Research School of Physical Sciences & Engineering 1999

Commitment to Teaching



Dr Neil Manson -Associate Director (Students)

The School has a significant commitment to postgraduate training. In 1999 we had a total of 78 PhD students, including continuing students and those completing their thesis. A total of 12 postgraduate students commenced their program of study during the year and of those six are women; in fact, one third of postgraduate students formally enrolled in the School are women.

The School, in co-operation with the ANU Graduate School, organized various activities aimed at assisting the postgraduate students and broadening their education. An introductory seminar for new students was given and various tours were conducted of the School facilities and the Department of Physics, The Faculties. The students also met at several social functions.

On Founders Day in October the School introduced two new student prizes:

- The inaugural biennial presentation of the Jagadishwar Mahanty Prize for the best PhD thesis. The Prize is given in memory of Jay Mahanty, a former member of the Department of Theoretical Physics. The winner was — Dr Elena Ostrovskaya of the Optical Sciences Centre for her thesis entitled *Optical Vector Solitons*.
- To complement the Mahanty Prize, The Director's Award was initiated for the most outstanding published research paper by a PhD student over the last year. For his paper entitled *Kinetics of Capillary Condensation in a Nanoscale Pore* (with N. Maeda and H. Christenson) the winner was — Marcus Kohonen, Department of Applied Mathematics.

The Graduate Program in Physical Sciences ran its seminar competition for the sixth year. Ten talks were presented by postgraduates from this School, The Faculties and the Australian Defence Force Academy, with the sessions chaired by the postgraduates. The winners were announced at the conclusions of the program and the prizes were presented at Founder's Day.

The winner of the 1999 John Carver Prize for the best seminar by a postgraduate student — Daniel Shaddock, Department of Physics, The Faculties.

The winner of the Director's Prize from best experimental seminar — Wayne Solomon, Plasma Research Laboratories.

The winner of the Dean's Prize for the best theoretical seminar — Keith Gaff, Optical Sciences Centre.

The School also makes a significant contribution to undergraduate education by offering a broader range of courses to enrich the undergraduate teaching program. These courses are offered in The Faculties, in the Physics, Engineering and Chemistry Departments. Also, to provide wider opportunities for ANU undergraduates at research level, the School has in recent years offered honours projects and many undergraduates have taken up this opportunity. The School supports this program by offering honours year scholarships of which there were five in the current year. It was also pleasing to note that four students who held scholarships in 1998 have continued and enrolled as PhD students in the School in 1999.



Degrees Awarded and Destinations

Atomic and Molecular Physics Laboratories

Dr D.T. Alle

Thesis: Low Energy Electron Scattering and Spectroscopy using Time of Flight Techniques Currently: IP Australia, Canberra

Dr D. Milic

Thesis: *Laser Cooling and Trapping of Metastable Helium* Currently: Therapeutic Goods Administration, Canberra

Dr J.C. Gibson

Thesis: *Electron Scattering from Ar, Xe, CO and CO*₂ Currently: Department of Defence, Salisbury, SA

Dr P.C. Palma

Thesis: *Laser-Induced Fluorescence Imaging in Free-Piston Shock Tunnels* Currently: Institute of Fluid Mechanics, German Aerospace Centre, Goettingen, Germany

Dr J.P. Sullivan

Thesis: *Negative ion resonances in magnesium and cadmium* Currently: Physics Department, University of California at San Diego, USA

Electronic Materials Engineering

Dr Z. Li

Thesis: Formation of Silicon Based Ceramics by Mechanochemistry and Ion Implantation Currently: Singapore

Dr J. Glasko

Thesis: Ion Beam Processing of Ge_{1-x} Si_x Strained Layers Currently: NC State University, USA



Dr Jennifer Gibson undertaking experiments during the completion of her PhD

66

Laser Physics Centre

Dr D. Body

Thesis: An Investigation into Passive Modelocking Using a Nonlinear Directional Coupler Currently: CRC for New Technologies for Power Generation from Low Rank Coal

Dr J. Christou

Thesis: Optical Vortices in Beam Propagation Dynamics Currently: Australian Defence Industries

Dr H. Giordano

Thesis: Development of a High-Power, Ultrashort Pulse Duration Optical Parametric Amplification System Currently: Commonwealth Superannuation Administration

Dr M.J. Lederer

Thesis: Sesams for Passive Mode-Locking of Solid-State Lasers Produced by MOCVD and Ion Implantation Currently: ARC Fellow, Laser Physics Centre

Dr B. Stenlake

Thesis: Experimental Investigation of the Reflection of Thermal Sodium Atoms from a Moving Evanescent Grating Currently: Wizard Computing

Dr W. Yu

Thesis: Applications of the Photorefractive Effect in Mutally Pumped Phase Conjugators and Planar Waveguides Currently: Electro Optic Systems

Optical Sciences Centre

Dr E. Ostrovskaya

Thesis: Optical Vector Solitons Currently: Visiting Fellow, Optical Sciences Centre

Plasma Research Laboratory

Dr A. Degeling

Thesis: Plasma Production by Helicon Waves Currently: CRPP, Lausanne, Switzerland

Theoretical Physics

Dr R. Ellem

Thesis: The Thermodynamic Bethe Ansatz Approach to Exactly Solvable Models in Statistical Mechanics and Quantum Field Theory Currently: Maritime Operations Division, Defence Science and Technology Organisation, South Australia



Dr Elena Ostrovskaya, receives the inaugural Jagadishwar Mahanty Prize for her PhD thesis, from Emeritus Professor Ken Le Couteur, founding head of Theoretical Physics

Research School of Physical Sciences & Engineering 1999.



Postgraduate Students

Sources of Funding

ADCOS Australian Development Co-operation Scholarship ADFA Australian Defence Force Academy ANUPS Australian National University Postgraduate Scholarship ANUPTS Australian National University Postgraduate and Tuition Fee Scholarship ANUTECH Supported by ANUTECH APA Australian Postgraduate Award APA(I) Australian Postgraduate Award (Industry) ATERB Australian Telecommunications and Electronics Research Board Award **CRC** Cooperative Research Centre CSFP Commonwealth Scholarship and Fellowship Plan ERDC Energy Research and Development Corporation GIRD Generic Industrial Research and Development GSS Graduate School Scholarship IPRS Overseas Postgraduate Research Scholarship **RMIT** Royal Melbourne Institute of Technology VC Vice Chancellor's Supplementary Scholarship

The lists include students who were not enrolled for the full year, or who had completed their course but not yet submitted their thesis.

Applied Mathematics

Ms J. Bright, BSc Sydney APA Mr M.M. Kohonen, BSc APA Mr N. Maeda, BEng Tohoku, Japan, MSc JAIST, Japan Ms Y. Qiao, BSc Sichuan, China, MSc Ancona, Italy IPRS/ANUPS Mr M. Schmidt, MSc ANUPTS (jointly with EME)

Atomic and Molecular Physics Laboratories

Mr M. Arifin, BSc IKIP Bandung, Indonesian Government Mr M. Colla, MSc Pisa IPRS/ANUPS (jointly with LPC) Mr R.G. Dall, BSc CQU, Hons ANU APA (jointly with LPC) Mr A.M. Elliott, BSc Wollongong ANUPS Mr W. Lu, BSc UNSW (jointly with LPC) Ms D. Milic, MSc Belgrade (joint with LPC) Mr A. Purwanto, BSc Gadjah Mada U Indonesian Govt Mr E. Roberts, BSc BE UNSW, MBA Deak, FIE(Aust) APA Mr J.A. Swansson, BA BSc MSc Melbourne APA (jointly with LPC) Miss L.J. Uhlmann, B.App.Sci CQU, Honours ANU APA

Ms K. Waring, BSc Monash (jointly with LPC)

Electronic Materials Engineering

Mr K.B. Belay, BSc MSc AAU ADCOS Ms J. Bradby, BApSc RMIT APA(I)

Ms C. Carmody, BSc UNSW APA CSIRO

Ms S. Cheylan, BSc MSc Grenoble ANUPS/IPRS (jointly with LPC)

Mr M. Cohen, BEng UQ APA

Mr P.N.K. Deenapanray, BEng ANU MSc Pretoria IPRS/ ANUPS

Ms A.R. Dowd, BSc UNSW APA

Mrs S. Fatima, BSc MSc Karachi ADCOS

Mrs L. Fu, MSc USTC ANUPS/IPRS

Mr J.M. Glasko, BSc Ottawa MSc Western Ont ANUPS

Mr C. Glover, BSc Newcastle ANUPS

Mr C.M. Johnson, BEng ANUPS/APA(I)

Mr S.O. Kucheyev, MPh StPSTU IPRS/ANU

Mrs Z.L. Li, BEng E Chin Inst Met ANUPS

Ms C. Lobo, BSc UWA APA

Mr M. Schmidt ANUPTS (jointly with AM)

Ms T.D.M. Weijers BSc APA,VC (jointly with NP)

Mr W-C. Wong, BSc MPhil Chin U Hong Kong ANUPS

Mr X. Zhu, BEng MSc NE U Chin IPRS/ANUPS

Laser Physics Centre

Mr M. Bott, BSc Qld

Ms S. Cheylan, MSc, BSc Grenoble IPRS/ANUPS (jointly with EME)

Mr J. Christou, BSc UWA

Mr M. Colla, MSc Pisa IPRS/ANUPS (jointly with AMPL)

Mr R. Dall, BSc APA (jointly with AMPL)

Mr T. Dyke, BSc Monash

Mr A. Greentree, BSc Adelaide

Mr V. Kolev, Eng-Phys Bulgaria ANUPS

Mr M. Lederer, BE FH Regensburg, ME UNSW APA(I)/ Electro Optic Systems

Mr W. Lu, BSc UNSW (jointly with AMPL)

Mr G. McCarthy, BSc UNSW (part-time scholarship)

Ms D. Milic, MSc Bel (jointly with AMPL)

Mr G. Pryde, BSc Qld APA

Mr J. Swansson, BA BSc MSc Melbourne APA (jointly with AMPL)

Ms S. Tomljenovic-Hanic, BSc Belgrade (jointly with OSC) APA(I)

Ms K. Waring, BSc Monash (jointly with AMPL)

Ms E. Wilson, BSc Vitebsk State ANUPS

Mr A. Windsor, BSc Adelaide

Nuclear Physics

Ms A.C. Berriman, BSc, Grad Dip APA

Ms R.D. Butt, BSc APA, VC Ms J.M. Evans, BSc ANUPS (jointly with RSES) Mr T.R. McGoram, BSc, MSc Auckland APA Mr M.P. Robinson, BSc Surrey, ANUPS Ms T.D.M. Weijers, BSc APA, VC (jointly with EME)

Optical Sciences Centre

Mr T. Alexander, BSc Darwin APA

Ms S. Ashby, BSc Sydney APA(I)/AOFR Pty Ltd

Mr A. Degeling, BSc Sydney Ericsson Australia Pty Ltd (jointly with PRL)

Mr K. Gaff, BSc Mon APA(I)/AOFR Pty Ltd (jointly with PRL)

Ms R. Jarvis, BE BSc APA(I)/Siemens Ltd

Ms E. Ostrovskaya, BSc Mosc IPRS/ANUPS

Mr A. Sukhorukov, BSc Mosc IPRS/ANUPS

Ms S. Tomljenovic-Hanic, BSc Belgrade APA(I) (jointly with LPC)

Plasma Research Laboratory

Mr A. Degeling, BSc Sydney Ericsson Australia Pty Ltd (jointly with OSC)

Mr K. Gaff, BSc Monash APA(I)/AOFR Pty Ltd (jointly with OSC) $% \mathcal{A}(\mathcal{A})$

Mr F. Glass, BSc Qld ANUPS

Ms S. Hatch, BSc ENYA

Mr R. Hawkins, BE BIT ANUPS

Mr C. Michael, BSc APA

Mr H. Punzmann, BSc Polytech Regensburg ANUPS

Mr W. Solomon, BSc Qld APA

Mr J. Wach, BAppSc BCAE, GradDipElect CCAE

Theoretical Physics

Mr Y.K. Chan, BSc Mr P. Cuthbert, BSc Monash APA Mr G. Ericksson, BSc Qld ANUPS Mr A. Hibberd, BSc Qld APA Mr M. Hoyles, BSc ANUPS Mr A.B. Khorev, DipPhys Mosc PTI IPRS/ANUPS Ms S.S. Lloyd, BSc Murdoch APA Mr I. McCulloch, BSc Tasmania APA Ms S.H. Sutanto, BSc ITB Indonesia ADCOS/ANUPS Mr P.C. Tjiang, BSc ITB Indonesia ADCOS/ANUPS Mr M. Walker, BSc Monash GSS Research School of Physical Sciences & Engineering 1999



Honours Students

Mr I. Miller
Mr L.A.W. Robinson
Mr.S. Iones
Mr K Ng
M. K. Garmant
WIS K. Stewart
Mr R. Heck
Ms N. Sih
Mr D. Tierney
Mr S. Chan
Mr C. Chung
Mr A. Gough
Mr K. Kwai
Mr B. Kwan
Mr A. Last
Mr T. Ng
Mr G. Bowen
Mr A. Krumm-Heller
Ms A. Potter
Mr J.A. Ringland
Ms C. Saputra
Mr A. Searle
Mr A. Venkatarama

Physics AM Physics AMPL/LPC Physics EME/NP Engineering EME Engineering EME LPC/AMPL Engineering Engineering LPC/AMPL Engineering/Science LPC/AMPL Physics PRL PRL Physics Physics PRL PRL Physics Physics PRL Physics PRL Physics PRL Physics TP TP Computer Science TP Engineering (until July) TP Physics Engineering TP Physics TP Engineering TP

Commitment to Teaching



Summer Scholars

The Summer Scholars from December 1999 to January 2000 were:

Mr A. Daley	Auckland University, NZ	AMPL
Mr M.D. Fraser	Griffith University	EME
Mr D.R. Sypher	University of Queensland	EME
Mr X. Gisz	Australian National University	LPC
Mr M. Leaver	Australian National University	LPC
Ms T. Martin	Australian National University	LPC
Ms B. Taylor	Macquarie University	LPC
Mr R. Nielson	University of Auckland, NZ	NP
Ms C. Low	University of Canterbury, NZ	NP
Ms C. Bellair	University of Melbourne	OSC
Mr D. Blake	James Cook University	PRL
Mr B. McMillan	University of Melbourne	PRL
Mr N. Whitlock	University of Queensland	TP
Ms J. McCabe	Monash University	TP

The following students received Departmental Summer Scholarships:

Mr A. Gough	Australian National University	PRL
Mr P. Linardakis	Australian National University	PRL
Mr D. Price	Australian National University	PRL
Mr L. Robinson	Australian National University	PRL

The students toured the School and the Department of Physics and Theoretical Physics in The Faculties, and also visited the Research School of Astronomy and Astrophysics at Mount Stromlo. Students gave short presentations on the projects they had undertaken at a seminar held near the end of their stay.



Winter Scholars

For the first time Winter Scholarships were offered and the following students spent periods of up to three weeks in the Research School during the July to August vacation, working in various departments on topics of their choice:

Australian National University	AM
Australian National University	AM
Australian National University	AMPL
Australian National University	EME
Australian National University	LPC
Australian National University	LPC
Australian National University	LPC
Australian National University	OSC
University of New South Wales	TP
Australian National University	TP
	Australian National University Australian National University Australian National University Australian National University Australian National University Australian National University Australian National University University of New South Wales Australian National University

Commitment to Teaching



Visiting Scholars

The following undergraduate and postgraduate scholars spent time in the School for the purpose of training and research:

Ms A. Barisic	Physics, Zagreb	AM
Ms B. Folmer	YKI, Stockholm	AM
Mr M. Olla	Chemistry, Cagliari	AM
Mr M. Persson	YKI, Stockholm	AM
Mr B. Schnurr	University of Michigan	AM
Mr C. Bresson	University of Paris, France	AMPL
Ms. A. Lovell	University of Melbourne	AMPL
Mr C. Meridja	IUP GSI of Metz, France	AMPL
Mr M.B. Johnston	University of New South Wales	EME
Mr J. Laird	University of Melbourne	EME
Mr M. Toth	UTS, Sydney	EME
Mr T-D. Kim	Hannam University, Taejon	LPC
Mr R. Neuhaus	University of Dortmund, Germany	LPC
Mr O-H. Park	Korea Advanced Institute of Science and Technology	LPC
Mr M. Stritzker	University Augsburg, Germany	LPC
Mr C. Weilnau	Darmstadt University of Technology, Germany	LPC
Ms D. Werner	FH Aalen University of Applied Sciences, Germany	LPC
Mr I. Boztosun	University of Oxford, UK	NP
Mr C. Bremner	University of Oxford, UK	NP
Ms R. Carling	Manchester University, UK	NP
Mr B. Greenhalgh	University of York, UK	NP
Mr P. Leask	University of Birmingham, UK	NP
Ms R.G. Liberman	Laboratorio Tandar, Argentina	NP
Mr A.A. Tulapurkar	Tata Institut of Fundamental Research, Mumbai, India	NP
Mr B. Varga	Loránt Eötvös University, Budapest, Hungary	NP
Mr M. Wharton	Manchester University, UK	NP
Mr A. Ash	RMIT	OSC
Mr. A. Carlsson	Chalmers University of Technology, Göteborg, Sweden	OSC
Mr A.M. Geisser	Fachhochschule Aalen, Germany	OSC
Mr B. Gibson	La Trobe	OSC
Mr J. Katsifolis	La Trobe	OSC
Mr K. Kolossorsk	Australian Defence Force Academy	OSC
Mr J. Malmberg	Chalmers University of Technology, Göteborg, Sweden	OSC

Research School of Physical Sciences & Engineering 1999





Mr N. Martiquet	Ecole Polytechnique, Paris, France	OSC
Mr P. Moar	La Trobe	OSC
Mr C. Glinkowski	Fachhochschule Kempten, Germany	PRL
Mr G. Gozadinos	Dublin City University	PRL
Mr J. Kircher	Fachhochschule Ravensburg-Weingarten, Germany	PRL
Mr M. Suiter	Fachhochschule Kempten, Germany	PRL
Ms M. Reineker	University of Ulm, Germany	TP

The following students, from local high schools and colleges, visited the School for work experience:

Mr C. Martin	Lake Tuggeranong College	AM
Mr R. Grover	Narrabundah College	EME/NP
Ms C. Henry	Canberra College	LPC
Mr A. Von Brasch	Lake Ginninderra College	LPC
Maysam Torabi	Canberra College	LPC
Mr S. Forsyth	Dickson College	LPC
Mr C. Bloomfield	Dickson College	NP
Mr T. Hanna	Canberra College	NP
Ms H. Lee	Canberra Girls Grammar School	NP*
Mr E. Mancini	Lake Ginninderra College	NP
Mr S. Rymers	Lake Ginninderra College	NP

* CSIRO sponsored student

Science Schools

Optical Sciences Centre

The 1999 Siemens Science and Engineering Experience, ANU, for Students entering Year 10 in 2000 was directed by Professor John Love, assisted by the treasurer, Mrs Andrea Robins from the Optical Sciences Centre, and received managerial support from the Centre for Continuing Education. The event was held from 27-29 September and attracted 81 students from the ACT and country NSW. Members of the School who helped with lectures and tours of facilities included Dr John Martin, LPC, Dr Tim Thompson, PR Unit, Ms Fu Lan, EME, and various members of the student body.

Theoretical Physics

Upcoming activities are the 13th Physics Summer School Bose-Einstein Condensation: Atomic Physics to Quantum Liquids and the workshops The Baxter Revolution in Mathematical Physics (Canberra, Australia 3-19 February, 2000) and Soft Condensed Matter: Physical and Biological Aspects (Canberra, Australia, 16-29 October 2000).

For details regarding the ANUCTP Summer Schools see page 89.



Outreach Activities

Founder's Day was celebrated on the 8th October with invited guests from ANU, other government organisations, industry and the media, and former employees. It is a forum for the informal presentation of science to guests, colleagues and students throughout the School. The following members of staff gave Founder's Day talks:

Dr Christine Charles, Plasma Research Laboratory *Visualisation as a Partner in Science*

Dr Adrian Sheppard, Applied Mathematics

Flow in Porous Rocks: From Food Stains to Nuclear Waste

Professor Trevor Ophel, Nuclear Physics Some Foils Ain't Foils

Mr Ron Cruikshank, Research Services and Dr Nikoli Lobanov, Nuclear Physics *How the Technology of Wire Cutting Helps Surfing on Electromagnetic Waves*

Ms Charlene Lobo, Electronic Materials Engineering *From Dots to Devices*

Dr Andrei Rode, Laser Physics Centre *Ultrafast Laser Ablation*

Mr Ben Corry, Theoretical Physics *Physics of Biological Ion Channels*

Dr Darran Edmundson, Optical Sciences Centre *Dynamics of Incoherent Solitons*

Dr Maarten Vos, Atomic and Molecular Physics Laboratories *Electrons: How (Fast) Are You Going?*

Rio Tinto National Youth Science Forum. The Forum provides a unique experience for Year 11 students (some 278 in total) to visit the School and meet with leading scientists and tour the laboratories and major national research facilities. Professor Crompton, AMPL, has been Chairman of the Board since 1996 and Dr Malcolm McIntosh, CSIRO, is President. The School's involvement is coordinated by Ms Laura Walmsley, EME. The Forum runs in two sessions from 2-16th and 16-30th January, and tours are conducted by Dr Tim Thompson, PR Unit. Further details can be obtained from this web address: http://www.anu.edu.au/nysf/



Founders Day: the School dons 3D glasses for Dr Darran Edmundson's Dynamics of Incoherent Solitons talk

The Australian Institute of Physics, "Adopt-a-Physicist" Program. Dr Ken Baldwin of LPC was an organiser and Dr Rob Elliman is the co-ordinator (northern region) of the ACT Australian Institute of Physics "Adopt-a-Physicist" Program for ACT Secondary College students. Drs Aidan Byrne and Nanda Dasgupta, NP, were participants, and Ms A. Dowd, EME, presented a talk: Physics of Musical Instruments to various high schools as part of the above program. http://beth.canberra.edu.au/aipact/default/htm

The 1999 Siemen's Sciences and Engineering Experience ANU was conducted for students entering Year 10 in 2000. The program is coordinated by Professor John Love, OSC, - see Science Schools, Section 2 for further details. Dr John Martin, LPC, Dr Tim Thompson, PR Unit, Ms Fu Lan, EME, and a variety of student helpers are acknowledged.

Dr Rob Elliman of EME gave a lecture to Canberra Institute of Technology students on The Application of Electron Microscopy on Electronic Materials.

WEDGING. Professor R.W. Boswell and Mr P. Alexander participated in setting up the WEDGE virtual reality theatre at the Powerhouse Museum Universal Machine exhibition in June

(along with Mr Drew Whitehouse of ANUSF). The exhibition, and especially the WEDGE, has been a great success with queues of about twenty children every day waiting to use it. They are also helping the CSIRO Discovery Centre to design their new exhibition using a WEDGE that will open in the year 2000. A portable version of the WEDGE theatre was exhibited at an international workshop at Magnetic Island, Queensland, in July, and in the Main Committee Room, Parliament House, Canberra, in October.

Demonstrations of the WEDGE were also given during the Australian Science Festival, as well as the Siemens Science and Engineering Experience, RSPhysSE Founder's Day and as part of the COMP3067 Computational Science and Engineering lecture course.

Australian Science Festival. The School was once again a major contributor to the ANU stand at the Australian Science Festival, this year providing a display illustrating the different spectral characteristics of common household light globes. Demonstrations of the WEDGE were also given during the Festival.

The School hosted 19 Summer Scholars and 10 Winter Scholars from Australian and New Zealand Universities for periods of up to six weeks. The School supported 40 international undergraduate and postgraduate scholars who spent time in the School for the purpose of training and research. Seven ACT College students spent time in the School for the purpose of work experience. For the names and affiliations of the above mentioned student groups see Section 2 Visiting Scholars.

Drs L.K. Fifield, M.L. di Tada, G.M. dos Santos and P.A. Hausladen participated in The David Culley Award of the Australian Nuclear Association. The ANA makes an annual award to a selected secondary school with an interest in furthering it activities in nuclear-related science. The award for 1999 went to the Ecology Group at Lake Ginninderra College for the project "Historical Rates of Erosion of the Australian Landscape as Measured with Beryllium-10". Students and teachers from the College joined the AMS group during the field sampling, chemical preparation and AMS measurements. A poster describing this work was prepared by the students and presented at the 3rd Conference on Nuclear Science and Engineering in Australia, held in Canberra on 27-28 October.



Dr Tim Senden demonstrates the fundamentals of spectroscopy to Science Festival visitors