

DEPARTMENTS

The Research School of Physical Sciences and Engineering is comprised of eight research departments:

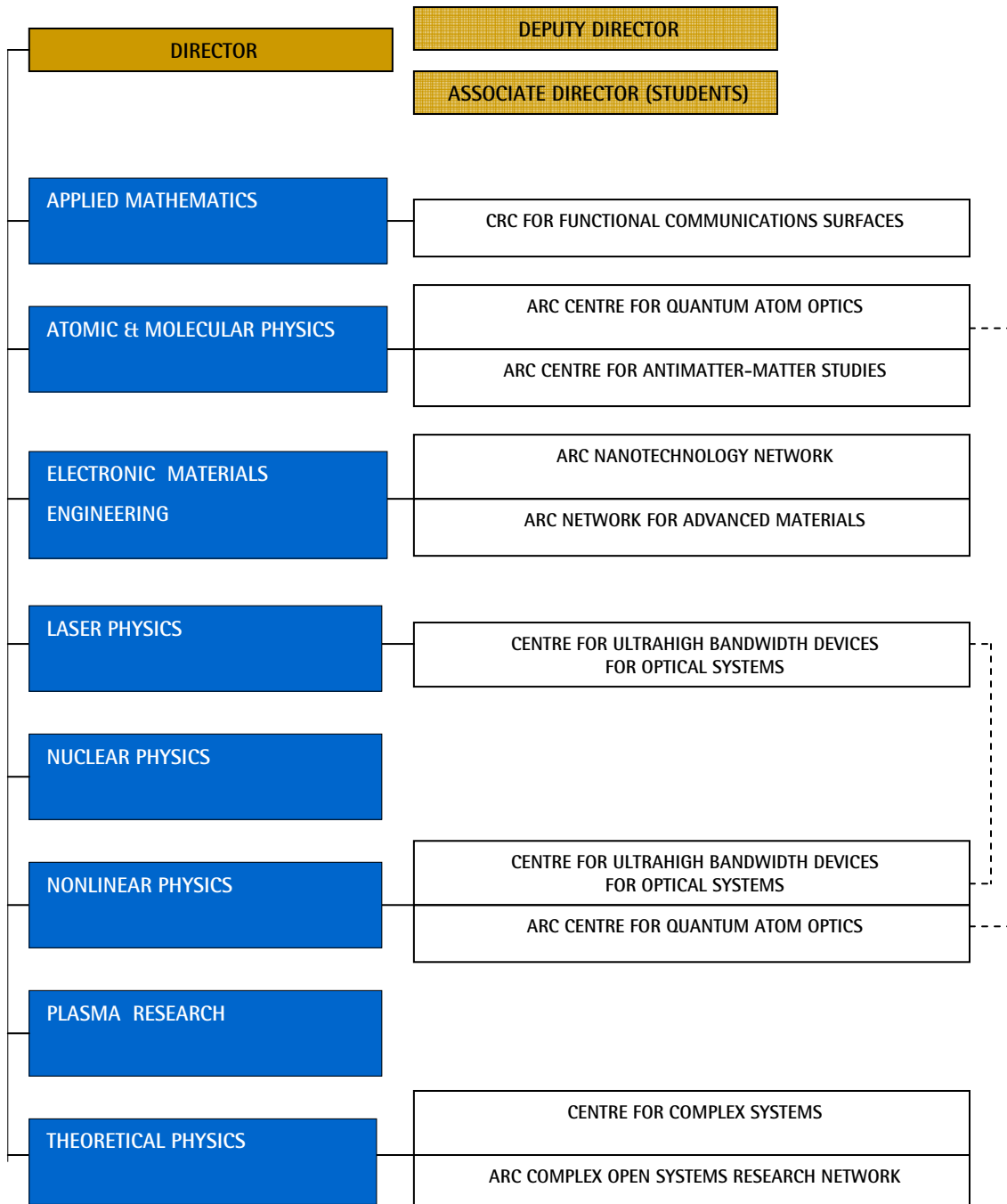
- Applied Mathematics
- Atomic and Molecular Physics
- Electronic Materials Engineering
- Laser Physics
- Nonlinear Physics
- Nuclear Physics
- Plasma Research
- Theoretical Physics

A brief description of each department is detailed in the following pages as well as a list of staff dedicated to that area. Note that centres, networks and other associations are often formed by teams of scientists undertaking a common research activity and can span across various national and international institutions. Detailed reporting of their activities would, in most cases, be available in their respective Annual Reports.



RESEARCH DEPARTMENTS

CENTRES & NETWORKS



Applied Mathematics



The Department of Applied Mathematics (AM) performs research on fundamental and applied topics in colloid, surface and polymer science, largely in measurement of surface forces; on self-assembly of organic and inorganic structures at mesoscopic scales; and on disordered materials, mostly on micron-scale morphology, granular materials and transport in porous structures and on complex systems.

Although condensed matter and materials research dominates the Department's efforts, individual programs are diverse; for example, studies of wettability in plant capillaries, modelling of multiphase flow properties of oil-bearing rocks, tomographic imaging of fossils and studies of networks and analysis of economic data are part of the group's ongoing research programs.

A large part of the Department's effort has been funded by the ARC Cooperative Research Centre for Functional Communications Surfaces (CRC SmartPrint) which focuses mainly on fundamental research on surface physics and material structure with applications to the paper industry.

Staff List

Professor and Head of Department

Mark Knackstedt BSc Columbia, PhD Rice

Professors

Stephen Hyde BSc PhD Monash, ARC Federation Fellow
David Williams BSc Sydney, PhD Cambridge

Senior Fellows

Tomaso Aste DipHons Genova, PhD Milan
Vince Craig BSc PhD ANU
Tiziana Di Matteo BSc PhD Salerno
Tim Senden BSc PhD ANU
Adrian Sheppard BSc Adelaide, PhD ANU

Research Fellows

Christoph Arns DipPhys Aachen, PhD UNSW
Lilliana De Camp BSc PhD Graz
Andrew Fogden BSc PhD ANU, Docent Lund
David King BSc ANU
Mika Kohonen BAppSc BSc PhD ANU
Shannon Notley BSc PhD ANU
Vanessa Robins BSc ANU, PhD Colorado
Ross Stephens PhD Sydney

Arthur Sakellariou BSc PhD Melbourne
 Rob Sok BSc PhD Groningen
 Trond Varslot MSc PhD NTNU Norway

Postdoctoral Fellows

Gary Delaney PhD Trinity, Ireland
 Shichen Ji PhD ANU
 Andrew Kingston PhD ANU
 Shane Latham BSc UQ, PhD ANU
 Mayhar Madadi BSc Tehran, MSc PhD IASBS
 Peter Wood BSc ANU, PhD Flinders
 Pär Wedin MSc KTH Stockholm, PhD Karlstad

Senior Technical Officers

Anthony Hyde Assoc IE Aust
 Tim Sawkins
 Paul Veldkamp BSc BEc ANU

Departmental Administrator

Margo Davies DipDent Tasmania

Visiting Fellows

Dr J-Y Arns, University of New South Wales
 Dr T Beck, University of Cincinnati, USA
 Dr F Clementi, University of Rome, Italy
 Dr C Di Guilmi, Università Politecnica dell Marche, Italy
 Dr J Jansen, Roskilde University, Denmark
 Professor P Lo Nostro, University of Florence, Italy
 Professor S Marcelja
 Professor K Mecke, Universität Erlangen-Nürnberg, Germany
 Professor Y Nagai, University Waseda, Japan
 Dr M Nicodemi, Università degli Studi Napoli, Italy
 Emeritus Professor B Ninham
 Dr M Saddatar, Trinity College Dublin, Ireland
 Dr G Schroder-Turk, Friedrich-Alexander Universität, Germany
 Ms C Testa, University of Rome, Italy
 Mr J Valbuena, University Venezuela, Venezuela
 Professor D Weaire, Trinity College Dublin, Ireland

Atomic and Molecular Physics



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, in order 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.

Experimental and theoretical studies are originally carried out in three specific areas, the Electron Physics Group, the Ultraviolet Physics Unit and the Atom Manipulation Project however over time the lines of distinction between the research directions changed and are now divided into nine research activities: Atom Manipulation, Atomic and Molecular Fragmentations Studies, Australian Positron Beamline Facility, Chemical Reaction/Photodissociation Dynamics, Helium BEC Project, High Energy Electrons Scattering in Solids, Low Energy Electron Physics, Planetary Atmospheres, Photon Collisions, Radiation Effects and Theoretical Studies.

The Department is also host to two Australian Research Council Centres of Excellence – the Centre for Quantum-Atom Optics (ACQAO) which plays a leading role in the study of the quantum properties of Bose-Einstein condensates and atom lasers via insights gained from quantum optics; and the Centre for Antimatter-Matter Studies (CAMS) whose experimental and theoretical program is based around the study of the interaction of positrons with matter. Both centres activities are reported in their respective annual reports.

Staff List

Professor and Head of Laboratories

Brenton Lewis PhD DSc Adelaide, C Phys, FlInstP, FAPS, FOSA, FAIP

Professors

Stephen Buckman BSc PhD Flinders, FAPS, FAIP, FlInstP

Anatoli Kheifets BSc PhD St Petersburg, FAPS

Adjunct Professors

Lewis Chadderton BSc DSc Durham, MA PhD Cambridge, C Phys, FlInstP, FAIP

Robert McEachran MSc PhD UWO, C Phys, FlInstP

Senior Fellows

Kenneth Baldwin MSc ANU, DIC PhD London, FAIP, FlInstP, FOSA

Stephen Gibson BSc PhD Adelaide

Robert Robson BSc Queensland, DipMet BoM, PhD ANU, FRMetS, FAPS

Maarten Vos MSc PhD Gröningen

Fellows

Julian Lower BSc Adelaide, PhD Flinders
 James Sullivan BSc PhD ANU
 Andrew Truscott BSc PhD Queensland

Research Fellows

Steven Cavanagh BSc PhD Griffith
 Robert Dall BSc Queensland
 Igor Ivanov PhD DSc Moscow
 Mitsuhiro Kono MSc KyotoIT, PhD GUAS Tokyo
 Franklin Mills BSE Princeton, MS PhD Caltech (jointly with CRES)
 Stan Newman BSc PhD Manchester

Postdoctoral Fellows

Susan Bellm BSc PhD Flinders
 Antonio Garcia-Munoz MEng UPM, PhD York
 Kandis Lea Jessup BSc Earlhan, MSc PhD Michigan (from July)
 Casten Makochekanwa BSc Zimbabwe, MSc PhD Yamaguchi (from February)
 Subhendu Mondal MSc PhD Banaras
 Michael Went BSc Newcastle, PhD Griffith

Technical Staff

Stephen Battisson AssocDip MechEng CIT
 Graeme Cornish AssocDip MechEng CIT (Head)
 Colin Dedman AssocDip Scilnd Bendigo CAE
 Gary Picker AssocDip MechEng CIT (until July)
 Kevin Roberts MechTech Cert SAIT (until April)

Departmental Administrator

Deborah Bordeaux CertIV SBM CIT

Visiting Fellows

Emeritus Professor R Crompton
 Professor G Garcia, Instituto de Matematicas y Fisica Fundamental, Spain
 Professor H Lefebvre, Université Paris-Sud, France
 Professor E Weigold

Electronic Materials Engineering



The Department of Electronic Materials Engineering (EME) undertake world-class interdisciplinary research into the growth, structure, properties, processing and applications of electronic materials and related structures and devices. The Department's diverse research program is underpinned by core expertise, a strong network of national and international collaborators, and a comprehensive suite of state-of-the-art equipment and facilities.

The department also hosts two networks, the Australian Research Council Nanotechnology Network (ARCNN) and the Australian Research Network for Advanced Materials (ARNAM) as well as the ACT node of the NCRIS fabrication facility.

Staff List

Professor and Head of Department

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

Professors

Chennupati Jagadish MSc PhD Delhi, FAA, FTSE, FAIP, FIP, FloN, FIEEE, FAPS, FOSA FSPIE, FECS, FIET, FAAAS, ARC Federation Fellow

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

Senior Fellows

Ying Chen BSc CAS, MSc Tsinghua, PhD Paris

Mark Ridgway BSc McM, MSc PhD Queens

Hoe Tan BE Melb, PhD ANU

Fellows

Jenny Wong-Leung BSc Bristol, PhD ANU

Research Fellows

Jodie Bradby BAppSc RMIT, PhD ANU

Tessica Dall BSc QUT, PhD ANU (until November)

Lan Fu MSc UTSC, PhD ANU

Naoki Fujisawa BE Waseda MSc PhD UNSW

Haroldo Hattori BSc MSc ITA Brazil, PhD VPISU Virginia

Patrick Kluth DipPhys Dusseldorf, PhD Jülich

Hongzhou Zhang PhD Rice (until October)

Postdoctoral Fellows

Leandro Araujo MSc PhD UFRGS Brazil

Almamun Ashrafi BSc MSc PhD Hokkaido (from March)

Yong Jun Chen MSc USTB, PhD Tsinghua (until January)

Douglas da Silva BA UFPeL, MSc PhD UFRGS Brazil
 Qiang Gao MS BSc NEU China, PhD ANU
 Patrick Kluth DipPhys Dusseldorf, PhD Jülich
 Wen Lei BSc MSc CUG, PhD CAS (from June)
 Qing Li BSc BNU China, MSc CAS, PhD HKU
 Chi Pui (Bill) Li BEng, MPhil, PhD HKU, MIEAust
 Rui Rao MSc WUST, PhD HUST China (until November)
 Simon Ruffell MEng Surrey, PhD UWO Canada
 Kallista Sears PhD ANU (until February)
 Avi Shalav PhD UNSW, MSc DipTchg BSc Massey NZ (from October)
 Andrew Wilkinson PhD ANU (until August)

Senior Technical Officers

Michael Aggett AssocDipMechEng CIT
 Tom Halstead ElectCommCert TAFE (until July)
 Fred Johnson MechEngCert TAFE, DipAppSciCCAEE (until February)
 Bernie King ONC London
 Craig Saint (from August)

Research Assistants

Kidane Belay BSc MSc AAU Ethiopia, PhD ANU
 David Llewellyn

Departmental Administrator

Renee Vercoe

Visiting Fellows

Dr A Babinski, University of Warsaw, Poland
 Professor N Fletcher
 Professor H Jackson, University of Cincinnati, USA
 Associate Professor S Krishna, University of New Mexico, USA
 Professor M Petracic, University of Rijeka, Croatia
 Dr M Premaratne, Monash University
 Associate Professor G Stewart, University of New South Wales
 Dr H Timmers, University of New South Wales

Laser Physics



The Department of Laser Physics (LP) undertakes research and training at the highest international level on a range of topics with a balance between fundamental, strategic and applied laser-based research.

The research program spans many of the most exciting aspects of contemporary laser physics and quantum electronics. Generally fundamental questions have been addressed in studies of the interaction of intense laser light with matter; nonlinear processes involving atoms; and ultra-high resolution spectroscopy of solids.

Research of more strategic nature includes work on photorefractive devices; on the properties of solitons and other nonlinear waves; on nonlinear optical materials for photonics; and aspects of solid-state physics for quantum computing. Applied research includes the development of novel high power lasers, parametric oscillators and amplifiers; techniques for waveguide, photonic crystal and other photonic devices.

Laser Physics also hosts the Australian Research Council Centre of Excellence for Ultrahigh Bandwidth devices for Optical Systems (CUDOS) and Australian Research Network for Advanced Materials (ARNAM) highlights.

Staff List

Professor and Head of Department

Barry Luther-Davies BSc PhD St'ou, SIEE, FAIP, ARC Federation Fellowship

Professors

Wieslaw Krolikowski MSc PhD Warsaw
Neil Manson MSc PhD Aberdeen

Senior Fellows

Eugene Gamaly PhD DSc Moscow
Andrei Rode MSc PhD Moscow
Marek Samoc PhD DSc Wroc

Research Fellows

Duk Yong Choi PhD Seoul
Steve Madden PhD Imperial College
Anna Samoc MSc PhD Wroc
Matthew Sellars BSc PhD ANU
Rong Ping Wang PhD CAS

Postdoctoral Fellows

Ruth Jarvis BE BSc PhD ANU

Vesselin Kolev PhD ANU
Jevon Longdell PhD ANU (until February)
Congji Zha BE Jingdezheng ME WUT, PhD Sydney (until May)

Senior Technical Officers

Craig Macleod AssocDipMechEng CIT
Anita Smith BSc Flinders

Technical Officers

John Bottega
Maryla Krolikowska
Martin Wulf

Departmental Administrator

Belinda Barbour

Visiting Fellows

Dr G Atkins
Dr R Charters
Dr M Humphrey
Dr D Kukulj
Dr D Pulford

Nonlinear Physics



The Nonlinear Physics Centre (NLPC) is engaged in interdisciplinary research, both theoretical and experimental, in a number of diverse topics unified by the general concepts of nonlinear physics and nonlinear photonics. The Centre's structure is defined by five major research directions and activities.

The experimental nonlinear photonics group is led by Dr Dragomir Neshev and research includes the experimental study of linear and nonlinear properties of light propagation and self-trapping in integrated and optically-induced photonic structures including waveguide arrays, photonic lattices, photonic crystals; polychromatic light, nonlinear patterns and self-focusing; singular optics and vortices.

The theoretical nonlinear photonics group is led by Dr Andrey Sukhorukov and the group's activity is based on our expertise in the study of nonlinear waves and optical solitons, and currently involves the development of theoretical models and numerical simulations of light propagation in nonlinear photonic structures with close collaboration with the experimental group (eg the generation of ideas, the study of visibility and experimental parameters, etc). More recently this included the development of novel concepts such as the physics of slow light, optical Bloch oscillations, light transmission in complex and quasi-periodic media, self-trapping of polychromatic light generated by a supercontinuum source.

The singular photonics and optical vortices group is led by Dr Anton Desyatnikov. This is the newest group recently awarded three ARC grants. The major research topics include the theoretical studies of the complex light with angular momentum, phase dislocation and optical vortices, optical polarization singularities, and vortex lattices.

The nonlinear matter waves and quantum-atom optics group is led by Dr Elena Ostrovskaya and is closely associated with the ARC Centre of Excellence on Quantum-Atom Optics, and involves the development of novel theoretical models, analytical and numerical studies of matter waves and nonlinear atom-optics problems, cold atoms, Bose-Einstein condensates in optical lattices and magnetic waveguides, atom lasers, quantum optics of nonclassical and squeezed light.

The composite structures and left-handed metamaterials group is led by Dr Ilya Shadrivov and is a new direction that involves the study of composite metamaterials with the property of negative refraction, with the emphasis on our pioneering results on nonlinear metamaterials and left-handed superlattices. One target of this group is the experimental verification for the first time in Australia of the basic phenomena of left-handed propagation and negative refraction for microwaves.

NPC continues to play an important role in two Centres of Excellence funded by the Australian Research Council: the ARC Centre of Excellence for Ultra-high Bandwidth Devices for Optical Systems (CUDOS) and the ARC Centre of Excellence for Quantum-Atom Optics (ACQAO). The Centre also hosts a Student Chapter of the Optical Society of America.

*Staff List***Professor and Head of Department**

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

Professors

Alexander Dreischuh DSc Bulgaria (October–December)

Senior Fellow

Solomon Saltiel PhD DSc Bulgaria (March–October)

Alexander Zharov DSc Russia (October–December)

Fellow

Dragomir Neshev MSc PhD Sofia

Research Fellows

Anton Desyatnikov PhD Moscow

Vladimir Denisenko PhD Kiev (August–October)

Libin Fu BSc PhD Lanzhou (April–June)

Elena Ostrovskaya MSc Moscow, PhD ANU

Vladlen Shvedov PhD Ukraine (September–December)

Andrey Sukhorukov MSc Moscow PhD ANU

Denis Sych PhD Moscow (January– March)

Xue-Hua Wang MSc Xiangtan, PhD Shanghai (from October)

Postdoctoral Fellows

Tristram Alexander PhD ANU

Chaohong Li PhD China

Michal Matuszewski PhD Warsaw (from July)

Andrey Miroshnichenko PhD Dresden

Ilya Shadrivov PhD ANU

Denis Sych PhD Moscow (January–March)

David Powell PhD Monash

Research Assistants

Artur Davoyan (from March)

Steven Morrison BEng Griffith

Departmental Administrator

Wendy Quinn BA ANU

Kathy Hicks (from September)

Visiting Fellows

Dr K Bliokh, Ukraine University, Ukraine

Dr E Brasselet, Laboratoire de Physique, France

Dr S Denisov, University of Augsburg, Germany

Dr T Fadeyeva, Taurida National University, Ukraine

Dr A Ferrando, Universitat de Valencia, Spain

Dr M Gorkunov, University of Strathclyde, United Kingdom
Dr M Gulacsi, Max Planck Institute, Germany
Professor P Kevrekidis, University of Massachusetts, USA
Dr S Kun
Professor M Molina, University of Chile, Chile
Dr V Schesnovich, Universidade Federal de Alagoas, Brazil
Professor N Smyth, University of Edinburgh, United Kingdom
Professor M Soskin, Institute of Physics, Kiev, Ukraine
Professor M Trippenbach, Warsaw University, Poland
Professor A Volyar, Taurida National University, Ukraine
Dr N Zharova, Russian Academy of Sciences, Russia

Nuclear Physics



The Department of Nuclear Physics (NP) carries out research into experimental Nuclear Physics and applications of nuclear techniques and other accelerator-based research. 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 Pelletron 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-EPSC agreement.

The Department and its facilities constitute the main laboratory in Australia for accelerator-based research and training in Nuclear Physics as well as specialised workshops in radiation physics and accelerator techniques. A Master of Nuclear Science by coursework was instituted in 2007.

To complement the research carried out on the local facilities, Department members conduct research in collaboration with international scientists at major overseas experimental facilities.

Current nuclear research areas cover nuclear spectroscopy and the study of exotic nuclear quantum states, heavy-ion reaction dynamics including nuclear fusion and nuclear fission, and the study and use of hyperfine interactions for moment measurements and nuclear structure. Both nuclear techniques and heavy-ion techniques are used in a range of materials science applications including materials modification and characterisation, while the technique of Accelerator Mass Spectrometry is applied extensively. It covers both applications and basic research in archaeology, hydrology, climate change, soil erosion and trace isotopic analyses applied to environmental pollution studies, both nuclear and non-nuclear.

Staff List

Professor and Head of Department

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

Professors

Aidan Byrne MSc Auckland, PhD ANU, FAIP (jointly with Dept of Physics)

Keith Fifield MSc Auckland, PhD Penn, FAIP

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

Senior Fellows

Mahananda Dasgupta BSc MSc Rajasthan, PhD Bombay, FAIP

Andrew Stuchbery BSc PhD Melbourne, FAIP

Fellows

Tibor Kibédi PhD Debrecen

Greg Lane BSc PhD ANU

Anna Wilson BSc Bristol, PhD Liverpool (jointly with Dept of Physics)

Research Fellows

Timothy Barrows BSc, PhD ANU

Clyde Morton BSc Sydney, PhD ANU (until May)

Stephen Tims BSc PhD Melbourne

Postdoctoral Fellows

Sanjay Chamoli BSc MSc BEd HNB Garhwal, PhD Chandigarh (from August)

Alexis Diaz-Torres BSc MSc Havana, PhD Giessen

Toshiyuki Fujioka BSc MSc Osaka, PhD ANU (from June)

Leandro Gasques BSc PhD São Paulo

Paivi Nieminen MSc PhD Jyväskylä (until May)

Renju Thomas BSc Kerala, MSc Cochin, PhD Mumbai

Hiroshi Watanabe BSc PhD Kyushu (until July)

Research Officers

Paul Davidson, BSc, MSc Auckland, PhD ANU (until July)

Technical Officers

John Bockwinkel, AssocDipMechEng CIT

Alan Cooper, AssocDipMechEng CIT

Alan Harding

Justin Heighway, AssocDipAppSci CIT

John Kennedy

Tom Kitchen

Lorenzo Lariosa

Matthew Lenahan

Alistair Muirhead

Bob Turkentine (until October)

Howard Wallace

Other Staff

Nikolai Lobanov, BSc Moscow, PhD St Petersburg (Engineer)

David Weisser, MSc, PhD Minn, FAIP (Accelerator Research & Operations Manager)

Departmental Administrator

Petra Rickman

Visiting Fellows

Dr R Du Rietz, Physiographic Society, Sweden

Dr T Esat, ANSTO

Dr Q Guo, Peking University, China

Emeritus Professor J Newton

Dr P Nieminen, Academy of Finland

Dr H Timmers, University of New South Wales

Plasma Research

The Plasma Research Laboratory (PRL) is comprised of two research areas – the Toroidal Plasma and the Space Plasma, Power and Propulsion (SP³) groups.



The Toroidal Plasma group, led by Dr Boyd Blackwell, embraces a range of pursuits associated with the physics of magnetised plasma; the physics of fluids, electromagnetics, remote sensing and inverse methods. The group operates the National Plasma Fusion Research Facility based on the H-1 heliac, an innovative plasma confinement device with flexible geometry allowing exploration of basic plasma physics, advanced configurations and remote measurement systems for fusion power plants. The Plasma

Configurations group, led by Dr Blackwell has developed datamining techniques on H-1 which are being applied to stellarators in Japan, Spain and Germany, to unravel the mode structure of plasma instabilities. A precision magnetic surface mapping technique has revealed magnetic islands structure, and some interesting effects on plasma confinement. The BushLAN project, a research-led teaching project led by Dr Borg, aims to provide Internet connectivity beyond the reach of conventional fibre networks using new wireless communications protocols.

Pioneering optical technologies developed by Prof Howard's Advanced Imaging and Inverse Methods group underpin collaborations on prototype fusion devices in the US, Europe and Asia, and with Bluescope, on steel production. With Chalmers University in Sweden, the group is adapting inverse techniques, initially developed for plasma diagnostics, to microwave imaging of human tissue. The Physics of Fluids group led by Dr Shats focuses on studies of waves, turbulence and nonlinear phenomena in fluids, important for the physics of weather phenomena, and for improving plasma confinement. A recent discovery, enabled by our high resolution velocimetry techniques, was the suppression of turbulence by shear decorrelation of turbulent eddies.



The Space Plasma, Power and Propulsion (SP³) group, led by Professor Rod Boswell, 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 EADS/ASTRIUM, Europe's largest Space company. Experimental work includes thrust measurement, prototype optimisation and plasma detachment. In addition, the group has a major program to simulate and model the double layer phenomena observed in the laboratory plasma. Furthermore, the laboratory double layers are being applied to understanding space plasma physics such as the magnetic funnels of the solar corona. Other research on space plasma physics includes studying high-beta plasmas and wave-plasma interactions.

Funded by an Australian Research Council Discovery grant until 2009, SP³ is using dry plasma processing techniques to produce fuel cell electrodes and membranes. Employing carbon nanofibers in the electrodes the group has reduced the amount of catalyst while maintaining the fuel cell efficiency. A new plasma system will deposit new plasma polymer membranes.

Staff List

Professor and Head of SP3 Group

Roderick Boswell BSc Adelaide, PhD Flinders, FTSE, FAPS

Professors

John Howard BSc PhD Sydney, FlinstP

Head of Toroidal Plasma Group

Boyd Blackwell BSc PhD Sydney

Senior Fellows

Michael Shats MSc KPI, PhD GPI Moscow

Christine Charles INSA Rennes, PhD Orléans

Fellow

Gerard Borg BSc PhD Sydney

Research Fellow

Frank Detering BSc Oldenburg, PhD Saskatchewan

George Warr PhD ANU

Postdoctoral Fellows

Cormac Corr PhD Belfast

Hua Xia, MSc Chongqing

Senior Technical Officers

Peter Alexander

John Wach BAppSci CAE Ball, GradDipEI CCAE

Technical Officers

Ananda Galagali Raghuttam

Mark Gwynneth

Research Engineer

Horst Punzmann BSc Regensburg, PhD ANU

Departmental Administrator

Bronwyn Stuart

Visiting Fellows

Professor J Baker, University of Queensland

Professor M Bilek, University of Sydney

Professor A Cheetham, University of Western Sydney

Emeritus Professor S Hamberger

Professor M Lieberman, University of California at Berkeley, USA

Dr D Mather, University of New South Wales

Professor J O'Connor, University of Newcastle

Professor R Storer, Flinders University

Dr K Takahashi, Tohoku University, Japan

Theoretical Physics



The Department of Theoretical Physics (TP) is one of the university's founding departments. The core research areas involve theoretical aspects of mathematical physics, plasmas and fluids, condensed matter physics and optical sciences.

Research in the mathematical physics group is centred on two related areas of activity. These are string theory and integrable models. The string theory team is led by Professor Peter Bouwknegt. The main area of research focusses on the mathematical structures underlying string theory, in particular on duality symmetries and generalizations of geometry. This involves studying non-commutative and non-associative C^* -algebras, generalised geometries (in the sense of Hitchin) and T-dualities between these structures.

The integrable model team is led by Professors Murray Batchelor and Vladimir Bazhanov. Research is based on the development of theoretical models and methods of analysis for the exact physical description of fundamental interacting systems in statistical mechanics and quantum field theory. It includes the study of phase transitions and magnetic ordering in low-dimensional spin systems and cold atomic gases and the development of new approaches and applications in quantum geometry.

The plasmas and fluids group is led by Professor Robert Dewar with the major research topic in complex, nonequilibrium systems. The area spans plasma physics, atmospheric physics, bushfire dynamics and other complex physical systems applications. Much of the research is focused on the fundamental physics and the modelling of magnetic confinement fusion energy devices. The group has active research links with CSIRO, Princeton Plasma Physics Laboratory, UKAEA Fusion, among others. Dr Matthew Hole is Chair of the Australian ITER Forum.

Research activity in the condensed matter theory group includes the theory of electron transport and noise in mesoscopic systems, high-temperature superconductivity, density functional theory of disordered systems, strongly correlated electrons, spintronics and semiconductor devices.

The optical sciences group is led by Professors John Love and Nail Akhmediev and involves studies in nonlinear optics and soliton theory. The group develops basic theory of solitons for optical systems that includes modern all-optical information transmission lines and ultra-short pulse lasers. The group is strongly linked to experimental photonics groups within the School, across campus, and to international research laboratories.

The Department is host to the ARC Research Network on Complex Open Systems (COSNet) led by Professor Dewar, and the Centre for Complex Systems (CCS) led by Professor Batchelor.

*Staff List***Professor and Head of Department**

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

Professors

Nail Akhmediev MS PhD DSc Moscow, FOSA

Vladimir Bazhanov PhD Serpukhov

Peter Bouwknegt BSc MSc Utrecht, PhD Amsterdam, FAIP, FAustMs (jointly with MSI)

Mukunda Das MSc Utkal, PhD Roorkee, FAIP, CPhys, FlnstP

Robert Dewar MSc Melb, PhD Princ, FAIP, FAPS, FAA

John Love MA Cambridge, MA DPhil DSc Oxford

Fellows

Adrian Ankiewicz BSc BE UNSW, PhD ANU

Rowena Ball BSc PhD Macquarie

Vladimir Mangazeev MSc Moscow, PhD Serpukhov

Sergei Sergeev MSc Moscow, PhD Serpukhov, PhD St Petersburg

Wen Xu BSc MSc PhD Antwerp

Research Fellows

Céline Durniak PhD Lille (until October)

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

Matthew Hole BSc BE PhD Sydney

Ryusuke Numata BSc MSc PhD Tokyo

Ashwin Pande BSc Mumbai MS PhD IISC/Bangalore MA PhD Maryland

Departmental Administrator

Mrs Trina Merrell

Visiting Fellows

Emeritus Professor F Barker

Dr W Chen (from Sept)

Dr J Frederiksen

Dr M Hall

Dr K Kumar

Dr J Larson

Dr B Robson

Dr A Stewart

Dr L Tassie

Dr W Woolcock