Cover Photo: 'Lasing from III-V semiconductor nanowires'
Image courtesy of Dhruv Saxena
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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 in Australia by some measure, with over 160 academic staff and a similar number of PhD students during 2013. We are also supported by more than 110 outstanding professional staff. The School has an excellent track record in innovative research and development and we support these activities through a large number of research grants from the Australian Research Council, other government agencies, and industry.

RSPE also pursues and achieves excellence in research-led education, and we strive to maintain the highest training standards and ensure 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 in the national and international landscape.

Grant successes were again strong in 2013, as were research outputs that flowed from this funding, and these measures are detailed in the report from the Deputy Director Research (Professor Ken Baldwin). We maintained a strong presence in three ARC Centres of Excellence, continue to host significant national research infrastructure in Nuclear, Plasma and Materials science, as well as a number of other facilities of national importance.

The Deputy Director Education (Professor John Close) had his first full year at the helm of the School’s education program, ably assisted by a strong team of Lecturers from across the School, Year Convenors, and Departmental Education coordinators. One of the key strategies of the School in the Physics Education area is to increase the size of our undergraduate program by attracting the best students from around Australia and, increasingly, we anticipate, from south-east Asia, through coordinated partnerships with other institutions. Some of the important education milestones for 2013 are recorded in Professor Close’s report.

During 2013 the School continued to ramp up its Development program in both commercial and philanthropic directions and these activities are recorded in the reports of Deputy Director, Technology Development (Professor Tim Senden), and the School Development Manager (Ms Kavitha Robinson). A new joint Business Development Officer appointment between the School, College and Technology Transfer Office is a key indicator of the importance that the School places on technology transfer, as is the establishment of the Sirtex Chair, sponsored by one of Australia’s largest biomedical companies, and awarded to Professor Ross Stephens of the Department of Applied Mathematics. This commercial activity has been more than matched in the Philanthropic and Alumni relations area with our School Endowment funds growing from four in 2010 to ten in 2013.

At a time of considerable political and funding uncertainty, the School remains focused on maintaining excellence in research and education and pursuing a range of opportunities in order to diversify our funding base and reduce the risk associated with reliance on any one major source of income.
The Research School of Physics and Engineering (RSPE) is the largest university-based institution in the country for physics research by some measure, with 163 academics, 110 professional staff and 164 post graduate students.

Physics at ANU has achieved the highest rank in in the Excellence for Research in Australia ranking (ERA level 5). In 2013, ANU Physics was also the highest ranked Australian physics department (28th in the world), and the highest in any discipline in Australia according to the Shanghai Jiao Tong Academic Ranking of World Universities (ARWU).

The School’s research in selected areas of strength covers the entire spectrum from fundamental research 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 program is not only confined to the discipline of Physics, as the School has significant links with Engineering, Chemistry, Astronomy, Earth Sciences, Mathematics and other scientific disciplines.

The School continued to excel in its research performance in 2013, with almost 500 journal publications and 150 international conference publications. In 2013 the School was successful in winning over $25 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 three 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). RSPE is also part of the Australian Nanotechnology Network (ANN).

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

In 2013 the School was successful in being awarded 2 Future Fellowships, 1 DORA Fellowship and 2 DECRA Fellowships. RSPE also was awarded 16 ARC Discovery and 1 Linkage grants for physics research.

RSPE is comprised of ten 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 ANU Energy Change Institute, and a Professor in the Department of Atomic and Molecular Physics, RSPE.
2013 has been another successful year for the Physics Education Centre (PEC). Student numbers in physics have grown steadily over the last five years, and a training in physics continues to be relevant to modern society, not only as a discipline in its own right, but also as an enabling science for students whose major interest lies in other areas. ANU and RSPE are unique in Australia in their ability to provide a research-led education to an undergraduate student population. In 2013, we continued to expand our undergraduate research project offerings and expanded the involvement of research staff in the research-led teaching enterprise.

Key staff in PEC continue to make important contributions to our operation. Professor John Close continued as head of the Physics Education Centre and took over as honours convenor. Professor Wieslaw Krolikowski continued in his role as HDR convenor with A/Prof Fu Lan and A/Prof Elena Ostrovskaya as co-convenors. A/Prof Patrick Kluth took over as special topics coordinator with Dr Sudha Mokkapati as 3rd year convenor. Dr Cormac Corr continued as 2nd year coordinator with a major role coordinating the second year lab program, and A/Prof Paul Francis continued as first year coordinator. A/Prof Jodie Bradby continued as PhB convenor.

A substantial number of RSPE staff are involved and active in the Physics Education Centre in diverse roles. Undergraduate lecturers are drawn from all departments in RSPE. These staff exhibited tremendous dedication in bringing their expertise to the undergraduate population through lectures, through lab sessions and through special research topics. The 2013 lecturers are listed elsewhere in this report. Lecturing staff were supported by a large number of graduate student demonstrators who ran tutorials, laboratory sessions and provided help with assignments to our undergraduate cohort. Although too numerous to list here, the contribution made by our student demonstrators and tutors is highly valued by the Physics Education Centre. In addition to lecturing staff, the honors program is supported by honours supervisors and examiners, and we thank those staff involved in that program.

Departmental education coordinators continued to play an important role in the Physics Education Centre providing information to staff in their local areas and driving the research/teaching culture in the School. The complete list of 2013 education coordinators is also provided elsewhere in this report. Their service in this important role is much appreciated. Similarly, the year convenors (listed at the end of this report) play an important role in coordinating courses within each year. Again their service is much appreciated by staff and students in PEC.

In the last few years, our first-year student numbers have grown markedly. First-year is the only year that has streamed courses. The strong demand for Physics highlights its continued relevance as a discipline in its own right and as an enabling discipline for other fields. The growing numbers in our Foundations Course (PHYS1001), our main-stream first-year physics courses (PHYS1101 and 1201) and our Life Physics course (PHYS1004) put increased demand on our technical support staff. In his role as Head Technical Officer, Mr Andrew Papworth led a very able team of technical and administrative staff. In addition, Mr Papworth continued to lead RSPE’s outreach program. Mr Mika Kohonen provided excellent support and leadership in the first year laboratories with electronic support from Mr Shane Grieves. Mr Papworth was awarded a Director’s Prize for his leadership in outreach.
In the first year of this role we have seen a distinctly enhanced connection with the Technology Transfer Office (formally Office of Commercialisation) through Neil Radford’s recent appointment. Neil has been active to look towards mapping capabilities and supporting developments. Furthermore, in a strategic three-way partnership between the College of Physical and Mathematical Sciences, RSPE and the TTO a new type of business development officer has been created to able researchers to engage more directly with commercial partners. Jean-ChristopheLonchampt has joined the team for a 3 year trial, bringing with him over a decade of experience with Intel venture capital and developing business opportunities for spin-off companies. I thank the School Development Board for their part in focusing the relevant attributes for this role, and I feel we have been very fortunate to attract Jean-Christophe, who joined us in October, 2013. The objective is to demonstrate that this approach should be extended across the University.

A narrative has been developed out of School examples to illustrate the flow of innovation that preserves the fundamental, while distilling selected opportunities into an applied direction. It is clear that prominent case studies can increase the School engagement in these avenues and this narrative will incorporate fresh examples.

The largest challenge remains a sociological one, that is to increase the grass-roots visibility for applied research at the ANU, and to demonstrate how this approach can interleave with fundamental pursuits. I believe RSPE is still one of the most engaged of the science schools, but we can go far further and must if we are to supplement falling government support for research. Already the visibility within the School is starting to improve and a number of groups have engaged directly with the TTO and School staff. The announcement of the Sirtex Chair, the first industry sponsored position at the ANU provided an example of industry funding supporting the fundamental. Exciting aerospace infrastructure being developed at Research School of Astronomy and Astrophysics together with our School also heralds new horizons that have stimulated a taste for the applied with Professor Christine Charles’ “pocket rocket”.

Lithicon, currently the only School spin-off is, set for a big year in 2014, as are the commercial avenues for the sale of tomography facilities. Towards the end of 2013 the prospects for several new spin-outs are emerging and possibly indicate a shift towards commercial engagement. There is no doubt that Neil and Jean-Christophe have been an important part of this new engagement strategy. These spin-offs promise novel graphene production methods, agile lab -based measurement equipment and cost-effective remote digital communications. The strength of this School has always been the union of technical excellence and academic innovation. I have a firm belief that we are in the best position to diversify this capability to benefit the research foundations of the School.
School Resources

EA to Director
Andrea Butler, BA Hons Archaeology

School Outreach
Tim Wetherell

School Projects
Liz Micallef

School Computer Unit
James Irwin (Manager)
Martin Conway
Julie Dalco
Deane Larkman

Facilities & Services
Graeme Cornish (Manager)
Lyndell Paseka

OHS
Anthony Hyde Assoc IE Aust (Manager)

School Stores
Goran Radovanovic (Manager)
Richard Adamow

Mechanical Workshop
Craig Young (Manager)
Anthony Barling
Thomas Cave
Steve Holgate
Owen Kershaw

Electronic Workshop
David Anderson (Manager)
Dennis Gibson
Steven Huynh
David Kelly
Steven Marshall
Luke Materne
Wasantha Ramasundara
Paul Redman
Tristan Steele
Daniel Tempra
Andrew Zeylemaker

Electrical
Patrick Lang
Nounou Chanthapanya

Carpentry
Anthony MacKey
Tristan Kent (until April)

Reception
Susie Radovanovic

Tearoom
Josephine Ivanic
RSPE has made considerable progress in connecting with its alumni and cultivating a sense of community through alumni and friends’ events and the e-newsletter ‘Resonance’. The School embraces the importance and support that physics alumni contribute through time, talent and wealth.

Alumni Relations Overview
The Research School of Physics and Engineering has embraced new programs of engagement and communication together with the ANU Alumni Relations and Philanthropy Office to celebrate achievements and create a sustainable on-going engagement with its alumni. This includes key programs such as the Alumni Awards, Golden Graduates Reunion (for Alumni 60+) and Alumni Volunteer leadership program.

Philanthropic Development
Philanthropic support from our alumni, staff and friends since 2010 has benefited our students, researchers, professional staff and the broader School and community.

2013 was a significant year in terms of philanthropic success and activities at the school. The culture of staff giving has continued to develop, resulting in the establishment of the Heavy Ion Accelerator Facility (HIAF) Endowment Fund. Three seniors members of the Department of Nuclear Physics joined forces to create and enhance opportunities for technical staff, the next generation of researchers and new accelerator based research initiatives and applications.
This period also saw an industry partnership towards biomaterials technology for medical applications in infectious disease and liver cancer. A new industry sponsored Chair was established by one of Australia’s largest biomedical companies, Sirtex. Professor Ross Stephens who leads the biomedical research team at the Department of Applied Mathematics was appointed as the Sirtex Chair.

Our perpetual endowments established at the School grew from four in 2010 to ten in 2013 due to the generous support of donors. This includes the Oliphant Endowment Fund and nine named endowment funds (as listed below).

- Wanda Henry Endowment Fund
- John Carver Endowment Fund
- Dunbar Endowment Fund
- Ben Williams Endowment Fund
- Robert & Helen Crompton Endowment Fund
- Boswell Technologies Endowment Fund
- Jagadishwar Mahanty Endowment Fund
- Tom Rhymes Technical Development Endowment Fund
- Heavy Ion Accelerator Facility Advancement Endowment Fund

The following collection of highlights showcase the generosity of donors and the impact they have had on our community. The achievements and developments mentioned here focus on the initiatives and successes in 2013.

**Industry Partnership towards cancer research**

A new industry sponsored Chair is shifting the way we view cancer treatment. The sponsorship from Sirtex allows imaging to make sure that radiation treatment is localised at the right spot by creating new materials that incorporate imaging radioisotopes and discovering how to stick them onto the surface of spheres.

“Our collaboration with Sirtex has been fantastic. They have introduced us to so many people doing things that can really complement our work.”

**Physical Legacy**

A generous bequest from one of the University’s past Deputy Vice-Chancellors is bringing the best physics students to Canberra through the Dunbar Endowment Fund.

“If I met the donor, I would thank them for the opportunities they have opened to me, as well as pledge to give my studies everything I can.”

*Robert Walker*

2013 Dunbar Physics Honours Scholar
External Honours & Awards

Walter Boas Medal
Professor Chennupati Jagadish was awarded the 2013 Walter Boas Medal of the Australian Institute of Physics for promoting excellence in research in Physics in Australia.

Joseph F Keithley Award
Prof David McClelland, American Physical Society’s Joseph F Keithley Award for Advances in Measurement Science.

Doctor technices honoris causa
Professor Wiesiek Krolikowski was awarded an Honorary Doctorate from the Technical University of Denmark. The doctor technices honoris causa is the highest honour the university offers.

Fulbright Postdoctoral Scholar
Dr Rose Ahlefeldt was awarded a Fulbright Postdoctoral Scholarship to focus on developing ultra low broadening rare-earth materials for quantum computing. In particular, she will study materials which may be applied to quantum computing, a method that uses the quantum properties of matter to perform some calculations much faster than a classical computer.

Internal Honours & Awards

25-year Service Award from the University.
Mr David Anderson was awarded a 25-year Service Award from the University.
Mr Graeme Blackburn was awarded a 25-year Service Award from the University.
Mr Paul Tant was awarded a 25-year Service Award from the University.
Professor David McClelland was awarded a 25-year Service Award from the University.
Mr Tibor Kibedi was awarded a 25-year Service Award from the University.

University Award for advancing the reputation of the University through media
Professors Nanda Dasgupta and Ping Koy Lam were presented with the ‘University Award for advancing the reputation of the University through media’ at the ANU Strategic Communication and Public Affairs (SCAPA) Annual Awards.
40-year Service Award

Emeritus Professor John Love was awarded a 40-year Service Award from the University.

John has been a champion of philanthropy supporting the Wanda Henry Scholarship in Photonics and Third Year Physics Prize endowment funds at the School. Recently, John donated $1 million dollars to the ANU community, which has been his de-facto family for the past 40 years to fund a new scholarship to help students who most need financial support.

Excellence in Education Award

Dr Nick Robins, Dr John Debs and the Foundations of Physics Team were awarded the Colleges of Science Excellence in Education Award.

2013 Promotions

Level B
Dr Maurits Evers, Nuclear Physics
Dr Bianca Haberl, Electronic Materials Engineering
Dr Taehyun Kim, Electronic Materials Engineering
Dr Patrick Parkinson, Electronic Materials Engineering
Dr Yan Sheng, Laser Physics Centre
Dr Isabelle Straude, Nonlinear Physics Centre

Level C
Dr Andrey Miroshnichenko, Nonlinear Physics Centre
David Ridout, Theoretical Physics

Level D
Dr Jodie Bradby, Electronic Materials Engineering
Dr Lan Fu, Electronic Materials Engineering
Dr Patrick Kluth, Electronic Materials Engineering
Dr Adrian Sheppard, Applied Mathematics
Dr James Sullivan, Atomic and Molecular Physics Laboratory

Level E
Dr Daniel Shaddock, Department of Quantum Science
Dr Hark Hoe Tan, Electronic Materials Engineering

HIAF Endowment Career Development Award

Dr Peter Lindardakis was awarded the 2013 HIAF Endowment Career Development Award
30-year pin

Professor Stephen Buckman received a commemorative clock in celebration of his 30 years of service to the School. The clock was presented by the Dean, Professor Andrew Roberts on Founder’s Day.

Director’s Awards

Miro Peric
For engineering excellence and outstanding contribution to the Research School of Physics and Engineering Mechanical Workshop

SCU team
For their excellent and prompt service and advice on computing and web-based matters

Andrew Papworth
For excellence in providing educational opportunities to high school students and the greater community through outreach

Kathleen Hicks
For her enthusiasm, positive energy, professionalism and outstanding support to the research activities of the School

Alan Cooper
For exceptional innovations in particle accelerators and amazing support to the School succession initiatives
National Youth Science Forum
Quantum Science, Plasma Research Lab and Nuclear Physics ran six sessions for the National Youth Science Forum and presented a mix of “hands on” experiments and laboratory demonstrations; with a visit to the Gravitational Wave research facilities. The students came from a wide range of backgrounds throughout Australia and for us it was an opportunity to discuss the Physics being taught in the various States and Schools.
PRL organised tours and visits with the National Youth Science Forum, local high schools, national and international undergraduate and graduate students, and other interested parties.

ACT Science Experience
Dr Gregory Lane was the Local Director for the ACT Science Experience, a 3 day program of scientific talks and visits attended by year 9 and 10 students hailing from schools across the ACT and country NSW. The 2013 program was held from 2nd to 4th of October, based at the ANU and Geoscience Australia.

Canberra Family Science
CSIRO: We worked with the CSIRO Education Centre to promote photonics and provide a series of hands on activities for visitors to the Canberra Family Science spectacular over a weekend in August. This event was very well attended as part of Science Week and attracted several thousand visitors.

Like us? RSPE Facebook and Twitter
A/Prof Jodie Bradby launched the RSPE Facebook and Twitter accounts.

Man Meets Ancestor
A life-sized reconstruction of a Devonian fish meets one of his discoverers, Dr Gavin Young. The model was constructed for the Canberra museum exhibition jointly curated by RSES and RSPE in 2012-2013 and published in PLoS One in 2013.

Barry or Bust
A larger-than-life reconstruction of founding Head, Professor Barry Ninham. A celebration of Barry’s continuing contribution to the ethos of the Department Prominent artist, Ante Debro, donated his skills to render Barry’s character as an enduring reminder of Barry’s life principle, “If you get the basics right, the rest will follow”.

Nuclear Physics Experiments for School and Community Groups
Dr Gregory Lane and Prof Andrew Stuchbery, with help from Dr Matthew Reed and Dr Sankha Hota, hosted almost 20 different visiting groups (mostly high school students and teachers) for tours of the 14UD accelerator that included hands-on experiments looking at natural and artificial radioactivity. Dr Gregory Lane also provided hands-on activities for visitors to Questacon on Marie Curie’s birthday.

School visits
About 20 different school groups were accommodated through the year with the emphasis on experimental work. Burgmann College spent a whole day with us and were able to complete a number of sophisticated experiments. School visits are a great way to engage the community, potential students and to be a good corporate citizen. Visits to the ANU in the wider Physics area were also very popular.

Physics Project Market Day
August saw the introduction of the first Physics Project Market Day for students to attend and discuss physics projects with supervisors. Associate Profs Jodie Bradby, James Sullivan, Patrick Kluth and Cormac Corr ran a very successful day.
Scientists in Schools
A/Prof Jodie Bradby was involved in the Scientists in Schools program with Curtin Primary.

Work Experience Students
PEC was host for 10 work experience students through the year and our efforts are much appreciated by the schools an students.
The PEC laboratory experience for students and demonstrators was again successful this year and was augmented by further hands on experiments left around the building as part of the Corridor Physics initiative.

Science Teachers Conference
Dr Steve Tims gave an invited presentation titled “Earth and Environmental Science enlightenment via radioactive atoms” to the Science Teachers Association of New South Wales as part of their Earth and Senior Science Teachers Conference, in Sydney, on Mon 13th May 2013.

Public Lectures
Peter Riggs gave a public lecture on the physics of time travel and its implications. It was presented in the Manning Clark Centre, ANU on 28 August 2013.

Professor Hans Bachor gave a public lecture series: Physics for our Future - the AIP turns 50 ANU / Questacon H.Bachor / P.Healan given 2013 /14 in Perth, Adelaide, Melbourne and Canberra.

SP3 co-hosted the AIAA public lecture by NASA Astronaut Dr Greg Chamitoff in Canberra on July 25, 2013.

Professor Hans Bachor gave a public lecture series: Lasers can do anything. ANU / Questacon H.Bachor / P.Healan given in 2013 /14 Perth, Wollongong, Melbourne Brisbane, Canberra

ANU Secondary College
2014 was our most successful year with their teachers and the students totally engaged with the program. In addition to the resources needed to run the program we provided visual demonstrations each week for the students. The program was very successful in introducing students to the campus; and especially “Subway”

Radio Interview
Peter Riggs gave an interview on the topic of time travel on the Drive program, ABC Radio 666 (Canberra) on 25 November 2013.

Conferences
SP3 organised the 21st International Symposium on Plasma Chemistry (August 4-9, 300 attendees) and associated Summer School (30 participants) in Cairns co-chaired by Prof. Rod Boswell and Dr Tony Murphy.
Prof. Charles was a local committee member.

SP3 organised the Electron Beam workshop in Thredbo (May 30-June 3 with 20 participants) chaired by Prof. Rod Boswell. Prof. Charles was a local committee member. The full program and uploaded presentations can be found at the workshop website (http://physics.anu.edu.au/prl/sp3/events/BPM2013/).

Higher Education Whisperer Review
On 29 August 2013, the website Higher Education Whisperer (an on-line review of vocational and university course design, learning, teaching and research) published a short, complimentary appraisal of the 2013 public lecture on time travel.

ANU News Article
An article dealing with Peter Riggs research into the nature of time entitled: ‘Dr Who at ANU?’, was published in ANU News on 23 November 2013.
The RSPE Founder’s Day was held on Friday 18 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.

Founder’s Day is a RSPE celebration honouring Sir Mark Oliphant. Sir Mark was an eminent Australian physicist and the founding Director of the School. In 1981, Professor John Carver (then Director of RSPE) introduced Founder’s Day as an initiative to unite the School in a celebration of the year’s achievements.

Founder’s Day involved research and education highlight presentations, informative talks on the School’s achievements during the year, a presentation of the RSPE Endowment awards and School awards, and finished with a BBQ lunch enjoyed by nearly 400 people in the Oliphant tearoom and courtyard.

**Departmental talks**

**Pathways to Change: Evolving Educational Culture**  
Cormac Corr, Physics Education Centre

**Bubble Lifetimes: Their Importance for Nanobubbles, New Medical Technologies and the Foaming of Beer and Champagne**  
Vince Craig, Hongjie An & many others, Applied Maths

**The Largest Space Simulation Facility in the Southern Hemisphere**  
Christine Charles, PRL SP3

**An Optical Funnel: Enhanced Particle Injection for Coherent Diffractive Imaging**  
Niko Eckerskorn, Laser Physics

**On the Classification of Topological Insulators**  
Peter Bouwknegt, Theoretical Physics

**Magnetic Nanophotonics: Teaching Light a Second Language**  
Isabelle Staude, Nonlinear Physics Centre

**Waves Dumping Particles: Fusion Research on Large and Small Scale Experiments**  
Clive Michael, PRL TORO

**The Role of Quantum Science in Precision Measurement**  
John Debs, Quantum Science

**A Homage to the Electron Gun**  
Maarten Vos, AMPL

**Controlling Corrosion to Make Nanowires**  
Avi Shalav, EME

**The Power of Four Nucleon**  
Duc Luong, Nuclear Physics
Fellowships of Learned Societies

The Acoustical Society of America
Emeritus Professor Neville Fletcher (since 1975)*

American Association for Advancement of Science
Professor Chennupati Jagadish (since 2007)

American Physical Society
Professor Ken Baldwin (since 2008)
Professor Rod Boswell (since 1998)
Professor Peter Bouwknegt (since 2000)
Professor Stephen Buckman (since 1998)
Professor Christine Charles (since 2013)
Emeritus Professor Robert Crompton (since 1995)*
Professor Mukunda Das (since 2003)*
Professor Robert Dewar (since 1980)
Emeritus Professor George Dracoulis (since 1993)*

American Vacuum Society
Professor Chennupati Jagadish (since 2008)

Asia-Pacific Academy of Materials
Professor Chennupati Jagadish (since 2013)

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 (since 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)

* Retired
## Fellowships of Learned Societies

### Institute of Physics (UK)
- Professor Hans Bachor (since 1999)
- Professor Ken Baldwin (since 2006)
- Professor Murray Batchelor (since 2005)
- Professor Stephen Buckman (since 2004)
- Professor Mukunda Das (1998)
- Professor Rob Elliman (since 2003)
- Emeritus Professor Neville Fletcher (since 1961)
- Professor David J. Hinde (since 2005)
- Professor John Howard (since 2005)
- Professor Chennupati Jagadish (since 1998)
- Professor Yuri Kivshar (since 2012)
- Professor Susan Scott (since 1999)

### International Society for Optical Engineering
- Professor Chennupati Jagadish (since 2006)

### International Society on Plasma Chemistry
- Professor Rod Boswell (from 2013)

### 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)
- Professor Chennupati Jagadish (since 2010)

### 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 Meteorological Society
- Adjunct Professor Robert Robson (since 1977)

### Royal Society of New Zealand
- Emeritus Professor George D. Dracoulis (Hon)* (since 1997)

### The World Academy of Sciences
- Professor Chennupati Jagadish (since 2013)
Australian Academy of Technological Sciences and Engineering
Professor Rod Boswell (since 1999)  Professor Barry Luther-Davies (since 2005)
Emeritus Professor Neville Fletcher (since 1987)*  Emeritus Professor Erich Weigold (since 1996)*
Professor Chennupati Jagadish (since 2002)  Professor Jim Williams (since 1992)
Professor Mark Knackstedt (since 2011)

The Australian Acoustical Society
Emeritus Professor Neville Fletcher (since 1980)

Australian Institute of Physics
Professor Hans Bachor (since 1987)  Emeritus Professor Neville Fletcher (since 1960)*
Professor Ken Baldwin (since 1995)  Professor David J. Hinde (since 1996)
Professor Murray Batchelor (since 1993)  Professor Chennupati Jagadish (since 1993)
Professor Vladimir Bazhanov (since 2006)  Professor Yuri Kivshar (since 2000)
Professor Stephen Buckman (since 1992)  Professor David McClelland (since 2000)
Professor Mukunda Das (1991)  Professor Susan Scott (since 2004)
Professor Mahananda Dasgupta (since 2004)  Professor Andrew Stuchbery (since 1992)
Emeritus Professor George D. Dracoulis (since 1990)*  Dr David C. Weisser (since 1992)
Professor Rob Elliman (since 1994)  Professor Jim Williams (since 1988)
Professor L. Keith Fifield (since 1997)

Australian Mathematical Society
Professor Murray Batchelor (since 2001)  Professor Peter Bouwknegt (since 2001)
Professor Vladimir Bazhanov (since 2006)

Electrochemical Society
Professor Chennupati Jagadish (since 2006)

European Academy of Sciences
Professor Susan Scott (since 2002)

Higher Education Academy
Professor John Close (Senior Fellow since 2014)  Dr Joe Hope (Senior Fellow since 2014)
A/Prof Paul Francis (Senior Fellow since 2014)  Professor Craig Savage (Senior Fellow since 2013)

Institute of Electrical and Electronics Engineers
Professor Chennupati Jagadish (since 2002)
Research School of Physics and Engineering

School Structure

Research School of Physics and Engineering
Physics Education Centre Lecturers

Undergraduate Coursework

PHYS 1001 Foundations of Physics
Nick Robins, John Debs

PHYS1101 Advanced Physics I
Paul Francis, Andre Carvalho

PHYS1004 Life Physics
Adrian Sheppard, Jodie Bradby

PHYS1201 Advanced Physics II
Craig Savage, Marcus Doherty, Ben Buchler

PHYS2013 Quantum Mechanics
Craig Savage, Andrew Truscott

PHYS2020 Thermal Physics
Frank Mills, Vladimir Mangazeev, Rachel Salmeron

PHYS2016 Electricity and Magnetism
Cormac Corr, Igor Ivanov

PHYS2017 Waves and Optics
Ben Buchler, Robert Ward

PHYS3001 Advanced Theoretical 1
Joe Hope, Andre Carvalho

PHYS3033 Nuclear Physics
Greg Lane, Cedric Simenel, Maurits Evers

PHYS3034 Fluid Mechanics
Ross Kerr, Andy Hogg, Yvan Dossmann, Bishakhdatta Gayen (RSES)

PHYS3057 Optical Physics
Dan Shaddock, Dragomir Neshev, Vincent Daria

PHYS3060 Fibre Optic Communication Systems
Jong Chow

PHYS3041/3044/5 Special Research Topics
Patrick Kluth

PHYS3002 Advanced Theoretical II
Susan Scott, Michael Hush

PHYS3031 Atomic Physics
Matt Sellars, Steve Gibson

PHYS3032 Condensed Matter Physics
Patrick Kluth, Rob Elliman, Jenny Wong-Leung

PHYS3051/ENGN4613: Microphotonics, Biophotonics and Nanophotonics
Jong Chow

PHYS3058 Work Experience in Photonics
Jong Chow

PHYS3060/ENGN4513: Fibre Optic Communications Systems
Jong Chow

PHYS3070 Physics of the Earth
Hrvoje Tkalčić and Giampiero Iaffaldano (RSES)

MATH2406 Mathematical Methods 2 Honours
Vladimir Mangazeev, Murray Batchelor

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

Honours Coursework

Science Communication: Hans Bachor

Electromagnetism: Mathew Hole

Quantum Mechanics: Joseph Hope

Classical Mechanics: David Williams

Statistical Mechanics: Edie Sevick (Chemistry)

Scattering Physics: Stephen Buckman and Mahananda Dasgupta

Quantum Measurement: Mathew James (CECS)

Nonlinear Physics: Dragomir Neshev, Andrey Sukhorukov

Non-equilibrium Statistical Mechanics: Denis Evans (Chemistry)

Relativistic Electricity and Magnetism: Ron Burman (UWA) with Nick Robins

General Relativity: Susan Scott

Surface Physics: Maarten Vos

Car Physics: David Williams

Graduate coursework

Master of Photonics Courses

PHYS6500 Optical Physics
Daniel Shaddock, Dragomir Neshev

PHYS6501 Fibre Optic Communication Systems
Jong Chow

PHYS6502 Microphotonics, Biophotonics & Nanophotonics
Jong Chow

PHYS6503 Work Experience in Photonics
Jong Chow

PHYS6504 Semiconductors
Andrew Blakers (Engineering)

PHYS8505 Research Project
Jong Chow
Master of Engineering Courses
ENGN6512 Optical Physics
Daniel Shaddock, Dragomir Neshev
ENGN6513 Fibre Optic Communication Systems
Jong Chow
ENGN6613 Microphotonics, Biophotonics & Nanophotonics
Jong Chow
ENGN6625 Power Electronics
Boyd Blackwell
PHYS8013 Principles of Energy Generation and Transformation
Igor Skryabin (Engineering)

Master of Nuclear Science Courses
PHYS8201 Nuclear Fundamentals
Andrew Stuchbery
PHYS8202 Reactor Science
Andrew Stuchbery, Tony Irwin
PHYS8203 Accelerator Science
Matthew Reed
PHYS8204 Nuclear Radiation
Greg Lane
PHYS8205 Nuclear Fuel Cycle
Andrew Stuchbery
PHYS8206 Nuclear Measurement Methods
Greg Lane

Undergraduate Year Coordinators
Paul Francis (1st year)
Cormac Corr (2nd year)
Patrick Kluth (3rd year) and Special Topics Coordinator
James Sullivan/John Close (Honours)

Departmental Education Coordinators
Joseph Hope: Department of Quantum Science
Matt Sellars: Laser Physics
Cormac Corr: Plasma Physics
Adrian Sheppard: Applied Mathematics
Patrick Kluth: Electronic Materials Engineering
Andrew Stuchbery: Nuclear Physics
Elena Ostrovskaya: Nonlinear Physics
Stephen Gibson: Atomic and Molecular Physics Laboratories
Vladimir Mangazeev: Theoretical Physics

Professional Staff
Departmental Administrator
Laura Walmsley
Assistant Departmental Administrator
Gaye Carney
HDR student support (College)
Karen Nulty
Liudmila Mangos/Karen Scholte

Technical Staff
Head Technical Officer
Andrew Papworth
Laboratory Development Officer
Mika Kohonen
Technical Officer (Electronics)
Shane Grieves

Laboratory Coordinators
First year: Mika Kohonen
Second year: Cormac Corr
It is was another year to celebrate diversity, with 2013 seeing a number of significant events to mark the long term commitments from, and to, our staff and students. The year started with the announcement of an exciting new Devonian predator, a 6 metre monster in PLOS ONE. While this was the result of a long collaboration between Research School of Earth Sciences it illustrates the breadth of collaborations across campus and beyond. In 2013 many of these collaboration evolved to their next level of sophistication. It is with that warmth a retrospective view can bring that I sense the Department is again shifting and adapting to meet new challenges.

In last year’s report I highlighted how instruments such as the Heliscan CT are a symbol of where technical excellence intersects academic innovation. This productive union of professional and academic staff led to the installation of a facility in Qatar, in May, and cements a long relationship with Maersk Oil found via the Digicore Consortium. Fast-forwarding to November the same Consortium saw a record membership of 14 companies join us in Canberra for the annual meeting. This is one of the largest university consortia in the world and demonstrates the funding agility which can only derive from investing in fundamental research.

Throughout 2013 Canberra celebrated it’s centenary and as part of that program our resident artist, Erica Seccombe and Ajay Limaye (National Computational Infrastructure) were invited to exhibit their long-term collaboration based around data from our CT facility. Earlier, Erica had been awarded the inaugural VC’s College Artist Fellowships to further develop her connection with our Department. In August they installed an entrancing animated and utterly 3D exhibition at the Canberra Contemporary Art Space called “Monster!” It attracted one of the largest crowds the Art Space has seen with a combination of large screen stereo visualisations and surreal, fluorescent 3D prints of a common garden slater. Also in August we celebrated the announcement of the Sirtex Chair, the first industry sponsored Chair at the ANU and proudly held by Professor Ross Stephens. He and his group have forged a remarkably rewarding engagement with the fastest growing Australian biotech, Sirtex Medical. Their CEO, Gilman Wong, was glowing in his dedication to Ross and the talents of his group, located in Research School of Biology. Again, it seemed another public triumph for the Department to see fundamental work find such meaningful application.

The end of August marked an opportunity to assemble around a tribute to our founding Head of Department, Professor Barry Ninham. World-renowned sculptor, Ante Dabro, graciously rendered Barry’s bust and so immortalised some of the essence of our Department.

In the long awaited conclusion to Teon Castle’s PhD his spectacular thesis, “Entangled graphs on surfaces in space”, untangled many problems in knot theory. Francesco Pozzi submitted an impressive thesis in Econophysics entitled, “Optimal Filtering Financial Networks and Optimal Portfolio Selection”. We welcomed 4 new students in 2013 into fields ranging from specific ions effects to upscaling petrophysical properties.

Just as the year commenced with an evolutionary landmark it seemed to be ending with another. Our spin-off company, now Lithicon, was being wooed by a major global company. Having merged the year before with the Norwegian counter-part, Lithicon was attracting great attention throughout 2013 and in the last days of the year exciting prospects loomed, imminent for 2014. Stay tuned.
**Academic Staff**

**Head of Department and Professor**
Tim Senden BSc PhD

**Professors**
Vince Craig BSc PhD, ARC Future Fellow
Stephen Hyde BSc PhD Monash
Mark Knackstedt BSc Columbia, PhD Rice (on leave, Digitalcore Pty Ltd)
David Williams BSc Sydney, PhD Cambridge

**Emeritus Professors**
Barry Ninham MSc WA, PhD Maryland, DTech (hon causa) KTH Stockholm D Phil (hon Causa) Lund, FAA
Stjepan Marcelja, DipIng Zagreb, PhD Roch, FAA

**Senior Fellows**
Adrian Sheppard BSc Adelaide, PhD, ARC Future Fellow

**Research Fellows**
Lilliana De Campo BSc PhD Graz
Andrew Fogden BSc PhD Docent Lund
David King BSc
Drew Parsons PhD
Vanessa Robins BSc, PhD Colorado
Ross Stephens PhD Sydney

**Postdoctoral Fellows**
Hongjie An PhD
Andrew Kingston PhD Monash
Shane Latham BSc PhD UQ
Glenn Myers PhD Monash
Benoit Recur PhD Bordeaux (from June)
Mohammad Saadatfar PhD
Andrea Salis PhD Cagliari (from June)

**Visiting Fellows**
Dr Linnea Andersson, Stockholm University (until February)

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Dr Christoph Arns, University of NSW
Dr Tomaso Aste, University of Kent (until January)
Dr Mathais Bostrom, Linköping Universitet Sweden (until April)
Dr Anna Carnerup, Digitalcore Pty Ltd
Dr Judith Caton
Dr Andy Christy
Mr Arthur Davies
Prof Phil Evans, University of British Columbia
Dr Olaf Delgado Friedrich (from May)
Dr Wilfred Fullagar (from June)
Dr Ankie Larsson (from September)
Prof John Maloney (until April)
Dr Rainer Mittlebach
Prof Norman Morrow, University of Wyoming
Dr Shannon Notley, Swinburne University
Dr Gerd Schröder-Turk, University of Erlangen
Dr Rob Sok, Digitalcore Pty Ltd

**Professional Staff**

**Senior Software Designer**
Paul Veldkamp BSc BEc

**Head Technical Officer**
Tim Sawkins

**Technical Officers**
Holger Averdunk
Jessica Bell (nee Blackmore)
Ron Cruikshank
Stuart Hungerford (from January)
Karen Knox (from August)
Rohini Marathe, BSc Mumbai, MSc Rutgers
Michael Turner PhD

**Contractors**
Levi Beeching (CT sales)
Joe Micallef (CT sales)
Roderick Vagg

**Departmental Coordinator**
Martina Landsmann

**Students**

**PhD**
Pieter Botha (from January)
Qianhao Cheng (from January)
Toen Castle
Vivianne Deniz
Timothy Duignan
Namsoon Eom (from August)
Shaun Howard
Heyang Li
Thomas McKay
Min-Chul Kim
Virginia Mazzini (from May)
Jill Middleton (until January)
Mahsa Paziresh
Francesco Pozzi (until August)
Stuart Ramsden (until September)
Mehdi Shabaninejad
Alison Sham
Tao Song
Ponlawat Tayati
Johnny Valbuena Soler
Rick Walsh

**Visiting Students**
Henri Der Sarkissian, University of Nantes, France
Koen Deuss, Technische Universiteit Eindhoven, The Netherlands
Michael Fischer, Universität Erlangen-Nürnberg, Germany
Mayam Hanifpour, Teheran University, Iran

Mehdi Alizadeh, University of New South Wales
Tianshu Liu, Australian National University
Erica Seccombe, Australian National University
Jin Tao, Australian National University
Qi Ziyuan, China University of Petroleum (Huadong), P.R. China
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 information that is critical to applications in other scientific disciplines, technology, and the environment.

AMPL’s 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 has a long 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 2013 has seen the construction of a new experiment in the field of polaritronics, a state that is a mixture of light and matter (jointly with the Non-Linear Physics Centre). This experiment 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. Theoretical results on attosecond science obtained in AMPL has been widely used by leading experimental groups including Max Born Institute, Berlin; Max-Plank Institute, Heidelberg, Vienna Technical University and ETH University in Zürich.

AMPL also hosts an Australian Research Council Centre of Excellence: the Centre of Excellence for Antimatter-Matter Studies (CAMS), which studies the interaction of positrons and electrons with matter. In 2013, positron research continued to focus on the study of biomolecules, relevant to processes important for better understanding PET scans. We also made the first attempts at an experiment, a positron reaction microscope, which was tested on the low energy positron beamline (jointly with the University of North Texas).

There is a strong interest in environmental and climate change issues. We study the molecular processes in the Venus atmosphere to enhance our understanding of what determines the climate on a planet. Calculations of the capability of the ALICE spectrometer on the NASA New Horizons probe, which will fly by Pluto in 2015, revealed that the spectrometer can measure nitrogen isotope ratios, of importance for the evolution of the solar system and galaxies. We 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**
Maarten Vos MSc PhD Groningen

**Professors**
Kenneth Baldwin BSc MSc, DIC PhD London, FAIP, FInstP, FOSA, FAPS (2 April to 31 August)
Stephen Buckman BSc PhD Flinders, FAPS, FAIP, FInstP
Anatoli Kheifets BSc PhD St Petersburg, FAPS

**Emeritus Professors**
Robert Crompton AM FAA FAPS FAIP
Erich Weigold AM FAA FTSE FAPS FAIP
Brenton Lewis PhD DSc Adelaide, C Phys, FInstP, FAPS, FOSA, FAIP

**Senior Fellows**
Stephen Gibson BSc PhD Adelaide

**Research Fellows**
James Sullivan BSc PhD ANU
Andrew Truscott BSc PhD Queensland
David Sprouster BSc (Hons) Wollongong PhD ANU (to 26 November)
Robert Dall BSc Queensland PhD
Igor Ivanov PhD DSc Moscow
Mitsuhiko Kono MSc KyotoIT, PhD GUAS Tokyo (to 30 November)

**Visiting Fellows**
Dr Simon Armitage (University of North Texas)
Prof Michael Brunger (Flinders University)
Dr Steven Cavanagh (Defense)
Dr Sarah Chamberlain
Dr Luca Chiari (Flinders University)
Prof Hyuck Cho (Chungnam University)
Dr Jan Chwedenczuk (University of Warsaw)
Prof Gustavo García Gómez-Tejedor (CSIC)
Dr Kandis Lea Jessup (Southwest Research Institute)
Dr Mitsuhiko Kono
Prof Robert McEachran
Prof Dennis Mueller (University of North Texas)
Adjunct Prof Robert Robson (James Cook University)
Mr Farshid Salehzahi (ACT Health)
Dr Vlad Serov (Saratov State University)
Dr David Sprouster (Brookhaven National Laboratory)
Prof Marek Trippenbach (University of Warsaw)
Dr Suzanne Smith
Prof Ravi Rau

**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
Jacob Hughes
Roman Khakimov
Andrew Geoffrey Manning
Joshua Machacek
Prasanga Palihawadana
Wade Tattersall
Ju-Kuei Wu
Henry Poetrodjojo

**Honours & Other Scholars**
Johannes Postler (Visiting student)
Andrew Ridden-Harper (Summer Scholar – University of Canterbury, NZ)
Sam Backwell (Summer Scholar – ANU)
Sabina Scully (Summer Scholar – ANU)
Joshua Petrass (honours-ANU)
Ashton Walker (honours-ANU)
Ly Duong (honours-ANU)
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 and photonic 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.

2013 was another successful year for EME, now the largest department in the School. We welcomed numerous persons across the academic, professional and student sectors in addition to a multitude of short and long term visitors. EME personnel represent a broad range of scientific backgrounds and expertise and also a broad range of cultural and ethnic origins. Departmental staff and students are 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 and capabilities continued to expand including major upgrades to the MOCVD infrastructure such that EME now houses three state-of-the-art MOCVD reactors dedicated to the growth of III-V materials. Departmental staff and students continued to make significant contributions to the under-graduate teaching program including first-year life physics and third-year condensed matter physics. The integration of teaching and research further strengthens 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, Flon, FIEEE, FAPS, FOSA, FSpIE, FECS, FIET, FAAAS, FAVS, FECS

**Professors**
Robert Elliman BAppSci MAppSci RMIT, PhD DSc Salford, FAIP, FIP
Hoe Tan BE Melbourne, PhD

**Emeritus Professor**
Jim Williams BSc PhD UNSW, FAA, FAIP, FIEAust, FTSE, FAPS, FMRS
Senior Fellows
Yin Yin (Jennifer) Wong-Leung BSc Bristol, PhD
Jodie Bradby BA BAppSc RMIT, PhD
Lan Fu MSc UTSC, PhD
Patrick Kluth DipPhys Düsseldorf, PhD Jülich

Fellows
Jiandong Ye PhD Nanjing
Qiang (Michael) Gao MS BSc NEU PhD
Philippe Caroff-Gaonac’h MSc U Louis Pasteur, PhD
INSA de Rennes (from January)

Research Fellows
Sudha Mokkapati PhD
Dinesh Venkatachalam MSc BITS, PhD RMIT,
Kiran Mangalapalli M.Sc, PhD U of Hyderabad
Bianca Haberl PhD
Matias Rodriguez PhD (till December)

Postdoctoral Fellows
Boshra Afra PhD (June-December)
Steffen Breuer PhD HU (till August)
Yanan Guo PhD UQ (from June)
Felipe Kremer PhD UFRGS (till August)
Scott Medling BSc Caltech, MSc UC Riverside, PhD
UC Santa Cruz (from October)
Shagufta Naureen (from June) PhD KTH Stockholm
Fang Fang Ren BSc, PhD NJU (from July)
Avi Shalav PhD UNSW, MSc DipTchg Massey
Pawel Sajewicz MSc Warsaw U of Tech, PhD UCC
Tyndall
Hazar Salama PhD UNSW
Fan Wang PhD UNSW (from July)
Hao Wang MSc Jinan, PhD South China Normal (till September)

Visiting Fellows
Neville Fletcher AM, PhD Harvard, DSc Sydney, FAA,
FTSE, Finst P, FAIP, FAAS. FASA
Haroldo Hattori (ADFA)
Simon Ruffell (Varian)
Leigh Smith U of Cincinnati (from December)

Research Assistants
Kidane Belay BSc MSc AAU Ethiopia, PhD
David Llewellyn (joint CMBE)

Professional Staff

Technical Officers
Michael Aggett AssocDipMechEng CIT
Josh Carr
Chris Kafer (from September)
Dane Kelly
Thomas Kitchen AdvDipMechEng (from September)

Departmental Administrator
Julie Arnold BA

ANFF
Manager
Fouad Karouta BSc LUB, PhD Perpignan, PhD
Montpellier

Processing Engineers
Kaushal Vora PhD Latrobe
Naeem Shahid PhD KTH Stockholm
Li (Lily) Li (from March) PhD USyd

Administrator
Jeffrey Kealley

Australian Nanotechnology Network Manager
Elizabeth Micallef
Students

PhD
Huda Alkhaldi (from February)
Boshra Afra (till June)
Amira Ameruddin
Leonardus Bimo Bayu Aji
Thomas Bierschenk
Timothy Burgess
Keng Chan
Ruixing (Andy) Feng
Aruni Fonseka
Qian Gao
Hao Feng Lu
Nian (Jenny) Jiang
Mykhaylo Lysevych
Sahar Mirzaei
Pablo Mota Santiago (from September)
Parvathala Reddy Narangari (from April)
Miranda Nash
Kun Peng
Daniel Pyke (till December)
Dhruv Saxena
Daniel Schauries
Yuanjing Shen
Lachlan Smillie (from February)
Clara Teniswood
Thien Tuan Tran (from February)
Ian Yesaya Wenas
Xiaoming (Fred) Yuan
Bijun Zhao (from September)

MPhil
Sam Turner
Sarita Deshmukh
Sherman Wong
Prakash Prasai

Honours
Ryland Harris
Christian Henderson
Angus Heyworth
Zhi (Rex) Li
Beau Olsen
Wei Yang

Occupational Trainees
Felipe Kremer, PhD UFRGS (from August)
Yu-Jie Ma (from September)
Fenglin Xian (from September)
Guogang Zhang (from November)
Nurul Aini Tarjudin (from December)
Since its inception in 1987 the Laser Physics Centre (LPC) has been engaged in research areas that either utilize lasers or are motivated by laser-based applications. Under this umbrella we undertake a broad range of world-class research projects both fundamental and applied in nature. This research covers such areas as nonlinear optics, photonic device engineering, material science, quantum information, quantum sensing, solid-state spectroscopy, laser matter interaction and optical trapping. The underlying strength of the Centre is in how our people, working in these diverse but interrelated areas, continue to inform, motivate and enable each other’s research.

The LPC hosts major programs from two Australian Research Council Centres of Excellence: The Centre for Ultrahigh Bandwidth Optical Systems (CUDOS) and The Centre for Quantum Computation and Communication Technology (CQC2T). These programs underpin central themes for the LPC: the development of integrated optical photonic devices for communication, sensing and quantum information applications.

During 2013 the Laser Physics Centre was engaged in numerous high profile research projects. Notable achievements included:

Demonstration of the first broadband mid infrared supercontinuum source spanning from 2-8 microns using a chalcogenide planar waveguide. The source is a vital component for a mid infra spectroscopic system for chemical finger printing. The keys to this success were the development of both low loss, dispersion engineered planar waveguides where we achieved the lowest losses over a very broad wavelength range of any material as well as a novel femtosecond mid-infrared optical parametric amplifier (OPA).

The first demonstration of the optical addressing of an individual erbium ion in silicon. In this work the optical excitation of a single erbium ion implanted in a silicon finFET transistor was detected electronically. This is the first step in developing a quantum interconnect between optical and silicon based quantum information devices. This work was conducted in collaboration with the University of New South Wales.

In December Prof. Wieslaw Krolikowski stepped down as head after a two-year appointment. We thank him for his valuable guidance and his contribution to the continued success of this department.

**Academic Staff**

**Head of Department and Professor**

Wieslaw Krolikowski (MSc PhD Warsaw)

**Professors**

Barry Luther-Davies (BSc, PhD (Southampton); FOSA; FTSE)

Neil Manson (PhD Aberdeen)

Andrei Rode (PhD Moscow)
Senior Fellows
Duk-Yong Choi (PhD Seoul)
Eugene Gamaly (MSc PhD DSc, Full Professor of Physics, Moscow)
Stephen Madden (PhD Imperial College)
Matthew Sellars (PhD)

Fellows
Rongping Wang (PhD CAS)

Research Fellows
Cyril Hnatovsky (PhD Ottawa)
Yan Sheng (PhD CAS, ARC Postdoctoral Fellow)
Vladlen Shvedov (PhD Taurida National)
Zhiyong Yang (PhD CAS)

Postdoctoral Fellows
Marcus Doherty (PhD, Bch Science (Honours), Bch Engineering (Honours))
Ludovic Rapp (PhD)
Khu Vu (PhD Mphil Southampton BSc (Honours) Monash)

Visiting Fellows
Deng Feng Chen
Anna Samoc
Marek Samoc
Wang Tong
Yang Xinyu

Professional Staff
Technical Officers
John Bottega
Sukhanta Debbarma
Maryla Krolikowska
Craig MacLeod

Research Officer
Robin Stevenson

Departmental Administrator
Sonia Padrun

Students

PhD Students
Rose Ahllefeldt
Michael Barson
John Bartholomew
Xin Chen
Niko Eckerskorn
Katherine Ferguson
Darren Freeman
Xin Gai
Ksawery Kajetan Kalinowski
Sara Marzban
Joseph Paulraj
Milos Rancic
Yue Sun
Ting Wang
Kunlun Yan
Yi (Ivy) Yu
Manjin (Grace) Zhong

Visiting Students
Jun Cheng
Katrin Kroeger
Li Li
Pan Ma
Yue Sun
Wenhou Wei
Si-Wei Xu

Other Students
Daniel Esposito
Sam Fischer
Prithvi Reddy
Richard Taylor
Nonlinear Physics Center is engaged in theoretical and experimental research in several areas of physics unified by the general concepts of nonlinear physics and photonics. Nonlinear Physics Center is composed of several major research groups with not sharply defined boundaries.

A majority of the experimental research in nonlinear photonics is led by Dr Dragomir Neshev who undertakes experimental studies of linear and nonlinear properties of light propagation and localization in photonic and nanoplasmonic structures including light self-action and harmonic generation, optical metamaterials, and nanophotonics. In 2013, the group's activities also included quantum optics in waveguide arrays, the physics of optical metamaterials, and all-dielectric nanostructures.

The theoretical group led by Dr Andrey Sukhorukov 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 optomechanical systems as well as quantum walks in waveguide arrays.

The group in nonlinear matter-wave optics is led by Dr Elena Ostrovskaya, and it is involved in the development of novel theoretical models, analytical and numerical studies of matter waves and nonlinear atom-optics problems associated with Bose-Einstein condensates. Recent highlights of the group are the development of novel concepts and experimental demonstrations of polaritonic 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 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.

The recently established group of Dr Andrey Miroshnichenko is focused on the study of the physics and applications of linear and nonlinear plasmonic structures and optical nanoantennas. The recent advances of this team include the prediction and demonstration of “magnetic light” effects in all-dielectric optical structures.
**Academic Staff**

**Head of Department and Professor**
Yuri Kivshar BSc PhD Kharkov, FAIP, FOSA, FAA, FAPS, FInstP

**Senior Fellows**
Dragomir Neshev PhD Sofia
Andrey Sukhorukov MSc Moscow, PhD

**Fellows**
Anton Desyatnikov Moscow PhD
Andrey Miroshnichenko PhD Dresden
Elena Ostrovskaya MSc Moscow, PhD
Willie Padilla San Diego, PhD (February to May)
Alexander Savin PhD Moscow (May to July)
Ilya Shadrivov PhD

**Research Fellows**
Robert Dall PhD
Manuel Decker PhD Karlsruhe
Yana Izdebskaya PhD Simferopol
Aliaksandr Minovich PhD
David Powell PhD RMIT
Isabelle Staude PhD Karlsruhe

**Postdoctoral Fellows**
Ivan Garanovich PhD (to April)
Christian Helgert PhD Jena (to March)
Ivan Maksymov PhD Kharkov (to August)
Lev Smirnov PhD Novgorod (September-November)
Alexander Solntsev PhD (from October)

**Visiting Fellows**
Prof Gaetano Assanto, University of Rome, Italy
Dr Maxim Dvornikov, University of San Paulo, Brazil
Dr Mikhail Lapin, University of Sydney

**Research Assistants**
Andrei Komar (January)
Wei Liu (April-September)
Alexander Solntsev (May-October)

**Students**

**PhD Students**
Jasur Abdullaev
Diana Antonosyan
Katie Chong
Rui Guo
Kirsty Hannam
Ben Hopkins
Ali KH Mirzaei
Sergey Kruk
Daniel Leykam
Guangyao (Leo) Li
Mingkai Liu
Wei Liu
Alexander Solntsev
Yue Sun
Lei Wang
Che Wen (Allen) Wu
Yair Zarate

**Honours Students**
Ben Hopkins
Shuai Li

**Visiting Students**
Paul Ackerman, University of Colorado, USA
Alexander Atrashchenko, St Petersburg
Sebastian Brake, Westfälische Wilhelms-Universität Münster Institut für Angewandte Physik
Falko Diebel, Institute of Applied Physics, University of Muenster

**Professional Staff**

**Departmental Administrator**
Kathy Hicks AdvDipAcct DipMngment CIT
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 NCRIS operational funding from the Federal Government. It provides a wide 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 specialized 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 utilize 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 characterization. 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. Recently, nuclear astrophysics became an additional major research topic at the Department.

Professor L. Keith Fifield retired at the end of 2013 after 27 years at the Department of Nuclear Physics. Keith obtained his PhD in Nuclear Physics from the University of Pennsylvania in 1973, and held research positions in nuclear physics laboratories at the universities of Pennsylvania and Oxford, and at the ANU. In 1986, he began to develop the new technique of accelerator mass spectrometry (AMS) at the ANU’s 14UD Heavy-Ion Accelerator Facility. This became a full-time occupation from 1991. Since then, Keith has been at the forefront of innovation in both the methods and the applications of the technique. He has published more than 280 refereed papers in the fields of Nuclear Physics and AMS. He will continue his research in the Department as Professor Emeritus.
**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  
Dr Cedric Simenel (ARC Future Fellow)

**Research Fellows**  
Mario DeCesare PhD Naples (until Oct)  
Michaela Srncik PhD Vienna  
Elizabeth Williams PhD Yale

**Postdoctoral Fellows**  
Maurits Evers PhD (until June)  
Duc Huy Luong PhD  
Ramachandran Kandasamy PhD Mumbai  
Sankha Hota PhD (from April)  
Chandani Palshetkar PhD (from July)  
Matthew Reed MPhys Leicester PhD Surrey

**Visiting Fellows**  
Dr Tezer Esat, ANSTO  
Dr Toshiyuki Fujioka, ANSTO (until Feb)  
Dr Heiko Timmers, University of New South Wales/ADFA  
Dr Rickard Du Rietz MSc PhD Lund (until Feb)  
Dr David Weisser, MSc, PhD Minn, FAIP (from June)

**Professional Staff**

**Accelerator Research and Operations Managers**  
Nikolai Lobanov BSc Moscow, PhD St Petersburg  
David Weisser MSc, PhD Minn, FAIP (Special Projects) (retired June)

**Accelerator Engineer**  
Peter Linardakis PhD

**Computer Manager Heavy Ion Facility**  
Dimitrios Tsifakis, BSc (Hons)

**Embedded Systems Programmer**  
Nicholas Withers, BE (Hons), BIT (from June)

**Scientific Programmer**  
Dr Toktam Ebadi PhD Otago (from July)

**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  
Allan Harding, Fitting and Machinist Trade Cert. (retired Dec)  
Justin Heighway, AssDip AppSci CIT  
Lorenzo Lariosa  
Alistair Muirhead, Fitting and Machinist Trade Cert.  
Thomas Tunningley AdvDip EngDesign CIT, B.Ind.Des. (Hon) UC
**Students**

**PhD students**
Badriah Alshahrani  
Ian Carter  
Kaitlin Cook  
Michael Edwards  
WeeTeck Hoo  
Dongyun Jeung  
Rajeev Lal  
Boon Lee  
Russell Leslie  
Steven McNeil  
Nyaladzi Palalani  
Dominic Rafferty  
Michael Smith  
Aditya Wakhle PhD (until June)

**Masters students (MPhil)**
Asif Ahmed  
Tristan Steele

**Masters students (CWk)**
Janette Deo  
Glenn Broadhurst  
Bret Grimshaw  
Andrew Hall  
Nigel Little  
Bill Noble  
Jarred Rorke  
Katherine Schiffl  
Maurice Walsh

**Honours**
Ellen Manning  
Joseph Horst  
Hannah Smith

**Summer Scholars (ANU)**
Melanie Hampel, University of Bonn, ANU Exchange  
Matthew Talia, Monash University, ANU Exchange  
Andrew Duong, Monash University, ANU Exchange

**Visiting students**
Aqeel Akber, 3rd year research project, ANU  
Matthew Berrington, PhB, ANU  
Martyn Dietze, 3rd year research project, Utrecht University, ANU Exchange  
James Frith, 3rd year research project, ANU  
Matthew Gerathy, 3rd year research project, ANU  
Melissa Hogan, 3rd year research project, ANU  
Kun Wang, Jzangnan University
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 have developed a new national space simulation facility to test the thrusters in collaboration with the astronomers at Mount Stromlo and with various industry partners (EADS-Astrium, Lockheed Martin…).

**Academic Staff**

**Head of Department and Professor**
Christine Charles BEng MSc Rennes, PhD Hab
Orléans, BMus

**Professors**
Roderick Boswell BSc Adelaide, PhD Flinders, FTSE, FAPS, FAA, AM

**Visiting Fellows**
Dr Craig Davis, Stayz Pty Ltd 2011
Dr James Dedrick
Dr Wesley Cox, Lam Research Corporation

**Visitors**
Mr Piotr Glowacki, DBD Innovations
Mr Guy Reynolds, DBD Innovation

**Professional Staff**

**Technical Officers**
Andrew Bish
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

**Students**

**PhD students**
Sam Dixon
Amelia Greig
Yunchao Zhang
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 (APFRF), 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. 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
Matthew Hole BSc BE PhD Sydney

**Research Fellows**
Cormac Corr PhD Belfast
Gerard Borg BSc PhD Sydney
Hua Xia MSc Chongqing PhD
Clive Michael Bsc PhD

**Postdoctoral Fellows**
Graham Dennis PhD
Gregory von Nessi BSc Massachusetts PhD
Michael Fitzgerald PhD University of Sydney (finished 10/2013)
Nicolas Francois BEng Toulouse PhD Université Bordeaux 1

**Visiting Fellows**
Dr Jay Larson, Argonne National Laboratory, USA

**Visitors**
John Wach BAppSci CAE Ball GradDipEl CCAE

**Professional Staff**

**Technical Officers**
Bernhard Seiwald PhD Graz Uni. of Tech (until Nov 2013)
David Pretty BSc Melb PhD (until November 2013)
Fenton Glass BSc Queensland PhD
Horst Punzmann BSc Regensburg PhD
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 fields 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 achieved in 2013 include: Storage of light in super dense atomic ensembles (published in New Journal of Physics), proposing a scheme for using laser light to levitate a macroscopic mirror suitable for metrological applications (published in Physical Review Letters).

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 2013, we continued to develop a next generation gravitational sensor with a projected sensitivity that promises to provide the best local measurement of gravity in the world. The apparatus spans two stories in the Department and required modification to the building to allow installation. In addition, we developed the first solitonic atom interferometer and demonstrated enhanced fringe visibility and signal to noise ratio in an interferometric measurement (published in Physical Review Letters).

The Centre for Gravitational Physics 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, earth observations and sensing. Highlights in 2013 included: using quantum enhancement to deliver the most sensitive gravitational wave detector ever built (published Nature Photonics); and searching for gravitational waves from binary black hole inspirals. We continued our collaboration with the National Measurement Institute to develop optical sensors for drug testing and our program to revolutionise and commenced a new collaboration with Electro Optic Systems to developed CW laser ranging for tracking space debris.
**Academic Staff**

**Head of Department and Professor**
David McClelland BSc (Hons1) MSc PhD (Otago)
FAPS FOSA FASA FAIP

**Professors**
John Close BSc, MA Berkeley, PhD Berkeley, SFHEA
Ping Koy Lam BSc Auckland, PhD
Craig Savage BSc MSc DPhil (Waikato), SFHEA
Susan Scott BSc (Hons) Monash, PhD Adelaide, EURASC, FAIP, FInstP
Daniel Shaddock PhD

**Emeritus Professors**
Hans-A Bachor Diplom Physiker Hannover, PhD
Hannover AM, FAA, FAIP, FIOP, FOSA
John Love, MA DPhil DSc Oxford, MA MMath Cambridge
Ronald John Sandeman OAM, BSc Adel, MSc Melb, PhD Cantab, FAIP

**Senior Fellows**
Joseph Hope PhD

**Fellows**
Benjamin Buchler PhD
Jong Chow BSEE Vermont, PhD ANU
Nicholas Robins PhD
Thomas Symul PhD CNET

**Research Fellows**
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
Sheon Chua PhD (from 12 April)
John Debs PhD
Roland Fledderman PhD LUH Germany
Mahdi Hosseini PhD
Noschang Kuhn, Carlos Claiton PhD UFRGS (Brazil)
(from 1 March)
Timothy Lam PhD (from 20 June)
John Miller PhD Glasgow (until 19 March)
Olivier Pinel PhD Paris
Alberto Stochino PhD Caltech (until 1 April)
Andrew Sutton PhD (from 4 March)

**Visiting Fellows**
Dr Mark Andrews
Dr Quentin Glorieux
Dr Peter Riggs

**Professional Staff**

**Head Technical Officer**
Andrew Papworth

**Technical Officers**
Neil Devlin
James Dickson (until 26 October)
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 (until 30 June)

Students

PhD Students
Sarah Adlong
Seiji Armstrong
Richard Barry
Shayne Bennetts
Christopher Bentley
Alexandre Brieussel
Geoff Campbell
Helen Chrzanowski
Sheon Chua
Jarrod Dong
Giovanni Guccione
Jesse Everett
Sam Francis
Kyle Hardman
Jing Yan Haw
Sara Hosseini
Jessica Hudspeth
Timothy Lam
Benjamin Lewis
Georgia Mansell
Gordon McDonald
Ruth Mills
Adam Mullavey
Silvie Ngo
Thanh Nguyen
Steven Pederson
Tarquin Ralph
Shasidran Raj
Nicolas Riesen
Lyle Roberts
Harry Slatyer
Benjamin Sparkes
Andrew Sutton
Philip Threlfall
Andrew Wade
Paul Wigley
Ross Whitfield
Danielle Wuchenich

Masters Students (Coursework)

Jesse Boylan
Glenn Broadhurst
Janette Deo
Bret Grimshaw
Andrew Hall
Nigel Little
Zahra Mirmoeini
Bill Noble
Robert Parker
Jarred Rorke
Farhad Safazadeh
Katherine Schiff
Nicholas Vazenios
Jie Wang

Summer Scholars
Chaimanowong Wee
Daniel Comber-Todd

Occupational Trainees

Jiao Geng
Honours Students
Ethan Barden
Jake Glidden
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, Dr Vladimir Mangazeev and Dr Zengo Tsuboi lead research in (i) algebraic approaches to lattice systems (ii) integrability structure of quantum field theory, (iii) quantum groups 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.

In 2013 Emeritus Professor Rodney Baxter who is the founder of mathematical physics research at the ANU has been awarded a Royal Medal for "remarkable exact solutions of fundamental models in statistical mechanics". The Royal Medal, also known as The Queen’s Medal, awarded each year by the Royal Society, two for "the most important contributions to the advancement of natural knowledge" and one for "distinguished contributions in the applied sciences" made within the Commonwealth of Nations. Some of the previous winners include many of the greats from the Natural Sciences over the past 150 years – to name just a few: John Dalton, Michael Faraday, James Joule, Charles Darwin, J.J. Thompson, Paul Dirac, Lawrence Bragg.
Academic Staff

Head of Department and Professor
Murray Batchelor BSc (Hons) UNSW, PhD, FAIP, FAustMS, FlinstP (jointly with MSI) (until April)

Professors
Nail Akhmediev MS PhD DSc Moscow, FOSA
Peter Bouwknegt MSc Utrecht, PhD Amsterdam, FAIP, FAustMS (Deputy Director of MSI)

Emeritus Professors
Brian Robson MSc PhD DSc Melb, FAIP
Lindsay Tassie MSc PhD Melb, FAIP
Mukunda Das BSc PhD Roorkee University

Research Fellows
Adrian Ankiewicz BSc BE UNSW, PhD
Wonkeun Chang BTech (Hons), MSc, PhD ANU (ARC Fellowship)
Vladimir Mangazeev MSc Moscow, PhD Serpukhov
David Ridout BSc, MSc UWA, PhD Adelaide (ARC Fellowship)
Zengo Tsuboi MSc PhD Tokyo
Xi-Wen Guan BSc Qufu, MSc Sichuan, PhD Jilin

Postdoctoral Fellows
Natasha Devine PhD

Visiting Fellows
Angela Foerster PhD FU-Berlin
Chaoqing Dai PhD Suzhou University
Sergey Sergeev MSc PhD Steklov Institute of Mathematics
Simon Wood PhD from ETH Zurich (Switzerland)
Yusuke Kageyama PhD Kyushu University
Yvan Saint-Aubin PhD from U de Montreal (Canada)

Professional Staff

Students

PhD
Amdadul H Chowdury
Andrew Kels
Brendan Wilson
Callan Cain
David Kedziora
Kyle Wright
Imam Alam
Song Cheng
Victor Surkus

MPhil
Seong Joon Yi


**Book chapter**

(4 publications)


Izdebskaya, Yana, Desyatnikov, Anton S., Kivshar, Yuri, *Dynamics of optical solitons in bias-free nematic liquid crystals*, Nematicons: Spatial optical solitons in nematic liquid crystals, John Wiley & Sons Inc, USA (2013) 159-178


**Journal article**

(465 publications)


Ahlefeldt, Rose, Manson, Neil, Sellars, Matthew, *Optical lifetime and linewidth studies of the 7Fo - 9Do transition in EuCl₃.6H₂O: A potential material for quantum memory applications*, Journal of Luminescence, Elsevier

Ahlefeldt, Rose, Manson, Neil, Sellars, Matthew, McAuslan, D.L, Longdell, Jevon Joseph, *Precision measurement of electronic ion-ion interactions between neighboring Eu³⁺ optical centers*, Physical Review Letters, American Physical Society

Ahlefeldt, Rose, Zhong, Manjin, Bartholomew, John, Sellars, Matthew, *Minimizing Zeeman sensitivity on optical and hyperfine transitions in EuCl₃.6H₂O to extend coherence times*, Journal of Luminescence, Elsevier


Al Khawaja, U, Al-Marzoug, S M, Bahlouli, H, Kivshar, Yuri, *Unidirectional soliton flows in PT-symmetric potentials*, Physical Review A: Atomic, Molecular and Optical Physics, American Physical Society


Ankiewicz, Adrian, Chowdhury, M. Amdadul, Devine, Natasha, Akhmediev, Nail, *Rogue waves of the nonlinear Schrodinger equation with even symmetric perturbations*, Journal of Optics, Institute of Physics Publishing


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Bazhanov, Vladimir, Kels, Andrew, Sergeev, Sergey M., *Comment on star-star relations in statistical mechanics and elliptic gamma-function identities*, Journal of Physics A: Mathematical and Theoretical, IOP Electronic Journals


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Bentley, Christopher, Carvalho, Andre, Hope, Joseph, Kiepinski, D, Fast gates for ion traps by splitting laser pulses, New Journal of Physics, Institute of Physics Publishing

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Bignell, Lindsay Jordan, Mo, L, Steele, Tristan, Hashemi-Nezhad, Seyed Reza, The Zero Model by using Coincidence Scintillation (ZoMBieS) method of absolute radioactivity measurement, IEEE Transactions on Nuclear Science, Institute of Electrical and Electronics Engineers (IEEE Inc)


Bleckmann, Felix, Minovich, Ailiaksandr, Frohnhaus, Jakob, Neshev, Oleg, Chicken, Abdelraouf, Wuchenich, Danielle, Ward, Robert, Malikides, Emmanuel, McClelland, David, Shaddock, Daniel, Internally sensed optical phased array, Optics Letters, Optical Society of America

Bliokh, Konstantin Y, Izdebskaya, Yana, Nori, Franco, Transverse relativistic effects in paraxial wave interference, Journal of Optics, Institute of Physics Publishing

Boström, Mathias, Persson, Claas, Parsons, Drew, Ellingsen, Simen A., Semelius, B, Atmospheric water droplets can catalyse atom pair break-up via surface-induced resonance repulsion, Europhysics Letters, Les Editions de Physique

Boström, Mathias, Persson, Claas, Ninham, Barry, Norman, Patrick, Semelius, B, Resonance interaction induced by metal surfaces catalyzes atom-pair breakage, Physical Review A: Atomic, Molecular and Optical Physics, American Physical Society

Bouwknegt, Pier, Jurco, Branislav, AKSZ construction of topological open p-brane action and NAMBU brackets, Reviews in Mathematical Physics, World Scientific Publishing Company

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Breuer, Steffen, Feiner, Lou-Fé, Geelhaar, L., Droplet bulge effect on the formation of nanowire side facets, Crystal Growth & Design, American Chemical Society

Brunton, J R, Hargreaves, L.R., Buckman, Stephen, Garcia, Gustavo, Blanco, Franco, Zatsarinny, Oleg, Bartschat, Klaus R, Brunger, Michael J, Anomalously large low-energy elastic cross sections for electron scattering from the CF$_3$ radical, Chemical Physics Letters, Elsevier


Burgess, Timothy, Breuer, Steffan, Caroff, Philippe, Wong-Leung, Yin-Yin, Gao, Qiang, Tan, Hoe Hark, Jagadish, Chennupati, Twinning superlattice formation in GaAs nanowires, *ACS Nano*, American Chemical Society


Cartwright, Ian, Fifield, L Keith, Morgenstern, Uwe, Using 3H and 14C to constrain the degree of closed-system dissolution of calcite in groundwater, *Applied Geochemistry*, Pergamon Press


Chabchoub, A., Akhmediev, Nail, Observation of rogue wave triplets in water waves, *Physics Letters A*, Elsevier


Chai, XuZhao, Zhang, Yun, Liu, Bin, Xie, ZiLi, Han, Ping, Ye, Jiandong, Hu, LiQuan, Xu, XiangQian, Zhang, R., Zheng, YouDou, Effect of the V/III ratio during buffer layer growth on the yellow and blue luminescence in undoped GaN epilayer, *Science China Physics, Mechanics and Astronomy*, Springer-Verlag Berlin Heidelberg


Chang, Lei, Breizman, Boris, Hole, Matthew, Gap eigenmode of radially localized helicon waves in a periodic structure, *Plasma Physics and Controlled Fusion*, Institute of Physics Publishing


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Chen, Bin, Gao, Qiang, Wang, Yan-Bo, Liao, Xiao-Zhou, Mai, Yu-Wing, Tan, Hoe Hark, Zou, Jin, Jagadish, Chennupati, Ringer, Simon P., Anelastic behavior in GaAs semiconductor nanowires, Nano Letters, American Chemical Society

Chen, Bin, Wang, Jun, Gao, Qiang, Chen, Yujie, Liao, Xiao-Zhou, Lu, Chunsheng, Tan, Hoe Hark, Mai, Yu-Wing, Zou, Jin, Ringer, Simon P., Gao, Hua-Jian, Jagadish, Chennupati, Strengthening brittle semiconductor nanowires through stacking faults: Insights from in situ mechanical testing, Nano Letters, American Chemical Society


Chen, Yu, Xu, Tiefeng, Shen, Xiang, Wang, Rongping, Zong, Shuangfei, Dai, Shixin, Nie, Qiuhua, Optical and structure properties of amorphous Ge-Sb-Se films for ultrafast all-optical signal processing, Journal of Alloys and Compounds, Elsevier

Chen, Zi-Bin, Lei, Wen, Chen, Bin, Wang, Y B, Liao, Xiao-Zhou, Tan, Hoe Hark, Zhou, J, Ringer, Simon P., Jagadish, Chennupati, Preferential nucleation and growth of InAs/GaAs(001) quantum dots on defected sites by droplet epitaxy, Scripta Materialia, Pergamon-Elsevier Ltd

Chiari, Luca, Anderson, Emma, Tattersall, Wade, Machacek, Joshua, Palihwadana, Prasanga, Makochekanwa, Casten, Sullivan, James, Garcia, Gustavo, Blanco, Francisco, McEachran, Robert, Brunger, Michael J, Buckman, Stephen, Total, elastic, and inelastic cross sections for positron and electron collisions with tetrahydrofuran, Journal of Chemical Physics, American Institute of Physics (AIP)

Chiari, Luca, Palihwadana, Prasanga, Machacek, Joshua, Makochekanwa, Casten, Garcia, Gustavo, Blanco, Francisco, McEachran, Robert, Brunger, Michael J, Buckman, Stephen, Sullivan, James, Experimental and theoretical cross sections for positron collisions with 3-hydroxy-tetrahydrofuran, Journal of Chemical Physics, American Institute of Physics (AIP)


Chow, Kwok Wing, Chan, Hiu Ning, Kedziora, David, Grimshaw, R, Rogue wave modes for the long wave-short wave resonance model, Journal of the Physical Society of Japan, Physical Society of Japan

Chrzanowski, Helen, Assad, Syed, Bernu, Julien, Hage, Boris, Lund, A, Ralph, Timothy Cameron, Lam, Ping Koy, Symul, Thomas, Reconstruction of photon number conditioned states using phase randomized homodyne measurements, Journal of Physics B: Atomic, Molecular and Optical Physics, Institute of Physics Publishing
Chua, Alvin, Wickramasinghe, Dayal, Ferrario, Lilia, Galactic escape speeds in mirror and cold dark matter models, European Physical Journal C, Springer

Ciret, Charles, Coda, Virginie, Rangelov, Andon A, Neshev, Dragomir, Montemaggioni, G., Broadband adiabatic light transfer in optically induced waveguide arrays, Physical Review A: Atomic, Molecular and Optical Physics, American Physical Society


Creutzig, Thomas, Ridout, David, Modular data and Verlinde formulae for fractional level WZW models II, Nuclear Physics B, Elsevier

Creutzig, Thomas, Ridout, David, Relating the archetypes of logarithmic conformal field theory, Nuclear Physics B, Elsevier

Cugia, Francesca, Monduzzi, Maura, Ninhm, Barry, Salis, Andrea, Interplay of ion specificity, pH and buffers: Insights from electrophoretic mobility and pH measurements of lysozyme solutions, RSC Advances, Royal Society of Chemistry

Cumming, Benjamin P, Debbarma, Sukhanta, Luther-Davies, Barry, Gu, Min, Simultaneous compensation for aberration and axial elongation in three-dimensional laser nanofabrication by a high numerical-aperture objective, Biomedical Optics Express, Optical Society of America


Dall, Robert, Manning, Andrew, Hodgman, Sean, Wu, Ju-Kuei, Kheruntsyan, Karen V, Truscott, Andrew, Ideal n-body correlations with massive particles, Nature Physics, Nature Publishing Group


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Weisser, David, Fifield, L Keith, Tims, Stephen, Lobanov, Nikolai, Crook, Gareth, Tsifakis, Dimitrios, Tunningley, Thomas, *Injection optics for fast mass switching for accelerator mass spectrometry*, Third International Symposium on Negative Ions, Beams and Sources (NIBS2012), American Institute of Physics (AIP)
Wu, Che, Solntsev, Alexander, Neshev, Dragomir, Sukhorukov, Andrey, Kivshar, Yuri. *Photon pair generation in nonlinear adiabatic waveguiding structures*, CLEO: QELS_Fundamental Science, CLEO:QELS FS 2013, Conference Organising Committee

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Australian National Fabrication Facility Ltd
Grant
Jagadish Chennupati Prof
NCRIS 2013 Funding Agreement - Australian National Fabrication Facility Limited (ANFFL)
1/07/2013 - 30/06/2015
$1,445,199.00

Australian National Low Emissions Coal Research & Development
Research Grant
Senden Timothy Prof - Sheppard Adrian Dr - Knackstedt Mark Prof - Pinczewski Wolf Val - Green Chris - Cunningham Saul - Golding Suzanne - Butcher Alan R
Improving CO2 storage site assessment: Maximising the value of Digital Core Analysis for carbon sequestration site assessment
1/04/2012 - 1/04/2015
$1,634,406.00

Australian National University (ANU)
Contribution from Central Funds
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)
1/01/2011 - 31/12/2015
$626,500.00

Australian Research Council (ARC)
2009 Australian Laureate Fellowship
Jagadish Chennupati Prof
Nanoscale nonlinear optics
1/01/2010 - 31/12/2014
$555,000.00

2011 Australian Laureate Fellowship
Dasgupta Mahananda Dr
Frontiers of Reaction Dynamics for New Generation Accelerator Science
1/06/2012 - 31/05/2017
$2,750,752.00

2012 Discovery Early Career Research Award
Xia Hua Dr
Understanding winds: energy transfer in turbulent rotating fluids
1/02/2012 - 31/01/2015
$375,000.00

2013 Discovery Early Career Research Award
Yang Zhiyong Dr
Integrated mid-Infrared optical microcavity sensors
1/01/2012 - 31/12/2014
$375,000.00

2013 Discovery Early Career Research Award
Chang Wonkeun Dr
Dissipative soliton lasers: Innovative approach to high-energy femtosecond pulse generation
31/03/2013 - 30/03/2016
$372,520.00

Chow Jong Dr
Geo-thermometers based on laser absorption spectroscopy
30/06/2013 - 30/06/2016
$366,069.00

Garanovich Ivan Dr
Nanowaves with a twist: shaping and switching of light pulses in modulated nanowaveguide arrays (RELINQUISHED)
30/06/2013 - 29/06/2016
$359,446.00

Hnatovsky Kyrilo (Cyril) Dr
Advanced laser micromachining with femtosecond vector beams
1/01/2013 - 31/12/2015
$375,000.00

Miroshnichenko Andrey Dr - Desyatnikov Anton S Dr - Izdebnskaya Yana Dr - Smalyukh Ivan
Advanced photonics with flexible pixels in liquid crystals
1/01/2013 - 31/12/2015
$435,000.00

Ostrovskaya Elena Dr - Desyatnikov Anton S Dr - Dall Robert Dr - Fraser Michael - Skryabin Dmitry
Towards polaritonics: Non-equilibrium dynamics of condensed microcavity polaritons
1/01/2013 - 31/12/2015
$530,000.00

Ren Fang Fang Dr
Development of terahertz metamaterials based on III-V compound semiconductors
18/07/2013 - 25/05/2016
$375,000.00

Sukhorukov Andrey Dr - Choi Duk-Yong Dr
Flexible nonlinear photonics with nanowire slow-light waveguides
1/01/2013 - 31/12/2015
$430,000.00

Sukhorukov Andrey Dr - Szameit Alexander - Pertsch Thomas
Nonlinear nano-photonic structures for frequency conversion: from classical to quantum applications
1/01/2013 - 31/12/2015
$335,000.00

2010 Discovery: Project Grant
Gao Qiang Dr - Tan Hoe Hark Prof - Johnston Michael B
Integration of III-V semiconductor nanowires on silicon platform
1/03/2010 - 28/02/2015
$740,000.00

Neshev Dragomir Prof
Nanoscale nonlinear optics
1/01/2010 - 31/12/2014
$555,000.00

Ridout David Dr
Indecomposable Structure in Representation Theory and Logarithmic Conformal Field Theory
20/09/2010 - 19/06/2015
$570,000.00

Robins Nicholas Dr - Close John Prof - Oberthaler Markus
K - Kasevich Mark A - Aspect Alain
Advanced Atomic Sources for Precision Measurement
1/01/2010 - 31/12/2014
$529,797.00

Shadrivov Ilya Dr
Nonlinear metamaterials and transformation optics
8/02/2010 - 31/12/2014
$780,000.00

Ye Jiandong Dr
Development of high performance wide-bandgap polar oxide electronic and optoelectronic devices
15/06/2010 - 31/12/2014
$780,000.00

2011 Discovery: Project Grant
Ahmediev 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
$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 the International Thermonuclear Experimental Reactor (ITER) and beyond
1/01/2011 - 31/12/2013
$255,000.00

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

Parsons Drew Dr - Ninham Barry Prof
Hofmeister at Work. Implementation of a paradigm shift in Physical Chemistry
1/01/2011 - 31/12/2013
$540,000.00

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

Robins 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 - Krolkowski Wieslaw Prof - Padgett Miles
Nanometrology of laser-trapped airborne particles
1/01/2011 - 31/12/2013
$510,000.00

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 Hark Hoe 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
Bouwknecht Pier (Peter) Prof - Varghese Mathai
Supersymmetric Quantum Field Theory Topology and Duality
1/01/2011 - 31/12/2013
$185,000.00

2012 Discovery Project Grant
Elliman Robert Prof - Fletcher Neville Prof - Jones Kevin
The effect of stress on the production and evolution of defects in ion-implanted silicon
1/01/2012 - 31/12/2014
$300,000.00

Elliman Robert Prof - Choi Suk Ho
Understanding and improving resistive-switching in hafnium-oxide-based high-k dielectrics for non-volatile memory applications
1/01/2012 - 31/12/2014
$300,000.00

Howard John Prof - Chung Jinil - Wolf Robert
Towards a steady-state fusion reactor: understanding and controlling eruptive instabilities in tokamaks
1/01/2012 - 31/12/2014
$430,000.00

Jagadish Chennupati Prof
Ternary and quaternary III-V semiconductor nanowires and related quantum structures for optoelectronics applications
1/01/2012 - 31/12/2014
$330,000.00

Kheifets Anatoli Prof - Ullrich Joachim
Atto-second Atomic Dynamics
1/01/2012 - 1/01/2014
$360,000.00

Kluth Patrick A/Prof - Weber William - Lang M - Trautmann Christina
Nanoscale investigation of fission track formation and stability in geological environments
1/01/2012 - 31/12/2014
$380,000.00

Krolkowski Wieslaw Prof - Bang Ole - Arie Ady
Managing light in non-linear photonic structures
1/01/2012 - 31/12/2014
$370,000.00

Luther-Davies Barry Prof - Wang Rongping Dr
Pulsed laser deposition of rare-earth-doped crystalline oxide films: a step towards quantum information processing on a chip
1/01/2012 - 31/12/2014
$380,000.00

Manson Neil Prof
Optically induced spin polarisation: the role of electron-vibration interactions
1/01/2012 - 31/12/2015
$280,000.00

Ridgway Mark C Prof - Byrne Aidan Prof - Wesch Werner - Nordlund Kai
Porosity in Si Ge and the Si(x)Ge(1-x) alloys induced by ion irradiation
1/01/2012 - 31/12/2014
$320,000.00

Rode Andrei V Prof - Yang Wenge - Juodkazis Saulius
Ultra-fast alchemy: A new strategy to synthesise super-dense nanomaterials
1/01/2012 - 31/12/2014
$560,000.00

Stricker Christian Prof - Redman Stephen Prof - Bachor Hans Prof - Stuart Gregory J Prof - Daria Vincent Dr
Using light to probe brain activity in three dimensions
1/01/2012 - 31/12/2014
$430,000.00

Truscott Andrew Dr - Baldwin Kenneth Prof - Aspect Alain - Westbrook Christoph I - Kheruntsyan Karen V
Quantum nonlocality tests with ultracold atoms
1/01/2012 - 1/01/2014
$360,000.00

Wong-Leung Yin-Yin (Jennifer) A/Prof - Williams James Prof - McCallum Jeffrey C - Grimaila Maria - Priolo Francesco
Understanding the structure and unusual properties of ion implanted amorphous germanium
1/01/2012 - 31/12/2014
$620,000.00

2013 Discovery Project Grant
Batchelor Murray Prof - Mangazev Vladimir Dr - Baxter Rodney Prof
The connection between discrete holomorphicity and Yang-Baxter integrability
1/01/2013 - 31/12/2015
$300,000.00

Fifield L Keith Prof - Tims Stephen Dr
Developing new techniques for mapping soil loss and movement in Australia
1/01/2013 - 31/12/2015
$360,000.00

Fu Lan A/Prof - Johnston Michael B - Parkinson Patrick Wallace
III-V semiconductor nanowires for ultrafast device applications
1/01/2013 - 31/12/2015
$400,000.00

Hinde David Prof - Williams Elizabeth Dr - Hagino Kouichi - Tostevin Jeffrey Allan - Freer Martin
Mapping the microscopic pathway to dissipation in quantum nuclear collisions
1/01/2013 - 31/12/2015
$405,000.00

Lane Gregory Dr - Dracoulis George Prof
Pure and applied nuclear structure research with radioactive ion beams at CARIBU
30/06/2013 - 30/06/2016
$385,000.00

2013 Discovery Project-externally led
Hope Joseph Dr - Carvalho Andre Dr - Kiepinski D
Building Schrodinger’s cat: large-scale entanglement of trapped ions
1/01/2013 - 31/12/2015
$66,000.00

2009 Future Fellowships
Hole Matthew Dr
Fusion Energy and the Physics of Burning Plasmas
15/02/2010 - 6/01/2014
$686,400.00

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

Fifield L Keith Prof
New directions for nuclear structure research in Australia
26/05/2011 - 25/05/2015
$706,552.00

Shaddock Daniel Dr
Laser Interferometry for Space Science
20/01/2011 - 19/01/2015
$706,552.00
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<td>Creating a National Time and Frequency Network for Australia</td>
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<td>Elliman Robert Prof</td>
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<td>Controlling the forming and switching characteristics of non-volatile resistive memory devices using ion implantation</td>
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<td>Williams James Prof - Haberl Bianca Dr - Bradby Jodie A/ Prof - Huis in ’t Veld Bert</td>
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<td>Exploiting deep sub-surface temperature-induced phase-transformations for an improved approach to semiconductor laser-dicing</td>
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<td>McClelland David Prof - Slagmolen Bram Dr - Shaddock Daniel Dr - Ottaway D J - Whitcomb Stanley Ernest - Shoemaker D - Reitze D - Munch Jesper - Veitch Peter John - Lazzarini A</td>
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<td>Australian partnership in Advanced LIGO - continuation</td>
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<td>Lam Ping Koy Prof - James Matthew Prof - Buchler Benjamin Dr - Symul Thomas Dr - Sellars Matthew Dr - Simmons Michelle Yvonne</td>
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<td>Luther-Davies Barry Prof - Neshov Dragomir Prof - Kivshar Yuri Prof - Madden Steve Dr</td>
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<td>Quantum nonlocality tests with ultracold atoms</td>
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<td>Choi Duk-Yong Dr</td>
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<td>A silicon-compatible light source on a silicon-on-insulator platform</td>
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<td>High performance compound semiconductor nanowire optoelectronic devices</td>
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<td>Nonlinear polaritonics: Harnessing collective behaviour of half-light half-matter</td>
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<td>Solid-state quantum communication technology</td>
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<td>Selective Area Nano-Epitaxy</td>
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<td>30/01/2012 - 29/01/2016 $8,62,856.00</td>
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<td>Caroff Philippe Dr</td>
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<td>Antimonide-based nanowires for infra-red and energy applications</td>
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<td>Hope Joseph Dr</td>
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<td>Controlling ultracold gases</td>
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<td>16/03/2012 - 15/08/2016 $6,03,902.00</td>
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<td>Investigation of the structure and stability of ion tracks in application specific materials and environments</td>
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<td>1/06/2013 - 31/05/2017 $7,10,628.00</td>
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<td>Simenel Cedric Dr</td>
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<td>Microscopic many-body new approaches for fundamental science and applications</td>
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**Super Science Fellowship**
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 Grants Program**
Kremer Felipe Dr
Structural properties of Co and Ni nanoparticles embedded in silicon oxynitride
29/10/2013 - 1/11/2013
$1,115.00

**Access to Synchrotron Facilities**
Williams James Prof - Bradby Jodie A/Prof
The temperature-dependent phase transition behavior and possible polymorphism of fully coordinated amorphous silicon
25/03/2013 - 25/03/2014
$6,400.00

**Bluescope Steel Australia Ltd Development Contract**
Howard John Prof
Joint Development and Testing Agreement
20/12/2013 - 11/04/2014
$39,765.00

**Commonwealth Department of Defence Science and Technology Organisation (DSTO)**
Postdoctoral Fellowship
Close John Prof - Debs John Mr
DSTO Post Doctoral Fellowship
1/06/2012 - 31/05/2014
$239,625.00

**Commonwealth Department of Education**
Education Investment Fund
Elliman Robert Prof - Hinde David Prof - Fifield L Keith Prof
Heavy Ion Accelerator Education Investment Fund Project
24/12/2009 - 31/03/2014
$10,000,000.00

**Collaborative Research Infrastructure Scheme**
Hinde David Prof
Heavy Ion Accelerators
1/07/2013 - 31/12/2014
$2,280,000.00

**Education Investment Fund**
Jagadish Chennupati Prof
Australian National Fabrication Facility EIF - ACT Node Project
8/06/2011 - 30/06/2013
$5,230,000.00

**Collaborative Research Infrastructure Scheme**
Blackwell Boyd Prof
The Australian Plasma Fusion Research Facility
1/07/2013 - 31/12/2015
$900,000.00

**Japan Oil Gas and Metals National Corporation**
Research Agreement
Senden Timothy Prof - Knackstedt Mark Prof - Arns Christoph Dr - Sheppard Adrian Dr - Pinczewski Wolf Val
Digital Core Research Consortium
13/07/2006 - 30/06/2009
$2,611,188.00

**Lithicon Australia Pty Ltd Research Contract**
Saadatfar Mohammad Dr
Study on 3D characterisation of permeability reduction with overburden stress
1/06/2013 - 20/12/2013
$10,000.00

**Lithicon Norway Research Contract**
Fogden Andrew Dr
Wettability Analysis
1/06/2013 - 30/12/2015
$40,000.00
Lockheed Martin Integrated Systems & Services
Research Services
Charles Christine Prof
R&D plan to increase Pocket Rocket Thruster's Technology Readiness Level (TRL)
11/11/2013 - 12/05/2014
$109,084.00

Maersk Oil
Industry contribution
Senden Timothy Prof - Fogden Andrew Dr - Sheppard Adrian Dr
Project B: Calibrated computational multiphase flow methods incorporating the surface/wettability state of Maersk core material
1/10/2012 - 1/11/2014
$1,62,000.00

Senden Timothy Prof - Sheppard Adrian Dr
Project A: Submicron CT scanning
1/11/2012 - 1/11/2014
$1,235,000.00

REPSOL Spain
Technology Cooperation Agreement
Senden Timothy Prof
Multiscale Reservoir Characterization & Rock Typing
22/05/2013 - 31/12/2015
$381,033.00

Schlumberger Foundation
Faculty for the Future Program
Salama Hazar Dr
Structural and vibrational properties of metal nanoparticles in silicon nitride
1/02/2013 - 1/02/2014
$4,752.00

Science and Industry Endowment Fund
John Stocker Postgraduate Scholarships
Corr Cormac Dr - De Temmerman G - Riley Daniel
Ion interactions with fusion relevant materials
1/01/2013 - 31/12/2015
$51,000.00

Statoil ASA
Contract
Fogden Andrew Dr
Wettability and residual oil in sandstones
1/10/2012 - 31/03/2016
$85,000.00

University of Arizona
Grant
Rode Andrei V Prof
30/09/2012 - 20/11/2015
$330,049.00

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
$687,383.00