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 165 academics, 120 professional staff and 160 post graduate students.

Physics at ANU has achieved the highest rank in in the Excellence for Research in Australia ranking (ERA level 5). In 2012, ANU Physics was also the highest ranked department (30th in the world) in any discipline in Australia according to the Shanghai Jiao Tong Academic Ranking of World Universities (ARWU).

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 research programme is not only confined to the discipline of Physics as the School has significant links with Engineering, Medicine and other science disciplines.

The School continued to excel in its research performance in 2012, with almost 500 journal publications and 150 international conference publications. In 2012 the School was successful in winning over $34 million in research grants including over $15 million from the Australian Research Council, with the remainder comprising funds from the Education Investment Fund (EIF), National Collaborative Research Infrastructure Strategy (NCRIS), Australian Space Research Program (ASRP) and industry.

RSPE hosts four major national facilities supported by EIF and NCRIS funding: the National Plasma Fusion Research Facility (H-1NF), the Heavy-Ion Accelerators Facility (HIAF), and the ACT node of the Australian National Fabrication Facility (ANFF) "NeCTAR: The Characterisation Virtual Laboratory (NeCTAR). RSPE is also part of the Australian Nanotechnolgoy Network (ANN).

The School is the lead institution for the ARC Centre of Excellence for Antimatter-Matter Studies (CAMS), and is a partner in the Centre for Quantum Computing and Communications (CQC2T) and the Centre for Ultrahigh Bandwidth Devices and Optical Systems (CUDOS).

In 2012 the School was successful in being awarded 4 Future Fellowships and 2 DECRA Fellowships. RSPE also was awarded 17 ARC discovery and linkage grants for physics research.

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.

Professor Ken Baldwin is Deputy Director (Research) of RSPE, as well as being Director of the Centre for Quantum-Atom Optics and Director of the ANU Energy Change Institute, and a Professor in the Department of Atomic and Molecular Physics, RSPE.

APPLIED MATHEMATICS

Professor Tim Senden
Head of Department

A quick scan of the 2012 Applied Mathematics publication titles has one feeling that the list must surely span several departments, or even Research Schools. If this is the first reaction then I am relieved. The Department remains as diverse as ever and continues to elude rigorous definition – just as our founders intended. Yet the challenge is not in staying broad, it would be trivial to be unfocussed. The key is to keep a direction guided by a particular set of fundamentals that tie seemingly disparate fields together. Whether this means exploring the role of dispersion forces has on the balance of electrolytes in cells, the topological frustration collagen undergoes as skin hydrates, the complex interfacial rearrangements which happen when water displaces oil in a reservoir rock, or the leap from disorder to order as grains pack under shear are all topics that stem from an understanding of interplay between structure and local forces. It is no coincidence that two of the most substantial investments in instrument development with the Department have been around the measurement of molecular forces (SFA) and microscopic structure (CT). Both instrument have and do support the very basic research fabric that attracts so many of the rich collaborations we enjoy with researchers an industry alike. The very existence of these instruments is a symbol of how technical excellence intersects academic innovation. This productive union of professional and academic staff separate the great universities from all the rest.

Just as the Surface Force Apparatus brought collaborators in from around the world, the micro-CT facility has equally focused a spectrum of new activities, from palaeontology, to entomology, granular materials and of course, flow through porous materials. By the end of the late 90's some 37 complete systems had been sold world-wide, resulting in over a thousand publications. The micro-CT (Heliscan) is set to be an equally significant venture for the Department and to date six systems have been ordered by collaborators around the world, forming part of the key technology on which Digitalcore is based.

By the end of the year the merger of Digitalcore with Norway-based Numerical Rocks was publicly announced, a result of an 18 month negotiation. Driven by the union of two complementary digital core technologies the new company, Lithicon, is well set to become a world leader in the Oil and Gas Industry. The awarding of the Eureka prize (below) is testament to this.

While it might appear that we are loosely captured by a materials science theme we mostly seem to attract people with an instinctive and natural curiosity for the nature of 'things', and it is with pleasure I specifically note our visitors: our resident artists, Erica Seccombe and Denise Higgins, our notable historian, Emeritus Professor John Maloney, Professor Norm Morrow a regular visitor and leader in petroleum research, Dr Judith Caton, an expert on bush foods and Kioloa Fellow, and Professor Phil Evans a world-class wood anatomist and composites expert. The diversity of human intellect in our a little Department is something to celebrate. And we do.

Academic Staff

Head of Department and Professor

Vince Craig BSc PhD, ARC Future Fellow (until February)

Tim Senden BSc PhD (from February for 3 years)

Professors

Stephen Hyde BSc PhD Monash, ARC Federation Fellow

Mark Knackstedt BSc Columbia, PhD Rice (on leave, Digitalcore Pty Ltd)

David Williams BSc Sydney, PhD Cambridge

Senior Fellows

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 (until February)

Drew Parsons PhD

Vanessa Robins BSc, PhD Colorado (on leave)

Ross Stephens PhD Sydney

Trond Varslot MSc PhD NTNU (on leave from August, Digitalcore Pty Ltd)

Postdoctoral Fellows

Hongjie An PhD (from February)

Nicolas Francois PhD Bordeaux (until March)

Andrew Kingston PhD Monash

Shane Latham BSc PhD UQ

Glenn Myers PhD Monash

Mohammad Saadatfar PhD

Visiting Fellows

Dr Linnea Andersso, Stockholm University (from December)

Dr Christoph Arns, University of NSW

Dr Tomaso Aste, University of Kent

Dr Mathais Bostrom, Linköping Universitet Sweden

Dr Anna Carnerup, PhD (Digitalcore Pty Ltd)

Dr Judith Caton, PhD

Mr Arthur Davies

Prof Phil Evans, University of British Columbia

Dr Olaf Delgado Friedrich (from May)

Prof John Maloney

Prof Stjepan Marcelja, University of Rochester

Dr Rainer Mittelbach (from February)

Prof Norman Morrow, University of Wyoming (from November)

Prof Barry Ninham

Dr Gerd Schröder-Turk, University of Erlangen

Dr Rob Sok, (Digitalcore Pty Ltd)

Professional Staff

Senior Software Designer

Paul Veldkamp BSc BEc

Technical Officers

Holger Averdunk

Jessica Blackmore

Ron Cruikshank

Karen Knox (from August)

Rohini Marathe, BSc Mumbai, MSc Rutgers

Tim Sawkins

Michael Turner, PhD

Contractors

Joe Micallef (CT sales)

Joseph Hamilton (geologist for Consortium)

Departmental Administrator

Margo Davies DipDent Tasmania (until March)

Departmental Coordinator

Martina Landsmann (from July)

Students

PhD

Castle, Toen

Deniz, Vivianne

Duignan, Timothy

Howard, Shaun

Kim, Min-Chul

Li, Heyang

McKay, Thomas

Middleton, Jill

Pozzi, Francesco

Ramsden, Stuart

Sham, Alison

Song, Tao

Tayati, Ponlawat

Valbuena Soler, Johnny

Walsh, Rick

MPhil

Cheng, Qianhao

Hannah, Nicholas

Honours

Carroll, Sebastian

Chung, Gavin

Khor, Josiah

Tupper, Lewis

Wolk, Brendon

PhB

Pagram, Thomas

Visiting Students

Alexandre, Lucile, Pierre and Marie Currie University, France

Alizadeh, Mehdi, University of New South Wales

Arnoux, Thibaud, Pierre and Marie Currie University, France

Liu, Tianshu, Australian National University

Mucadam, Riyad, Victoria University, New Zealand

Seccombe, Erica, Australian National University

Tao, Jin, Australian National University

Wu, Bo, University of Science & Technology, China

Ziyuan, Qi, China University of Petroleum (Huadong), P.R. China

Atomic & Molecular Physics

Professor Stephen Buckman
Head of Department Until March

Professor Ken Baldwin
Acting Head Mar -Sept

Dr Maarten Vos
Head of Department from Oct

The Atomic and Molecular Physics Laboratories (AMPL) are engaged in a broad range of experimental and theoretical studies of the interaction of electrons, positrons, and photons with atoms, molecules and solids as well as the internal structure of a new state of matter: Bose-Einstein condensates. 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.

AMPL has a long and proud tradition of developing new, cutting-edge experiments. Our outstanding technical staff is pivotal for the success of these developments. In this tradition, we are particularly excited that 2012 has seen the start of research in a brand new area (jointly with the Non-Linear Physics Centre): polaritronics, a state that is a mixture of light and matter. This research will complement our successful research in Bose-Einstein condensation of metastable helium atoms which have a similar high-degree of internal coherence.

New free-electron lasers are coming on-line overseas, producing extreme intensities of photons. Experiments using these sources reveal the intricate behavior of atoms in these strong photon fields. Understanding these phenomena is presently a hot topic and our theoretical physics group plays a leading role here.

AMPL's laboratories research activities include photon interactions: VUV/XUV laser spectroscopy, laser photodetachment and photofragment spectroscopy, computational molecular physics, positron and electron interactions: low-energy positron and electron physics, materials studies with positrons and electrons, 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.

AMPL also hosts an Australian Research Council Centre of Excellence: the 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 centre operates two unique positron beam lines: one for positron scattering from atoms and molecules, the other for the interaction of positrons with surfaces.

There is also a strong interest in environmental and climate change issues within AMPL. We study the molecular processes in the Venus atmosphere to enhance our understanding of what determines the climate on a planet. We study aerosols in the atmosphere, are involved (together with the Fenner School of the Environment) in understanding cloud physics in order to forecast the output of rooftop photovoltaics. We also play an important role in the ANU Energy Change Institute.

Academic Staff

Head of Department and Professors

Stephen Buckman BSc PhD Flinders, FAPS, FAIP, FInstP (until 1 April)

Kenneth Baldwin BSc MSc, DIC PhD London, FAIP, FInstP, FOSA, FAPS (2 April to 30 September)

Head of Department

Maarten Vos MSc PhD Groningen (from 1 October)

Professors

Anatoli Kheifets BSc PhD St Petersburg, FAPS

Brenton Lewis PhD DSc Adelaide, C Phys, FInstP, FAPS, FOSA, FAIP (until 24 July)

Emeritus Professors

Robert Crompton AM FAA FAPS FAIP

Brenton Lewis PhD DSc Adelaide, C Phys, FInstP, FAPS, FOSA, FAIP (from 25 July)

Erich Weigold AM FAA FTSE FAPS FAIP

Senior Fellows

Stephen Gibson BSc PhD Adelaide

Research Fellows

James Sullivan BSc PhD

Andrew Truscott BSc PhD Queensland

David Sprouster (from April) BSc (Honours) Wollongong PhD

Robert Dall BSc Queensland PhD

Igor Ivanov PhD DSc Moscow

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

Postdoctoral Fellows

Eskender Mume BSc PhD Uppsala (ANSTO) (until 31 December)

Selvakumar Sellaiyan BSc PhD (ANSTO) (until 1 December)

Visiting Fellows

Dr Simon Armitage (University of North Texas)

Prof Michael Brunger (Flinders University)

Dr Steven Cavanagh (Defense, from 1 May)

Prof Lewis Chadderton (to 19 December)

Dr Luca Chiari (Flinders University)

Prof Hyuck Cho (Chungnam University)

Prof Gustavo García Gómez-Tejedor (Spanish National Research Council, CSIC)

Assoc Prof Oddur Ingólfsson (University of Iceland)

Dr Kandis Lea Jessup (Southwest Research Institute)

Dr Mitsuhiko Kono

Dr Paulo Limao-Vieira (Universidade Nova de Lisboa)

Prof Robert McEachran

Prof Dennis Mueller (University of North Texas)

Adjunct Prof Robert Robson (James Cook University)

Prof Akira Uedono (Tsukuba University)

Professional Staff

CAMS Chief Operating Officer

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

Technical Officers

Stephen Battisson AssocDip MechEng CIT

Colin Dedman AssocDip SciInst Bendigo CAE

Ross Tranter

Departmental Administrator

Julia Wee BA Sydney, GCM MGSM

Students

PhD

Roisin Boadle

Colin Campbell

Andrew Geoffrey Manning

Joshua Machacek

Prasanga Palihawadana

Jason Roberts

Wade Tattersall

Ju-Kuei Wu

Honours & Other Scholars

Emma Anderson (Honours – ANU)

Ly Duong (Honours, Summer Scholar – ANU)

Joseph Horst (Summer Scholar)

Jacob Hughes (Honours – ANU)

James Frith (Summer Scholar - ANU)

Ashton Walker (ASC)

Visiting Students

Christopher Lee (Uni North Texas)

Corbin Vermet (Uni North Texas)

ELECTRONIC MATERIALS ENGINEERING

Professor Mark Ridgway
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.

The year of 2012 was yet another successful one. The Departmental population continued to grow such that EME now ranks as the largest in the School. We welcomed back/welcomed numerous persons across the academic, professional and student sectors. This included the return of Founding EME Professor Jim Williams upon his retirement as School Director. (Jim now assumes the role of EME Post-Directorial Fellow, a Departmental first!). EME personnel represent not only a broad range of scientific backgrounds and expertise but also a broad range of cultural and ethnic origins with the Departmental population now drawn from over 25 countries world-wide.

Successes this year included a range of promotions, awards, grants, fellowships, elections and appointments too numerous to list though details are provided below. The Departmental research programs continued to expand and will soon be supported by major upgrades in experimental capabilities over the next few years including the installation of major infrastructure in the MOCVD, ANFF and ion accelerator laboratories. Similarly, Departmental teaching programs grew with academic staff contributing to a variety of under-graduate courses in addition to formally assuming responsibility for the delivery of the third-year condensed matter physics course. This integration of teaching and research will further strengthen the Department and bodes well for the future of EME.

Academic Staff

Head of Department and Professor

Mark Ridgway BSc McM, MSc PhD Queens

Distinguished Professor & Australian Laureate Fellow

Chennupati Jagadish MSc, PhD Delhi, FAA, FTSE, FAIP, FInstP, FIoN, FIEEE, FAPS, FOSA, FSPIE, FECS, FIET, FAAAS, FAVS, FECS

Professors

Robert Elliman BAppSci MAppSci RMIT, PhD DSc Salford, FAIP, FIP

Jim Williams BSc PhD UNSW, FAA, FAIP, FIEAust, FTSE, FAPS, FMRS (till October) (Director til March)

Emeritus Professor

Jim Williams BSc PhD UNSW, FAA, FAIP, FIEAust, FTSE, FAPS, FMRS (from October)

Visiting Fellows

Neville Fletcher AM, PhD Harvard, DSc Sydney, FAA, FTSE, FInst P, FAIP, FAAS. FASA

Haroldo Hattori (ADFA)

Simon Ruffell (Varian)

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

Qiang (Michael) Gao MS BSc NEU PhD

Research Fellows

Sudha Mokkapati PhD

Dinesh Venkatachalam PhD RMIT, MSc BITS

Kiran Mangalapalli M.Sc, PhD U of Hyderabad

Postdoctoral Fellows

Bianca Haberl PhD

Tae Hyun Kim PhD (until December)

Patrick Parkinson MPhys DPhil Oxon (until November)

Matias Rodriguez PhD

Avi Shalav PhD UNSW, MSc DipTchg Massey

Hao Wang MSc Jinan, PhD South China Normal

Steffen Breuer PhD HU

Pawel Sajewicz MSc Warsaw U of Tech, PhD UCC Tyndall

Hazar Salama PhD UNSW

Felipe Kremer PhD UFRGS

Research Assistants

Kidane Belay BSc MSc AAU Ethiopia, PhD

David Llewellyn (joint CMBE)

Visiting Fellows

Neville Fletcher AM, PhD Harvard, DSc Sydney, FAA, FTSE, FInst P, FAIP, FAAS. FASA

Haroldo Hattori (ADFA)

Simon Ruffell (Varian)

Professional Staff

Technical Officers

Michael Aggett AssocDipMechEng CIT

Dane Kelly

Bernie King ONC London

Thomas Kitchen AdvDipMechEng (until May)

Josh Carr (from June)

Departmental Administrator

Helen Shelper (January-April)

Julie Arnold (from April)

ELECTRONIC MATERIALS ENGINEERING

Australian National Fabrication Facility (ANFF)

Manager

Fouad Karouta BSc LUB, PhD Perpignan, PhD Montpellier

Processing Engineers

Animesh Basak PhD KUL (joint with AMMRF) (until March)

Jie Tian PhD CAEP (until October)

Kaushal Vora PhD Latrobe

Naeem Shahid (from November) KTH Stockholm

Administrator

Jeffrey Kealley

Australian Nanotechnology Network Manager

Elizabeth Micallef

Students

PhD

Boshra Afra

Amira Ameruddin

Leonardus (Bimo) Bayu Aji

Thomas Bierschenk

Timothy Burgess

Keng Chan

Ruixing (Andy) Feng (from July)

Aruni Fonseka

Ms Qian Gao

Yu-Heng (Jaret) Lee

Hao Feng Lu

Mykhaylo Lysevych

Sahar Mirzaei

Miranda Nash (from Feb)

Nian (Jenny) Jiang

Kun Peng (from February)

Aldowan Premala (from June)

Daniel Pyke

Dhruv Saxena

Daniel Schauries (from July)

Clara Teniswood

Ian Yesaya Wenas (from March)

Mr Xiaoming (Fred) Yuan

MPhil

Sam Turner

Sarita Deshmukh

Sherman Wong

Shriniwas Deshpande

Prakash Prasai

Honours

Ryland Harris

Christian Henderson

Angus Heyworth

Zhi (Rex) Li

Beau Olsen

Ben Weise (till June)

Wei Yang

Kangrui Zhou (till June)

Occupational Trainees

Manuel Buerzle (Feb- April)

Sreekar Molakalapalli (June-August)

Thomas Lisy (from October)

Jens Hansen Ölmedal (July-November)

Samer Sulieman (September-December)

LASER PHYSICS CENTRE

Professor Wieslaw Krolikowski
Head of Department

During 2012 the Laser Physics Centre was engaged in numerous high profile research projects of a 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.
Notable achievements in 2012 included:

Optical devices

- Demonstration of the first mid-infrared super continuum generated in a dispersion engineered chalcogenide glass waveguide
- Demonstration of record high Q 2-D photonics crystal nano cavity in a 2D photonic crystal membrane fabricated from chalcogenide glass fully embedded in a silica-like cladding.
- In collaboration with researcher at the University of Sydney, the first on-chip demonstration of stimulated Brillouin scattering in planar waveguides leading to slow and fast light and SBS based microwave photonics filters
- In collaboration with researchers at Macquarie University, the design and production of chalcogenide waveguides for efficient generation of correlated photon pairs
- Demonstration of the first loss compensated nonlinear planar waveguides and first very low loss vertical taper coupler spot size transformers for efficient fibre coupling to chalcogenide nano waveguides
- Demonstration of first low loss highly Erbium doped chalcogenide planar waveguides

Optical materials and nonlinear optics

- Theory of Cerenkov second harmonic generation induced by the spatial modulation of quadratic nonlinearity
- Theory of anomalous interaction of solitons in media with competing nonlinearities, (in collaboration with Danish researchers)
- Theoretical and experimental studies of second and third harmonic generation in media with randomized nonlinearity (in collaboration with groups in Spain and Poland).
- Theory of soliton stability in nonlocal random media (in collaboration with researchers from Germany)

Laser matter interaction

- Observation of several new phases of silicon formed in ultrafast light induced micro-explosion.
- Observation of polarization-dependent ablation of silicon using tightly focused femtosecond laser vortex pulses

Solid state spectroscopy and quantum computing

- Formulation of the first comprehensive theory of the properties of the NV spin qubit. This work is a clear milestone in the understanding of the NV centre and is a key resource for the future development of NV centre quantum technologies.
- Development of the first theoretical proposal for the employment of the NV centre to measure geometric phases due to a macroscopic rotation. Whilst important to the fundamental understanding of geometric phases, this proposal has also led to the pursuit of high precision nanoscale quantum gyroscopes based upon

the NV centre for nanotechnology applications. (in collaboration with Melbourne University)

- Demonstration of optical access to a single dopant atom in a silicon. This was achieved in a hybrid approach were a single erbium atom was resonantly addressed by light and its excitation measured using a Field Effect Transistor (FET) detecting the change in the charge state of the atom. This is a major step forward towards interfacing silicon and photonic based quantum computing technologies (in collaboration with the University of New South Wales)

Laser trapping

- "Proof-of-principle' experiments demonstrating that a hollow-core Bessel beam from a cw laser source does apply sufficient radiation pressure to divert the particle jet in Free Electron Laser X-ray experiments (in collaboration with DESY, Hamburg)
- Revealing the role of polarization of optical beam on photophoretic trapping of airborne particles
- Demonstration of optical manipulation of particle ensembles in air

Our research activities have been supported mainly by the Australian Research Council (Discovery projects and Centre of Excellence). In the 2012 round of the ARC Discovery program Dr. Cyril Hnatovsky won the DECRA postdoctoral fellowships to work on application of vector beams in laser micromachining.

In 2012 our colleague Prof. Barry Luther-Davies was awarded the Australian Optical Society SW.H. (Beattie) Steel Medal for "strong and sustained record or authority, enterprise and innovation in the field of optics in Australia." In 2012 Sarah Beavan, Xin Gai, Lachlan Rogers, Khu Vu, Ting Han, Malte Duering and Morgan Hedges completed their graduate studies and have been subsequently awarded their PhD. In addition Zhe Jin has been awarded his MSc degree. We congratulate them on this achievement.

Academic Staff

Head of Department and Professor

Krolikowski, Wieslaw (MSc PhD Warsaw)

Professors

Luther-Davies, Barry (PhD S'ton, SIEE, FAIP, FTSE)

Manson, Neil (PhD Aberdeen)

Rode, Andrei (PhD Moscow)

Senior Fellows

Choi, Duk-Yong (PhD Seoul)

Gamaly, Eugene (MSc PhD DSc, Full Professor of Physics, Moscow)

Madden, Stephen (PhD Imperial College)

Sellars, Matthew (PhD ANU)

Fellows

Wang, Rongping (PhD CAS)

Research Fellows

Hnatovsky, Cyril (PhD Ottawa)

Shvedov, Vladlen (PhD Taurida National)

Yang, Zhiyong (PhD CAS)

Postdoctoral Fellows

Sheng, Yan (PhD CAS, ARC Postdoctoral Fellow)

Hedges, Morgan (PhD Melbourne Uni)

Doherty, Marcus (PhD, Bch Science (honours), Bch Engineering (honours))

Rapp, Ludovic (PhD)

Vu, Khu (PhD ANU, Mphil Southampton, BSc Honors ANU, BSc Monash)

Wittig, Sven (PhD)

Visiting Fellows

Deng Feng Chen

Ma, Dongli (Chinese Academy of Sciences, China)

Roppo, Vito (Polytechnic University of Catalunya, Barcelona, Spain)

Samoc, Anna

Samoc, Marek

Professional Staff

Technical Officers

Bottega, John

Debbarma, Sukhanta

Krolikowska, Maryla

MacLeod, Craig (AssocDip MechEng CIT)

Smith, Anita (until August 2012)

Departmental Administrator

Uyen Nguyen (until June 2012)

Sonia Padrun (from July 2012)

Students

PhD Students

Ahlefeldt,Rose Louise

Bartholomew,John Glen

Beavan,Sarah Elizabeth Maria

Eckerskorn, Niko

Ferguson, Katherine

Freeman,Darren

Gai,Xin

Jin, Zhe

Kalinowski,Ksawery Kajetan

Marzban, Sara

McMurtrie,Roger Learmonth

Paulraj, Joseph

Rancic, Milos

Rogers,Lachlan James

Sun, Yue

Wang, Ting

Yan, Kunlun

Yu, Yi (Ivy)

Zhong, Manjin (Grace)

Visiting Students

Li, Li (OT)

Ma, Pan (OT)

Pischke, Thomas (OT)

Reville, Victor (OT)

Su, Xueqiong (OT)

Sun, Yue (OT -- LPC/NLP)

Wei, Wenhou (OT)

Yan, Kunlun (OT until August 2012, then PhD student)

Zhang, Yu (OT)

NONLINEAR PHYSICS CENTRE

Professor Yuri Kivshar
Head of Department

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

The experimental photonics group, led by Dr Dragomir Neshev, undertakes experimental studies of linear and nonlinear properties of light propagation and localization in integrated and optically-induced photonic and nanoplasmonic structures, including light self-action and harmonic generation, optical metamaterials, and nanophotonics. In 2012, the group's activities moved towards quantum optics in waveguide arrays, and the physics of optical metamaterials and plasmonic structures.

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 nolinear 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, topologically protected states, and singular beams in periodic optical lattices. A part of the group's activities is devoted to the experimental studies of self-action effects in nematic liquid crystals.

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, 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 the general direction involving the phenomenon of negative refraction, nonlinear metamaterials and left-handed materials, and optical cloaking. Recently, the group developed novel concepts for tunable and reconfigurable metamaterials, and supported them by a series of experimental observations at microwave and THz frequencies.

More recent developments of the NLPC research activities, and the success of Dr Andrey Miroshnichenko with a 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. The most recent research of this new team is devoted to the so-called "magnetic light" and nanophotonics of all-dielectric optical structures.

Academic Staff

Head of Department and Professor

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

Senior Fellows

Andrei Maimistov (April-June)

Dragmoir Neshev PhD Sofia

Andrey Sukhorukov MSc Moscow, PhD

Fellows

Anton Desyatnikov PhD Moscow

Elena Ostrovskaya MSc Moscow, PhD

Alexander Savin PhD Moscow (May to July)

Ilya Shadrivov PhD

Research Fellows

Manuel Decker PhD Karlsruhe

Aliaksandr Minovich PhD

Andrey Miroshnichenko PhD Dresden

David Powell PhD RMIT

Postdoctoral Fellows

Ivan Garanovich PhD (to April)

Christian Helgert PhD Jena (to March)

Yana Izdebskaya PhD Simferopol

Ivan Maksymov PhD Kharkov (to August)

Michal Matuszewski PhD Warsaw (to March)

Isabelle Staude PhD Karlsruhe

Omri Triedel PhD Haifa (March-June)

Visiting Fellows

Dr Nora Alexeeva, Capetown South Africa

Prof Igor Bareshenkov, Capetown South Africa

Dr Mikhail Lapin, University of Sydney

Dr Pusheng Liu, UEST China

Professional Staff

Departmental Administrator

Kathy Hicks AdvDipAcct DipMngment CIT

Research Assistants

Diana Antonosyan (March-August)

Andrei Komar (October-December)

Students

PhD Students

Jasur Abdullaev

Diana Antonosyan

Rui Guo

Kirsty Hannam

Ksawery Kalinowsky

Ali KH Mirzaei

Sergey Kruk

Daniel Leykam

Guangao (Leo) Li

Mingkai Liu

Wei Liu

Alexander Solntsev

Che Wen (Allen) Wu

Sun Yue

Honours Students

Ben Hopkins

Shuai Li

Visiting Students

Martin Boguslawski, University of Muenster, Germany

Wen-Chen Chen, Boston College, USA

Michael Greppmair, University of Applied Science, Regensburg Germany

Francois-Xavier Parise, Polytech Clermont-Ferrand, France

Andreas Pusch, Imperial College, London

Patrick Rose, University of Muenster, Germany

Stefan Schlecht, University of Applied Science, Regensburg Germany

Ivan Shishkin, Ioffe Physical Technical Institute, Russian Academy of Sciences

Sergey Suchkov, Russian Academy of Sciences

NUCLEAR PHYSICS

Professor David Hinde
Head of Department

The Department of Nuclear Physics carries out fundamental research in Nuclear Physics, as well as developing and applying nuclear techniques for basic studies in interdisciplinary accelerator based research. The Heavy Ion Accelerator Facility, maintained, developed and operated by the Department is supported financially by the ANU, and by CRIS and now NCRIS operational funding from the Federal Government. It 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 scientists from many overseas Universities and laboratories in Europe, North and South America and Asia. Scientists from the United Kingdom have formal access to the Facility 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, 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

Head of Department and Professor

David Hinde BSc Manchester, PhD, FAIP, FInstP, FAPS,FAA

Professor and Director, Heavy Ion Accelerator Facility

Keith Fifield MSc Auckland, PhD Penn, FAIP

Professors

Mahananda Dasgupta MSc Rajasthan, PhD Bombay, FAIP, FAA

Andrew Stuchbery BSc PhD Melbourne, FAIP

Emeritus Professor

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

Senior Fellows

Tibor Kibédi PhD Debrecen

Gregory Lane BSc PhD (ARC Future Fellow)

Anton Wallner PhD Vienna

Fellows

Stephen Tims BSc PhD Melbourne

Research Fellows

Mario DeCesare PhD Naples (from March)

Rickard Du Rietz MSc PhD Lund (until Feb)

Elizabeth Williams PhD Yale

Postdoctoral Fellows

Maurits Evers PhD

Duc Huy Luong PhD (from Oct)

Ramachandran Kandasamy PhD Mumbai (from April)

Matthew Reed MPhys Leicester PhD Surrey (from March)

Michaela Srncik PhD Vienna (from March)

Visiting Fellows

Dr Tezer Esat, ANSTO

Dr Heiko Timmers, University of New South Wales/ ADFA

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

Rickard Du Rietz MSc PhD Lund (from Feb)

Professional Staff

Accelerator Research and Operations Managers

Nikolai Lobanov BSc Moscow, PhD St Petersburg

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

Accelerator Engineer

Peter Linardakis PhD

Computer Manager Heavy Ion Facility

Dimitrios Tsifakis, BSc (Hons)

Computer Control Specialist

Angus Gratton, BSc, BAS (until Dec)

Technical Officers

John Bockwinkel, AdvDip MechEng CIT

Alan Cooper, Fitting and Machinist Trade Cert. AssDip MechEng CIT

Gareth Crook, Cert IV MechEng CIT

Caleb Gudu, AdvDip MechEng CIT

Gordon Foote BSc London, PhD (Casual)

Allan Harding, Fitting and Machinist Trade Cert.

Justin Heighway, AssDip AppSci CIT

Lorenzo Lariosa

Alistair Muirhead, Fitting and Machinist Trade Cert.

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

Departmental Administrator

Petra Rickman

Students

PhD students

Badriah Alshahrani

NUCLEAR PHYSICS

Michael East
Michael Edwards
Ian Carter
WeeTeck Hoo
Rajeev Lal
Albert Lee
Russell Leslie
Duc Huy Luong (until July)
Steven McNeil
Dominic Rafferty
Michael Smith
Aditya Wakhle

Masters students (MPhil)

Asif Ahmed
Michael Brown
Vincent Margerin
Nyaladzi Palalani

Masters students (CWk)

Jesse Boylan
Duncan Crawford
Dongyun Jeung
Michael Lane
Peter Lewis
Vanessa Masters
Robert Parker
Dimitrios Tsifakis
Nick Vazenios
Eric Wawra

Honours

Kaitlin Cook
Boon Quan Lee
Puvanesvari Rajan
Mapril Ng

Summer Scholars (ANU)

Melanie Hampel, University of Bonn, ANU Exchange

Visiting students

Khalid Al Hashmi, University of Wollongong
Sultan Alhujaili, University of Wollongong
Yasser Al Rahbi, University of Wollongong
Taleb Alwadi, University of Wollongong
Kevin Bai, University of Wollongong
Wing Chan, 3rd year project, ANU
Catherin Cheak, University of Wollongong
Gan Chin Chin, 3rd year project, ANU
Patrick Copp, University of Wisconsin, US
Donna Curtis, University of Wollongong
Shreder Daria , University of Wollongong
Saptarshi Das, 3rd year project, ANU
Keiran Delves, University of Wollongong
Yu Deng, University of Wollongong
Mitchell de Vries, 3rd year project, ANU
Andrew Dipuglia, University of Wollongong
Andrew Duong, Monash University
Ali Ghabag, University of Wollongong
Patrick James, University of Wollongong
Haijie Jin, University of Wollongong
Azira Khalil, University of Wollongong
Andrew Manettas, University of Wollongong
Ellen Manning, University of Tasmania
Bradley McAlpine, University of Wollongong
Leanne Miller-Bassett, University of Wollongong
Joel O'Brian, Alstonville High School
Carmela Sampang, University of Wollongong
Rohit Inipully Somasundaran, Uni of Wollongong
Matthew Talia, Monash University
Nikolina Vicoroski, University of Wollongong
James Vohradsky, University of Wollongong
Clair Walsh, University of Wollongong
Sean Wang, University of Wollongong
Bryce Webb, University of Wollongong
Melek Zarifi, University of Wollongong

PLASMA RESEARCH LABORATORIES SP3

Professor Christine Charles
Head of Department

The Space Plasma, Power and Propulsion division is lead by Prof Christine Charles and conducts work on both basic and applied plasma physics. The core research areas involve experimental, theoretical and computer simulation aspects of low pressure helicon discharges and high pressure (including atmospheric pressure) radiofrequency discharges and of their numerous applications.

Interaction of these plasmas with surfaces (etching, sputtering, deposition, surface functionalisation) are applied to microelectronics and optoelectronics processes, to focused ion beam sources, to fuel cell manufacturing for the hydrogen economy and to the design of materials with biological responses, catalytic activity, optical or mechanical properties. Formal collaborative development of industrial plasmas is proceeding successfully with LAM research of Silicon Valley.

Expansion of these plasmas is applied to electric propulsion with the development of three new thrusters (HDLT, Pocket Rocket, DS4G) and to space plasma physics such as the magnetic funnels of the solar corona and the Earth's aurora. Other research on space plasma physics includes studying high-beta plasmas, wave-plasma interactions, plasma instabilities, cross-field diffusion, momentum imparted from plasma expansion and plasma detachment from magnetic fields. We are developing a new national space simulation facility to test the thrusters in collaboration with the astronomers at Mount Stromlo and with various industry partners (e.g. EADS-Astrium).

Academic Staff

Head of Department and Professor

Christine Charles BEng MSc Rennes, PhD Hab Orléans, BMus

Professor

Roderick Boswell BSc Adelaide, PhD Flinders, FTSE, FAPS

Visiting Fellows

Dr Craig Davis, Stayz Pty Ltd 2011

Dr Timo Gans, University of York, UK

Dr Deborah O'connell, University of York, UK

Robert Laine, SPACINOV, France

Jay Vennick, VIPAC, Australia (ASRP Project with RSAA)

Andrew Bish

Peter Alexander

Mike Petkovic (ASRP Project with RSAA)

Nick Herald (ASRP Project with RSAA)

Robert Boz (ASRP Project with RSAA)

Nicolas Paulin (ASRP Project with RSAA)

Departmental Administrator

Uyen Nguyen BA Monash

Professional Staff

Technical Officers

Students

PhD students

Dixon, Sam

Dedrick, James

Greig, Amelia

Visiting Student

Timo Schroeder, Max Planck Institute of Plasma Physics

PLASMA RESEARCH LABORATORIES TORO

Professor John Howard
Head of Department

Toroidal Plasma Research embraces a diversity of activities associated with the physics of magnetised plasma, electromagnetics, fluids and remote sensing. The Department is home to the H-1 Australian Plasma Fusion Research Facility, which is the national focus of high temperature experimental plasma fusion research for clean energy generation. It also houses a variety of smaller plasma devices and the experimental facilities of the physics of fluids group. There are four primary research activities within the Department.

The Experimental Plasma Science group undertakes research into plasma magnetic confinement on the H-1 heliac, and fusion-relevant materials studies on the MAGnetised Plasma Interaction Experiment (MAGPIE) (which also involves formal collaborations with the Australian Nuclear Science and Technology Organisation). The techniques and instruments pioneered in the laboratory are deployed at many fusion institutes around the world.

The Plasma Theory and Modeling group focuses on the fundamental physics and modelling of magnetic confinement fusion energy devices. The group has flourishing research links with many international fusion laboratories around the world.

The Physics of Fluids group undertakes research into waves, turbulence and non linear phenomena, important for the physics of weather, climate, and plasma confinement.

The BushLAN project is developing the world's first fully distributed wireless telecommunications network. A demonstrator is nearing completion and industrial partners are being sought. The distributed approach is inherently superior to, and potentially more economical than current universal cellular networks.

Academic Staff

Head of Department and Professor

John Howard BSc PhD Sydney, FInstP

Professors

Michael Shats MSc KPI, PhD GPI Moscow

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

Senior Fellows

Boyd Blackwell BSc PhD Sydney

Research Fellows

Cormac Corr PhD Belfast

Gerard Borg BSc PhD Sydney

Matthew Hole BSc BE PhD Sydney

Hua Xia MSc Chongquing PhD

Clive Michael Bsc PhD

Postdoctoral Fellows

Graham Dennis PhD

Gregory von Nessi BSc Massachusetts PhD

Michael Fitzgerald PhD University of Sydney

Nicolas Francois BEng Toulouse PhD Université Bordeaux 1

Visiting Fellows

Dr Jerew Oday

Dr Jay Larson, Argonne National Laboratory, USA

Dr Kazunori Takahashi, Iwate University, Japan

Prof. Zensho Yoshiba, University of Tokyo, Japan

Dr Stuart Hudson, Princeton Plasma Physics Laboratory

Dr Jana Brotankova

Dr Oliver Ford, Max-Planck-Institut für Plasmaphysik

Prof. Gregory Falkovich, Weizmann Institute of Science, Rehovot, Israel

Prof. Roger Hosking, University of Adelaide

Professional Staff

Technical Officers

Bernhard Seiwald PhD Graz Uni. of Tech.

David Pretty BSc Melb PhD

Fenton Glass BSc Queensland PhD

Horst Punzmann BSc Regensburg PhD

Michael Blacksell

Peter Alexander

Departmental Administrator

Uyen Nguyen BA Monash

Students

PhD students

Abdullatif, Farzand

Bowie, Craig

Bowden, George

Byrne, David

Caneses, Juan

Chang, Lei

Chen, Haitao

Haskey, Shaun

Khandaker, Asaduzzaman

Lester, Romana

McGann, Mathew

Qu, Zhisong

Stock, Graham

Thapar, Nandika

Thompson, Matt , BSc ANU, awarded PhD in August 2011 (ANU)

Masters students (MPhil)

Bertram, Jason

Frost, Benjamin

Gibson, Ashley

Cox, Sebastian

Nizette, Aimee

Honours

Thorman, Alexander

Woolfe, Kieran

Chan, Ka-Jin

Summer Scholars

Le, Kavin

Jacobs, Marthinus

Wright, Adelle

McKay, James

Visiting students

Thomas Harle, University of Surrey, UK

Aude Petin, University Paris sud-11,

Maimbourg Thibaud, Ecole Normale Supérieure (ENS) in Paris

Zhai Yang, Nanjing University of Science and Technology, China

Kamil Szewc, The Institute of Fluid-Flow Machinery in Gdańsk, Poland

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. As the second largest node of the Centre of Excellence for Quantum Computation and Communication Technology, it hosts programs in Secure Quantum Communication, Quantum Memory and Quantum Repeater. In addition to the Centre programs, the group also undertakes research in quantum opto-mechanics and ultra-precision machining. Major results in 2012 include: Demonstration of precision spectral manipulation of light using optical memory (published in PRX), characterization of quantum discord as a resource for quantum communications (Nature Physics), demonstration of programmable multimode quantum network (Nature Communications), and nonlinear interaction enhancement using optical memory (Nature: light science and applications).

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 2012 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 2012 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 continued our collaboration with the National Measurement Institute to develop optical sensors for drug testing and our program to revolutionise the next space-based Gravity Climate and Recovery Experiment by using a laser interferometer produced prototype hardware which passed environmental testing.

Academic Staff

Head of Department and Professor

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

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 (until 30 June)

Andre de Carvalho PhD UFRJ Brazil

Jiri Janousek PhD DTU Denmark

Mattias Johnsson PhD Canterbury

Bram Slagmolen PhD

Robert Ward PhD Caltech

Postdoctoral Fellows

Syed Assad PhD NUS Singapore/ANU

Julien Bernu PhD ENS France

David Bowman PhD ADFA

Roland Fledderman PhD LUH Germany (from 6 Feb)

Angela Maria Florio PhD INRIM Turin (until 3 May)

Boris Hage PhD LUH Germany (until 31 January)

Ra Inta PhD UNSW

John Miller PhD Glasgow

Conor Mow-Lowry PhD (until 8 March)

Olivier Pinel PhD Paris

Alberto Stochino PhD Caltech

Visiting Fellows

Dr Mark Andrews

Emeritus Prof Hans Bachor

Dr Quentin Glorieux

Dr Peter Riggs

Emeritus Prof John Sandeman

Dr Edward Teo

Professional 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 Carney

Centre of Excellence for Quantum Computation and Communication Technology

Node Administrator

Amanda White

GRACE FoM Project Administrator

Kerrie Cook

Students

PhD Students

Adlong, Sarah

Altin, Paul

Armstrong, Seiji

Barry, Richard

Bennetts, Shayne
Bentley, Christopher
Brieussel, Alexandre
Campbell, Geoff
Chrzanowski, Helen
Debs, John
Chua, Sheon
Guccione, Giovanni
Hardman, Kyle
Higginbottom, Daniel
Hillman, Briana
Hosseini, Mahdi
Hosseini, Sara
Hudspeth, Jessica
Hush, Michael
Lam, Timothy
Lewis, Benjamin
McDonald, Gordon
Mills, Ruth
Morizur, Jean-Francois
Mullavey, Adam
Ngo, Silvie
Nguyen, Thanh
Poldy, Rachel
Riesen, Nicolas (PEC)
Roberts, Lyle
Sparkes, Benjamin
Stefszky, Michael
Stevenson, Robin
Sutton, Andrew
Szigeti, Stuart
Threlfall, Philip
Wade, Andrew
Whitfield, Ross
Wuchenich, Danielle

Masters Students (Coursework)

Archer, Ian
Beltman, Scott
Boylan, Jesse
Crawford, Duncan
Gleeson, Jeremy
Harding, Daniel
Jeung, Dongyun
Lane, Michael
Lewis, Peter
Parker, Robert
Pretty, David
Robertson, Vanessa
Tsifakis, Dimitrios
Vazenios, Nicholas
Wang, Kun
Wawra, Eric
Wu, Che Wen
Zhang, Meiying

Summer Scholars

Bandutunga, Chathura
Mansell, Georgia
Torrisi, Dominic

Occupational Trainees

Yong, Shen
Geng, Jiao

Honours Students

Aslanides, John
Chua, Alvin
Dong, Jarrod
Elliot, Megan (Engineering)
Francis, Sam (Engineering)
Johnston, David
Kalyanasundaram, Shankar (Engineering)
Keal, Hannah
Malikedes, Emmanuel
Wigley, Paul

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.

Professor Murray Batchelor leads research on aspects of exactly solved models in statistical mechanics, most recently on understanding the implications of the remarkable connection between the theory of Yang-Baxter integrability 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

Head of Department and Professor

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

Professors

Nail Akhmediev MS PhD DSc Moscow, FOSA

Peter Bouwknegt MSc Utrecht, PhD Amsterdam, FAIP, FAustMS (Deputy Director of MSI)

Vladimir Bazhanov PhD Serpukhov FAA

Research Fellows

Adrian Ankiewicz BSc BE UNSW, PhD

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

Vladimir Mangazeev MSc Moscow, PhD Serpukhov

Zengo Tsuboi MSc PhD Tokyo

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

Postdoctoral Fellows

Natasha Devine PhD

PeiWen Kao BSc(Hons) PhD

Visiting Fellows

Uwe Bandelow PhD Humboldt University

Thomas J Creutzig PhD from DESY Hamburg (Germany)

Daisuke Takahashi University of Tokyo

Mukunda Das BSc PhD Roorkee University

Subir Ghosh PhD SINP Calcutta

Michael Hall MSc PhD ANU

Yusuke Kageyama PhD Kyushu Univeristy

Astuo Kuniba University of Tokyo

Carlos Kuhn Occupational Trainee

Brian Robson MSc PhD DSc Melb, FAIP

Lindsay Tassie MSc PhD Melb, FAIP

Daisuke Takahashi PhD University of Tokyo

Metin Unal MPhil PhD Glasgow University

Yvan Saint-Aubin PhD from U de Montreal (Canada)

Sergey Sergeev MSc PhD Steklov Institute of Mathematics

Yan Wang PhD Shanxi University, China

Simon Wood PhD from ETH Zurich (Switzerland)

Professional Staff

Departmental Administrator

Lucia Lu

Students

PhD

Mikhail Dudalev

Imam Alam

Amdadul H Chowdury

David Kedziora

Andrew Kels

Brendan Wilson

MPhil

Seong Joon Yi