quantum Optics organised jointly between the School and the Physics Department, The Faculties was held in December as a satellite meeting following the Australasian Conference on Optics Lasers and Spectroscopy (ACOLS) in Brisbane. The linkage between the two fields was provided through a keynote presentation by Professor Mark Kasevich, the 2001 Frew Fellow of the Australian Academy of Science, who spoke on Quantum state manipulation in BEC. Other international speakers included Hideo Mabuchi (Caltech - quantum information and quantum feedback using atoms) and Juergen Eschner (Innsbruck - experiments with trapped ions for quantum logic). Around fifty participants from Australia and overseas enjoyed two days of presentations linking the two fields of atom and quantum optics.

### Nuclear Physics

The inaugural **Workshop in Nuclear Techniques** (24–28 September) was conducted for undergraduate students from the University of Wollongong and the Department of Physics, the Faculties. The Workshop provided a hands-on introduction to nuclear methods designed for students in the Bachelor Medical Physics Program at the University of Wollongong. Lectures in the workshop were presented by Drs Aidan Byrne, David Weissner, Greg Lane, Anna Wilson, David Hinde and Professor Rob Elliman. Fifteen students participated in an intensive five-day program that included experiments on the 14UD heavy-ion accelerator and the 5SDH accelerator. Topics covered included radiation safety, detector design and operation, isotope production, accelerator operation and Rutherford backscattering methods. The Workshop was highly successful and will become an annual event.





## Plasma Research Laboratory

The tragic events of 11<sup>th</sup> September 2001 led to the postponement of **The 13<sup>th</sup> International Stellarator Workshop** which was scheduled to be held at the Leonard Huxley Theatre, ANU from 25–29 September. The Workshop took place on 25<sup>th</sup> February–1 March, 2002. The Workshop attracted over 80 participants from a wide range of overseas institutions and a number of national delegates. Topics included recent experimental projects; transport and confinement improvement; MHD equilibrium and stability; turbulence and plasma heating; diagnostics; configuration optimisation; new devices and reactor studies.

## Theoretical Physics

**The 14<sup>th</sup> Canberra International Physics Summer School in Biophysics: From Proteins to Cells**, was held at the ANU from 15–26 January. Dr Serdar Kuyucak was the Convenor. The purpose of the School was to provide physics perspectives on the emerging molecular structure of biosystems for a broad audience with backgrounds in physics, chemistry and biology. Participants numbered 60 and lecturers 12. As always, the Summer School was visited by people from around the world.

A **Mini Summer School on Plasma Physics** was held from 29 January–2 February. The School was intended for senior undergraduates, graduate students and academic staff with interests in plasma science and technology and was supported by the Australian Institute for Nuclear Science and Engineering (AINSE). Lectures on “The Framework of Plasma Physics” were presented by Professor Hazeltine as well as a series of experimentally oriented lectures. The School was attended by 31 participants.

The **25<sup>th</sup> International Workshop of the Condensed Matter Theories** was held in conjunction with the **11<sup>th</sup> Gordon Godfrey Condensed Matter Research Workshop** in Belconnen during 3–7 December. The Workshop was an external activity of the Asia-Pacific Centre for Theoretical Physics. Dr Mukunda Das was the Chair of the Organising Committee.

The topics covered were in the currently researched areas of mesoscopic and strongly correlated systems including quantum liquids, boson condensates, superconductivity, superfluidity, and MonteCarlo simulations, etc. Forty-one invited talks were presented to 60 participants.

The Workshop was financially sponsored by the US Army Research Office, Asia Pacific Centre for Theoretical Physics, University of NSW, University of Melbourne, University of Wollongong, RSC (ANU) and RSPHysSE (ANU).

For more detailed information please refer to section “Centre for Complex Systems” on page 84



*Participants of the 14<sup>th</sup> Canberra International Physics Summer School in Biophysics*



*Participants of the 25<sup>th</sup> International Workshop of the Condensed Matter Theories and 11<sup>th</sup> Gordon Godfrey Condensed Matter Research Workshop*



## Visitors

### Applied Mathematics

Dr C. Arns, University of NSW  
Dr C. Neto, University of Florence, Italy  
Professor R. Netz, Max Planck Institute, Germany

### Atomic and Molecular Physics Laboratories

Dr E. Bieske, University of Melbourne  
Dr A. Dorn, Max Planck Institute for Nuclear Physics, Germany  
Professor H. Schmidt-Böcking, University of Frankfurt, Germany  
Dr J. Sternberg, High Energy Accelerator Research Organization, Japan  
Dr K. Ullman-Pfleger, University of Frankfurt, Germany

### Director's Unit

Dr A. Akulshin, University of Melbourne  
Mr M. Elias, ADC Australia Pty Ltd  
Professor A. Fetter, Stanford University, USA  
Professor E. Foerster, Friedrich-Schiller University, Germany (jointly with LPC)  
Professor J. Hullett, Curtin University  
Dr D. Liley, Swinburne University  
Professor L.C. Woods, Oxford University, UK  
Professor W. Zakrzewski, Durham University, UK

### Electronic Materials Engineering

Dr W. Assmann, University of Munich, Germany (jointly with NP)  
Dr S.L. Bai, Beijing University, China  
Dr A. Balogh, Darmstadt University of Technology, Germany  
Professor S. Bandyopadhyay, Virginia Commonwealth University, USA  
Mr W. Berky, Darmstadt University of Technology, Germany  
Professor H.M. Cheng, Chinese Academy of Science, China  
Professor J.A. Davies, Chalk River, Canada  
Ms T. Dessauvage, University of Bonn, Germany  
Dr A. Dowd, ANU (until January)  
Dr J. Evans-Freeman, University of Manchester Institute of Science & Technology, UK  
Dr B. Gallagher, University of Nottingham, UK  
Dr D. Golbert, National Institute of Materials Research, Japan  
Dr M. Janson, Royal Institute of Technology, Sweden  
Dr C. Jeynes, University of Surrey, UK (jointly with NP)  
Dr A. Kuznetsov, Royal Institute of Technology, Sweden  
Dr M. Linnarsson, Royal Institute of Technology, Sweden  
Dr R. Pal, University of Western Australia  
Professor G. Ross, INRS – Energie et Matériaux, Canada  
Professor D. Tomanek, Michigan State University, USA  
Dr A. Uddin, University of Canberra  
Professor H. Whitlow, University of Lund, Sweden

### Laser Physics Centre

Dr A. Boiko, Electro Optic Systems, Canberra  
Professor E. Foerster, Friedrich-Schiller University, Germany (jointly with DU)  
Mr R. McMurtie, University of Essex, UK  
Professor B.J. Orr, Macquarie University  
Dr D. Pulford, Defence Science & Technology Organisation, Canberra  
Professor M. Saffman, University of Wisconsin, USA  
Professor G. Stegeman, University of Central Florida, USA  
Dr O. Uteza, Université Aix-Marseille II, France

### Nuclear Physics

Dr W. Assmann, University of Munich, Germany (jointly with EME)  
Professor P. Barker, University of Auckland, NZ  
Dr A. Bruce, University of Brighton, UK  
Dr W. Catford, University of Surrey, UK  
Dr M. Carpenter, University of Tennessee, USA  
Dr N. Clarke, University of Birmingham, UK  
Dr N. Curtis, University of Birmingham, UK



Dr S. Fox, University of York, UK  
 Dr M. Freer, University of Birmingham, UK  
 Professor B. Fulton, University of York, UK  
 Professor P. Gomes, Universidade Federal Fluminense, Brazil  
 Dr D. Hartley, University of Tennessee, USA  
 Mr P. Jagpal, University of Birmingham, UK  
 Dr C. Jeynes, University of Surrey, UK (jointly with EME)  
 Dr G. Joshi, Bhabha Atomic Research Centre, India  
 Dr H. Jones, Middlesex University, UK  
 Dr M. Kassymzhanov, University of Kazakhstan, Kazakhstan  
 Dr F. Kondev, Argonne National Laboratory, USA  
 Dr D. Mahboub, University of Surrey, UK  
 Mr T. McGoram, Nuclear Physics  
 Dr M. Pfabe, Smith College, USA  
 Professor B. Phillips, University of Manchester, UK  
 Mr V. Pucknell, Daresbury Laboratory, UK  
 Dr M. Rizzoto, Universidade de Sao Paulo, Brazil  
 Professor A. Rozenfeld, University of Wollongong  
 Dr S. Tovey, University of Melbourne  
 Dr D. Varley, University of Keele, UK  
 Professor P. Walker, University of Surrey, UK  
 Dr D. Watson, University of York, UK  
 Dr C. Wheldon, University of Surrey, UK  
 Dr S. Yates, University of Kentucky, USA

### Plasma Research Laboratory

Dr M. Yokoyama, National Institute for Fusion Science, Japan  
 Professor I. Hutchinson, Massachusetts Institute of Technology, USA  
 Professor P. Diamond, University of California (San Diego), USA

### Theoretical Physics

Dr D. Adams, University of Queensland  
 Dr R. Austin, Princeton University, USA  
 Dr A. Ben-Shaul, Hebrew University, Israel  
 Professor E.H. Brandt, Max-Planck Institut für Metallforschung, Stuttgart, Germany  
 Dr R. Bursill, University of New South Wales  
 Dr H. Coster, University of New South Wales  
 Dr K. Dill, University of California (San Francisco), USA  
 Professor V. Flambaum, University of New South Wales  
 Dr P. Gooley, University of Melbourne  
 Professor R. Hazeltine, University of Texas at Austin, USA  
 Dr M.I. Heggie, University of Sussex, UK  
 Professor I.H. Hutchinson, Massachusetts Institute of Technology, USA  
 Dr B. James, University of Sydney  
 Professor T. Janssen, University of Nijmegen, The Netherlands  
 Dr P. Kollman, University of California (San Francisco), USA

Professor B. McKellar, University of Melbourne  
 Professor J.D. Meiss, University of Colorado, USA  
 Professor B. Nienhuis, University of Amsterdam, The Netherlands  
 Dr M. Parker, St. Vincent's Hospital, Melbourne  
 Professor J.J. Quinn, University of Tennessee, USA  
 Dr S. Sergeev, Joint Institute for Nuclear Research, Dubna, Russia  
 Dr J. Sternberg, High Energy Accelerator Research Organization, Japan  
 Dr J. Tuszynski, University of Alberta, Canada  
 Dr G.K. White, CSIRO, Sydney  
 Dr A. Zagoskin, University of British Columbia, Canada

### Government & Industry Delegations

14/2/2001 Defence and Industry Study Course (30)  
 21/2/2001 Brendan Smyth, ACT Deputy Chief Minister

### International Visitors & Delegations

23/3/2001 Mr Ashimzhan S. Akhmetov, Vice-Minister, Ministry of Education, Republic of Kazakhstan  
 2/5/2001 Mrs Lee-Ying Adams, Chief Operating Officer, Archon IP (Philippines, Malaysia, Singapore & Brunei Section)  
 25/7/2001 Galen K. Straub, Program Manager T-Division, Industrial & Technical Partnerships, Los Alamos National Laboratory, USA  
 28/9/2001 Dr Craig Dorman, Chief Scientist and Technical Director, Office of Naval Research, Europe  
 11/12/2001 Tsunenori Sakamoto and Koji Abe, National Institute of Advanced Industrial Science and Technology, Japan

### Colloquium Speakers

Convenor: Professor Yuri Kivshar

**Professor I. Oppenheim**, Massachusetts Institute of Technology, USA  
*Clusters in Glass-forming Liquids and Suspensions*

**Professor G. Stegeman**, CREOL, USA  
*Optical Spatial Solitons: An Experimental Overview*

**Professor M.J.G. Veltman** (1999 Nobel Laureate), Michigan State University, USA (retired)  
*Fact and Mysteries in Particle Physics*

**Professor D. Tomanek**, Michigan State University, USA  
*Unusual Phenomena in Quasi-1D Carbon Nanotubes*

**Professor L.C. Woods**, Mathematical Institute, Oxford, UK  
*Generation of Magnetic Fields in the Solar Convection Zone*

**Professor M. Kasevich**, Yale University, USA  
*Atom Interferometry with Ultra-cold Atoms*

National and  
International Links



## Postdoctoral Fellowship Completions and Destinations

### Atomic and Molecular Physics Laboratories

Dr Robert Gulley took up a position at the Department of Physics, University of Western Australia in February.

### Laser Physics Centre

Dr Matt Sellars completed his ARC Fellowship and has been appointed as a Fellow in the Laser Physics Centre.

### Nuclear Physics

Dr Paul Hausladen of the Accelerator Mass Spectrometry Group resigned his position as a Postdoctoral Fellow to take up a Postdoctoral Fellowship with the Physics Division, Oak Ridge National Laboratory, USA.