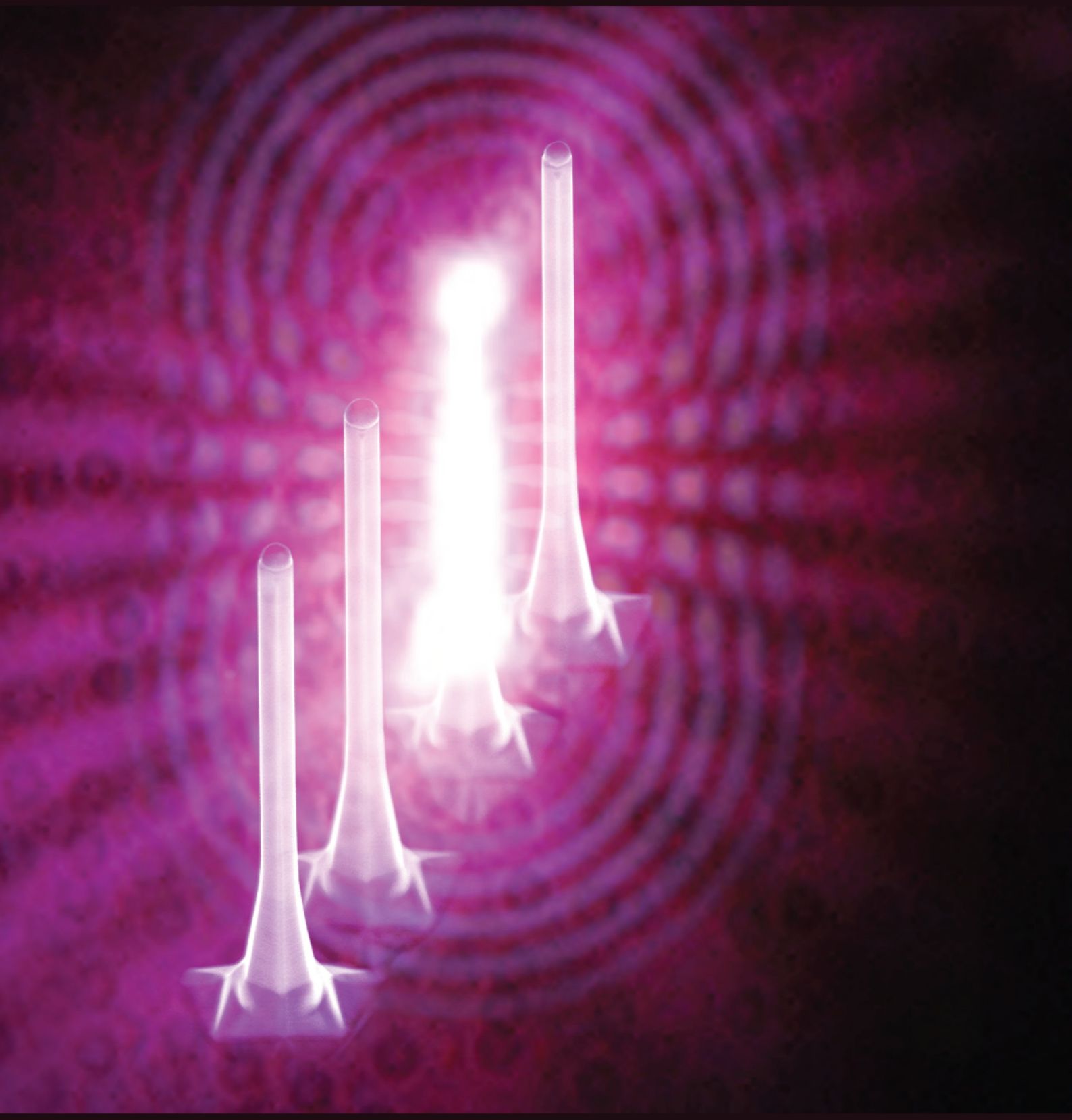
RESEARCH SCHOOL OF PHYSICS & ENGINEERING
ANNUAL REPORT 2013



Australian National University

ANU COLLEGE OF PHYSICAL AND MATHEMATICAL SCIENCES

Cover Photo: 'Lasing from III-V semiconductor nanowires'
Image courtesy of Dhruv Saxena

FOR FURTHER INFORMATION PLEASE CONTACT

Director's Office

Research School of Physics and Engineering

Australian National University

Oliphant Building #60, Mills Road

ACTON ACT 0200

Email: Director.RSPE@anu.edu.au

Phone: 6125 2476

Fax: 6125 5457

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Director's Report

Professor Stephen Buckman
Director

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.

Research Report

Professor Ken Baldwin
Deputy Director (Research)

The Research School of Physics and Engineering (RSPE) is the largest university-based institution in the country for physics research by some measure, with 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.

EDUCATION REPORT

Professor John Close
Deputy Director (Education)

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 honours 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.

Technology Development Report

Professor Tim Senden
Deputy Director (Technology Development)

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-Christophe Lonchampt 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

Mr Rana Ganguly
School Manager

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

Richard Kolterman

Miroslav Peric

Luke Roberts (from August)

Alex Shanahan

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

Alumni Relations and Philanthropy

Ms Kavitha Robinson
Development Manager

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.

Professor Denis Sullivan and Dr Gregory Clark at the inaugural Golden Graduates Reunion

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.

HIAF founders Profs. Keith Fifield, Nanda Dasgupta and David Hinde

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.

Professor Ross Stephens

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

Staff Accomplishments

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.

Prof Jagadish and Dr Rob Robinson presenting the Walter Boas Medal

Professor Krolikowski receiving the Honorary Doctorate from the President of the Technical University of Denmark, Professor Anders Bjarklev during the award ceremony on 3 May 2013 in Copenhagen.

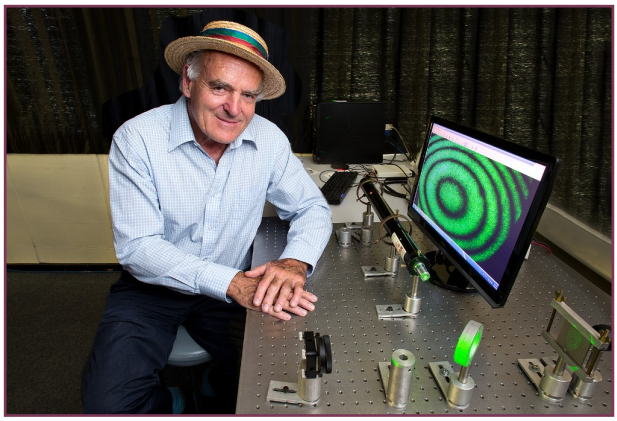
University Award for advancing the reputation of the University through media

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.



Professor John Love

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.

Drs Nick Robins and John Debs

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 Matias Rodriguez, 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 Linardakis was awarded the 2013 HIAF Endowment Career Development Award

Dr Peter Lindardakis

Professors Stephen Buckman and Andrew Roberts

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

Andrew Papworth, Yuri Kivshar for Kathy Hicks , Alan Cooper, Julia Wee, Miro Peric, Stephen Buckman and James Irwin representing the School Computer Unit.

Staff Outreach Activities

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 organisied 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

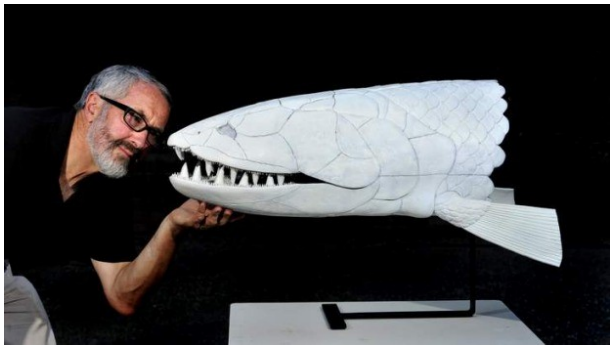
CSIRO: We worked with the CSIRO Education Centre to promote photonics and provide a series of hands on activities for visitors to the Canberra Family Science spectacular over a weekend in August. This event was very well attended as part of Science Week and attracted several thousand visitors.

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.



Gavin Young (RSES) and a life sized model of Edenopteron kiethcrooki.

Left to right: Nick Stranks (Master Founder, School of Art), Ante Dabro (Sculptor), Tim Senden (HoD), Barry Ninham (Dept Founding HoD), Steve Buckman (Director).

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.

Founder's Day

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)*

Professor David J. Hinde (since 2011)

Professor Chennupati Jagadish (since 2003)

Professor Anatoli Kheifets (since 2004)

Professor Yuri Kivshar (since 2006)

Professor Brenton Lewis (since 2001)*

Professor David McClelland (since 2010)

Adjunct Professor Robert Robson (since 1994)

Emeritus Professor Erich Weigold (since 1990)*

Professor Jim Williams (since 2006)

* Retired

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)

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)

Emeritus Professor Neville Fletcher (since 1987)*

Professor Chennupati Jagadish (since 2002)

Professor Mark Knackstedt (since 2011)

Professor Barry Luther-Davies (since 2005)

Emeritus Professor Erich Weigold (since 1996)*

Professor Jim Williams (since 1992)

The Australian Acoustical Society

Emeritus Professor Neville Fletcher (since 1980)

Australian Institute of Physics

Professor Hans Bachor (since 1987)

Professor Ken Baldwin (since 1995)

Professor Murray Batchelor (since 1993)

Professor Vladimir Bazhanov (since 2006)

Professor Stephen Buckman (since 1992)

Professor Mukunda Das (1991)

Professor Mahananda Dasgupta (since 2004)

Emeritus Professor George D. Dracoulis (since 1990)*

Professor Rob Elliman (since 1994)

Professor L. Keith Fifield (since 1997)

Emeritus Professor Neville Fletcher (since 1960)*

Professor David J. Hinde (since 1996)

Professor Chennupati Jagadish (since 1993)

Professor Yuri Kivshar (since 2000)

Professor David McClelland (since 2000)

Professor Susan Scott (since 2004)

Professor Andrew Stuchbery (since 1992)

Dr David C. Weisser (since 1992)

Professor Jim Williams (since 1988)

Australian Mathematical Society

Professor Murray Batchelor (since 2001)

Professor Vladimir Bazhanov (since 2006)

Professor Peter Bouwknegt (since 2001)

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)

A/Prof Paul Francis (Senior Fellow since 2014)

Dr Joe Hope (Senior Fellow since 2014)

Professor Craig Savage (Senior Fellow since 2013)

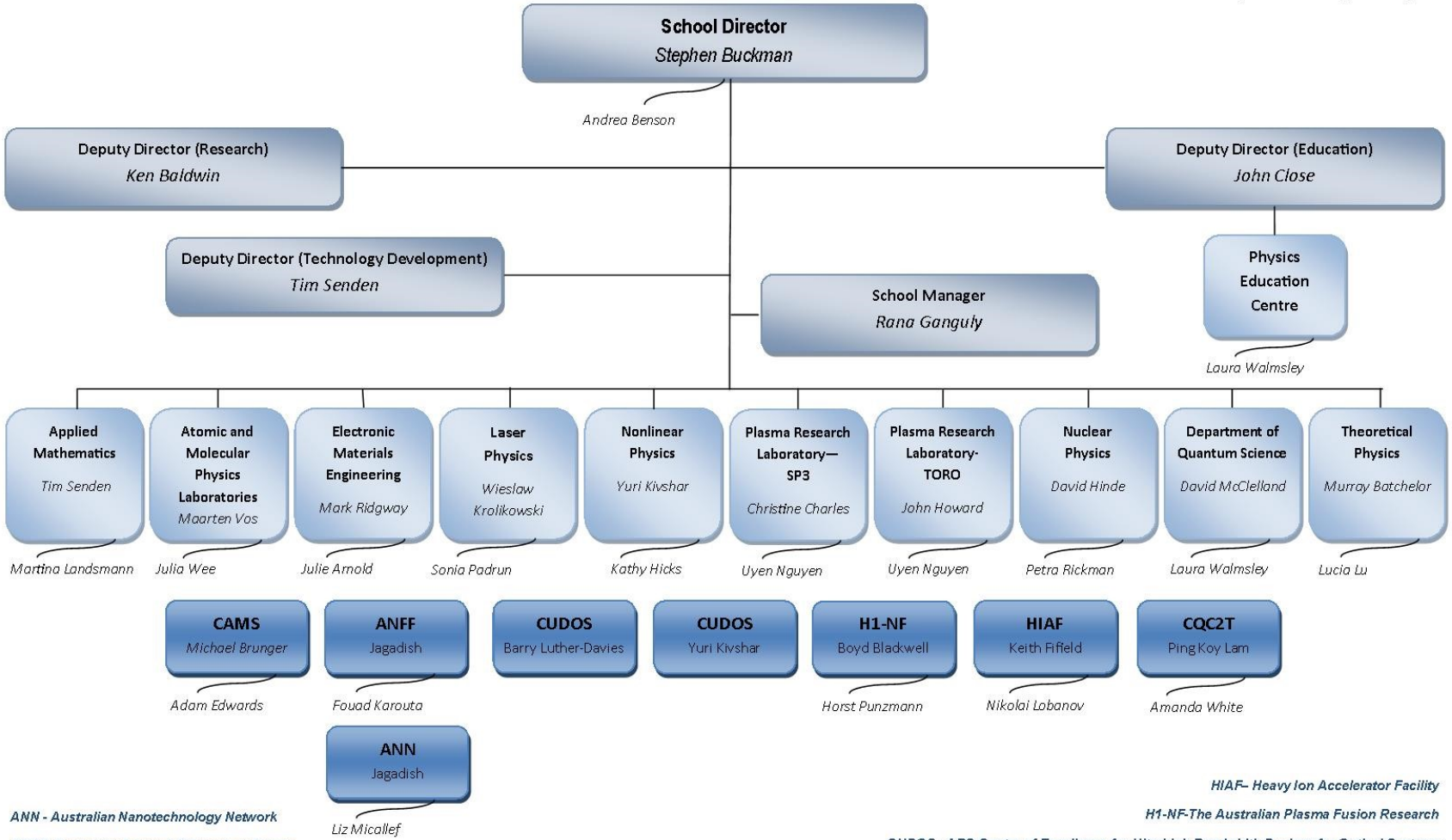
Institute of Electrical and Electronics Engineers

Professor Chennupati Jagadish (since 2002)

School Structure

Australian National University

Research School of Physics and Engineering



ANN - Australian Nanotechnology Network

ANFF- Australian National Fabrication Facility

CAMS - ARC Centre of Excellence for Antimatter-Matter Studies

HIAF– Heavy Ion Accelerator Facility

H1-NF-The Australian Plasma Fusion Research

CUDOS - ARC Centre of Excellence for Ultrahigh Bandwidth Devices for Optical Systems

CQC2T - ARC Centre of Excellence for Quantum Computation and Communication Technology

Physics Education Centre

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

PHY3032 Condensed Matter Physics
Patrick Kluth, Rob Elliman, Jenny Wong-Leung

PHYS3051/ENGN4613:Microphotonics, Biophotonics and Nanophtonics
Jong Chow

PHYS3058 Work Experience in Photonics
Jong Chow

PHYS3060/ENGN4513: Fibre Optic Communications Systems
Jong Chow

PHYS3070 Physics of the Earth
Hrvoje Tkalcic 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

Applied Mathematics

Professor Tim Senden
Head of Department

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, Diplng 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)

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

Atomic & Molecular Physics

Dr Maarten Vos
Head of Department

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, FIstP

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 (Unversity 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 (Unversity 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)

Electronic Materials Engineering

Professor Mark Ridgway
Head of Department

The Department of Electronic Materials Engineering (EME) conducts interdisciplinary research in condensed matter physics, materials science and device engineering. This includes world-class research in the growth, structure, properties and applications of electronic 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, FIoN, 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 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)

Laser Physics Centre

Professor Wieslaw Krolikowski
Head of Department

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 Ahlefeldt

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 CENTRE

Professor Yuri Kivshar
Head of Department

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

Professional Staff

Departmental Administrator

Kathy Hicks AdvDipAcct DipMngment CIT

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

NUCLEAR PHYSICS

Professor David Hinde
Head of Department

The Department of Nuclear Physics carries out fundamental research in Nuclear Physics, as well as developing and applying nuclear techniques for basic studies in interdisciplinary accelerator-based research. The Heavy Ion Accelerator Facility, maintained, developed and operated by the Department is supported financially by the ANU, and by CRIS and 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

Aditya Wakhle PhD (from June)

Departmental Administrator

Petra Rickman

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

PLASMA RESEARCH LABORATORIES SP3

Professor Christine Charles
Head of Department

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

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

Expansion of these plasmas is applied to electric propulsion with the development of three new thrusters (HDLT, Pocket Rocket, DS4G) and to space plasma physics such as the magnetic funnels of the solar corona and the Earth's aurora. Other research on space plasma physics includes studying high-beta plasmas, wave-plasma interactions, plasma instabilities, cross-field diffusion, momentum imparted from plasma expansion and plasma detachment from magnetic fields. We 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

PLASMA RESEARCH LABORATORIES TORO

Professor John Howard
Head of Department

Toroidal Plasma Research embraces a diversity of activities associated with the physics of magnetised plasma, electromagnetics, fluids and remote sensing. The Department is home to the H-1 Australian Plasma Fusion Research Facility (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 Chongquing 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

Mark Gwynneth

Michael Blacksell BEngineering University of Canberra

Departmental Administrator

Uyen Nguyen BA Monash

Quantum Science

Professor David McClelland
Head of Department

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

Quantum Optics: The quantum optics group aims to exploit quantum mechanical properties of laser 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 Schiffl
Nicholas Vazenios
Jie Wang

Summer Scholars

Chaimanowong Wee
Daniel Comber-Todd

Occupational Trainees

Jiao Geng

Honours Students

Ethan Barden
Jake Glidden

THEORETICAL PHYSICS

Professor Murray Batchelor
Head of Department (until April)

Professor Vladimir Bazhanov
Head of Department (from April)

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, FInstP (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 Univeristy

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

Professional Staff

Departmental Administrator

Lucia Lu

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

PUBLICATIONS

Book chapter

(4 publications)

Ivanov, Igor, Kheifets, Anatoli, *Atoms with one and two active electrons in strong laser fields,* **Fragmentation Processes: Topics in Atomic and Molecular Physics,** Cambridge University Press, United States (2013) 98-110

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

Lunardi, Leda, Mokkapati, Sudha , Jagadish, Chennupati , *Optoelectronic Devices,* **Guide to State-of-the-Art Electron Devices,** John Wiley & Sons Inc, UK (2013) 265-274

Robson, B A, *Generation Model of Particle Physics and the Parity of the Neutral Pion,* **Exciting Interdisciplinary Physics: Quarks and Gluons, Atomic Nuclei, Relativity and Cosmology, Biological Systems,** Springer New York LLC, Germany (2013) 345-355

Journal article

(465 publications)

Afra, Boshra, Rodriguez, Matias, Trautmann, Christina, Pakarinen, Olli, Djurabekova, Flyura, Nordlund, Kai, Bierschenk, Thomas, Giulian, Raquel, Ridgway, Mark C, Rizza, G, Kirby, N, Toulemonde, M., Kluth, Patrick, *SAXS investigations of the morphology of swift heavy ion tracks in α-quartz,* **Journal of Physics: Condensed Matter,** Institute of Physics Publishing

Ahlefeldt, Rose, Hutchinson, David, Manson, Neil, Sellars, Matthew, *Method for assigning satellite lines to crystallographic sites in rare-earth crystals,* **Physical Review B: Condensed Matter and Materials,** American Physical Society

Ahlefeldt, Rose, Manson, Neil, Sellars, Matthew, *Optical lifetime and linewidth studies of the ^{7}Fo - ^{5}Do transition in $EuCl_3 . 6H_2O$: 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 $EuCl_3 . 6H_2O$ to extend coherence times,* **Journal of Luminescence,** Elsevier

Akhmediev, Nail, Bandelow, U., *Solitons on a background, rogue waves, and classical soliton solutions of the Sasa-Satsuma equation,* **Journal of Optics,** Institute of Physics Publishing

Akhmediev, Nail, Dudley, John M, Solli, D R, Turitsyn, S, *Recent progress in investigating optical rogue waves,* **Journal of Optics,** Institute of Physics Publishing

Akhmediev, Nail, Soto-Crespo, J.M., Brand, Helmut, *Dissipative solitons with energy and matter flows: Fundamental building blocks for the world of living organisms,* **Physics Letters A,** 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

Alarcon-Llado, Esther, Conesa-Boj, Sonia, Wallart, Xavier, Caroff, Philippe, Fontcuberta i Morral, Anna, *Raman spectroscopy of self-catalyzed $GaAs_{1-x}Sb_x$ nanowires grown on silicon,* **Nanotechnology,** Institute of Physics Publishing

Alexandrov, Alexander, Kazakov, Vladimir, Leurent, Sebastien, Tsuboi, Zengo, Zabrodin, Anton, *Classical tau-function for quantum spin chains,* **Journal of High Energy Physics,** Institute of Physics Publishing

Allmond, J.M., Stuchbery, Andrew, Radford, D C, Galindo-Uribarri, A., Stone, N J, Baktash, C, Batchelder, J C, Bingham, C.R., Danchev, M., Gross, C J, Hausladen, P.A., Lagergren, K., Larochelle, Y., Padilla-Rodal, E., Yu, C.-H, *Magnetic moments of 2_1^+ states in $^{124,126,128}Sn$,* **Physical Review C: Nuclear Physics,** American Physical Society

Altin, Paul, Johnsson, Mattias, Negnevitsky, V, Dennis, Graham, Anderson, R P, Debs, John, Szigeti, Stuart, Bennetts, Shayne, McDonald, Gordon, Close, John, Robins, Nicholas, *Precision atomic gravimeter based on Bragg diffraction,* **New Journal of Physics,** Institute of Physics Publishing

Amiranashvili, Sh., Bandelow, U., Akhmediev, Nail, *Few-cycle optical solitary waves in nonlinear dispersive media,* **Physical Review A: Atomic, Molecular and Optical Physics,** American Physical Society

Amiranashvili, Sh., Bandelow, U., Akhmediev, Nail, *Ultrashort optical solitons in transparent nonlinear media with arbitrary dispersion,* **Optical and Quantum Electronics,** Kluwer Academic Publishers

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

Ankiewicz, Adrian, Devine, Natasha, Unal, Metin, Chowdury, Atiqur, Akhmediev, Nail, *Rogue waves and other solutions of single and coupled Ablowitz-Ladik and nonlinear Schrodinger equations,* **Journal of Optics,** Institute of Physics Publishing

Ankiewicz, Adrian, Soto-Crespo, Jose M, Chowdhury, M. Amdadul, Akhmediev, Nail, *Rogue waves in optical fibers in presence of third-order dispersion, self-steepening, and self-frequency shift,* **Journal of the Optical Society of America B,** Optical Society of America

Arakawa, Tomoyuki, *Rationality of Bershadsky-Polyakov Vertex Algebras,* **Communications in Mathematical Physics,** Springer

Aslanides, John, Savage, Craig, *The Relativity Concept Inventory: development, analysis and results,* **Physical Review ST: physics education research,** American Physical Society

Aste, Tomaso, Butler, P, Di Matteo, Tiziana, *Self-referential order,* **Philosophical Magazine,** Taylor & Francis Group

Avez, B., Simenel, Cedric, *Structure and direct decay of Giant Monopole Resonances,* **European Physical Journal A - Hadrons and Nuclei,** Springer

Babichenko, Andrei, Ridout, David, *Takiff superalgebras and conformal field theory,* **Journal of Physics A: Mathematical and Theoretical,** IOP Electronic Journals

Baraglia, David, *Conformal courant algebroids and orientifold T-Duality,* **International Journal of Geometric Methods in Modern Physics,** World Scientific Publishing Company

Barille, Regis, Samoc, Anna, Luther-Davies, Barry, Samoc, Marek, Nunzi, Jean-Michel, *Self-reconstructing all-optical poling in polymer fibers,* **Optics Letters,** Optical Society of America

Barrows, Timothy T., Almond, P, Fifield, L Keith, Rose, Robert, Mills, Stephanie C, Tims, Stephen, *Late Pleistocene glacial stratigraphy of the Kumara-Moana region, West Coast of South Island, New Zealand,* **Quaternary Science Reviews,** Pergamon-Elsevier Ltd

Bayu Aji, Leonardus Bimo, Ruffell, Simon, Haberl, Bianca, Bradby, Jodie, Williams, James, *Correlation of indentation-induced phase transformations with the degree of relaxation of ion-implanted amorphous silicon,* **Journal of Materials Research,** Materials Research Society

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

Bazhanov, Vladimir, Mangazeev, Vladimir, Okada, Yuichiro, Sergeev, Sergey M., *An elliptic parameterisation of the Zamolodchikov model,* **Nuclear Physics B,** Elsevier

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Madden, Steve, Vu, Khu, Jin, Zhe, Yan, Kunlun, Choi, Duk-Yong, Gai, Xin, Luther-Davies, Barry, *Hybrid As_2S_3: Er-TeO_2 loss compensated nonlinear waveguides,* **CLEO: QELS_Fundamental Science, CLEO:QELS FS 2013,** Conference Organising Committee

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Marpaung, David, Pant, Ravi, Choi, Duk-Yong, Morrison, B, Madden, Steve, Li, Enbang, Luther-Davies, Barry, Eggleton, Benjamin J, *Microwave photonic notch filter using on-chip stimulated Brillouin scattering,* **10th Conference on Lasers and Electro-Optics Pacific Rim, CLEO-PR 2013,** Conference Organising Committee

Maucher, Fabian, Siminos, E, Krolikowski, Wieslaw, Skupin, Stefan, *Quasi-Periodic shape-transformations of nonlocal higher-order solitons,* **2013 IEEE 2nd International Workshop on Nonlinear Photonics, NLP 2013,** IEEE

Middleton, Jill, Latham, Shane, Sheppard, Adrian, *Performance Comparison of Segmentation Methods: Automated Watershed and Thresholding Methods with Iterated Conditional Modes Post Processing,* **International Conference on Tomography of Materials and Structures (ICTMS 2013),** Ghent University

Minovich, Aliaksandr, Bleckmann, Felix, Frohnhaus, Jakob, Neshev, Dragomir, Linden, Stefan, *Control of Airy Plasmon Trajectories in Linear Gradient Systems,* **7th International Congress on Advanced Electromagnetic Materials in Microwaves and Optics (Metamaterials 2013),** IEEE

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Poddubny, Alexander N, Belov, Pavel A, Kivshar, Yuri, *Electric and magnetic dipole radiation and Purcell effect in hyperbolic metamaterials,* **Metamaterials: Fundamentals and Applications VI,** SPIE - The International Society for Optical Engineering

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Sellars, Matthew, Beavan, Sarah, Furguson, Katherine, *Cavity enhanced rephased amplified spontaneous emission,* **Advances in Photonics of Quantum Computing, Memory, and Communication VI,** SPIE - The International Society for Optical Engineering

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Shadrivov, Ilya, *Tunable metamaterials for microwave and terahertz frequencies,* **7th International Congress on Advanced Electromagnetic Materials in Microwaves and Optics (Metamaterials 2013),** IEEE

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Taylor, Michael A, Janousek, Jiri, Daria, Vincent, Knittel, Joachim, Hage, Boris, Bachor, Hans, Bowen, Warwick, *Quantum enhanced microrheology of a living cell,* **10th Conference on Lasers and Electro-Optics Pacific Rim, CLEO-PR 2013,** Conference Organising Committee

Tims, Stephen, Tsifakis, Dimitrios, Srncik, Michaela, Fifield, L Keith, Hancock, Gary, DeCesare, Mario, *Measurements of low-level anthropogenic radionuclides from soils around Maralinga,* **Heavy Ion Accelerator Symposium on Fundamental and Applied Science 2013,** EPJ Web of Conferences

Tsimeris, Jessica, Dedman, Colin J, Broughton, Michael, Gedeon, Tamas, *ForceForm: A Dynamically Deformable Interactive Surface,* **26th ACM UIST Symposium,** Association for Computing Machinery (ACM)

Vora, Kaushal, Karouta, Fouad, Jagadish, Chennupati, *Nanostencil Lithography for fabrication of III-V nanostructures,* **Nanoengineering: Fabrication, Properties, Optics, and Devices X,** SPIE - The International Society for Optical Engineering

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Weisser, David, Fifield, L Keith, Kitchen, Thomas, Tunningley, Thomas, Lobanov, Nikolai, Muirhead, Alistair, *Tube entrance lens focus control,* **Third International Symposium on Negative Ions, Beams and Sources (NIBS2012),** American Institute of Physics (AIP)

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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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Zhang, Yanbing, Neo, Richard, Schroder, Jochen, Husko, Chad, Lefrancois, Simon, Choi, Duk-Yong, Madden, Steve, Luther-Davies, Barry, Eggleton, Benjamin J, *Pump-degenerate phase sensitive amplification in chalcogenide waveguides,* **10th Conference on Lasers and Electro-Optics Pacific Rim, CLEO-PR 2013,** Conference Organising Committee

GRANTS

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

Luther-Davies Barry Prof - Neshev Dragomir Prof - Kivshar Yuri Prof - Madden Steve Dr
Quantum nonlocality tests with ultracold atoms
1/01/2012 - 1/01/2014
$700,000.00

Australian Research Council (ARC)

2009 Australian Laureate Fellowship

Jagadish Chennupati Prof
Nanowire Quantum Structures for Next Generation Optoelectronics
25/11/2009 - 24/11/2014
$2,753,840.00

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

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

Hnatovsky Kyrylo (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 - Izdebskaya 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
$700,000.00

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

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

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

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

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

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

Hole Matthew Dr
Emergence and control of self organisation in fusion plasmas: through 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 - Krolikowski 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

Bouwknegt 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

Krolikowski Wieslaw Prof - Bang Ole - Arie Ady
Managing light in nonlinear 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 - Grimaldi 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 - Mangazeev 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 - Kielpinski 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

Lane Gregory Dr
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

Sheppard Adrian Dr
Testing theories of two-phase flow in porous media through experiment imaging and modelling
7/01/2011 - 31/12/2014
$773,072.00

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

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

2011 Future Fellowships

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

Fu Lan A/Prof.
High performance compound semiconductor nanowire optoelectronic devices
1/01/2012 - 31/12/2015
$711,228.00

Miroshnichenko Andrey Dr
Resonant Nanophotonics: tailoring resonant interaction of light with nanoclusters
1/01/2012 - 31/12/2015
$578,704.00

Ostrovskaya Elena Dr
Nonlinear polaritonics: Harnessing collective behaviour of half-light half-matter
8/02/2012 - 7/02/2016
$594,928.00

Sellars Matthew Dr
Solid-state quantum communication technology
1/01/2012 - 31/12/2015
$702,684.00

Tan Hark Hoe Prof
Selective Area Nano-Epitaxy
30/01/2012 - 29/01/2016
$822,856.00

2012 Future Fellowships

Caroff Philippe Dr
Antimonide-based nanowires for infra-red and energy applications
1/02/2013 - 31/01/2017
$714,528.00

Hope Joseph Dr
Controlling ultracold gases
16/08/2012 - 15/08/2016
$813,902.00

Kluth Patrick A/Prof.
Investigation of the structure and stability of ion tracks in application specific materials and environments
1/06/2013 - 31/05/2017
$710,628.00

Simenel Cedric Dr
Microscopic many-body new approaches for fundamental science and applications
17/01/2013 - 16/01/2017
$712,828.00

2011 Linkage: Projects-externally led

Baldwin Kenneth Prof - McClelland David Prof - Luiten Andre Nicholas
Creating a National Time and Frequency Network for Australia
24/06/2011 - 24/06/2014
$30,000.00

2012 Linkage: Projects (Round 1)

Elliman Robert Prof
Controlling the forming and switching characteristics of non-volatile resistive memory devices using ion implantation
1/01/2012 - 31/12/2014
$335,000.00

2012 Linkage: Projects (Round 2)

Williams James Prof - Haberl Bianca Dr - Bradby Jodie A/Prof - Huis in 't Veld Bert
Exploiting deep sub-surface temperature-induced phase-transformations for an improved approach to semiconductor laser-dicing
1/06/2013 - 1/06/2015
$180,000.00

2013 Linkage: Infrastructure Equipment Facilities

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
Australian partnership in Advanced LIGO - continuation
1/01/2013 - 31/12/2013
$990,000.00

Centre of Excellence

Lam Ping Koy Prof - James Matthew Prof - Buchler Benjamin Dr - Symul Thomas Dr - Sellars Matthew Dr - Simmons Michelle Yvonne
ARC Centre of Excellence for Quantum Computation and Communication Technology (QC2T)
1/01/2011 - 31/12/2015
$6,265,000.00

Luther-Davies Barry Prof - Neshev Dragomir Prof - Kivshar Yuri Prof - Madden Steve Dr
Quantum nonlocality tests with ultracold atoms
1/01/2012 - 1/01/2014
$7,700,000.00

Sullivan James Dr - Lower Julian Dr - Buckman Stephen Prof - McEachran Robert Prof - Burrow Paul - Bray Igor - Stelbovics Andris - Fursa Dmitry - Bastow Timothy - Samarin Sergey - Smith Suzanne - Vance Lou - Surko Clifford M - Marler Joan P - McCurdy Clyde - Orel Ann - Nagai Yasuyoshi - Bartschat Klaus R - Koller Hubert - Pas Steven - Teubner Peter J - Brunger Michael J - Williams J.F - Hill Anita - Lohmann Birgit - Mason Nigel John - Rescigno Thomas Nicola
ARC Centre of Excellence: Centre for Antimatter-Matter Studies
1/07/2010 - 31/12/2013
$4,550,000.00

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 polyamorphism 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

National Collaborative Research Infrastructure Strategy
Hinde David Prof
NCRIS 2013 Heavy Ion Accelerators Project
1/07/2013 - 30/06/2016
$760,000.00

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

Punzmann Horst Dr - Howard John Prof - Blackwell Boyd Prof
Plasma Fusion Education Investment Fund Project
24/12/2009 - 31/03/2014
$7,000,000.00

Senden Timothy Prof
NeCTAR: The Characterisation Virtual Laboratory
1/06/2012 - 31/12/2014
$184,162.00

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

Dept of Industry Innovation Climate Change Science Research and Tertiary Education (DIICCSRTE)
National Enabling Technologies Strategy
Jagadish Chennupati Prof
ANU Australian Research Council Nanotechnology Network (ARCNN)
1/04/2011 - 31/07/2013
$600,000.00

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
$162,000.00

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
$44,752.00

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
(BRI) Unified First Principle Analysis of Ultraintense Laser Matter interactions: Theory Computation and Experiments CFDA: 12.800
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