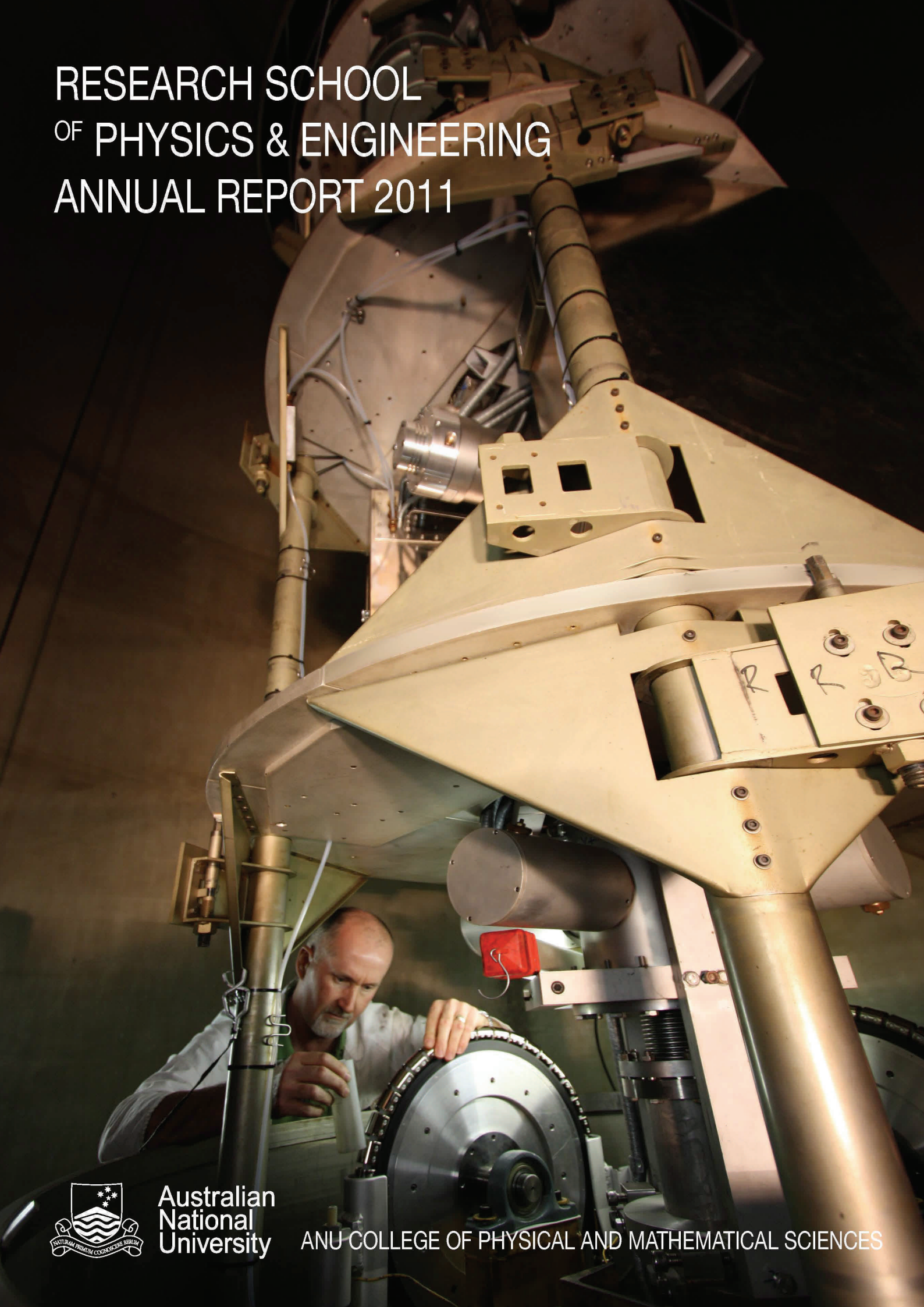
RESEARCH SCHOOL OF PHYSICS & ENGINEERING ANNUAL REPORT 2011



Australian National University

ANU COLLEGE OF PHYSICAL AND MATHEMATICAL SCIENCES

FOR FURTHER INFORMATION PLEASE CONTACT

Director's Office

Research School of Physics and Engineering

Australian National University

Building 60, Mills Road

ACTON ACT 0200

Email: director@physics.anu.edu.au

Phone: 6125 2476

Fax: 6125 5457

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DIRECTOR'S REPORT

Professor Jim Williams

The Research School of Physics and Engineering (RSPE) is the leading institution in the country for physics research and its applications. It is the largest physics-based research activity by some measure with over 150 academic staff during 2011.

RSPE maintains excellence in education and training standards and ensures a quality educational experience for all our students. We continue to develop our staff to their full potential whilst ensuring that staff skills are matched to priority directions, and implement appropriate succession planning to replace key late career staff. It is the ability of the School to launch appropriately resourced research efforts built around outstanding staff in a number of important areas of national significance, the unique and integrated research infrastructure and the interdisciplinary collaboration with colleagues across the ANU, nationally and internationally, that distinguish the School's research effort and capacity.

Grant successes during the year from the Australian Research Council included two new Centre of Excellence nodes, 19 discovery projects, nine Future Fellowships, two linkage projects and one linkage infrastructure Equipment and Facility (LIEF). The School is also involved in four externally-led LIEF grants, with some of the equipment being located at the School. Along with the award of five super science fellowships and other grant successes of note were the award of an Australian Space Research Program from the Department of Innovation, Industry, Science and Research (DIISR), three from the Australian Nuclear Science and **T**echnology Organisation (ANSTO) and eight from the Australian Synchrotron Company Ltd.

During 2011 the School continued to ramp up its development program to grow non-conventional funding through focusing on individual donors, foundations and companies including the appointment of a Development Manager, the formation of a Development Board, the consolidation of School endowments and planning towards philanthropic endowed funds (initially endowed chairs in areas of research strength) the encouragement of work place giving and a stronger engagement with Alumni and friends of the School.

The School continued to lead the cross-campus effort to coordinate energy research at ANU, through the Energy Change Institute. We continue to communicate our research achievements through *ScienceWise* and *ANU Reporter* as well as key press releases of scientific breakthroughs.

External collaborations with colleagues from national or international institutions are indicated through: Published works - 66% (330 of 499) have been as a result of collaborations with external authors;

Research Grants - 49% (81 of 179) have been as a result of collaborations with external institutions; and Visiting Fellows – 62 visiting fellows have spent a substantial period of time at the school during the year.

The School also continued its strong performance in commercialization of its research through more than 30 grants or research contacts with industry and four active spin-off companies in 2011.

Jim Williams

STAFF ACCOMPLISHMENTS

External Honours & Awards

Mr Seiji Armstrong
Prime Minister's Australia Asia Award

Professor Christine Charles
Finalist for the World Technology Awards (Space / Individual category)

Finalist in the Australian Innovation Challenge (Manufacturing and Hi-Tech design category)

Dr Cormac Corr
2011 ACT Young Tall Poppy Science Awards

Professor Mahananda Dasgupta
Elected Fellow of the Australian Academy of Science

Awarded ARC Laureate Fellowship and inaugural ARC Georgina Sweet Fellowship.

Professor David Hinde
Elected Fellow of the American Physical Society

Dr Matthew Hole
Appointed Judge of one of the Eureka Prizes for Science

Distinguished Professor Chennupati Jagadish
Elected as a Fellow of the School of Engineering at The University of Tokyo

IEEE Nanotechnology Council Distinguished Service Award

Professor Yuri Kivshar
Fellowship of the Institute of Physics, UK

Professor John Love
Master of Mathematics Degree, University of Cambridge

Professor Jim Williams
2011 Thomas Ranken Lyle Medal for research in Physics by the Australian Academy of Science

Professor Mahananda Dasgupta

STAFF AWARDS AND ACHIEVEMENTS

VC award recipients pictured left to right: David Llewellyn, Liz Micallef, James Williams, David Anderson and Boyd Blackwell

Internal Honours & Awards

Mr David J Anderson
Vice-Chancellor's Award for Career Achievement

Dr. Boyd Blackwell
Vice-Chancellor's Award for Career Achievement

Ms Liz Micallef
Vice-Chancellor's Award for Innovation & Excellence in Service Quality

Mr David Llewellyn
Vice-Chancellor's Award for Innovation & Excellence in Service Quality

Professor James Williams AM
Chancellor's awards- Peter Baume Award

Professor Andrew Stuchbery
ANU 25 Years Service Award

Mr John Bottega
ANU 25 Years Service Award

Mr Graeme Cornish
ANU 25 Years Service Award

Dr Stephen Gibson
ANU 25 Years Service Award

Professor Stephen Hyde
ANU 25 Years Service Award

Professor George Dracoulis
2011 Australian National University Media Award (with Aidan Byrne) Winner in category of Best Response from a Media Event: Japan Tsunami Crisis

Allan Cooper
Tom Rhymes Technical Development Award

Caleb Gudu
Tom Rhymes Technical Development Award

Alan Harding
Tom Rhymes Technical Development Award

Justin Heighway
Tom Rhymes Technical Development Award

Alistair Muirhead
Tom Rhymes Technical Development Award

John Bockwinkel
Tom Rhymes Technical Development Award

Tom Tunningley
Tom Rhymes Technical Development Award

30 year pins

Ron Cruikshank 30/04/1981

Keith Fifield 07/01/1981

Emeritus Staff of the School

Hans Bachor

Bob Dewar

George Dracoulis (awarded 2010)

Neville Fletcher

Promotions

Level B

Dr Andrew Kingston

Dr Avi Shalav,

Dr Dinesh Venkatachalam

Dr Zhiyong Xu

Level C

Dr Ilya Shadrivov

Level D

Dr Tibor Kibedi

Dr Stephen Madden

Dr Dragomir Neshev

Dr Matthew Sellars

Dr Andrew Truscott

Dr Anna Wilson

Dr Yin (Jenny) Wong Leung

Level E

Professor Christine Charles

Professor Craig Savage

Professor Tim Senden

FELLOWSHIPS OF LEARNED SOCIETIES

American Association for Advancement of Science

Professor Chennupati Jagadish (since 2007)

American Physical Society

Professor Ken Baldwin (since 2008)
Professor Murray Batchelor (since 1993)
Professor Rod Boswell (since 1998)
Professor Peter Bouwknegt FAIP (since 2000)
Professor Stephen Buckman (since 1998)
Emeritus Professor Robert Crompton (since 1995)*
Adjunct Professor Mukunda Das (2003)*
Professor Robert Dewar (since 1980)
Emeritus Professor George Dracoulis (since 1993)*
Professor Rob Elliman (since 1994)
Professor David J. Hinde (since 2011)
Professor Chennupati Jagadish (since 2003)
Professor Anatoli Kheifets (since 2004)
Professor Yuri Kivshar (since 2006)
Professor Brenton Lewis (since 2001)*
Professor David McClelland (since 2010)
Emeritus Professor Erich Weigold (since 1990)*
Professor Jim Williams (since 2006)

American Vacuum Society

Professor Chennupati Jagadish (since 2008)

Astronomical Society of Australia

Professor David McClelland (since 2006)

Australian Academy of Science

Professor Vladimir Bazhanov (since 2010)
Professor Rod Boswell (since 2008)
Emeritus Professor Robert Crompton (since 1979)*
Professor Mahananda Dasgupta (since 2011)
Professor Robert Dewar (since 1992)
Emeritus Professor George Dracoulis (since 1997)*
Emeritus Professor Neville Fletcher (since 1976)*
Professor David Hinde (2006)
Professor Stephen Hyde (since 2005)
Professor Chennupati Jagadish (since 2005)
Professor Yuri Kivshar (since 2002)
Professor Stjepan Marcelja (since 1991)*
Emeritus Professor Barry Ninham (since 1978)*
Emeritus Professor Erich Weigold (since 1986)*
Professor Jim Williams (since 2003)

Australian Academy of Technological Sciences and Engineering

Professor Rod Boswell (since 1999)
Emeritus Professor Neville Fletcher (since 1987)*
Professor Chennupati Jagadish (since 2002)
Professor Barry Luther-Davies (since 2005)
Emeritus Professor Erich Weigold (since 1996)*
Professor Jim Williams (since 1992)

Australian Institute of Physics

Professor Hans Bachor (since 1987)
Professor Ken Baldwin (since 1995)
Professor Stephen Buckman (since 1992)
Professor Mahananda Dasgupta (since 2004)
Emeritus Professor George D. Dracoulis (since 1990)*
Professor L. Keith Fifield (since 1997)
Emeritus Professor Neville Fletcher (since 1960)*
Professor David J. Hinde (since 1996)
Professor Yuri Kivshar (since 2000)
Professor David McClelland (since 2000)
Professor Susan Scott (since 2004)
Professor Andrew Stuchbery (since 1992)
Dr David C. Weisser (since 1992)

Australian Mathematical Society

Professor Murray Batchelor (since 2001)
Professor Peter Bouwknegt FAustMS (since 2001)

Electrochemical Society

Professor Chennupati Jagadish (since 2006)

European Academy of Sciences

Professor Susan Scott (since 2002)

Institute of Electrical and Electronics Engineers

Professor Chennupati Jagadish (since 2002)

Institute of Physics (UK)

Professor Hans Bachor (since 1999)
Professor Ken Baldwin (since 2006)
Professor Murray Batchelor (since 2004)
Professor Stephen Buckman (since 1995)
Professor Rob Elliman (since 2003)
Emeritus Professor Neville Fletcher (since 1956)
Professor David J. Hinde (since 2005)
Professor Chennupati Jagadish (since 1998)
Profesor Yuri Kivshar (since 2012)
Professor Susan Scott (since 1999)

International Society for Optical Engineering

Professor Chennupati Jagadish (since 2006)

Institution of Engineering and Technology

Professor Chennupati Jagadish (since 2007)

Institute of Nanotechnology

Professor Chennupati Jagadish (since 2001)

Materials Research Society

Professor Jim Williams (since 2008)

Optical Society of America

Professor Nail Akhmediev (since 1996)

Professor Hans Bachor (since 2009)

Professor Ken Baldwin (since 2000)

Professor Chennupati Jagadish (since 2005)

Professor Yuri Kivshar (since 2001)

Professor Wieslaw Krolikowski (since 2007)

Professor Brenton Lewis (since 2003)*

Professor Barry Luther-Davies (since 2006)

Royal Society of New Zealand

Emeritus Professor George D. Dracoulis (Hon)* (since 1997)

The Acoustical Society of America

Emeritus Professor Neville Fletcher (since 1975)*

The Australian Acoustical Society

Emeritus Professor Neville Fletcher (since 1980)*

* *retired*

STAFF OUTREACH ACTIVITIES

RSPE staff and guests enjoying the barbeque lunch on Founder's Day

The RSPE Founder's Day was held on Friday 14 October with invited guests from ANU, government organisations, industry and the media, as well as former employees. Over 400 people attended the day's celebrations.

The following are examples of some major research and student events where RSPE staff members were key organisers:

- In January 2011 staff and students were involved in organizing the lab visit by the participants of the National Youth Science Forum.
- Staff at Nuclear Physics Department gave over 100 TV, radio and phone interviews to national and international media covering problems at the Fukushima nuclear power station after the Tohoku earthquake and tsunami in Japan in March 2011.
- Dr Greg Lane gave a series of four public lectures at Questacon entitled, 'Radiation, nuclear power and what went wrong at Fukushima.' Two of these were given as part of Australian Science Week. He also gave seminars and demonstrations at local ACT schools. In addition, Dr Lane was the Local Director for the ACT Science Experience that was held from 5th to 7th of October. In the 2011 program, 45 Year 9 and 10 students from across the ACT and NSW visited a number of scientific laboratories at both the Australian National University and Geoscience Australia.
- James Sullivan gave presentations to senior physics/chemistry students and two year 8 classes at Merici College, Braddon ACT and also spoke to 2nd and 3rd year students at Flinders University and at other Universities.
- In the week of September 26th to 30th, the Department of Nuclear Physics hosted 20 undergraduate students from the University of Wollongong for the annual 'Workshop on Nuclear Measurement Techniques.' The students produced long-lived radioactivities using the 14UD accelerator and then characterised the decay by measuring changes in the emitted gamma-rays over the course of the week.
- Dr Christine Charles was an invited panel member for Café Scientifique Lecture and Workshop and presented 'Children of the stars, plasma is the fourth state of matter'.
- Prof. Michael Shats gave radio interviews on *ABC Canberra*, *ABC Queensland* and *Radio Adelaide News* in February 2011.

- Prof. Michael Shats was also interviewed on the *ABC News Breakfast* television programme, 8 February 2011.
- Dr. H. Xia and Prof. M. Shats contributed to several media releases about predicting cyclones.
- Dr Cormac Corr's article 'Pinching the plasma' was published in *ScienceWise*, Spring 2011.
- Prof Christine Charles received several mentions in print media: 'Finalist Christine Charles: Helicon Double Layer Thruster' (*The Australian*), 'Australian National University Developing Plasma Thruster' (Daily *Launch*), 'One small thrust for man, one giant leap for ANU' (*The Canberra Times*) and 'Rockets and all that jazz' (*ANU Reporter*).
- Professor Ken Baldwin was General Chair of the International Quantum Electronics Conference/CLEO Pacific Rim Conference in Sydney from August 29 - September 1, 2011, which with over 1,000 delegates was the largest laser-based conference to be held in the Southern hemisphere. He also presented several public lectures on the Energy Change Institute in Canberra and the region.
- Frank Mills co-convened and co-chaired 'Comparative Atmospheres of the Giant Planets and Their Satellites' session at the International Union of Geodesy and Geophysics quadrennial conference, Melbourne, was a member of the Education panel at the International Conference Energy & Meteorology, and was lead organizer of the 7th Australia and New Zealand Aerosol Workshop, Canberra.

RESEARCH

Professor Ken Baldwin
Deputy Director (Research)

The Research School of Physics and Engineering (RSPE) is the largest university-based institution in the country for physics research by some measure, with over 150 academics, 110 general staff and 130 post graduate students.

The School's research thrusts in selected areas of strength cover the entire spectrum from fundamental research (understanding nature) through to applied research and pre-commercial development. The research program is built around three "big picture" themes: quantum science and technology; advanced materials and technology, and energy and environmental science and technology.

The School continued to excel in its research performance, with 420 journal publications in 2011 and its 138 international conference papers. Physics at ANU achieved the highest rank in in the Excellence for Research in Australia ranking (ERA level 5). In 2011 the School was successful in winning over $31 million in research grants of which $14 million was from the Australian Research Council.

The link between research and teaching is critical to the future of the School and the nation. The School has made a major commitment in using its research strength and scale, together with its unique mix of outstanding researchers, teachers and infrastructure, to developing world-leading education programs for gifted students that link directly to postgraduate research study. The research and teaching links are not only confined to the Physics discipline but have significant involvement with Engineering and with other science disciplines.

RSPE is comprised of nine research departments. A brief description of each department is detailed in the following pages as well as a list of staff dedicated to that area.

Applied Mathematics

Atomic & Molecular Physics Laboratories

Electronic Materials Engineering

Laser Physics

Nonlinear Physics

Nuclear Physics

Plasma Research Laboratory

Quantum Science

Theoretical Physics

Professor Ken Baldwin is also Director of the Australian Centre of Excellence for Quantum-Atom Optics, Director of the ANU Energy Change Institute and Professor in the Atomic and Molecular Physics Laboratories.

APPLIED MATHEMATICS

Professor Vince Craig
Head of Department

> *There are two kinds of truth: the truth that lights the way and the truth that warms the heart. The first of these is science, and the second is art. Neither is independent of the other or more important than the other. Without art science would be as useless as a pair of high forceps in the hands of a plumber. Without science art would become a crude mess of folklore and emotional quackery. The truth of art keeps science from becoming inhuman, and the truth of science keeps art from becoming ridiculous. -Raymond Thornton Chandler, writer (1888-1959)*

Condensed matter and materials research dominates the research performed in the Department but we are notoriously difficult to pigeon-hole as the range of research programs currently underway are numerous and diverse; for example, statistical mechanical studies of liquids at interfaces, specific ion effects in soft matter, modeling and experiments of multiphase flow properties of oil-bearing rocks, tomographic imaging of fossils, nanobubbles for cleaning, low dimensional geometry and topology as structure descriptors and studies of networks and are part of the group's ongoing research programs. We also host artists in residence and a seminar program that extends from applied mathematics to investigations of European interaction with the east coast of Australia prior to Captain Cook and the foods of the aboriginals on the south coast in the 1700s. This large portfolio of research is possible, due to our strong network of collaborators around the world and the contribution of individuals in the Department to areas outside of their core areas of interest.

The burgeoning success of the Departments spin-off company, Digital Core, now provides us with the opportunity to embrace new challenges, particularly in the area of tomography and tomographic data analysis applied to new problems. A large international consortium of oil and gas companies continues to financially underpin our research effort, particularly in the CT and wetting areas.

Members of the Department continue to embrace new challenges, including seeking out new funding to address the ever diminishing block grant and participating in a wide variety of teaching and supervision roles in Physics, Engineering and Chemistry.

The challenge we face in the coming years is to continue to find new sources of funding whilst remaining at the cutting edge of fundamental research and finding time to think. Through our science we continue to seek truth and beauty.

> *The best people possess a feeling for beauty, the courage to take risks, the discipline to tell the truth, the capacity for sacrifice. Ironically, their virtues make them vulnerable; they are often wounded, sometimes destroyed. -Ernest Hemingway, author and journalist, Nobel laureate (1899-1961)*

Academic Staff

Head of Department

Vince Craig BSc PhD, ARC Future Fellow

Professors

Stephen Hyde BSc PhD Monash, ARC Federation Fellow

Mark Knackstedt BSc Columbia, PhD Rice

Tim Senden BSc PhD

David Williams BSc Sydney, PhD Cambridge

Senior Fellows

Vince Craig BSc PhD, ARC Future Fellow

Adrian Sheppard BSc Adelaide, PhD

Research Fellows

Lilliana De Campo BSc PhD Graz

Andrew Fogden BSc PhD Docent Lund

David King BSc

Shannon Notley BSc PhD

Drew Parsons PhD

Vanessa Robins BSc, PhD Colorado

Ross Stephens PhD Sydney

Arthur Sakellariou BSc PhD Melbourne (until February)

Rob Sok BSc PhD Groningen

Trond Varslot MSc PhD NTNU

Postdoctoral Fellows

Nicolas Francois PhD Bordeaux

Andrew Kingston PhD Monash

Shane Latham BSc PhD UQ

Mayhar Madadi BSc Tehran, MSc PhD IASBS

Glenn Myers PhD Monash

Mohammad Saadatfar PhD

Michael Turner, PhD

Visiting Fellows

Dr Christoph Arns, University of NSW

Dr Ji-Youn Arns, University of NSW (until July)

Dr Tomaso Aste, University of Kent

Dr Judith Caton

Dr Robert Corkery, Lund University

Mr Arthur Davies

Dr Tiziana Di Matteo, King's College (until February)

Prof Phil Evans, University of British Columbia (from May)

Ms Denise Higgins (until October)

Prof John Maloney (from May)

Prof Stjepan Marcelja, University of Rochester

Prof Yoshinori Nagi, University of Kokushikan

Prof Norman Morrow, University of Wyoming

Prof Barry Ninham

Mr Jafar Qajar, University of NSW (until July)

General Staff

Senior Software Designer

Paul Veldkamp BSc BEc

Technical Officers

Holger Averdunk

Anthony Hyde AssocIE

Rohini Marathe, BSc Mumbai, MSc Rutgers (from September)

Tim Sawkins

Departmental Administrator

Margo Davies DipDent Tasmania

ATOMIC & MOLECULAR PHYSICS

Professor Stephen Buckman
Head of Department

The Atomic and Molecular Physics Laboratories are engaged in a broad range of experimental, theoretical and computational studies of the interaction of electrons, positrons, and photons with atoms, molecules and solids. Our goal is both to further our knowledge of fundamental physical and chemical processes, and to provide essential information that is critical to applications in other scientific disciplines, technology, and the environment.

The Laboratories' research activities include Photon interactions: VUV/XUV laser spectroscopy, laser photodetachment and photofragment spectroscopy, computational molecular physics, computational planetary atmospheres, computational multiple photo ionization); Positron and electron interactions: low-energy positron and electron physics, materials studies with positrons, Electron Momentum Spectroscopy studies of gases and solids, and computational studies of charged particle interactions, Bose Einstein condensation studies of helium atoms, atom manipulation, experimental tests of QED theory, and quantum-atom optics.

The Laboratories also host an Australian Research Council Centre of Excellence: the Australian Research Council Centre of Excellence for Antimatter-Matter Studies (CAMS), whose experimental and theoretical program is based on the study of the interaction of positrons and electrons with matter. The year also saw the final phase of the Australian Research Council Centre of Excellence for Quantum-Atom Optics (ACQAO) which had been in operation for the past 8 years.

Academic Staff

Head of Department

Stephen Buckman BSc PhD Flinders, FAPS, FAIP, FInstP

Professors

Kenneth Baldwin MSc, DIC PhD London, FAIP, FInstP, FOSA, FAPS

Anatoli Kheifets BSc PhD St Petersburg, FAPS

Brenton Lewis PhD DSc Adelaide, C Phys, FInstP, FAPS, FOSA, FAIP (until June)

Senior Fellows

Stephen Gibson BSc PhD Adelaide

Maarten Vos MSc PhD Gröningen

Fellows

Franklin Mills BSE Princeton, MS PhD Caltech

James Sullivan BSc PhD

Andrew Truscott BSc PhD Queensland

Research Fellows

Steven Cavanagh BSc PhD Griffith

Robert Dall BSc Queensland PhD

Mitsuhiko Kono MSc KyotoIT, PhD GUAS Tokyo (from June)

Igor Ivanov PhD DSc Moscow

Postdoctoral Fellows

Casten Makochekanwa BSc Zimbabwe, MSc PhD Yamaguchi (until August)

Eskender Mume BSc PhD Uppsala (ANSTO)

Selvakumar Sellaiyan BSc PhD (ANSTO)

Postdoctoral Research Assistant

Jessica Brunton BSc (Hons) Flinders, PhD Flinders

Visiting Fellows

Prof Lewis Chadderton

Em Prof Robert Crompton AM

Dr Mitsuhiko Kono (from Feb)

Prof Robert McEachran

Prof Dennis Mueller (University of North Texas)

Dr Christopher Parkinson (University of Michigan)

Adjunct Prof Robert Robson (James Cook University)

Dr Brad Sandor (Space Science Institute)

Em Prof Erich Weigold AM

Dr Valerie Wilquet (Belgian Institute for Space Aeronomy)

General Staff

Technical Officers

Stephen Battisson AssocDip MechEng CIT

Colin Dedman AssocDip SciInst Bendigo CAE

Ross Tranter

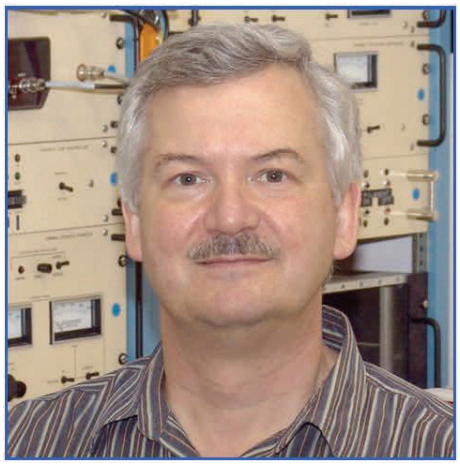
CAMS Chief Operating Officer

Adam Edwards LLB Nottingham, BSc Wollongong, GDM Western Sydney, MAppFin Charles Sturt

Departmental Administrator

Julia Wee BA Sydney, GCM MGSM

ELECTRONIC MATERIALS ENGINEERING



Professor Robert Elliman
Head of Department

Professor Mark Ridgway
Acting Head of Department

The Department of Electronic Materials Engineering (EME) conducts interdisciplinary research in condensed matter physics, materials science and device engineering. This includes world-class research in the growth, structure, properties and applications of electronic materials. Diversity is a key strength and underpins a broad collaborative base and an ability to attract students and researchers from a range of disciplines and countries.

2011 was a stellar year for the Department. Research quality continued to be outstanding and our success with external funding applications was exceptional. The year also saw EME academic staff rejuvenated with the appointment of three mid-career researchers, Drs. Jodie Bradby, Patrick Kluth and Lan Fu, to tenured positions. A change of leadership also followed with Prof. Rob Elliman completing his final term as Head of Department. His wise fiscal management policy steered the Department through difficult times and I thank Rob for his dedicated service over the last 11 years.

Academic Staff

Head of Department

Robert Elliman BAppSci, MAppSci RMIT, PhD DSc Salford, FAIP, FIP (until August)

Mark Ridgway BSc McM, MSc PhD Queens (Acting HOD from May and HOD from August)

Distinguished Professors

Chennupati Jagadish MSc PhD Delhi, FAA, FTSE, FAIP, FInstP, FIoN, FIEEE, FAPS, FOSA, FSPIE,

FECS, FIET, FAAAS, FAVS, FECS

Australian Laureate Fellow

Professors

Jim Williams BSc PhD UNSW, FAA, FAIP, FIEAust, FTSE, FAPS, FMRS

Senior Fellows

Hoe Tan BE Melbourne, PhD

Yin Yin (Jennifer) Wong Leung, BSc, Bristol, PhD

Fellows

Jodie Bradby BAppSc RMIT, PhD

Lan Fu MSc UTSC, PhD

Patrick Kluth DipPhys Düsseldorf, PhD Jülich

Jiandong Ye PhD Nanjing

Sudha Mokkapati PhD (from July)

Research Fellows

Leandro Araujo MSc PhD UFRGS (till February)

Qiang Gao MS BSc, NEU PhD

Wen Lei MSc CUG, PhD CAS

Postdoctoral Fellows

Satyam Bhuyan PhD Iowa State (until July)

Suprakit Charnvanichborikarn PhD (until May)

Bianca Haberl PhD

Tae Hyun Kim PhD

Patrick Parkinson MPhys DPhil Oxon

Matias Rodriguez PhD

Avi Shalav MSc DipTchg Massey, PhD UNSW

David Sprouster PhD

Dinesh Venkatachalam PhD RMIT MSc BITS

Hao Wang MSc Jinan, PhD South China Normal

Steffen Breuer PhD (from October)

Raquel Giulian PhD (until February)

Pawel Sajewicz, MSc Warsaw University of Technology, PhD UCC Tyndall (from August)

Hazar Salama, PhD UNSW (from March)

Felipe Kremer, PhD UFRGS (from August)

Ian McKerracher PhD (from December)

Visiting Fellows

Ping Ping Chen, SITP (until August)

Marvin Cohen, UC Berkley (October)

Stefan Decoster, KUL (until October)

Neville Fletcher, AM, PhD, FAA, FTSE, FInst P, FAIP, FAAS, FASA

Haroldo Hattori, ADFA

Mladen Petravic, University of Rijeka, Croatia

Simon Ruffell Varian

General Staff

ANFF Manager

Fouad Karouta BSc LUB, PhD Perpignan, PhD Montpellier

ANFF Processing Engineers

Animesh Basak PhD KUL (joint with AMMRF)

Xijun Li PhD CAEP (until November)

Jie Tian PhD CAEP

Kaushal Vora PhD Latrobe

ANFF Administrator

Jeffrey Kealley

Research Assistants

Kidane Belay MSc AAU Ethiopia, PhD

Gregory Jolley PhD

David Llewellyn (joint CMBE)

Technical Officers

Michael Aggett AssocDipMechEng CIT

Dane Kelly

Bernie King ONC London

Craig Saint (until April)

Thomas Kitchen AdvDipMechEng (from November)

Australian Nanotechnology Network Manager

Elizabeth Micallef

Departmental Administrator

Scott Yates

LASER PHYSICS CENTRE

Professor Barry Luther-Davies
Head of Department

During 2011 the Laser Physics Centre was engaged in numerous high profile research projects of fundamental as well as applied nature covering such areas as nonlinear optics, material science, quantum computing, solid state spectroscopy, laser matter interaction and optical trapping.

Research highlights for 2011 have included:

Optical devices

- Demonstration of on-chip stimulated Brillouin scattering and slow light in chalcogenide waveguides (with U. Sydney)
- Fabrication of ultra-high-Q 2-D microcavities with intrinsic Q ≥750,000 in chalcogenide 2-D photonic crystal fully embedded in a silica cladding
- Design of ultra-low dispersion chalcogenide waveguides for correlated photon generation free from Raman noise

Optical materials and nonlinear optics

- Development of the fabrication process of silver doped chalcogenide glass waveguides, and measured very high nonlinearity (~1000 times higher than that of silica).
- Analytical theory of formation of spatial solitons and their interaction in nonlocal media with competing focusing and defocusing nonlinearities (with Tech. Univ. Denmark)
- Experimental demonstration of the broadband second harmonic generation in randomized nonlinear photonic crystals (Chinese Acad. Sci., Beijing; U. Mainz, Max Planck Inst. Polymer Res.).
- Observation of Cerenkov third-harmonic generation in quadratic nonlinear photonic crystal (with U. Polit. Catalunya, Tel Aviv U., Nankai U.)

Laser matter interaction

- First experimental demonstration of theoretically predicted but never observed before super-dense aluminium in laser-induced micro-explosion confined inside sapphire crystal by international team including our colleagues E.G. Gamaly and A.V. Rode.
- The book by Eugene Gamaly Femtosecond Laser-Matter Interaction: Theory, Experiments and Applications, (CRC Press, Taylor & Francis; Pan Stanford Publishing 2011).
- Demonstration of the effect of polarization on ablation and pattern formation in media illuminated by tightly focused femtosecond vector beams.

Quantum computing and solid state spectroscopy

- Observation and characterization of the electric dipole-dipole interactions between europium ions in Lu3+:EuCl3.6D2O crystals.
- The order of the electronic states of the nitrogen vacancy centre has been established, resolving a controversy in the literature (with U. Melbourne, Queens U. Belfast)

Laser trapping

- First ever demonstration of micron-sized light-absorbing particles trapping and transportation in air in three dimensions with a single laser beam.
- Theory and experiments on using polarization of the laser vortex beam to control photophoretics trapping and transport of particles in air.

In December Prof. Barry Luther-Davies stepped down as head. Barry has led the LPC continuously from its inception in 1987. We thank him for his contribution to the success of this department.

Academic Staff

Professor and Head of Department

Barry Luther-Davies PhD S'ton, SIEE, FAIP, ARCFF

Professors

Wieslaw Krolikowski MSc PhD DScWarsaw, FOSA

Andrei Rode PhD Moscow

Neil Manson PhD Aberdeen

Senior Fellows

Eugene Gamaly PhD DSc Moscow

Matthew Sellars PhD ANU

Fellows

Duk Yong Choi PhD Seoul

Rongping Wang PhD Chinese Academy of Science, Beijing

Steve Madden PhD Imperial College

Research Fellows

Cyril Hnatovsky PhD Ottawa

Vladlen Shvedov PhD Taurida National V.I. Vernadsky University, Ukraine

Zhiyong Yang PhD Chinese Academy of Sciences, Beijing

Postdoctoral Fellows

Morgan Hedges PhD ANU

Sven Wittig PhD University of New South Wales

Yan Sheng PhD Institute of Physics, Chinese Academy of Science, Beijing

Visiting Fellows

Dr Anna Samoc

Prof. Marek Samoc, Wroclaw University of Technology, Poland

Dr Ludovic Rapp, University of Mediterranean Aix-Marseille II, France

Prof. Ole Bang, Technical University of Denmark

Prof. Echart Foerster, Jena University, Germany

Dr Igor Malkiel, Hermitage, St Petersburg, Russia

Prof. William Randall Babbitt, Montana State University, USA

General Staff

Technical Officers

John Bottega

Sukanta Debbarma

Romana Krolikowska

Craig Macleod AssocDip MechEng CIT

Anita Smith BSc Flinders

Departmental Administrator

Sonia Padrun (from April)

NONLINEAR PHYSICS CENTRE

Professor Yuri Kivshar
Head of Department

Nonlinear Physics are engaged in theoretical and experimental interdisciplinary research in a number of diverse areas unified by the general concepts of nonlinear physics and nonlinear photonics. Nonlinear Physics are defined by six major research directions and groups.

The experimental photonics group, led by Dr Dragomir Neshev, undertakes experimental study of linear and nonlinear properties of light propagation and localization in integrated and optically-induced photonic structures including waveguide arrays, photonic lattices, photonic crystals, as well as polychromatic light, nonlinear patterns and self-focusing. In 2011, the group's activities moved towards quantum optics in waveguides, nanophotonics, and the physics of optical metamaterials.

The theoretical photonics group, led by Dr Andrey Sukhorukov undertakes the study of different linear and nonlinear optical systems. Currently, this involves the development of theoretical models and numerical simulations of the propagation of slow light in nonlinear photonic structures with close collaboration with the experimental groups. More recently this included the development of novel concepts of light control in periodically modulated waveguide arrays and optomechanics, as well as quantum effects on waveguide arrays.

The singular photonics group, led by Dr Anton Desyatnikov undertakes both theoretical and experimental studies of the light beams with angular momentum, optical vortices, optical polarization singularities, and vortex lattices. The new activities in 2011 are associated with the physics of knots and complex phases of light.

The nonlinear matter waves and quantum-atom optics group, led by Dr Elena Ostrovskaya, is involved in the development of novel theoretical models, analytical and numerical studies of matter waves and nonlinear atom-optics problems, cold atoms, Bose-Einstein condensated in optical lattices and magnetic waveguides, atom laser, quantum optics of nonclassical and squeezed light. More recently, the group developed several novel concepts, including the study of solitons and vortices in polariton condensates.

The research on composite structures and left-handed metamaterials, led by Dr Ilya Shadrivov is in directions involving the phenomenon of negative refraction, nonlinear metamaterials and left-handed superlattices, optical cloaking and transformation optics. Recently, the group developed novel concepts for tuneable and reconfigurable metamaterials, and supported them by a series of experimental observations.

More recent developments of the NLPC research activities and the success of Dr Andrey Miroshnichenko with the Future Fellowship grant led to the creation of the sixth research group focused on the study of the physics and applications of linear and nonlinear plasmonic structures and optical nanoantennas.

Academic Staff

Professor and Head of Department

Yuri Kivshar BSc PhD Kharkov, FAIP, FOSA, FAA, FAPS, FInstP, ARC Federation Fellow

Senior Fellows

Dragmoir Neshev PhD Sofia

Fellows

Anton Desyatnikov PhD Moscow

Elena Ostrovskaya MSc Moscow, PhD ANU

Alexander Savin PhD Moscow (January-February and September-December)

Ilya Shadrivov PhD ANU

Andrey Sukhorukov MSc Moscow, PhD ANU

Research Fellows

Manuel Decker PhD Karlsruhe (from August)

Mikhail Lapine PhD Osnabruck (to August)

Aliaksandr Minovich PhD

Andrey Miroshnichenko PhD Dresden

David Powell PhD Monash

Zhiyong Xu PhD Barcelona

Postdoctoral Fellows

Ivan Garanovich PhD

Christian Helgert PhD Jena (from December)

Yana Izdebskaya PhD Simferopol

Ivan Maksymov PhD Kharkov

Michal Matuszewski PhD Warsaw (to March)

Isabelle Staude PhD Karlsruhe (from August)

Thomas White PhD (jointly with Laser Physics)

Weiren Zhu PhD Xian (from May)

Visiting Fellows

Dr Pusheng Liu, UEST China

Prof Roland Schiek, Regensburg, Germany

Dr Guangyong Zhang, China

Research Assistant

Artur Davoyan PhD (to May)

General Staff

Departmental Administrator

Kathy Hicks AdvDipAcct CIT

NUCLEAR PHYSICS

Professor David Hinde
Head of Department

Professor Andrew Stuchbery
Acting Head of Department

The Department of Nuclear Physics carries out fundamental studies in experimental Nuclear Physics as well as developing and applying nuclear techniques for basic studies in interdisciplinary research, much of it accelerator-based. The Heavy Ion Accelerator Facility, maintained, developed and operated by the Department, provides a range of energetic heavy-ion beams produced with a suite of ion sources and accelerated by a 15 million-volt tandem electrostatic accelerator and a superconducting linear accelerator. Beams are delivered to ten separate beam-lines, each dedicated to specialised detector instrumentation.

The facilities are used by staff and students of the Department as well as external users from other Australian universities and institutions, and international scientists from a number of laboratories. Scientists from the United Kingdom, for example, have formal access to the facilities through the ANU-STFC agreement.

The Department and its facilities constitute the main laboratory in Australia for accelerator based research and training in Nuclear Physics. It contributes to undergraduate and postgraduate teaching and training at honours, masters and PhD levels, conducts expert workshops in radiation physics and accelerator techniques, and manages a Master of Nuclear Science by coursework degree that was instituted in 2007. To complement the research carried out on the local facilities,

Department members collaborate with international scientists and utilise major experimental facilities overseas, gaining access through competitive processes.

Current nuclear research areas of interest cover nuclear spectroscopy and the study of exotic nuclear quantum states, heavy-ion reaction dynamics including nuclear fusion and nuclear fission and reactions of weakly-bound nuclei, and the study and use of hyperfine interactions for moment measurements and for elucidating nuclear structure. Nuclear techniques and heavy-ion detection techniques are used in a range of materials science applications including materials modification and characterisation. The technique of Accelerator Mass Spectrometry is applied to a broad range of topics including research and applications in archaeology, hydrology, climate change, soil erosion and trace isotopic analyses applied to environmental pollution studies, both nuclear and non-nuclear.

Academic Staff

Professors and Head of Department

David Hinde BSc Manchester, PhD, FAIP, FInstP, FAPS FAA (until July)

Andrew Stuchbery BSc PhD Melbourne, FAIP (July - December)

Professor and Director of Heavy Ion Accelerator Facility

Keith Fifield MSc Auckland, PhD Penn, FAIP

Professors

Aidan Byrne MSc Auck, PhD, FAIP

Mahananda Dasgupta MSc Rajasthan, PhD Bombay, FAIP, FAA

Emeritus Professors

George Dracoulis BSc PhD Melbourne, FAIP, FAPS, Hon FRSNZ, FAA

Senior Fellows

Tibor Kibédi PhD Debrecen

Gregory Lane BSc PhD (ARC Future Fellow from May)

Anton Wallner PhD Vienna (from October)

Fellows

Stephen Tims BSc PhD Melbourne

Research Fellows

Rickard du Rietz MSc PhD Lund

Cédric Simenel MSc Paris PhD Caen (until April)

Postdoctoral Fellows

Maurits Evers PhD

Michael Smith

Visiting Fellows

Dr Tezer Esat, ANSTO

Dr Toshi Fujioka, ANSTO

Dr Heiko Timmers, University of New South Wales/ ADFA

Dr Cedric Simenel, CEA/Sacley, France (from April)

General Staff

Accelerator Research and Operations Managers

Nikolai Lobanov BSc Moscow, PhD St Petersburg

David Weisser MSc, PhD Minn, FAIP (Special Projects)

Computer Manager Heavy Ion Facility

Dimitrios Tsifakis, BSc (Hon)

Computer Control Specialist

Angus Gratton, BSc, BAS

Technical Officers

John Bockwinkel, AdvDip MechEng CIT

Alan Cooper, AssDip MechEng CIT

Gareth Crook, Cert IV MechEng CIT

Caleb Gudu, AdvDip MechEng CIT (from February)

Gordon Foote BSc Lond, PhD (Casual)

Allan Harding

Justin Heighway, AssDip AppSci CIT

Tom Kitchen, AdvDip MechEng CIT (until November)

Lorenzo Lariosa

Peter Linardakis PhD (Accelerator Engineer) (from December)

Alistair Muirhead

Thomas Tunningley AdvDip EngDesign CIT, B.Ind.Des. (Hon) UC (from February)

Departmental Administrator

Petra Rickman

PLASMA RESEARCH LABORATORIES

Professor John Howard
Head of Department PRL TORO

Professor Christine Charles
Head of Department PRL: Space Plasma, Power and Propulsion (SP3)

Plasma Research Laboratory conducts research in two main areas: toroidal and space plasma.

Toroidal Plasma research embraces a multiplicity of activities associated with the physics of magnetised plasma, electromagnetics, fluids, remote sensing and inverse methods. The Department operates the Australian Plasma Fusion Research Facility which is centred on the H-1 heliac, an innovative plasma confinement device with flexible magnetic geometry. As a national focus for fusion-science research, collaboration and education, the Facility accommodates the study of basic plasma physics, advanced magnetic configurations and remote measurement systems for future fusion power plants.

This year saw the installation of several major upgrades to H-1 under a $7M EIF grant, including a new plasma heating system and plasma diagnostics. A new magnetized linear plasma source "MAGPIE" for investigating interaction of plasma with potential fusion reactor wall materials was also commissioned. Techniques and systems pioneered on the heliac continue to be deployed on world-leading fusion devices in the US, Asia and Europe.

Among other research areas, the Plasma Theory and Modeling group focuses on the fundamental physics and the modelling of magnetic confinement fusion energy devices. The group has active research links with multiple fusion research institutes in both Europe and Asia. The Physics of Fluids group undertakes research into physics of fluid turbulence, nonlinear wave phenomena and rotating fluids, including applications to environmental and atmospheric physics, weather and climate. The BushLAN project aims to deploy provisionally patented wireless broadband systems to remote areas using distributed MIMO (Multiple transmitter and multiple receiver) techniques on the band I TV spectrum.

The Space Plasma, Power and Propulsion division conducts work on both basic and applied plasma physics. The core research areas involve experimental and theoretical aspects of expanding radiofrequency helicon plasmas applied to space science, space propulsion and hydrogen fuel cells. The discovery of current free double layers and of the Helicon Double Layer Thruster led to a contract with ASTRIUM-EADS, Europe's largest Space company, and an Australian Research Space Program grant. Work includes thrust measurement, prototype space qualification and plasma modeling and simulation. Furthermore, the laboratory double layers are being applied to understanding space plasma physics such as the magnetic funnels of the solar corona and the Earth's aurora. A large contract has been signed with LAM Research Corporation in Silicon Valley for the further development of an SP3 invention to be used for the next generation of plasma etching systems for microelectronics. This opens a new and exciting career path for students and researchers alike.

Academic Staff

Professor and Head, Toroidal Plasma

John Howard BSc PhD Sydney, FInstP

Professor and Head, Space Plasma, Power and Propulsion

Christine Charles BEng MSc Rennes, PhD Hab Orléans, BMus

Director, Australian Plasma Fusion Research Facility and Senior Fellow

Boyd Blackwell BSc PhD Sydney

Professors

Michael Shats MSc KPI, PhD GPI Moscow

Robert Dewar MSc Melbourne, PhD Princeton, FAIP, FAPS, FAA

Roderick Boswell BSc Adelaide, PhD Flinders, FTSE, FAPS

Fellows

Cormac Corr PhD Belfast

Gerard Borg BSc PhD Sydney

Matthew Hole BSc BE PhD Sydney

Research Fellows

Hua Xia, MSc Chongquing, PhD

Shuiliang Ma PhD (left in September)

Postdoctoral Fellow

Graham Dennis PhD

Gregory von Nessi BSc Massachusetts PhD

Michael Fitzgerald PhD University of Sydney

Visiting Fellows

Dr Amael Caillard, University of Orleans, France

Dr Christian Sarra-Bournet,

Dr Jerew Oday

Dr Jay Larson, Argonne National Laboratory, USA

Dr Kazunori Takahashi, Iwate University, Japan

Prof. Zensho Yoshiba, University of Tokyo, Japan

General staff

Andrew Bish

Bernhard Seiwald , PhD Graz Uni. of Tech.

David Pretty, BSc Melb PhD

Fenton Glass BSc Queensland, PhD

Horst Punzmann BSc Regensburg, PhD

John Wach BAppSci CAE Ball, GradDipEl CCAE

Mark Gwynneth

Michael Blacksell

Peter Alexander

Departmental Administrator

Maxine Hewitt BA UC (until April)

Uyen Nguyen BA Monash (from April)

QUANTUM SCIENCE

Professor David McClelland
Head of Department

The core research programs in the Department of Quantum Science cover a broad range of activities linked by the quest to investigate the interface between the quantum and classical realms, to probe the quantum mechanical limits to measurement, to develop precision measurement using quantum sources, and to use these concepts in technological applications. These activities are pursued in three programs.

Quantum Optics: The quantum optics group aims to exploit quantum mechanical properties of laser field for metrological and information technology applications. 2011 is the start of the new Centre of Excellence for Quantum Computation and Communication Technology, hosting programs for Secure Quantum Communication, Quantum Memory and Quantum Repeater. In 2011, the group has published 12 articles including papers in Nature Photonics, Nature Physics, Nature Communication, Optics Letters, and Applied Physics Letters. Major results include: the generation of Gigabits of random number by measuring vacuum fluctuations at optical frequencies; and the storage and noiseless recall of Quantum optical pulses in Rubidium vapour cells at room temperature. The efficiency of this “quantum memory” is the highest achieved in the world at 87%.

Atom Optics: The atom optics program has focused on the development of the atom laser as a useful tool for investigations in fundamental physics and in precision inertial measurement. All cold atom precision inertial measurements have used cold thermal atomic sources, and all are limited in their precision by classical or technical noise sources. Can the high brightness and long coherence length of atom lasers mitigate these limiting effects? This is the question that, in part, drives our research program. At the applied end of the research spectrum, we are exploiting our technology in the development of field deployable inertial sensors in close collaboration with end users. In 2011 for example, we developed a state of the art cold atom gravimeter.

The Centre for Gravitational Physics (CGP) undertakes research on many aspects of gravity, from mathematical relativity to searching for gravitational waves to developing technology for future generations of ground and space based gravitational wave detectors and earth observations. Highlights in 2011 include: producing the ‘quietest’ laser yet at audio frequencies; using this quantum enhancement to deliver the most sensitive gravitational wave detector ever built; and searching for gravitational waves from rapidly spinning neutron stars. We commenced collaboration with the National Measurement Institute to develop optical sensors for drug testing and our program to revolutionise the space-based Gravity Climate and Recovery Experiment by using an optical readout gathered pace.

Academic Staff

Professor and Head of Department
David McClelland MSc UWA, PhD Otago

Professors
John Close PhD Berkeley

Ping Koy Lam BSc Auckland, PhD

Craig Savage PhD Waikato

Susan Scott BSc Melbourne, PhD Adelaide

Senior Fellows/Associate Professors
Joseph Hope PhD

Daniel Shaddock PhD

Fellows
Benjamin Buchler PhD

Nicholas Robins PhD

Thomas Symul PhD CNET

Research Fellows
Jong Chow BSEE Vermont, PhD ANU

Vincent Daria PhD

Andre de Carvalho PhD UFRJ Brazil

Cristina Robins-Figl PhD Hannover

Jiri Janousek PhD DTU Denmark

Mattias Johnsson PhD Canterbury

Bram Slagmolen PhD

Robert Ward PhD Caltech (from November)

Postdoctoral Fellows
Syed Assad PhD NUS Singapore/ANU

Julien Bernu PhD ENS France

David Bowman PhD ADFA (from August)

Boris Hage PhD LUH Germany

Ra Inta PhD UNSW

John Miller PhD Glasgow

Conor Mow-Lowry PhD (from July)

Olivier Pinel PhD Paris

Alberto Stochino PhD Caltech

Visiting Fellows
Dr Mark Andrews

Emeritus Prof Hans Bachor (from August)

Dr Peter Riggs

Emeritus Prof John Sandeman

General Staff

Head Technical Officer
Andrew Papworth

Technical Officers
Neil Devlin

James Dickson

Shane Grieves

Neil Hinchey

Paul McNamara

Paul Tant

Departmental Administrator
Laura Walmsley

Assistant Administrative Officer
Gaye Buratto

Centre of Excellence for Quantum Computation and Communication Technology

Node Administrator
Kerrie Cook (until April)

Amanda White (from April)

GRACE FoM Project Administrator
Kerrie Cook (from April)

THEORETICAL PHYSICS

Professor Murray Batchelor
Head of Department

The Department of Theoretical Physics is one of the university's founding departments. The primary research themes in the Department are in mathematical physics and optical sciences.

The work in mathematical physics is in a number of related areas in statistical mechanics, quantum field theory and string theory. Professor Vladimir Bazhanov and Dr Vladimir Mangazeev lead research in (i) finite lattice systems, combinatorics and Painleve equations, (ii) computational approaches to scaling and universality in statistical physics, (iii) quantum geometry and three-dimensional integrable systems. Dr Xiwen Guan leads research on exactly solved (integrable) models in cold atoms and spin systems. Integrable models of this kind have been realized recently with the trapping and cooling of quantum gases in tightly confined optical wave guides.

Professor Murray Batchelor leads research on aspects of exactly solved models in statistical mechanics, most recently on understanding the implications of a remarkable connection between the theory of Yang-Baxter integrability for lattice models and the notion of discrete holomorphicity. Professor Peter Bouwknegt leads research on the mathematics of string theory and quantum field theory. Dr David Ridout leads research on the mathematical structures underlying conformal field theory, with the properties of logarithmic conformal field theories of particular interest. Work on fundamental aspects of condensed matter is led by Professor Makunda Das, in particular on high temperature superconductivity and vortex matter phase transitions and electron transport in mesoscopic systems.

The Optical Sciences Group led by Professor Nail Akhmediev and Dr Adrian Ankiewicz performs studies in extreme events, rogue waves and soliton theory. The group develops basic theory of dissipative solitons that includes high-power ultra-short pulse lasers and giant waves in the ocean. The group is strongly linked to international research laboratories working at the forefront of ocean waves, nonlinear optics and dissipative systems.

Academic Staff

Professor and Head of Department

Murray Batchelor BSc (Hons) UNSW, PhD ANU, FAIP, FAustMS, FInstP (jointly with MSI)

Professors

Nail Akhmediev MS PhD DSc Moscow, FOSA

Vladimir Bazhanov PhD Serpukhov FAA

Pier Bouwknegt MSc Utrecht, PhD Amsterdam, FAIP, FAustMS (jointly with MSI)

Fellows

Adrian Ankiewicz BSc BE UNSW, PhD

Xi-Wen Guan BSc Qufu, MSc Sichuan, PhD Jilin

Vladimir Mangazeev MSc Moscow, PhD Serpukhov (jointly with MSI)

David Ridout BSc, MSc UWA, PhD Adelaide (ARC Fellowship) (jointly with MSI)

Postdoctoral Fellows

David Baraglia BSc(Hons) Adelaide, PhD Oxford (jointly with MSI)

John Huerta BSc(Hons) Arizona, MSc, PhD UC Riverside (jointly with MSI)

Natasha Devine PhD ANU

PeiWen Kao BSc(Hons) PhD ANU

Visiting Fellows

Rowena Ball BSc PhD Macquarie

Uwe Bandelow PhD Humboldt University

Mukunda Das BSc PhD Roorkee University

Joaquim Gomis BSc PhD Fisica, Firenze

Michael Hall, MSc PhD ANU

Carlos Kuhn Occupational Trainee

Brian Robson MSc PhD DSc Melb, FAIP

Hjalmar Rosengren BSc, PhD Lund University

Lindsay Tassie MSc PhD Melb, FAIP

Metin Unal MPhil PhD Glasgow University

Sergey Sergeev MSc PhD Steklov Institute of Mathematics

Meishan Wang MPhil PhD Shandong University

General Staff

Departmental Administrator

Lucia Lu

EDUCATION

Professor David McClelland
Deputy Director (Education)

Professor McClelland is also Head of the Department of Quantum Science, and the Physics Education Centre (PEC), which was established in 2009 to coordinate education across the School.

RSPE saw a variety of changes to the management and organization of its educational programs in 2011. The retirement of Professor Neil Manson, who had served the School in the role of Associate Director (HDR) for more than20 years, and the stepping down of both Professor Craig Savage as Associate Director (undergraduate) in July and Professor David McClelland as Deputy Director (Education) in November occasioned a significant restructuring of responsibilities. RSPE would like to extend heartfelt thanks to all three for their work. Professor Manson has created a high quality, welcoming environment for postgraduate research students entering the school for more than two decades, and has been an extremely important representative of the School's interests on relevant University-level committees. Profs McClelland and Savage oversaw the creation of the Physics Education Centre, the virtual Centre initially responsible for delivery of the School's undergraduate programs, during the merger of the former Department of Physics with the Research School of Physical Sciences and Engineering to create the new RSPE. Their contribution to both planning and delivery of the undergraduate program in particular will continue to be valued after they relinquish their formal leadership roles.

A/Professor Anna Wilson assumed overall responsibility of the School's undergraduate and graduate education programs as the new Deputy Director (Education), with formal responsibility commencing in January 2012. A new HDR Board of Studies was constituted to deliver strategic planning as well as day-to-day management of the School's postgraduate research-based education activities. On the coursework side of the School's programs, each research department appointed an Education Coordinator, responsible for liaisons between the Physics Education Centre and their home department. Current members of the HDR Board of Studies (BoS) and Departmental Education Coordinators are listed below.

As well as structural changes at the School level, 2011 saw a major overhaul of the University's undergraduate degree structure, with the introduction of a new Major, Specialisation and Minor system to replace the old Majors-only system. Through the Physics Education Centre, RSPE now offers two Majors, in Physics and Theoretical Physics; two specialisations, in Physics and Optics; and a minor in Physics. It is also a major contributor to specialisations in Astrophysics, Geophysics and Mathematical Physics in the College of Physical and Mathematical Sciences, and to the Photonics Major in the College of Engineering and Computer Science.

In education research, A/Professor Anna Wilson was successful in obtaining competitive funding for three national teaching enhancement projects, one based at ANU and two in partnership with the University of Canberra, totaling over $400,000 over 2011/2. Professor Savage's 2010 Teaching Enhancement Grant collaboration with A/Professor Paul Francis (RSAA/PEC) and Dr Nick Robins (QS), on the use of iPads to enhance student learning, has continued in 2011 with Dr Robins taking a lead role in the transition to 2012. The School (through the Physics

Education Centre) is also a participant in two externally-funded national benchmarking projects.

Recognition for the outstanding contribution of RSPE staff to undergraduate and graduate education continued with three academics nominated for College of Physical and Mathematical Sciences Awards for Teaching Excellence. Professor Andrew Stuchbery, Dr Nick Robins and Dr Xiwen Guan were all highly-deserving nominees who missed out by a whisker and have been encouraged by the College to nominate for Vice-Chancellor's awards.

School staff continue to engage at a local and national level in a variety of educational leadership roles. A/Professor Wilson participated in the ACARA National Curriculum Consultation Process and, together with academics from the Australian Council of Deans of Science, RMIT, USyd, UTS and UQ, formed a new national Physics Education Network. She also took over the baton of ACT representation on the Australian Institute of Physic's Program Accreditation Panel from Professor Hans Bachor (Professor Bachor continues to serve on the panel).

Recent trends of increasing student numbers at the undergraduate level continued with record numbers in the Advanced Physics subjects at first year. In collaboration with first year coordinator Paul Francis and Life Physics convenor Adrian Sheppard, Undergraduate Laboratory Development Officer Mika Kohonen continued to introduce a range of new experiments at first year. Greg Lane introduced two new experiments into PHYS3033 (Nuclear Physics). Andrew Papworth introduced several new experiments at second and third year, and continued his sterling work providing overall management and delivery of the undergraduate laboratory program.

Departmental Education Coordinators

David Williams (AM)

Stephen Gibson (AMPL)

Patrick Kluth (EME)

Matthew Sellars (LP)

Andrew Stuchbery (NP)

Andrei Sukhorukov (NLP)

Cormac Corr (PRL)

Joe Hope (QS)

Vladimir Mangazeev (TP)

HDR Board of Studies

Anna Wilson (Chair)

John Close (Convenor, Strategic Planning)

Wieslaw Krolikowski (Convenor, Student Management)

Fu Lan (Deputy Convenor)

Elena Ostrovskaya (Deputy Convenor)

Undergraduate Year Coordinators

Paul Francis (1st year)

Anna Wilson (2nd year)

Joe Hope (3rd year)

David Williams (Honours)

Coursework program convenors

Anna Wilson (Physics and Theoretical Physics Majors, Physics Specialisation and Physics Minor)

Daniel Shaddock (Optics Specialisation)

Andrew Stuchbery (Master of Nuclear Science)

John Love (Master of Photonics)

Laboratory Coordinators

First year: Mika Kohonen

Second year: Ben Buchler and Anna Wilson

Administrator

Laura Walmsley

STAFF WHO CONTRIBUTED TO TEACHING

Physics Education Centre Lecturers

Undergraduate coursework (years 1-3)

PHYS1001 Foundations of Physics: Craig Savage, Nick Robins

PHYS1101 Advanced Physics I: Paul Francis, Craig Savage

PHYS1004 Life Physics: Adrian Sheppard, Jodie Bradby, Phil Threlfall

PHYS1201 Advanced Physics II: Craig Savage, Paul Francis, Bianca Haberl, Patrick Kluth, John Love

PHYS2013 Quantum Mechanics: Anna Wilson, Andrew Truscott

PHYS2016 Electromagnetism: John Close, Cormac Corr

PHYS2017 Waves and Optics: Ben Buchler, Jong Chow

PHYS2020 Thermal and Statistical Physics: Frank Mills, Raquel Salmeron, Vladimir Mangazeev

PHYS3001 Theoretical Physics: Joe Hope

PHYS3002 Advanced Theoretical Physics: Susan Scott, Joe Hope

PHYS3031 Atomic Physics: Matthew Sellars, Stephen Gibson, Vincent Daria

PHYS3032 Condensed Matter Physics: Darren Goossens, David Williams

PHYS3033 Nuclear Physics: Greg Lane, Cedric Simenel, Maurits Evers

PHYS3034 Fluid Physics: Graham Hughes, Ross Griffiths, Andy Hogg, Ross Kerr (RSES)

PHYS3044/5 Plasma Physics: Cormac Corr

PHYS3051/ENGN4613 Microphotonics, Biophotonics & Nanophotonics: John Love

PHYS3057/ENGN3512 Optical Physics: Daniel Shaddock, Dragomir Neshev

PHYS3058 Work Experience in Photonics: John Love

PHYS3060/ENGN4513 Fibre Optic Communication Systems: John Love, Jong Chow

PHYS3070 Physics of the Earth: Hrvoje Tkalcic, Ian Jackson (RSES)

MATH2406 Mathematical Methods 2 Honours: Vladimir Mangazeev, Murray Batchelor

MATH3351/MATH6211 Topics in Mathematical Physics Honours: David Ridout, Murray Batchelor

Honours coursework

Hans Bachor: Science Communication.

Murray Batchelor: Introduction to integrable models in statistical mechanics

Steve Buckman: Scattering

Ron Burman (UWA): Advanced Electromagnetism

Mahananda Dasgupta: Scattering.

Denis Evans (RSC): Non-equilibrium Thermodynamics

Matthew Hole : Electromagnetism

Joe Hope: Quantum Mechanics

Mathew James (CECS): Quantum Measurement

Dragomir Neshev: Nonlinear Physics

Nick Robins: Remote Broadcast Organiser

Susan Scott: General Relativity

Andrey Sukhorukov: Nonlinear Physics

Maarten Vos: Surface Physics

David Williams: Classical Mechanics

David Williams: Motor Vehicle Physics

Stephen Williams (RSC): Thermodynamics

David Williams: Convenor

Graduate coursework

Master of Photonics Courses

PHYS6500 Optical Physics: Daniel Shaddock, Dragomir Neshev

PHYS6501 Fibre Optic Communication Systems: John Love

PHYS6502 Microphotonics, Biophotonics & Nanophotonics: John Love

PHYS6503 Work Experience in Photonics: John Love

PHYS6504 Semiconductors: Andrew Blakers

PHYS8505 Research Project: John Love

ENGN6624 Solar Electricity

ENGN6626 Digital Communications

Master of Engineering Courses

ENGN6512 Optical Physics: Daniel Shaddock, Dragomir Neshev

ENGN6513 Fibre Optic Communication Systems: John Love

ENGN6613 Microphotonics, Biophotonics & Nanophotonics: John Love

ENGN6625 Power Electronics: Boyd Blackwell

Master of Nuclear Science Courses

PHYS8201 Nuclear Fundamentals: Andrew Stuchbery

PHYS8202 Reactor Science: Andrew Stuchbery, Tony Irwin

PHYS8203 Accelerator Science: Andrew Stuchbery

PHYS8204 Nuclear Radiation: Greg Lane

PHYS8205 Nuclear Fuel Cycle: Andrew Stuchbery,

PHYS8206 Nuclear Measurement Methods: Greg Lane

Physics Education Centre Tutors and Demonstrators

First year

Rose Ahlefeldt, Boshra Afra, Imam Alam, Scott Bales, Michele Bannister, Thomas Bierschenk, Jessica Brunton, Samuel Dixon, Timothy Duignan, James Farnell, Kate Ferguson, Iain Forsyth, Kim Heenan, Diana James, Ksawery Kalinowski, Emma Kirby, Rajeev Lal, James Leslie, Rashel Li, Benjamin McKinley, Prasanga Palihawadana, Vidya Ramesh, Jason Roberts, Phil Threlfall, Frédéric Vogt, Khu Vu, Danielle Wuchenich,

Second year

Geoff Campbell, Helen Chrzanowski, Kimberley Heenan, Daniel Higginbottom, Mahdi Hosseini, Andrew Manning, Robin Stevenson, Cameron Samuell, Ben Sparkes, Michael Stefszky, Stuart Szigeti, Thanh Nguyen, Greg von Nessi, Joseph Paulraj, Dhruv Saxena, Imam Alam, Andrew Wade

Third year

Tibor Kibedi, Steve Tims, Vincent Margerin, Greg Lane, Nick Riesen, Sandy Box, Jesse Everett, Mohammed Atiq, Richard Barry, Michael Hush, Rose Ahlefeldt, Emma Anderson, Lewis Ryan, Kimberley Heenan

STUDENTS

Honours Students

Anderson, Emma
Adlong, Sarah
Bentley, Christopher
Cain, Callan John
Collin, Gabriel
Higginbottom, Daniel
Hillman, Briana
Horsley, Andrew
Hoschke, Matthew
Lester, Romana
Leykam, Daniel
McNeil, Steven
Ng, Ping Fung
Reid, David
Robertson, Calum
Ross, Joshua
Stock, Graham
Vickers, Byron

Summer Scholars

Bai, Bing
Cairns, Cameron
Chua, Alvin
Churton, Blake
Duignan, Timothy
Farnell, James
Ferguson, Kate
Forsyth, Iain
Henry, Robert Alexander
Kowarsky, Mark
Lee, Boon Quan
Leslie, James
Leykam, Daniel
McNeil, Steven
Milburn, Thomas
Ng, Ping Fung (Davidson)
Pooranachandran, Sathyan
Rajan, Puvanesvari
Sammut, Steven
Somerville, Walter
Teniswood, Clara
Teo, Ming Hao
Thorman, Alex
Wong, Sherman

PhD Students

Abdullaev, Jasur
Abdullatif, Raden
Afra, Boshra
Ahlefeldt, Rose
Alam, Imam
Altin, Paul
Ameruddin, Amira
Armstrong, Seiji
Barry, Richard
Bartholomew, John
Bayu Aji, Leonardus
Beavan, Sarah
Bennet, Francis
Bertram, Jason
Bierschenk, Thomas
Boadle, Roisin
Brown, Michael
Burgess, Timothy
Byrne, David
Caballero Benitez, Santiago
Campbell, Geoff
Caneses, Juan
Caradonna, Peter
Castle, Toen
Chan, Keng
Chang, Lei
Chowdury, Md. Amdadul
Chua, Sheon
Chrzanowski, Helen
Debs, John
Dedrick, James
Deniz, Vivianne
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Luong D, Hinde D, Dasgupta M, Evers M, Rafiei R, DuRietz R, *A complete picture of the breakup in 6,7Li-induced reactions,* **International Conference on Reaction Mechanisms and Nuclear structure around the Coulomb Barrier (FUSION 2011)** (2011) 1-4

Maksymov I, Miroshnichenko A, *Active All-Optical Spectral Tuning of Nanorod Plasmonic Nanoantennas,* **Conference on Lasers and Electro-Optics/Pacific Rim (CLEOPR 2011)** (2011) 643-645

Maksymov I, Miroshnichenko A, Kivshar Y, *Tunable plasmonic Yagi-Uda nanoantenna,* **International Workshop on Nonlinear Photonics (NLP 2011)** (2011)

Maleshkov G, Hansinger P, Garanovich I, Skryabin D, Neshev D, Dreischuh A, Paulus G, *Degenerate four-wave mixing of optical vortices assisted by self-phase and cross-phase modulation,* **International School on Quantum Electronics: Laser Physics and Applications 2010** (2011)

Mayer K, Wallenius M, Lutzenkirchen K, Galy J, Varga Z, Erdmann R, Buda J, Kratz J, Trautmann N, Fifield K, *Nuclear forensics: A methodology applicable to nuclear security and to non-proliferation,* **International Nuclear Physics Conference (INPC 2010)** (2011)

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Minovich A, Klein A, Janunts N, Pertsch T, Neshev D, Kivshar Y, *Generation and near-field imaging of Airy plasmons,* **Conference on Lasers and Electro-Optics (CLEO 2011)** (2011)

Minovich A, Klein A, Janunts N, Pertsch T, Neshev D, Kivshar Y, *Near-field observation of Airy plasmons,* **Conference on Lasers and Electro-Optics/Pacific Rim (CLEOPR 2011)** (2011) 402-403

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Miroshnichenko A, Luk-yanchuk B, Maier S, Kivshar Y, *Antiferromagnetic response of dielectric nanoparticles coupled to split-ring resonators* **Conference on Lasers and Electro-Optics/Pacific Rim (CLEOPR 2011)** (2011) 1028-1030

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Mume E, Uedono A, Mizunaga G, Lynch D, Smith S, *The role of positron annihilation lifetime studies and nuclear sensors for characterising porous materials,* **International Workshop on Slow Positron Beam Techniques 2010 - SLOPOS12** (2011) 4

Orlov A, Voroshilov P, Belov P, Kivshar Y, *Nonlocality in multilayered metal-dielectric optical metamaterials,* **Conference on Lasers and Electro-Optics (CLEO 2011)** (2011) 2

Pant R, Poulton C, Choi D, McFarlane H, Hile S, Li E, Thevenaz L, Luther-Davies B, Madden S, Eggleton B, *On-chip stimulated Brillouin scattering,* **European Conference on Lasers and Electro-Optics (CLEO/Europe 2011) 19**, 9 (2011) 8285-8290

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Pflüger T, Holzwarth M, Senftleben A, Ren X, Dorn A, Ullrich J, Hargreaves L, Lohmann B, Slaughter D, Sullivan J, Lower J, Buckman S, *Kinematically complete experiments for positron-impact ionization of helium atoms at the NEPOMUC facility,* **International Workshop on Slow Positron Beam Techniques 2010 - SLOPOS12** (2011) 7

Powell D, *Tuning interaction between metamaterial elements,* **IEEE International Workshop on Antenna Technology Small Antennas Novel Metamaterials 2011** (2011) 411-413

Powell D, Hannam K, Shadrivov I, Kivshar Y, *Interaction of twisted split ring resonators,* **European Quantum Electronics Conference (EQEC 2011)** (2011) EJ.P.6

Salgueiro J, Kivshar Y, *Nonlinear switching in tapered plasmonic couplers,* **International Workshop on Nonlinear Photonics (NLP 2011)** (2011)

Samblowski A, Laukotter C, Grosse N, Lam P, Schnabel R, *Two color entanglement,* **International Conference on Quantum Communication, Measurement And Computing 2010** (2011) 219-222

Sellaiyan S, Smith S, Hughes A, Miller A, Jenkins D, Uedono A, *Understanding the effect of nanoporosity on optimizing the performance of self-healing materials for anti-corrosion applications,* **International Workshop on Slow Positron Beam Techniques 2010 - SLOPOS12** (2011) 4

Setzpfandt F, Sukhorukov A, Pertsch T, *Solitons in waveguide arrays with competing quadratic nonlinearities,* **European Quantum Electronics Conference (EQEC 2011)** (2011) EF.P.7 1

Setzpfandt F, Sukhorukov A, Neshev D, Schiek R, Solntsev A, Kivshar Y, Pertsch T, *Nonlinear pulse transformation and phase transitions in LiNbO3 waveguide arrays,* **European Quantum Electronics Conference (EQEC 2011)** (2011) EF.5.3 1

Setzpfandt F, Sukhorukov A, Neshev D, Schiek R, Solntsev A, Ricken R, Min Y, Sohler W, **Conference on Lasers and Electro-Optics/Pacific Rim (CLEOPR 2011)** (2011) 584-586

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Simenel C, Golabek C, Kedziora D, *Actinide collisions for QED and superheavy elements with the time-dependent Hartree-Fock theory and the Balian-Veneroni variational principle,* **International Conference on Reaction Mechanisms and Nuclear structure around the Coulomb Barrier (FUSION 2011)** (2011) 1-6

Solntsev A, Neshev D, Schiek R, *Time-resolved ultrafast all-optical switching in directional couplers with second-order nonlinearity,* **European Quantum Electronics Conference (EQEC 2011)** (2011)

Solntsev A, Sukhorukov A, Kivshar Y, *Modulated nanowire couplers for ultrashort pulses,* **European Conference on Lasers and Electro-Optics (CLEO/Europe 2011)** (2011) CK.P.8 1

Solntsev A, Sukhorukov A, Neshev D, Kivshar Y, *Photon pair generation and quantum walks in arrays of quadratic nonlinear waveguides,* **European Quantum Electronics Conference (EQEC 2011)** (2011) EF.5.1 1

Solntsev A, Sukhorukov A, Neshev D, Kivshar Y, *Photon Pair Generation and Quantum Walks in Quadratic Nonlinear Waveguide Arrays,* **Conference on Lasers and Electro-Optics/Pacific Rim (CLEOPR 2011)** (2011) 962-964

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Sukhorukov A, *Optical phase transitions and quantum walks in nonlinear waveguide arrays,* **Conference on Lasers and Electro-Optics/Pacific Rim (CLEOPR 2011)** (2011) 893-894

Sukhorukov A, White T, *Slow light in photonic crystals with loss or gain,* **Advances in Slow and Fast Light 2011** (2011) 1-7

Sukhorukov A, Dmitriev S, Suchkov S, Kivshar Y, *Nonlocal effects in waveguide arrays with PT-symmetric defects,* **European Quantum Electronics Conference (EQEC 2011)** (2011) EH.2.5 1

Sukhorukov A, Xu Z, Dmitriev S, Suchkov S, Kivshar Y, *Time-reversal and nonlocal effects in PT-symmetric nonlinear lattices with balanced gain and loss,* **Active Photonic Materials 2011** (2011) 1-8

Sullivan J, Caradonna P, Jones A, Machacek J, Makochekanwa C, McEachran R, Mueller D, Buckman S, *Low energy positron interactions with rare gas atoms: threshold features and benchmark cross sections,* **International Workshop on Slow Positron Beam Techniques 2010 - SLOPOS12** (2011)

Sun Y, White T, Sukhorukov A, *Slow-light enhanced forces between shifted photonic-crystal waveguides,* **European Quantum Electronics Conference (EQEC 2011)** (2011) EI.2.3 1

Sun Y, White T, Sukhorukov A, *Slow-light enhanced optomechanical interactions between shifted photonic-crystal waveguides,* **Conference on Lasers and Electro-Optics/Pacific Rim (CLEOPR 2011)** (2011) 895-897

Sundaram M, Mills F, Allen M, Yung Y, *An Initial Model Assessment of NOx Photochemistry on Venus with Heterogeneous Oxidation of CO,* **Australian Space Science Conference 2010** (2011) 119-132

Tattersall W, White R, Robson R, Sullivan J, Buckman S, *Simulations of pulses in a buffer gas positron trap,* **International Workshop on Slow Positron Beam Techniques 2010 - SLOPOS12** (2011) 5

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Umezu I, Kohno A, Warrender J, Takatori Y, Hirao Y, Nakagawa S, Sugimura A, Charnvanichborikarn S, Williams J, Aziz M, *Strong mid-infrared optical absorption by supersaturated sulfur doping in silicon,* **International Conference on the Physics of Semiconductors 2010** (2011) 51-52

Vailionis A, Gamaly E, Mizeikis V, Yang W, Rode A, Juodkazis S, *Synthesis of Materials by Ultrafast Microexplosion,* **Conference on Lasers and Electro-Optics (CLEO 2011)** (2011) 2

Vailionis A, Gamaly E, Mizeikis V, Yang W, Rode A, Juodkazis S, *Super-dense Al formed by ultrafast laser microexplosion,* **European Conference on Lasers and Electro-Optics (CLEO/Europe 2011)** (2011) 1

Vo T, Pant R, Pelusi M, Schroder J, Choi D, Debbarma S, Madden S, Luther-Davies B, Eggleton B, *Photonic chip based all-optical XOR gate for phase-encoded signals,* **Optical Fiber Communication Conference and Exposition and the National Fiber Optic Engineers Conference 2011** (2011)

Vo T, Pant R, Pelusi M, Schroder J, Choi D, Debbarma S, Madden S, Luther-Davies B, Eggleton B, *All-optical logic gate for 160 Gbit/s DPSK signals in a highly nonlinear glass chip,* **European Conference on Lasers and Electro-Optics (CLEO/Europe 2011)** (2011)

Vu K, Madden S, *Erbium Doped Tellurium Dioxide Planar Waveguide Amplifiers with 2.8dB/cm Internal Gain,* **IEEE International Conference on Group IV Photonics 2011** (2011) 317-319

Vu K, Madden S, *High Gain Erbium Doped Tellurium Oxide Waveguide Amplifier,* **European Conference on Lasers and Electro-Optics (CLEO/Europe 2011)** (2011)

Vu K, Madden S, *Passive and Active Amorphous Tellurium Dioxide Thin Film Waveguides for Integrated Photonics,* **International Meeting of Pacific Rim Ceramic Societies (PACRIM 2009)** (2011)

Walk N, Ralph T, Symul T, Lam P, *Security of post-selection based continuous variable quantum key distribution against arbitrary attacks,* **Conference on Lasers and Electro-Optics (CLEO 2011)** (2011)

Wetzel B, Erkintalo M, Genty G, Dias F, Hammani K, Kibler B, Fatome J, Finot C, Millot G, Akhmediev N, Dudley J, *Analytical studies of modulation instability and nonlinear compression dynamics in optical fiber propagation,* **Optical Sensors 2011; and Photonic Crystal Fibers V** (2011)

White T, Sukhorukov A, *Loss saturation in dispersion-engineered slow light waveguides,* **European Conference on Lasers and Electro-Optics (CLEO/Europe 2011)** (2011) CD.10.3 1

White T, Gai X, Madden S, Choi D, Debbarma S, Luther-Davies B, *Bistable switching in chalcogenide 1D photonic crystal nanocavities,* **European Conference on Lasers and Electro-Optics (CLEO/Europe 2011)** (2011)

Xiong C, Marshall G, Peruzzo A, Lobino M, Clark A, Choi D, Madden S, Natarajan C, Tanner M, Hadfield R, Dorenbos S, Zijlstra T, Zwiller V, Thompson M, Rarity J, Steel M, Luther-Davies B, Eggleton B, O'Brien J, *Generation of Correlated Photons in an Integrated Chalcogenide As_2S_3 Waveguide,* **European Conference on Lasers and Electro-Optics (CLEO/Europe 2011)** (2011)

Xu Y, Miroshnichenko A, *Enhancement of the nonlinear response in Mach-Zehnder-Fano interferometer,* **Conference on Lasers and Electro-Optics/Pacific Rim (CLEOPR 2011)** (2011) 590-592

Yan K, Wang R, Vu K, Elliman R, Belay K, Luther-Davies B, *Photoluminescence in Er-doped Ge-As-Se chalcogenide thin films,* **Conference on Lasers and Electro-Optics (CLEO 2011)** (2011) 1612-1616

Yoon Y, Lee S, Choi D, *Highly efficient color filter based on a subwavelength metal grating integrated with a dielectric monolayer,* **Photonics Society 2011 annual meeting** (2011) 403 - 404

GRANTS

Australian Academy of Science

Scientific Visits to Europe

Buckman Stephen Prof
Antimatter Applications in Biology and Medicine
15/05/2011 - 30/05/2011
$4,880.00

Australian Institute of Nuclear Science and Engineering (AINSE)

Research Project

Craig Vincent Prof - Notley Shannon Dr - Nelson Andrew
Determining crystal structure of surfaces prepared using ALD
1/01/2011 - 31/12/2011
$4,860.00

Australian Learning and Teaching Council

Competitive Grants Program

Higgins Denise Ms - Howitt Susan A/Prof - Wilson Anna Dr - Roberts Pamela Ms - Ross Pauline - Akerlind Gerlese - Gill Betty
Teaching Research- Evaluation and Assessment Strategies for Undergraduate Research Experiences (TREASURE)
30/09/2011 - 3/10/2013
$182,000.00

Australian National University (ANU)

Discovery Translation Fund

Ganguly Rana   - Howard John Prof - Borg Gerard Dr - Hammond Thomas Dr
BushLAN - Distributed Wireless Broadband
21/11/2011 - 24/12/2012
$24,320.00

Notley Shannon Dr
Development and evaluation of an in-vitro nematode permeability assay to discover new classes of anti-nematode drugs
14/11/2011 - 17/12/2012
$66,210.00

Industry Linkage Pilot Project Fund

Lobov Sergey Dr
Targeted nano particles for cancer imaging and treatment
20/10/2011 - 20/10/2012
$3,000.00

Borg Gerard Dr
Decentralised distributed wireless networks
17/10/2011 - 17/10/2012
$3,000.00

Contribution from Central Funds

Charles Christine Prof - Butcher Harvey Prof - Boswell Roderick Prof - Perren M - Lappas Viaos - Clark Andrew
The Australian Plasma Thruster Project (Round 4) HDLT
1/08/2011 - 30/06/2013
$3,589,672.00

Jagadish Chennupati Prof - Martyniuk Mariusz - Kostylev Mikhail - Wang Jia - Liu Yinong - Konstantinov Konstantin - Woodward Robert - Jeffery Roger - Dell John Marcel
National Facility for Biased Target Deposition of Alloyed Nanolayers (externally led by University of Western Australia)
1/01/2011 - 31/12/2011
$16,862.00

Jagadish Chennupati Prof - Elliman Robert Prof - Wong-Leung Yin-Yin (Jennifer) Dr - MacDonald Daniel Dr - Williams James Prof
State-of-the-art Hall effect system for detailed electrical characterisation in semiconductors
1/02/2011 - 31/01/2012
$333,333.00

Lam Ping Koy Prof - James Matthew Prof - Buchler Benjamin Dr - Symul Thomas Dr - Sellars Matthew Dr - Simmons Michelle Yvonne
ARC Centre of Excellence for Quantum Computation and Communication Technology (QC2T) (externally led by University of New South Wales)
1/01/2011 - 31/12/2015
$7,521,500.00

Luther-Davies Barry Prof - Neshev Dragomir Prof - Kivshar Yuri Prof - Madden Steve Dr
ARC Centre of Excellence for ultrahigh bandwidth devices for optical systems (CUDOS) (externally led by University of Sydney)
1/01/2011 - 31/12/2011
$8,599,500.00

Luther-Davies Barry Prof - Madden Steve Dr - Mitchell Arnan - Alameh Kamal - Moss David J - Monat Christelle - de Sterke C Martijn - Eggleton Benjamin J - Pelusi Mark - Withford Michael - Frisken Steven - Lowery Arthur J
100 Gbit to 1 Terabit per second optical communication test-bed facility (externally led by University of Sydney)
1/01/2011 - 31/12/2011
$12,500.00

McClelland David Prof - Slagmolen Bram Dr - Shaddock Daniel Dr - Blair David Gerald - Munch Jesper - Zhao Chunnong - Ju Li
Equipment and Instrumentation for Breaking the Quantum Measurement Barrier (externally led by University of Western Australia)
1/01/2011 - 31/12/2011
$168,062.00

Tan Hoe Hark Prof - Fu Lan Dr - Kane Deborah - Withford Michael - Herberstein Marie - Faraone Lorenzo - Keating Adrian - Dawes Judith Margaret - Carman Robert John - Antoszewski Jarek
Optical Profiler with D-MEMS Capability (externally led by Macquarie University)
1/01/2011 - 31/12/2011
$11,785.00

Contribution from College of Physical & Mathematical Sciences

Charles Christine Prof - Butcher Harvey Prof - Boswell Roderick Prof - Perren M - Lappas Viaos - Clark Andrew
The Australian Plasma Thruster Project (Round 4) HDLT
1/08/2011 - 30/06/2013
$3,589,672.00

Lam Ping Koy Prof - James Matthew Prof - Buchler Benjamin Dr - Symul Thomas Dr - Sellars Matthew Dr - Simmons Michelle Yvonne
ARC Centre of Excellence for Quantum Computation and Communication Technology (QC2T) (externally led by University of New South Wales)
1/01/2011 - 31/12/2015
$7,521,500.00

Luther-Davies Barry Prof - Neshev Dragomir Prof - Kivshar Yuri Prof - Madden Steve Dr
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1/01/2011 - 31/12/2011
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Lam Ping Koy Prof - James Matthew Prof - Buchler Benjamin Dr - Symul Thomas Dr - Sellars Matthew Dr - Simmons Michelle Yvonne
ARC Centre of Excellence for Quantum Computation and Communication Technology (QC2T) (externally led by University of New South Wales)
1/01/2011 - 31/12/2015
$7,521,500.00

Contribution from Research School of Physics & Engineering

Charles Christine Prof - Butcher Harvey Prof - Boswell Roderick Prof - Perren M - Lappas Viaos - Clark Andrew
The Australian Plasma Thruster Project (Round 4) HDLT
1/08/2011 - 30/06/2013
$3,589,672.00

Lam Ping Koy Prof - James Matthew Prof - Buchler Benjamin Dr - Symul Thomas Dr - Sellars Matthew Dr - Simmons Michelle Yvonne
ARC Centre of Excellence for Quantum Computation and Communication Technology (QC2T) (externally led by University of New South Wales)
1/01/2011 - 31/12/2015
$7,521,500.00

Luther-Davies Barry Prof - Neshev Dragomir Prof - Kivshar Yuri Prof - Madden Steve Dr
ARC Centre of Excellence for ultrahigh bandwidth devices for optical systems (CUDOS) (externally led by University of Sydney)
1/01/2011 - 31/12/2011
$8,599,500.00

Australian Nuclear Science & Technology Organisation (ANSTO)

Access to Major Research Facilities Program

Hole Matthew Dr
Scoping TAE excitation using NBI
1/08/2011 - 2/08/2011
$1,800.00

Lane Gregory Dr - Smith Michael Mr
Pure and applied nuclear structure research with radioactive ion beams at CARIBU - Attendance at International Workshop
1/08/2011 - 2/08/2011
$3,175.00

Howard John Prof
Imaging Motional Stark Effect for internal current measurements
18/07/2011 - 29/07/2011
$1,800.00

Hinde David Prof - Evers Maurits Dr - Dasgupta Mahananda Dr
Towards understanding the transition from transfer to energy dissipation in reactions of 32S and 40Ca with 208Pb
20/06/2011 - 29/06/2011
$12,000.00

Australian Research Council (ARC)

Centre of Excellence

Lam Ping Koy Prof - James Matthew Prof - Buchler Benjamin Dr - Symul Thomas Dr - Sellars Matthew Dr - Simmons Michelle Yvonne
ARC Centre of Excellence for Quantum Computation and Communication Technology (QC2T) (externally led by University of New South Wales)
1/01/2011 - 31/12/2015
$7,521,500.00

Luther-Davies Barry Prof - Neshev Dragomir Prof - Kivshar Yuri Prof - Madden Steve Dr
ARC Centre of Excellence for ultrahigh bandwidth devices for optical systems (CUDOS) (externally led by University of Sydney)
1/01/2011 - 31/12/2011
$8,599,500.00

2011 Discovery: Project Grant

Akhmediev Nail Prof - Ankiewicz Adrian Dr - Taki Majid
Rogue waves in oceans and optical fibers
1/01/2011 - 31/12/2013
$390,000.00

Baldwin Kenneth Prof - Orr Brian J - Warrington Richard B - Eyler Edward
Using high-resolution lasers to test quantum electrodynamics
1/01/2011 - 31/12/2013
$240,000.00

Craig Vincent Prof - Senden Timothy Prof - Notley Shannon Dr
Using light to move molecules - a novel approach to exploring intermolecular forces
1/01/2011 - 31/12/2013
$365,000.00

Dasgupta Mahananda Dr - Hagino Kouichi - Tostevin Jeffrey Allan
From coherent to dissipative dynamics in complex quantum systems: Emerging new ideas from precision measurements of nuclear collisions
4/04/2011 - 3/04/2014
$450,000.00

Hinde David Prof - Schmidt Karl-Heinz - Liang Junjien Felix
Researching the super heavy elements: a quantitative understanding through integrating new reaction time measurements with theoretical models
1/01/2011 - 31/12/2013
$490,000.00

Hole Matthew Dr
Emergence and control of self-organisation in fusion plasmas: through ITER and beyond
1/01/2011 - 31/12/2013
$255,000.00

Hyde Stephen Prof - Mortensen Kell
Theory and synthesis of self-assembled polyfunctional supramolecular fibres and associated soft materials
1/01/2011 - 31/12/2013
$445,000.00

Izdebskaya Yana Dr
All-optical reconfigurable interconnects in nematic liquid crystals
1/04/2011 - 31/03/2014
$355,000.00

Kingston Andrew Dr - Varslot Trond Dr - Sheppard Adrian Dr
Dynamic tomography: high resolution 4 dimensional process tomography
1/01/2011 - 31/12/2013
$246,000.00

Parsons Drew Dr - Ninham Barry Prof
Hofmeister at Work. Implementation of a paradigm shift in Physical Chemistry
1/01/2011 - 31/12/2013
$378,000.00

Powell David Dr - Shadrivov Ilya Dr - Engheta Nader
Functional metamaterials based on chiral structures
1/01/2011 - 31/12/2013
$475,000.00

Robins Nicholas Dr - Close John Prof - Rasel Ernst - Ertmer Wolfgang
Precision inertial sensing with cold atoms
1/01/2011 - 31/12/2013
$340,000.00

Robins Vanessa Dr - Sheppard Adrian Dr
Foundations and advanced algorithms for topological image processing
1/01/2011 - 31/12/2013
$255,000.00

Rode Andrei V Prof - Krolikowski Wieslaw Prof - Padgett Miles
Nanometrology of laser-trapped airborne particles
1/01/2011 - 31/12/2013
$510,000.00

Ruffell Simon Dr - Williams James Prof - Cohen M - Louie Steven - Zettl Alex
Narrow band gap silicon: understanding and exploiting this new silicon phase
1/01/2011 - 31/12/2013
$420,000.00

Shaddock Daniel Dr - Miller John Mr - Adhikari Rana - Hild Stefan
Enhancing the science reach of second generation interferometric gravitational wave detectors through innovative mirror design and control
1/01/2011 - 31/12/2012
$295,000.00

Shats Michael Dr - Punzmann Horst Dr - Falkovich Gregory
Extreme wave events on the water surface
1/01/2011 - 31/12/2013
$330,000.00

Tan Hoe Hark Prof
III-V semiconductor nanowire solar cells
1/01/2011 - 31/12/2013
$556,000.00

Wang Rongping Dr - Russo Salvy P - Jain Himanshu - Ngai Kia
Understanding and optimizing the microstructure of Ge-As-Se glasses for superior device performance
1/01/2011 - 31/12/2013
$210,000.00

2011 Discovery: Project Grant - externally led

Bouwknegt Pier (Peter) Prof - Varghese Mathai
Supersymmetric Quantum Field Theory Topology and Duality (externally led by University of Adelaide)
1/01/2011 - 31/12/2013
$185,000.00

2010 Future Fellowships

Buchler Benjamin Dr
Memory and light for integrated quantum systems
7/03/2011 - 6/03/2014
$577,884.00

Corr Cormac Dr
The plasma boundary: A major challenge for fusion science and material technology for ITER and beyond
1/01/2011 - 31/12/2014
$680,552.00

Lane Gregory Dr
New directions for nuclear structure research in Australia
26/05/2011 - 25/05/2015
$706,552.00

Notley Shannon Dr
Tuning adhesion through polymer chain entanglement
1/08/2011 - 31/07/2015
$783,126.00

Shaddock Daniel Dr
Laser Interferometry for Space Science
20/01/2011 - 19/01/2015
$706,552.00

Sheppard Adrian Dr
Testing theories of two-phase flow in porous media through experiment imaging and modelling
1/01/2011 - 31/12/2014
$773,072.00

Sukhorukov Andrey Dr
Functional nonlinear nanophotonics
31/05/2011 - 30/05/2015
$580,429.00

Truscott Andrew Dr
Observing Einstein-Podolsky-Rosen entanglement with ultracold atomic gases
6/01/2011 - 5/01/2015
$692,552.00

2011 Future Fellowships

Choi Duk-Yong Dr
A silicon-compatible light source on a silicon-on-insulator platform
16/12/2011 - 15/12/2015
$714,528.00

2011 Linkage: Infrastructure Equipment Facilities

Jagadish Chennupati Prof - Elliman Robert Prof - Wong-Leung Yin-Yin (Jennifer) Dr - MacDonald Daniel Dr - Williams James Prof
State-of-the-art Hall effect system for detailed electrical characterisation in semiconductors
1/02/2011 - 31/01/2012
$333,333.00

2011 Linkage: Infrastructure Equipment Facilities led by an External Institution

Jagadish Chennupati Prof - Martyniuk Mariusz - Kostylev Mikhail - Wang Jia - Liu Yinong - Konstantinov Konstantin - Woodward Robert - Jeffery Roger - Dell John Marcel
National Facility for Biased Target Deposition of Alloyed Nanolayers (externally led by University of Western Australia)
1/01/2011 - 31/12/2011
$16,862.00

Luther-Davies Barry Prof - Madden Steve Dr - Mitchell Arnan - Alameh Kamal - Moss David J - Monat Christelle - de Sterke C Martijn - Eggleton Benjamin J - Pelusi Mark - Withford Michael - Frisken Steven - Lowery Arthur J
100 Gbit to 1 Terabit per second optical communication test-bed facility (externally led by University of Sydney)
1/01/2011 - 31/12/2011
$12,500.00

McClelland David Prof - Slagmolen Bram Dr - Shaddock Daniel Dr - Blair David Gerald - Munch Jesper - Zhao Chunnong - Ju Li
Equipment and Instrumentation for Breaking the Quantum Measurement Barrier (externally led by University of Western Australia)
1/01/2011 - 31/12/2011
$168,062.00

Tan Hoe Hark Prof - Fu Lan Dr - Kane Deborah - Withford Michael - Herberstein Marie - Faraone Lorenzo - Keating Adrian - Dawes Judith Margaret - Carman Robert John - Antoszewski Jarek
Optical Profiler with D-MEMS Capability (externally led by Macquarie University)
1/01/2011 - 31/12/2011
$11,785.00

2011 Linkage: Projects led by an External Institution

Baldwin Kenneth Prof - McClelland David Prof - Luiten Andre Nicholas
Creating a National Time and Frequency Network for Australia (externally led by Uni of Western Australia)
24/06/2011 - 24/06/2014
$30,000.00

Catchpole Kylie Dr - Rode Andrei V Prof - Gan Xiaosong - Zhang Chao - Alameh Kamal - Lewis Roger - Peng Gang Ding - Juodkazis Saulius - Thoni Carola - McPherdan Ross - McPhail Dennis - Gu Min - Day Daniel - Jia Baohua
3D nano-photonic fabrication facility based on super-resolution techniques
31/05/2011 - 31/05/2012
$0

Super Science Fellowship

Fifield L Keith Prof - De Deckker Patrick Prof - Ellwood Michael Dr - Fallon Stewart Dr
Novel Dating Methods for Marine Sediments of Relevance to Determining Past Climate Changes
4/04/2011 - 31/12/2013
$556,800.00

Jagadish Chennupati Prof - Kivshar Yuri Prof
Nanofabrication of Metamaterials for Next Generation Optical Devices
1/07/2011 - 30/06/2014
$835,200.00

Australian Synchrotron Company Ltd

Access to Synchrotron Facilities

Bierschenk Thomas Mr - Ridgway Mark C Prof - Decoster Stefan Mr - Salama Hazar Dr
Study of the local structural configuration of ion implanted copper impurities in germanium
3/09/2011 - 6/09/2011
$815.00

Decoster Stefan Mr - Bierschenk Thomas Mr - Ridgway Mark C Prof - Salama Hazar Dr
Lattice location study of implanted manganese in dilute magnetic semiconductor materials
1/09/2011 - 3/09/2011
$1,115.00

Kluth Patrick Dr
Swift heavy ion induced track formation and porosity in crystalline and amorphous semiconductors
30/08/2011 - 2/09/2011
$1,115.00

Ridgway Mark C Prof
Australian Synchrotron Beamtime Application - Anisotropic vibrational properties in semiconductors-IV
28/07/2011 - 31/07/2011
$1,415.00

Ridgway Mark C Prof - Salama Hazar Dr
Structural and vibrational properties of metal nanoparticles in silicon notraide
12/11/2011 - 16/11/2011
$7,565.00

Rodriguez Matias Dr - Bierschenk Thomas Mr
Integral SAXS study of the swift heavy ion induced structural modifications in Cu30Zr35Ti35 amorphous metal
24/11/2011 - 27/11/2011
$815.00

Rodriguez Matias Dr
Swift heavy ion induced structural modifications in polymers AS112/SAXS3851
2/09/2011 - 3/09/2011
$1,115.00

Grants Program

Afra Boshra Ms - Kluth Patrick Dr
Annealing kinetics of ion tracks in apatite
22/11/2011 - 24/11/2011
$815.00

Decoster Stefan Mr - Ridgway Mark C Prof - Bierschenk Thomas Mr
Lattice location study of implanted manganese in dilute magnetic semiconductor
17/02/2011 - 2/06/2011
$1,415.00

Ridgway Mark C Prof - Bierschenk Thomas Mr - Decoster Stefan Mr
Impurity clustering in electronic and photonic materials -II
1/04/2011 - 4/04/2011
$1,415.00

Rodriguez Matias Dr - Kluth Patrick Dr - Afra Boshra Ms
Study of the influence of ion tracks in the recrystallization process of amorphous metals using simultaneous SAXS and WAXS
24/03/2011 - 27/03/2011
$1,415.00

BP Exploration Operating Company Ltd

Consultancy

Senden Timothy Prof
Combined Micro CT System - BP Instrument Sale
6/12/2011 - 5/12/2013
$350,000.00

Commonwealth Department of Defence Defence Science and Technology Organisation (DSTO)

Research Agreement

Close John Prof - Robins Nicholas Dr - Altin Paul Dr
*State of the Art Gravimeter: Thermal Atom Source **CONFIDENTIAL PROJECT***
30/05/2011 - 30/06/2012
$992,520.00

Dept of Industry Innovation Climate Change Science Research and Tertiary Education (DIICCSRTE)

Australian Space Research Program Stream B: Space Science & Innovation Project Grants

Charles Christine Prof - Butcher Harvey Prof - Boswell Roderick Prof - Perren M - Lappas Viaos - Clark Andrew
The Australian Plasma Thruster Project (Round 4) HDLT
1/08/2011 - 30/06/2013
$3,589,672.00

Education Investment Fund

Jagadish Chennupati Prof
Australian National Fabrication Facility EIF -ACT Node Project (externally led by ANFFL)
8/06/2011 - 30/06/2013
$5,230,000.00

National Enabling Technologies Strategy

Jagadish Chennupati Prof
ANU Australian Research Council Nanotechnology Network (ARCNN) - 2010-2013
1/04/2011 - 31/07/2013
$600,000.00

Volkswagen Stiftung

Grant

Akhmediev Nail Prof - Hoffman Norbert - Pelinovsky E - Peinke Joachim
Extreme Ocean Gravity waves: Analysis and prediction on the basis of breather solutions of nonlinear evolution equations
1/02/2011 - 3/02/2014
$316,514.03

SCHOOL RESOURCES

Mr Rana Ganguly
School Manager

Executive Assistant to Director
Deborah Bordeau

School Outreach
Tim Wetherell

School Development
Kavitha Robinson

School Projects
Liz Micallef

School Stores
Ken Staples, Manager

Richard Adamow

Goran Radovanovic

School Computer Unit
James Irwin, Manager

Martin Conway

Julie Dalco

Deane Larkman

Facilities & Services
Graeme Cornish, Manager

Lyndell Paseka

Reception
Susie Radovanovic

Tearoom
Josephine Ivanic

School Technical Services

Electrical
Patrick Lang, Manager

Christopher Gordon (from July)

Carpentry
Anthony MacKey, Manager

Tristan Kent

Electronic Workshop
David Anderson, Manager

Dennis Gibson

Steven Huynh

David Kelly

Steven Marshall

Luke Materne (from February)

Wasantha Ramasundara

Paul Redman

Daniel Tempra

Oliver Thearle

Andrew Zeylemaker

Mechanical Workshop
Thomas McGuinness , Manager

Anthony Barling

Thomas Cave

Steve Holgate

Owen Kershaw

Richard Kolterman

Miroslav Peric

Gordon Scott (until November)

Matthew Wallace

Craig Young