CREATE THE FUTURE

RESEARCH IN ENGINEERING, INFORMATION, MATHEMATICAL & PHYSICAL SCIENCES

UNIVERSITY OF WOLLONGONG
AUSTRALIA

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INTRODUCTION

Dean of Engineering and Information Sciences
Professor Chris Cook

Chris worked for Marconi Avionics in the UK as a project engineer designing aerospace computing systems after receiving his PhD in 1976, and later with GEC Australia as the Technical Manager of their Automation and Control division, where he set up a group which designed and installed robot controlled automation systems for manufacturing applications. He then became the founding Managing Director of the Automation and Engineering Applications Centre Ltd., a non-profit company of the University of Wollongong, which built and installed automation and robotic systems for manufacturing companies around Australia. He became Professor of Electrical Engineering at the University of Wollongong in 1989 and was Head of School for 12 years before taking on the role of Dean of Engineering. With the merger of the Faculty of Engineering and the Faculty of Informatics in 2013, his current position is Executive Dean of the Faculty of Engineering and Information Sciences (EIS). His research interests are in industrial automation, robotics and power engineering; he supervises many different research projects in these areas which are funded by industry and government, and is fortunate to be supervising several talented PhD students involved in this research.

Associate Dean of Research
Professor Roger Lewis

Roger Lewis began with a Bachelor of Science (Honours) in Physics at the University of Sydney. He then moved to Brisbane, where he studied for a PhD at Griffith University. His thesis concerned the disposal of nuclear waste - specifically the behaviour of nuclear waste glasses in conditions of high temperature and pressure. He was supported by a Research Studentship of the Australian Institute of Nuclear Science and Engineering and made frequent visits to the Australian Atomic Energy facility at Lucas Heights during this work. After receiving his PhD, Roger moved to Rockhampton where he taught and conducted research at Central Queensland University. He was also in charge of the Electron Microscope Unit. Since moving to Wollongong, Roger's research has concentrated on the optical and electronic properties of materials in the part of the electromagnetic spectrum between the visible and microwave, known as the terahertz region. This work has been supported by numerous fundamental and industrial research grants and led to the publication of his book "Terahertz Physics". Roger served as the Head of Physics for five years before taking up his current position as Associate Dean - Research. Roger is also an accomplished teacher, having won teaching grants, publishing widely in the literature and recognised by teaching awards, including a Carrick Citation.

Vice Chancellor
Professor Paul Wellings

The University of Wollongong is among the best modern universities in the world. For example, UOW stands 26th in the world in the QS Top 50 under 50 Rankings 2014 and 33rd in the world in the Times Higher Education Top 100 under 50 rankings 2014. This enviable reputation reflects a strong research performance, much of which emanates from the Faculty of Engineering and Information Sciences (EIS). In many EIS disciplines spanning Statistics, Medical Radiation Physics, Manufacturing Engineering and Mechanical Engineering UOW is ranked first or second in Australia according to the latest ERA evaluation. Materials Engineering and Interdisciplinary Engineering are two examples in the very top ERA category of well above world standard. The breadth and quality of research in EIS are truly world class.

UOW prides itself on its strong links with industry and these are nowhere more evident than in EIS. UOW sees through EIS the opportunity to contribute to the economic and social prosperity of the region and the nation and to make an increasingly global impact in research and research training.

Prosperity in the 21st Century will rely more on creative minds than on the abundance of natural resources. Mathematics, Physics, Information Sciences and Technology, and Engineering will provide innovative solutions to the energy, food, shelter, communication, transport, information and environmental needs of a world population expected to double by 2030. Research in these fields is essential to meet future challenges and these challenges offer exciting prospects for those embarking on research careers. Profitable opportunities also exist in a range of industries, in Australia and abroad, seeking to invest in research and development.

This brochure outlines the University of Wollongong's outstanding record in the Faculty of Engineering and Information Sciences (EIS). We warmly invite enquiries from potential research scholars and collaborative research partners to join us in our research efforts.

Wollongong has a distinguished research reputation, particularly in collaboration with industry, both in Australia and internationally. Our Research Management Plan led to the creation of a number of research groupings, which has attracted a critical mass of researchers engaged in significant, well-funded projects with the very latest equipment and infrastructure. Teamwork is encouraged, providing an excellent training environment and enhancing collaborative research. Our research groupings are refreshed each year to reflect the dynamics of the environment.

EIS Research staff at Wollongong are now major participants in several National Research Centres, each with guaranteed long term (up to 10 years) funding including the CRC for Energy Pipelines, the Defence Materials Technology Centre, and the ARC Centre of Excellence for Geotechnical Science and Engineering. The Faculty of Engineering and Information Sciences also contributes to six of the University of Wollongong's major research strengths in:

- Advanced Materials Technology (AMT)
- Centre for Health Initiatives (CHI)
- Centre for Medical Radiation Physics (CMRP)
- Engineering Materials (EM)
- GeoQUEST Research Centre (GeoQUEST)
- Intelligent Polymer Research Institute (IPRI)
- Institute for Superconducting and Electronic Materials (ISEM)
- National Institute for Applied Statistics Research Australia (NIASRA)

The Faculty is also a prime mover in some of the University's largest and most recent initiatives involving Government and Industry funding for research and training, such as the 61 million dollar SMART Infrastructure Centre, the 25 million dollar Redesign for Resilient and Sustainable Buildings Initiative, and the 35 million dollar Australian Institute for Innovative Materials and the 27 million dollar ARC Research Hub for Australian Steel Manufacturing. These are all located in Wollongong and together greatly enhance the research capacity of the University and the Faculty.

These and other major research groupings are described in the following pages.

Applications from potential research scholars are welcome. Graduate students enrolling in EIS research are expected to have imagination, creativity, and a desire for knowledge for its own sake as well as for practical application, and a commitment to success. While supervision is of the highest standard, we expect research students to take responsibility for their own progress and success. Research students can add value to their degrees through additional programs designed to develop the skills and knowledge appropriate for careers in industry, government, research, or academia.

Several scholarships are offered each year to outstanding applicants (see web link in this brochure).

Industry and other external organisations can access the University's excellent resources in a number of ways. Collaborative research on major projects may be undertaken with the support of a number of government schemes. Such research is usually strategic in nature and spans one to three years. Industry partners make only a modest cash contribution but a strong in-kind commitment is usually required.

The University also helps industry solve short-term tactical problems through contract research or consulting. Fees reflect true costs, and government incentives are available in some cases.

The University offers industry access to excellent research infrastructure. Details are outlined in the following pages.

For more information about research in the Faculty of Engineering and Information Sciences at the University of Wollongong, visit our homepage at http://eis.uow.edu.au/index.html?ssSourceSiteId=UOW_Main .

NATIONAL INSTITUTE OF APPLIED STATISTICS RESEARCH AUSTRALIA

Director: Professor David Steel

The National Institute of Applied Statistics Research Australia (NIASRA) is a leader in methodological research and development for challenging areas of quantitative design and analysis. It is committed to developing and applying innovative statistical methods to important problems. NIASRA comprises four specialist centres focused on Biometry and Bioinformatics, Environmental Informatics, Sample Survey Methodology, and Statistical Consulting. The Institute has extensive experience with complex data and populations and has approximately 20 staff members and 25 postgraduate research students.

Objectives:

- Provide leading- edge research and consulting capacity in applied statistics.
- Collaborate extensively with researchers and professionals in universities, governments, businesses and industries in Australia and overseas.

Research Groups and projects include:

Centre for Bioinformatics and Biometrics Research

- Genomic Selection in wheat.
- Capacity Building in Statistics.
- Development of algorithms and statistical software for fitting linear and generalized linear mixed models.
- Development of model- based design approaches and R statistical computing environment for generating optimal designs using a model based approach.
- The analysis of multi-environment tree breeding data including information on ancestors.
- Multi-phase partial compositing designs for expensive traits.
- Implementation of genomic selection in sorghum breeding.
- Decision support systems for grain growers linking multi-layered environmental data with multi-environment trial data-sets.
- Statistics for the rice improvement program.
- Association analysis for high yielding environments.

Centre for Environmental Informatics

- Precisions and accuracies of estimated XCO2 for the OCO-2 NASA mission.
- Multivariate data fusion and uncertainty quantification for remote sensing.
- Addressing the reduction of GHG emission from agriculture and forestry.
- Production through outcomes delivered from statistical sciences.
- Statistics for Australian rain technologies.
- Uncertainty quantification for inferring marine biogeochemical cycles.

Centre for Sample Survey Methodology

- Statistical inference for probability-linked longitudinal data.
- Dynamic analyses to optimise ageing (DYNOPTA).
- The role of households, neighbourhoods and networks in social statistics.
- Handling missing data in complex household surveys.
- New methods for small group analysis from sample surveys.
- Methodology development.
- Sampling for Sub-populations in Household Surveys with application to Maori and Pacific Sampling.
- Health Track.
- Telephone Sampling Methods.
- Spatio-temporal Statistics NSF-Census Research Network (STSN) at the University of Missouri.
- Maximum likelihood Inference based on combining data from surveys and population registers.
- Robust modelling of data with group structure.

Statistical Consulting Centre

- Methods of analysis for parallel and clustered Randomised Control Trials with missing data (Methodological research).
- Increasing physical activity among young children from disadvantaged communities: A group randomised controlled effectiveness trial.
- Effect of fish oil micronutrient supplementation of behaviour and mental health of adult offenders: A randomized controlled trial (RCT) feasibility study.
- Effect of reducing staff-to-child ratios in childcare settings on physical activity participation: a pilot randomised controlled trial.
- The impact of fruit flavonoids from cherries on memory and cognition in older adults with mild to moderate dementia.

Collaboration:

NIASRA has successfully developed long-term collaborative partnerships with government agencies and industry, including: New Zealand Ministry of Health; NSW Department of Primary Industries; CSIRO Food Futures Flagship; Radiate Pine Breeding Company; VSN International; Australian Grain Industries; Australian Bureau of Statistics.

For more information: http://niasra.uow.edu.au/index.html

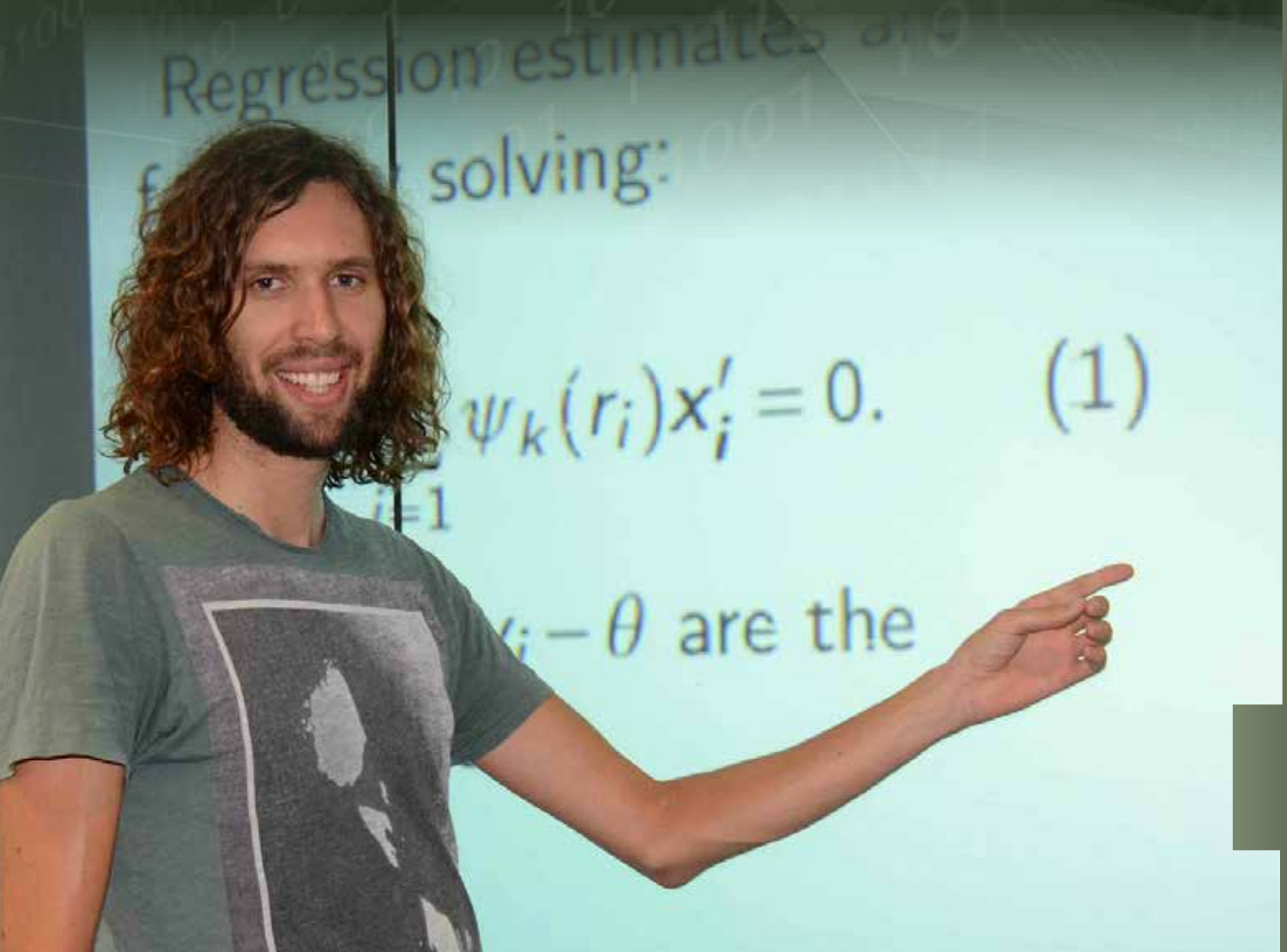
Professor David Steel

Professor David Steel is Director of the National Institute for Applied Statistics Research Australia (NIASRA) at the University of Wollongong. He leads a team of over twenty academics undertaking programs of research developing new statistical methods for obtaining and analysing data relevant to agriculture, energy, engineering, environmental sciences, finance, health, medicine, mining, natural resources, and social sciences. He has extensive experience in developing sample design, estimation and analysis procedures for a wide range of sample surveys. Prior to joining the University of Wollongong in 1992 he was a senior methodologist at the Australian Bureau of Statistics.

He has over 70 refereed publications and fourteen major research grants awarded by the Australian Research Council, the National Health and Medical Research Council and other competitive grant agencies. He is a foundation member of the ABS's Methodological Advisory Committee. He has a Bachelor (Hons), Masters and PhD degrees in Statistics.

PhD Student Profile: James Dawber

James Dawber completed his undergraduate studies in New Zealand, and after being awarded the Statistics New Zealand Prize moved to Wollongong to gain experience as an applied statistician at the Australian Health Services Research Institute. After three years of valuable experience, James commenced his PhD research in April 2013 at the School of Mathematics and Applied Statistics. In search of further challenges, James focused his study in theoretical statistics, specifically in modelling and robust statistics. His project is directed at M-quantile models which can be used to flexibly and robustly explore data from all fields. These models overcome many limitations of standard modelling techniques, while improving the efficiency of any estimates in the presence of outliers. James works to improve the interpretation of these models and to enhance their output capacity. He also works to extend these M-quantile models to discrete outcomes where they have great potential for classification problems.



INSTITUTE FOR MATHEMATICS AND ITS APPLICATIONS

Director: Associate Professor James McCoy

The Institute for Mathematics and its Applications (IMIA) is the University of Wollongong's research powerhouse in pure and applied mathematics, located within the School of Mathematics and Applied Statistics. The Institute carries out world-class research across a broad spectrum of mathematical fields and includes both fundamental research and applications in nanotechnology, finance and engineering modelling. It has 28 primary members and associate members, and is involved in research collaboration throughout Australia and all over the world.

Objectives:

- Produce and publish outstanding research in mathematics and its applications.
- Attract, supervise and support the next generation of mathematicians including higher degree students and postdoctoral staff.
- Obtain competitive grants, particularly grants of the Australian Research Council.
- Grow links with mathematicians and those using mathematics outside our school, in other schools in the university, in Australian and international research institutes, industry and government.
- Engage with the community and promote our contributions to society by holding regular activities including specialist workshops and conferences.

Research Areas:

- Geometric analysis, including nonlinear partial differential equations, curvature flow and optimal transport.
- Functional analysis, including harmonic analysis, noncommutative geometry and dynamical systems.
- Abstract algebra, including operator algebras, k-graphs and topological groups.
- Mathematical modelling in finance, nanotechnology, industry, biology and medicine.

Selected Projects

- Antenna and reflector models via optimal transport.
- Mathematical modelling for pricing of complex financial derivatives and carbon credits.
- Mathematical modelling of tumour growth.
- Modelling sludge disintegration in industrial processes such as waste water treatment.
- Joining of carbon and boron nitride nanostructures by minimising mathematical bending energy.
- Deformation of surfaces by non-smooth speeds, with applications to image analysis.
- Modelling fire-front propagation using curvature flow.
- Ideal structure and representations of topological graphs.
- Zappa-Szép product semigroups and their C*-algebras.
- Linking geometry and quantisation of charge in quantum Hall type systems and topological insulators.
- Using index theory to describe the topology of curved space times arising in general relativity.
- For more Information: http://imia.uow.edu.au/index.html

Associate Professor James McCoy

Associate Professor James McCoy joined the University of Wollongong in 2005 as a lecturer and Australian Postdoctoral Fellow, after three years of postdoctoral research at the Australian National University (ANU). He became Director of IMIA in 2014. James' PhD thesis concerned the surface area preserving mean curvature flow. Since then, he has continued research in curvature flow, including fully nonlinear and higher order variants, related elliptic partial differential equations in geometry and geometric analysis more generally. James is also interested in the applications of mathematics, having recently developed mathematical models for helical protein structure and fire-front modelling with colleagues in IMIA and external collaborators. James supervises PhD students in pure and applied topics involving partial differential equations. He has over 20 publications appearing in journals including Calculus of Variations and Partial Differential Equations, Journal für die Reine und Angewandte Mathematik, Journal of Differential Geometry, Mathematische Annalen and Transactions of the American Mathematical Society.

PhD Student Profile: Scott Parkins

Scott Parkins commenced his PhD study in the School of Mathematics and Applied Statistics (SMAS) in 2013. His field of interest is geometric analysis, which concerns the shape of geometric objects through mathematical analysis. His current research topic is higher order geometric flows, which involves analysing the evolution of curves, surfaces, hypersurfaces and manifolds over time with a prescribed flow equation. These higher order flows (which include equations involving four or more derivatives) have not been studied in as much depth as their lower order counterparts. The topic is very mathematically rich and interesting on its own, but also enjoys numerous applications in areas like surface and image modelling, solving interfacial problems, studying membranes, material science and relativity theory to name but a few. Scott is the recipient of an Australian Postgraduate Award.

CENTRE FOR MEDICAL RADIATION PHYSICS

Director: Professor Anatoly Rozenfeld

The Centre for Medical Radiation Physics (CMRP) is internationally recognised and has attracted competitive funding from the National Health & Medical Research Council (NHMRC), the Australian Research Council (ARC), Cancer Institute NSW, Cancer Council NSW, FP-7 European Community and NSBRI (NASA), as well as strong support from industry. The CMRP has close links with four major hospitals in NSW: St George Cancer Care Centre, Illawarra Cancer Care Centre, Liverpool and Prince of Wales Hospitals' Radiation Oncology Departments that provides opportunities for translational research and training in medical physics.

Objectives:

- Research and development in the field of radiation detectors and radiation instrumentation for mini-, micro- and nano-dosimetry in radiation therapy, nuclear medicine imaging, space sciences, and high energy physics (HEP).
- Radiation physics of nanoparticles and its applications in radiotherapy.
- Monte Carlo radiation transport simulations and its applications for mini-, micro- and nano-dosimetry.
- Continuous education and training in medical physics through our comprehensive postgraduate research program, and strong national and international collaborations.
- Translational research into clinical environments and commercialising our research and development to improve the results of cancer treatment.
- Development of new radiation oncology modalities, including proton therapy, heavy ion therapy, synchrotron micro-beam therapy, Image Guided Radiation Therapy (IGRT), MRI-Linac, Volumetric Modulated Arc Radiotherapy (VMAT), and new methods of radiation diagnostics.

Projects include:
Radiation Detection and Instrumentation

- Real time semiconductor micro-mini dosimetry for QA in external beam therapy including charged particle therapy and synchrotron micro-beam radiation therapy and imaging and brachytherapy (MOSkin, spectroscopy dosimetry, TimePix dosimetry, BrachyView, Dose Magnifying Glass (DMG), Magic Plate (MP), neutron dosimetry), and micro-dosimetry .
- Radiation probes, Positron Emission Tomography (PET) and Single Photon Emission Computer Tomography (SPECT) detector modules and gantry for small animal imaging.

Radiation Oncology – Radiotherapy Physics

- Intensity Modulated Radiation Therapy (IMRT)-translational research.
- Image Guided Radiotherapy/ Adaptive Radiotherapy and advanced dosimetry.
- Brachytherapy (HDR and LDR) to treat prostate cancer and eye melanoma.
- Radio-Magneto-Therapy and MRI guided-Linac radiotherapy.
- Nanoparticles for dose and RBE enhancement in radiotherapy.

Micro- and nano-dosimetry and new radiation oncology modalities

- Silicon micro-dosimetry for radiotherapy, space, and avionics.
- Proton and Heavy Ion therapy and proton computer tomography.
- Monte Carlo radiation transport simulations, including nano-dosimetry on the DNA scale.

Applied Medical Imaging

- Image fusion for radiotherapy planning.
- Imaging and image reconstruction with high resolution pixelated detectors.

Industrial Partners and Collaboration

CMRP has a strong research and educational program in medical radiation physics in conjunction with St George and Illawarra Cancer Care Centres, and the Liverpool and Prince of Wales Hospitals Radiation Oncology Departments in Australia.

Overseas institutions include:

- Advanced radiation therapy - Memorial Sloan Kettering Cancer Care Center (New York), Albert Einstein College of Medicine, Yeshiva University (NY), Moffitt Cancer Center.
- Proton therapy and micro- and nano-dosimetry - Loma Linda University Medical Centre (proton therapy) and MGH Francis H.Burr Proton Beam Therapy Centre, USA, CNAO (Italy), NIRS (Japan) and Heidelberg (Germany) Heavy Ion Therapy Centres, and Ludwig Maximilians University Munich (LMUM) on laser proton accelerator therapy Space radiation medicine- US NAVAL Academy, NASA, NSBRI and Brookhaven National Laboratory.
- Synchrotron therapy and imaging- European Synchrotron Radiation Facility (France).
- Semiconductor radiation detector groups at Polytechnico di Milano, Institute of Experimental and Applied Physics, Technical University in Prague, CERN, PTB (Germany) and the Nuclear Medicine Medical Physics Department at University College, London and others.

Industrial partners:

- Radiation detection instrumentation: Australian Nuclear Science Technology Organisation (ANSTO), Australian Nano-Fabrication Facility (ANFF) at the University of New South Wales.
- Radiation therapy and imaging : Insight Oceania P/L and Varian Medical systems, Siemens, Alpha XRT , Australian Synchrotron, Institute of Scintillating Materials and Scientific Production Association-BIT in the Ukraine.

For more information: www.uow.edu.au/eng/phys/cmrp/index.html

Professor Anatoly Rozenfeld

Professor Anatoly Rozenfeld is the Director and founder of CMRP, and is world renowned for his research work on semiconductor radiation detectors and their application for mini- and micro-dosimetry in radiation therapy, radiation protection, nuclear medicine and space sciences. He is a member of numerous editorial boards and international advisory committees on Solid State Dosimetry, Micro-dosimetry, IEEE Radiation Instrumentation Steering Committee, IEEE NPSS Transnational Committee and local committees, including the Australian National Hadron Therapy Steering Committee, Prostate Cancer Institute, Australian HEP Executive Board and NHMRC Academy. He has also established a strong research program on proton and heavy ion therapy in Australia.

Professor Rozenfeld is the founder of the biennial international workshops on Mini-Micro-Nano-Dosimetry and its Applications, and Modern Technology for Prostate Cancer Treatment, and was President of the Solid State Dosimetry (SSD 16) International Conference in 2010. He is Vice-Chair of International Solid State Dosimetry Organization (ISSDO)

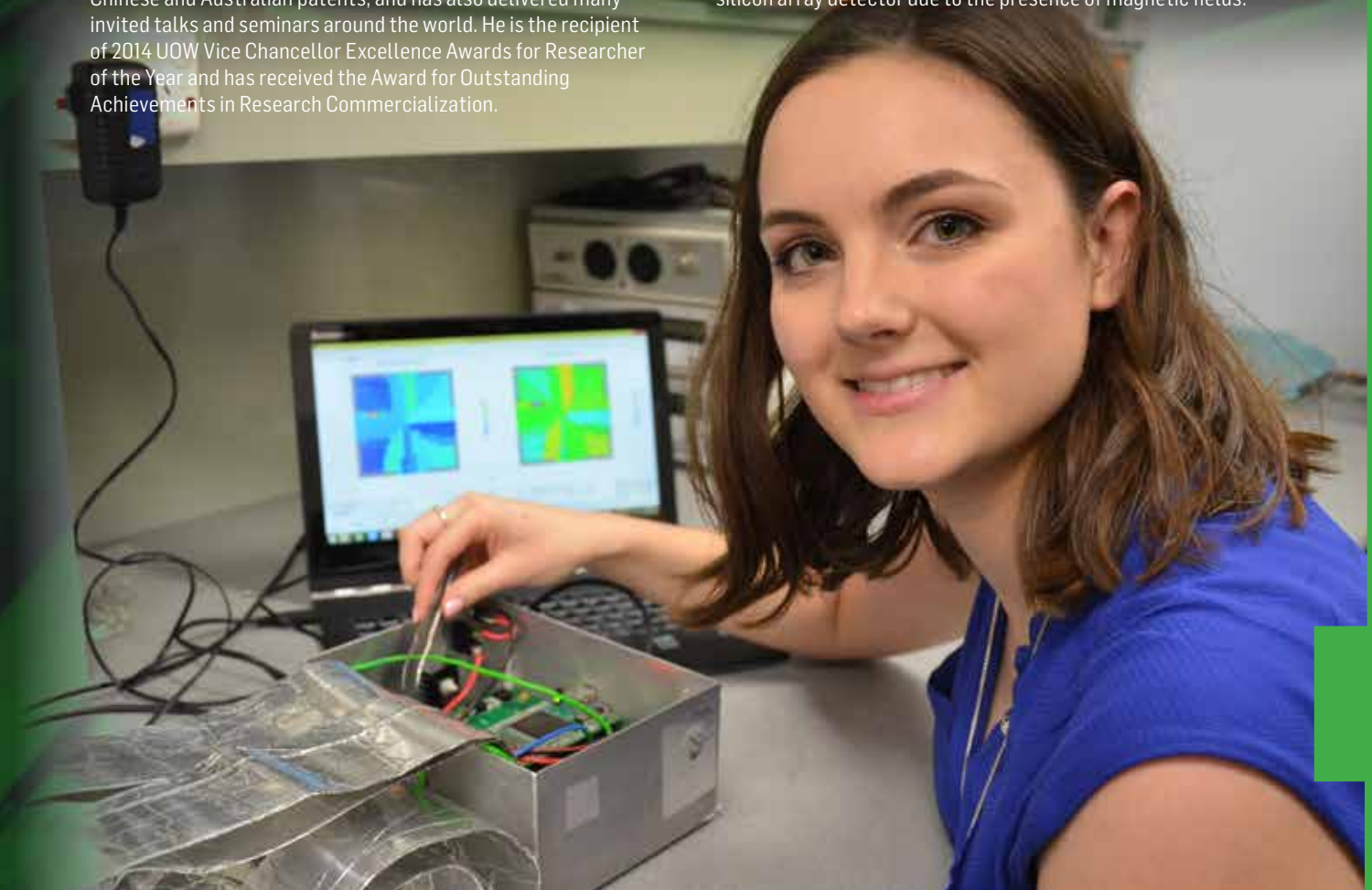
Professor Rozenfeld has published more than 240 articles and three chapters in books; holds 18 ex- Soviet, USA, Canadian, Chinese and Australian patents; and has also delivered many invited talks and seminars around the world. He is the recipient of 2014 UOW Vice Chancellor Excellence Awards for Researcher of the Year and has received the Award for Outstanding Achievements in Research Commercialization.

PhD Student Profile: Maegan Gargett

Maegan Gargett completed her Bachelor of Medical and Radiation Physics Advanced (Class 1 Honours) at the University of Wollongong in 2012, and is currently undertaking a PhD in the field of radiation oncology medical physics. Her project is conducted at the Centre for Medical Radiation Physics, under the supervision of Professor Peter Metcalfe and Professor Anatoly Rozenfeld and involves collaboration with Dr Brad Oborn at the Illawarra Cancer Care Centre as well as medical physics personnel at the Ingham Institute of Applied Medical Research.

Maegan's research is guided by the MRI-linac facility currently under construction at the Ingham Institute, Sydney. One of just a handful of such prototypes worldwide, it combines magnetic resonance imaging and external beam radiation delivery in one hybrid machine. The aim of the system is to provide real time imaging with superior soft tissue contrast during cancer treatments. This, in turn, should improve treatment outcomes for patients by maximising the precision of tumour targeting and minimising healthy tissue damage.

Her role in the project involves researching detectors developed by the CMRP for use at the facility, as current detector technology lacks accuracy when measuring radiation dose in the presence of a magnetic field. So far, Maegan's project has focused on using Monte Carlo simulations to investigate possible irregularities in the dose response of a silicon array detector due to the presence of magnetic fields.



INSTITUTE FOR SUPERCONDUCTING AND ELECTRONIC MATERIALS

Director: Professor Shi Xue Dou

The Institute for Superconducting and Electronic Materials (ISEM) has secured more than $20M in funding and more than 50 highly competitive ARC fellowships since 1994 from the ARC and the private and public sectors. The Institute is part of the Australian Institute for Innovative Materials, a leading Australian research centre with two ultra-modern buildings containing world class facilities and laboratories. It is a truly international centre with more than 30 full time researchers, 80 postgraduate students, and a number of academic and visiting researchers from Australia, Europe, the Middle East, and South-East Asia. ISEM maintains its outstanding research quality through collaboration with numerous world- renowned institutions such as the University of Cambridge (UK), Ohio State University (USA), and the National Institute for Materials Science (Japan), etc.

Objectives:

- Establish a world class inter-disciplinary research team in materials technology and manufacturing.
- Promote the commercial potential of emerging materials technology to industry.
- Enhance and develop strong national and international links in various fields.
- Offer the best possible postgraduate education and training.

Research Groups and representative projects include:

Applied Superconductivity Group

- Technology and the application of High Temperature Superconductors (HTSC).
- Fabrication and the application of HTSC and MgB2 wires and tapes.
- Microstructure, flux pinning, and critical current density of HTSC and MgB2 superconductors.
- Powder processing and characterisation of HTSC and MgB2 superconductors.
- Investigation and development of newly discovered Fe-based superconducting materials.

Energy Storage Group

- Hydrogen-fed fuel-cell technology.
- Electro-materials for advanced lithium-ion batteries and super-capacitors.
- Investigation of nickel-metal hydride materials for rechargeable batteries.
- Novel hybrid electro-chemical energy storage and conversion systems.
- Battery management and battery safety system for electric vehicles.

Spintronic and Electronic Materials Group

- First principle calculations for electronic structures and exploration for new superconductors.
- Ferroelectric and hybrid ferroelectric-magnetic materials for multi-functional electronic applications and data storage.
- Novel magnetic materials for electronic spin applications.
- New thermo-electric materials for power generation and refrigeration.
- Exploration of new concepts in functional materials: gapless spin and multi-ferroic materials.

Thin Film Technology Group

- New technology for HTSC coated conductors for future long length and "over-critical" current carrying applications.
- Nano-structures and interfaces for super current flow and limitation in HTSC films, multi-layers and hybrid structures.
- Magneto-optical investigation of HTSC films, multi-layers and hybrid structures for electronic applications.
- MgB2 thin films for electronic devices and telecommunication.
- Single atomic layer structures: silicene, phosphorene.

Nano-structured Materials Group

- High surface area nano-structured oxides for energy saving.
- Chemical deposition methods for solid state thin film batteries.
- Novel nano-structured materials for asymmetric super-capacitors.
- Application of nano-structured ceramics for treatment and prevention of cancer and other diseases.

Terahertz Science, Solid State Physics Group

- Quantum tunnelling and electrical characterisation of semi-conductor nanostructures.
- Magneto-optical study of colossal magneto-resistance.
- Thermionics and thermo-electrics in nanomaterials.
- High efficiency terahertz emitters.
- Advanced materials and structures for terahertz science and technology.
- Theoretical and applied research on graphene and its applications.

For more information: http://isem.uow.edu.au

Professor Shi Xue Dou

Institute Director Professor Shi Xue Dou is an internationally- renowned expert in the field of superconductivity and energy storage. His experience and dedication to the field has been acknowledged with the award of a Doctor of Science at UNSW in 1998. He is a Fellow of The Australian Academy of Technological Science and Engineering, the leader of the Vehicle Electrification Program within Auto CRC, and winner of 13 academic awards for excellence in research and teaching. He has been proactive in promoting collaborations uniting industry in the national and international arena. Through Professor Dou's great dedication, experience and leadership, ISEM continues to achieve outstanding results and recognition in research. He holds four patents, has published more than 1000 refereed papers, and has presented more than 50 invited talks at international conferences.

PhD Student Profile: Joao Rafael Lourenco dos Santos

Rafael completed his Bachelor of Materials Engineering and Master of Materials Engineering at the New University of Lisbon in 2011, where he continued to work as a Research Fellow. He is now enrolled in a PhD at University of Wollongong and works in a very challenging field – the development of novel high- efficiency thermoelectric materials for automotive applications. The time he spent as a Research Fellow in Portugal was very useful in acquiring the necessary skills to manoeuvre between many constraints imposed by the material requirements in his research topic. So far Rafael has shown outstanding knowledge of the field, exceptional equipment maintenance and handling skills. There is no doubt that due to his high level of motivation and energy, he will achieve many important results and make ISEM very proud in the years to come.

SMART INFRASTRUCTURE FACILITY

Research Director: Professor Pascal Perez

The SMART Infrastructure Facility (Simulation, Modelling, Analysis, Research, and Teaching) is a world class inter-disciplinary research centre.

One of the largest infrastructure research institutions in the world, it is defining a new area of research called 'integrated infrastructure planning and management'. As part of this commitment, SMART has established a wide range of national and international partnerships with government, industry and research institutions to undertake problem solving through applied research.

SMART has been specifically designed and fitted out with laboratories and research collaboration spaces concerning all aspects of infrastructure such as water, energy, transport and economic assessment. It provides specialist and teaching laboratories for 200 postgraduate research students, and over 5000 undergraduate students interact with the facility every week.

A diverse team of academic and industry practitioners focus on the key drivers of change affecting infrastructure, and how knowledge can be used to better serve and shape our society to a more sustainable future.

SMART at UOW is partnering with industry and government to provide their personnel with the next generation of skills and expertise to ensure infrastructure underpins both liveable and productive cities and regions.

Objectives

- Generate, publish and disseminate ideas that support greater understanding of the interconnection and interdependencies of infrastructure assets and systems to drive multi-disciplinary infrastructure research and education.
- Forge a new branch of research called 'Integrated Infrastructure Planning and Management' to analyse the individual and combined effects of infrastructure systems and how they can better work together to serve the community.
- Encourage positive policy formation through deeper understanding of infrastructure systems using reasoned arguments and intellectual rigour, converting conceptual insights into practical initiatives beneficial to governments, industry and the community.
- Promote vigorous and evidence based dialogue with industry and government, and in doing so be a compelling intellectual partner in the development of the infrastructure industry in Australia and abroad.

For more information: http://smart.uow.edu.au

Professor Pascal Perez

Pascal Perez received his PhD in Environmental Studies from Montpellier University, France in 1994. Pascal is a specialist in integrative infrastructure modelling, using various computer simulation technologies to explore complex interactions between social and technological components of infrastructure systems. He has 30 years of experience in complex system modelling, first in France, then at the Australian National University and CSIRO. Pascal joined the University of Wollongong in 2011, where he now holds the position of Research Director of the SMART Infrastructure Facility. Pascal is a member of the Technical Committee of the Australian Urban Research Infrastructure Network (AURIN) and the Modelling and Decision Support Division of Simulation Australia and of the Modelling and Simulation Society of Australia and New Zealand (MSSANZ). In 2002, he received an ARC-International Linkage Fellowship to develop social modelling research at the Australian National University. Professor Perez has published more than 100 refereed papers and book chapters. In 2006, he co-edited with his colleague David Batten the book Complex Science for a Complex World (ANU E Press).

PhD Student Profile: Shiva Pedram

Shiva Pedram completed her Master of Engineering Management at the University of Wollongong in 2011, and is currently undertaking a PhD in the same field. Her research is conducted in collaboration with Coal Services Pty Ltd, under the supervision of Professor Pascal Perez and Associate Professor Steven Palmisano.

Shiva's research is highly industry- driven and focuses on the impact of utilising virtual reality environments to train mine rescue brigades for dangerous and catastrophic situations. Coal Services Pty Ltd is one of just a few facilities worldwide which delivers a mix of reality and highly immersive training opportunities for miners. The aim of her research is to evaluate the impact of implementing such advanced technologies for training and improving safety in high risk industries such as mining. The outcome of the study will improve the quality of training for the mining industry by analysing the various aspects of their technology, developing predictive and explanatory models to predict and explain the relationship between different factors and variables affecting the training; it will also offer frameworks and a decision making tool to enhance the overall training strategies and also help manage their decision making processes.

Her role in the project involves collecting data from four stations across the NSW, conducting interviews with mine managers and under managers, and finally to analyse the primary and secondary data to develop her models and tool.

INFORMATION & COMMUNICATION TECHNOLOGY RESEARCH

Director: Professor Philip Ogunbona

University of Wollongong's Information and Communication Technology (ICT) Research Institute is one of the longest-running university-based research institutes in the field of ICT in Australia and is a flagship research strength within the University. The Institute has been instrumental in establishing the University's international reputation in ICT research and is recognised as a Centre of Excellence in Telecommunications by the New South Wales State Government. The ICT Research Institute has significant R&D capacity in the areas of communication and wireless technology, multimedia and information processing, computer and information security, and intelligent systems. The research institute currently consists of six laboratories which collectively represent about 32 academic research staff and over 70 post-graduate students; 90% of these are PhD students.

Objectives:

- Conduct leading edge research and development into technologies and applications of future multimedia information communication and services.
- Conduct world-class research in cryptography, network security and multi-agent systems.
- Use its expertise and reputation to help establish the Illawarra Region as the Information and Communication Technology (ICT) hub of New South Wales.
- Offer excellent postgraduate education and training.

Key Competencies

- Wireless ad hoc and sensor networks.
- Immersive multimedia virtual environment.
- Smart vision sensors and 3D data acquisition.
- Coding, search and retrieval of multimedia content.
- Detection, tracking and recognition of human faces.
- Human motion analysis and video surveillance.
- Multimedia security and forensics.
- Access control and computer security.
- Cryptography and network security.
- Information retrieval, web search and data mining.
- Multi-agent systems and agent-based simulation and modelling.

Projects include:

- Immersive Multimedia Communications - provides an immersive and interactive virtual environment for many applications including education and training services and virtual office for dispersed workforce.
- Human face detection, tracking and analysis - provides the leading technologies of face detection, face recognition, facial expression recognition and gender recognition under realistic conditions.
- Bio-acoustic signal processing and analysis - develops state-of-the-art technology for automatic recognition, localisation and monitoring of endangered fauna.
- Dynamic single sign-on with identity-based cryptography - offers a novel solution to manage multiple credentials for multiple on-line services.
- Secure payment systems - offers the latest secure payment systems over the Internet for e-commerce. The system enables users' privacy and anonymity whenever required.
- 3D profile acquisition based on digital fringe projection - provides cost effective solutions for non-contact measurement of 3D shapes for such applications as engineering prototyping, 3D biometrics and 3D virtual reality.
- A Multi-agent System for Power Grid Networks - provides an innovative approach for power grid management and resource allocation through the combination of local intelligence and global coordination using multi-agent technology.
- Distributed Information Retrieval Systems for Web Search - introduces technologies that will advance web search services towards meeting current and future needs.
- Analysis of distributed Surveillance Systems for Event Detection - aims at combining sensory data from globally distributed surveillance systems to detect interdependent events for enhancing national and international security.

Collaboration:

ICT has established strong research collaborations with world leading research organizations including Microsoft Research, Apple, Department of Foreign Affair, Directorate Signal Defence, NSW government and partnership with the Smart Service CRC.

For more information: http://ictr.uow.edu.au/index.html

Professor Philip Ogunbona

Professor Philip Ogunbona studied at the Department of Electrical and Electronic Engineering, Imperial College of Science, Medicine and Technology, University of London where he obtained the DIC and PhD for research conducted in the field of Image Processing.

He joined the University of Wollongong, School of Electrical, Computer and Telecommunications Engineering in 1990. He was with the Visual Information Processing Lab, Motorola Labs, Sydney from 1998 – 2004 where he worked on a range of research projects including, image and video segmentation, image compression (he was part of the Motorola team that worked on the JPEG2000 standardization), digital camera image processing, stereo image processing, multimedia security (watermarking and authentication) and multimedia content management for broadband applications. Apart from the many publications emanating from the research output, Philip was also co-author of several patent disclosures. He currently has four patents filed in the US and has published over 50 journal and conference papers. His current research interests include image and video processing, video surveillance, multimedia security and multimedia content management. He is a Senior Member of the IEEE and the Australian Computer Society.

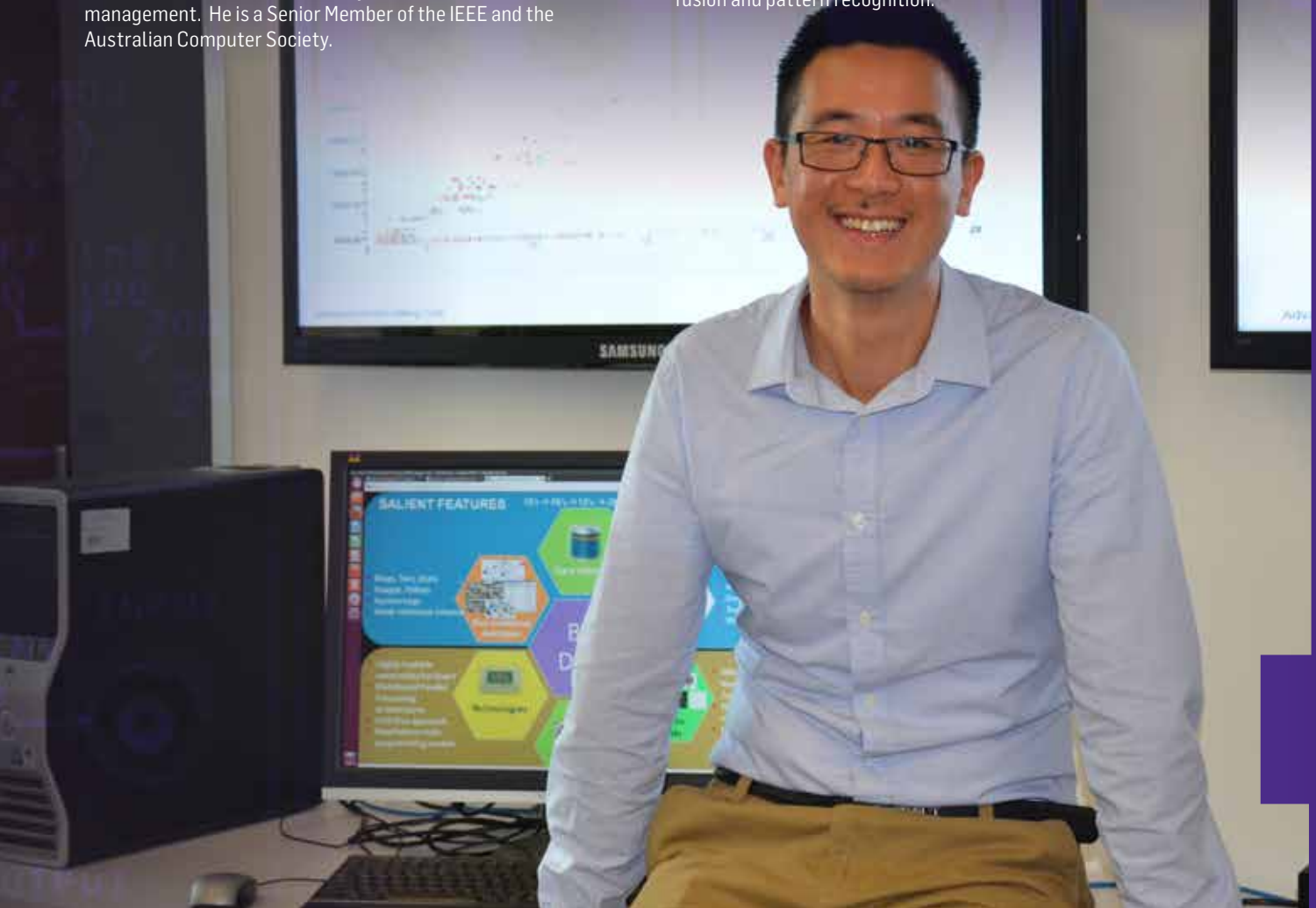
PhD Student Profile: Early Career Researcher Jie (Jack) Yang

Jie (Jack) Yang has extensive experience in machine learning and cloud computing for data analysis. Prior to joining the SMART Infrastructure Facility at University of Wollongong, Jie completed his Master degree at Huazhong University of Science and Technology (HUST), China, and completed his PhD degree at the University of Wollongong.

He was awarded the "University Prize for Top Ten Students in Scientific Research" from HUST, and also received the second prize from "China National Mathematical Modelling" in 2007. From 2009 to 2011, he has received three Australian national awards related to his research on data analysis and signal processing.

At SMART Infrastructure Facility, Dr. Yang is responsible for translating conceptual models into implementation programs and code prototyping (in particular, machine learning and cloud computing). These projects involve the application of the novel signal processing paradigm to develop efficient techniques for big-data analytics.

To date, Dr. Yang has authored or co-authored 16 conference and 17 journal papers, and three book chapters on a variety of topics. He has also been granted two patents for his work on data fusion and pattern recognition.



CENTRE FOR IT-ENABLED TRANSFORMATION

Leader: Associate Professor Ping Yu

Objectives:

- Investigate IT-enabled transformation of human society.
- Information technology is one of the most significant forces shaping all aspects of modern society. Consequently, there is a great need to better understand and more effectively manage the IT-enabled transformation processes. Our goal is to make a positive impact in this direction in the key area of information systems.
- Our key research areas include e-health, e-government, e-business and e-community.

Research Groups and projects include:

- Business analytics and decision making.
- IT in health and aged care.
- IT architecture and competitive advantage.
- Innovation management.
- Human-computer interaction.
- Social media and consumer behaviour.
- E-community, e-government and governance.
- Web services and cloud computing.

For more information: http://eis.uow.edu.au/sisat/citt/index.html

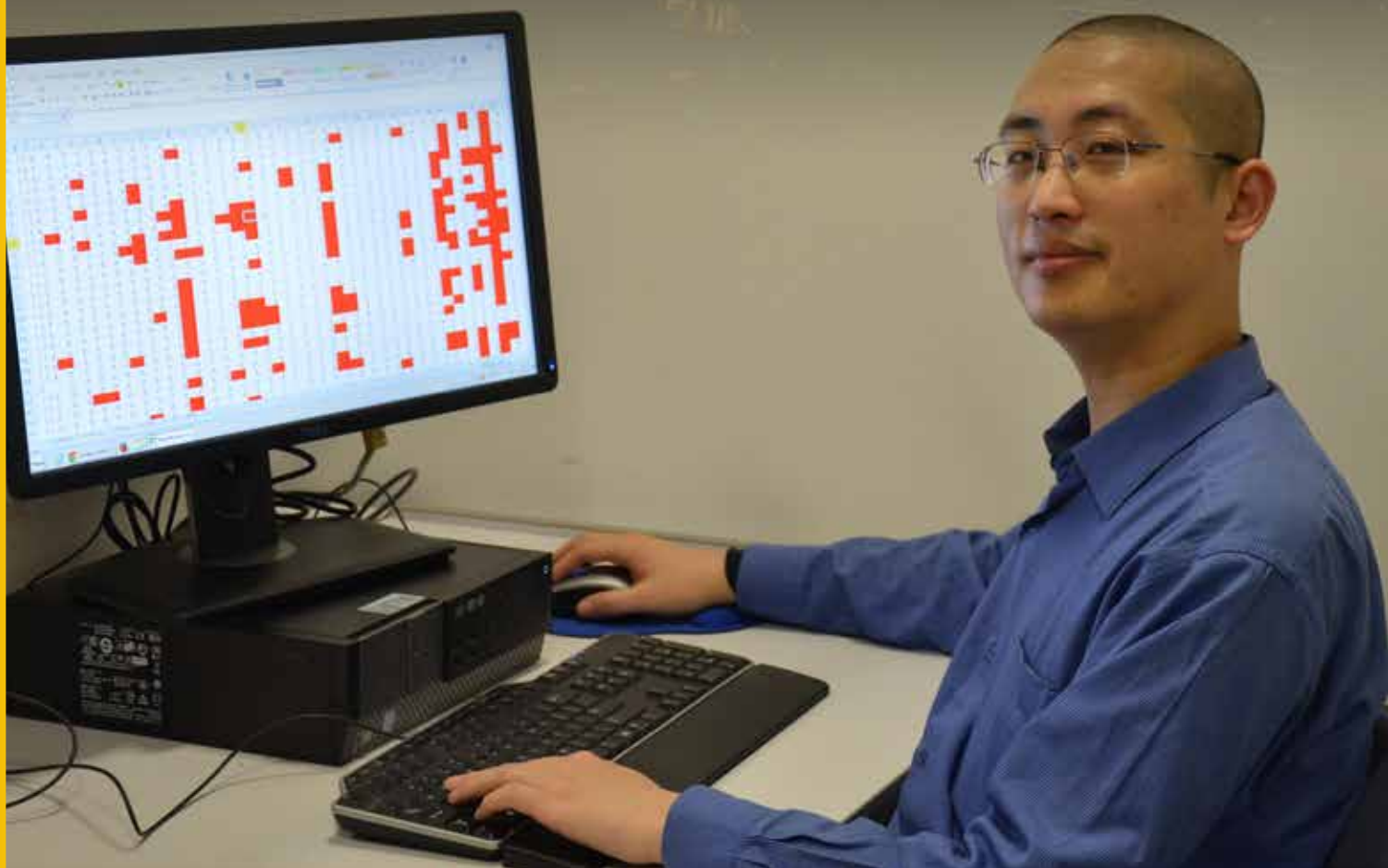
PhD Student Profile: Tao Jiang

Tao Jiang completed a Master of Public Health in 2010 and a Master of Health Informatics 2011 at the University of Wollongong. Currently, he is a PhD Candidate in School of Computing and Information Technology.

Tao's special research field is Aged Care informatics. His work examines the contribution that electronic health records has made to the quality of residential aged care in terms of compliance with aged care accreditation standards. The outcomes of the study include new text data mining methods for analysing aged care accreditation reports, which could be generalisable to other text data; the identification of risk factors for resident safety in residential aged care homes as suggested by aged care accreditation reports; and evidence about the contribution of electronic health records to resident safety in residential aged care.

Tao's study will benefit older people in residential aged care homes by generating insights about how the Aged Care Quality Agency actually evaluate the quality of residential aged care services. It will also provide evidence to support the improvement of aged care quality measurement conducted by the Aged Care Quality Agency in Australia.

Tao is supervised by health informatics expert Associate Professor Ping Yu and data mining expert Dr Jun Ma.



DECISION SYSTEMS LAB

Leader: Professor Aditya Ghose

Objectives:

The Decision Systems Lab (DSL) conducts research in the areas of data science, service science, business process management, agent technology, optimization and knowledge representation and reasoning. The quality of this research has been recognized by the books and papers published in its 18-year history, the research funding it has received (approx. $4 million, including eight major ARC grants as well international funding from Canada, Japan and the US) and its network of international collaborative linkages which include the Netherlands (Utrecht, Delft, Tilburg), Austria (Vienna and Linz), US (North Carolina State), Canada (Alberta), India (Calcutta) and Japan (the National Institute for Informatics). The impact of this work is evident in DSL's collaborations with IBM Research and Infosys Labs (researchers from both corporate labs are regular visitors), and with CSC, Bluescope Steel, SES and several other organizations (including startups seeded by the Lab).

Research Groups and projects include:

- Service delivery optimization (with IBM Research).
- Software analytics (with Infosys Labs).
- Oncology decision support (with Wollongong Hospital).
- Data science in oncology (with Wollongong Hospital and several others).
- Business process variability management (with IBM Research).
- Software maintenance (with Linz).
- Model-driven dashboards.
- Normative systems (with Utrecht and Delft).

For more information: www.dsl.uow.edu.au

SOFTWARE DESIGN SCIENCE

Leader: Associate Professor Ghassan Beydoun

Objectives:

Many complex IS applications are characterised by a constant and strong interplay between human users and the software components. The complexity of such systems often requires specific techniques to analyse their requirements and design. Existing development methodologies are typically inadequate when dealing with such systems. A deeper understanding of the deployment context of the systems is often required. SDS research focuses on design, implementation, and simulation in a range of applications for such systems; as well as tuning existing methodological knowledge to develop them.

Research Groups and projects include:

- Social analysis approaches for improving systems design.
- Enhancing agent- based modelling with domain knowledge.
- Exploring ontologies and formal concept analysis in systems design.
- System of Systems Approach in Socially Complex Settings.
- Exploration and validation of innovative systems analysis and design methods.
- Ontologies and systemic functional linguistics for system design.
- Development and Testing of innovative CASE ontology-based tools.
- Current applications: Disaster Management, Virtual Museums, Early Childhood Teaching/Learning Systems.

For more Information: http://eis.uow.edu.au/sisat/software-design-science/index.html

ADVANCED MANUFACTURING TECHNOLOGIES

Director: Professor Weihua Li

Advanced Manufacturing Technologies (AMT) research strength represents a unique and comprehensive multi-disciplinary group of researchers engaged in both generic and applied research into manufacturing and application of associated methods to solve major problems in industry and health. The vision of AMT is to further enhance its leading unique strategic position both nationally and internationally, and through the synergy among its diverse groups to develop niche and innovative projects, concepts and solutions.

AMT is based on several key manufacturing research groups -- Welding and Joining of Steel and Light Alloys, Automation and Robotics, and Bulk Materials Handling. These strategic areas are supported by an Engineering Mechanics Centre, a Power Quality and Reliability Centre, two Intelligent Mechatronics Groups, and a Renewable Energy Systems and Sustainability Group. Extensive use is made of computer- aided design, numerical modelling, and computer simulation techniques, supported by experimental work in several large laboratories equipped with the latest equipment and systems at the forefront of international industry's 'best practice'.

Objectives:

- Perform strategic research in advanced manufacturing, mechatronics, robotics, power quality, and sustainability.
- Investigate innovative manufacturing techniques and develop cost- effective, sustainable solutions to industry problems.
- Develop new manufacturing processes and improve existing ones.
- Provide novel support services in areas such as advanced materials and health and safety.

Research Groups and projects include:

Centre for Engineering Mechanics (CEM)

- Computational mechanics in materials manufacturing (FEM, CFD etc.).
- Research into manufacturing processes such as rolling and metal forming.
- Contact mechanics in metal manufacturing.
- Advanced rolling technology of thin strip materials.

Centre for Intelligent Mechatronics Research (CIMR)

- Haptics and virtual manipulation.
- Analysis and recognition of human motion.
- Intelligent robotic grippers.
- Autonomous Bi-ped robots.

Intelligent Nano-Tera Systems Research Group

- Novel actuators and sensors based on smart materials and structures, and their fabrication using innovative micro and nano technologies.
- Nano/Micro/Macro robotic systems for drug delivery and medical applications.
- Nano/Micro-fluidics for manipulation of biological particles.
- Semi-active vibration control.

Integral Energy Power Quality & Reliability Centre (PQRC)

- Improving power quality for distribution networks and industry.
- Power quality data management and reporting concepts for power systems.
- Application and development of Australian Standards for power quality.
- Harmonics of photo-voltaic inverter systems in distribution networks.

Centre for Bulk Solids and Particulate Technologies (BMH)

- Effect of product properties on the behaviour and flow of bulk materials.
- Environmental emissions research, including dust-air generation and minimisation, and development of sustainable dust suppression technology.
- Validated/calibrated computer simulation modelling of product properties, behaviour, and flow.
- Contract research for industry via Bulk Materials Engineering Australia.

Welding Engineering Research Group

- Rapid Robotic Programming for Repair Welding.
- Magnetically Impelled Arc Butt Welding of Pipe.
- Hybrid Laser GMAW and Tandem GMAW.
- On Line Process Monitoring and Control in Arc Welding.

Applied Automation

- Advanced robotic programming.
- Additive Manufacturing.
- Fully automated mining systems.
- Vehicle dynamics and control strategy development.

Renewable Energy Systems and Sustainability

- Sustainable energy; wind and wave power generation.
- Industrial ventilation and fume control.
- Optimal and robust control of building energy systems.
- Energy efficiency and climate adaption.

Multi-disciplinary Projects

One of the main attributes of Manufacturing Research activity is the ability to combine multi-disciplinary teams from within the university, with advanced resources, to focus on specific industrial automation and precision engineering problems. Examples of some of these projects include:

- Applying nano/micro/macro actuators and sensors for biomedical and biological applications.
- Applying electrical design, power quality, and superconductor engineering expertise in superconducting technology to build Magnetic Energy Storage Systems and novel fault current limiters.
- Bringing together electrical, welding engineers and WH&S expertise to elucidate electrocution hazards in welding.

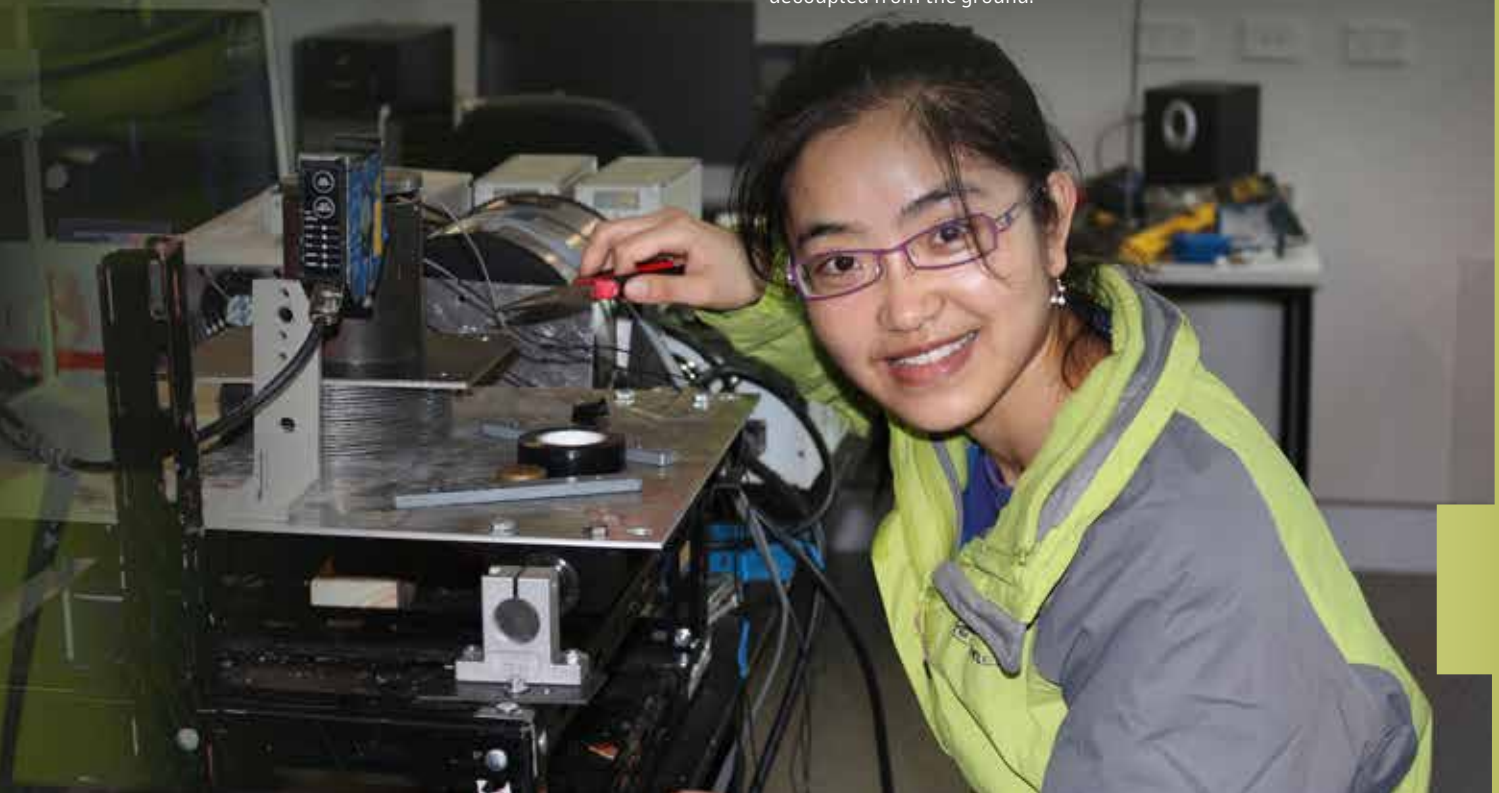
For more information: http://eis.uow.edu.au/manufacturing/index.html

Professor Weihua Li

Professor Weihua Li is the Director of the Advanced Manufacturing Technologies Research Strength at the University of Wollongong. He obtained his B.Eng. (1992) and M.Eng. (1995) from the University of Science and Technology of China, and PhD from Nanyang Technological University, Singapore (2001). His research focuses on magnetorheological materials and their applications, microfluidics, rheology, and intelligent mechatronics. He serves as Associate Editor or Editorial Board Member for eight prestigious international journals. He has published more than 250 journal and conference papers. He is the recipient of a number of prestigious awards and fellowships including JSPS Invitation Fellowship (2014), Australian Endeavour Fellowship (2011), and AAS Scientific Visit Awards (2010 and 2006).

PhD Student Profile: Jian Yan

Jian Yang is currently a full-time PhD student in the School of Mechanical, Materials and Mechatronics. Jian completed her Bachelor of Engineering (Automation) as an outstanding graduate at the China University of Petroleum in 2011. Jian commenced her PhD in 2013 and her research project mainly focuses on building protection from the seismic events using stiffness softening magnetorheological elastomer isolators. This innovative development has a stiffened stiffness without any power consumption and the building can be more stable under normal operating conditions. When earthquakes come, the lateral stiffness of the isolator decreases by activating the solenoid which generates an electromagnetic field that is opposed to the permanent magnetic field so the building can be decoupled from the ground.



ENGINEERING MATERIALS

Director: Professor Brian Monaghan

The vision of the Engineering Materials Strength (EM) is to make a demonstrable contribution to the design, synthesis, characterisation and manufacturing of advanced materials for applications in both core engineering fields and newly emerging engineering technologies. The institute maintains a tradition of more than two decades of UOW being at the forefront of steel processing and product research, but also encompasses targeted programs in non-ferrous metallurgy and functional engineering materials. Material innovations are often central to the development of new products so current EM researchers are developing advanced materials for automotive, building/construction, pipelines, and even bio-medical applications. Similarly, innovations in material processing can greatly impact on the economic viability and environmental sustainability of key industries such as steel production. EM has approximately 21 academic and research staff and 38 postgraduate students.

Objectives

- Conduct world class research in the design, synthesis, and characterisation of advanced materials for engineering applications.
- Maintain a special interest in ferrous metallurgy.

Research Groups and Projects Include:

Materials Process Engineering Group

- Study the physical metallurgy of steel processing.
- Conduct in-situ observations of phenomena such as phase transitions, oxidation, crystallisation of metallic glasses and slag dissolution using high temperature laser scanning confocal microscopy.
- Study phase transformations and thermo-mechanical processing of titanium alloys.
- Develop titanium alloys and component manufacturing techniques using powder metallurgical routes.

PYROmetallurgy Research Group

- The development and optimisation of new and existing melt processing techniques.
- Sustainable smelting technologies for low greenhouse gas emissions.
- Light metals processing.
- The fundamentals of coke reactivity for blast furnace and power generation applications.
- Inter-facial phenomena in high temperature processing.

Special Materials Advanced Research & Technology Group

- Advanced processing - Advanced materials processing technologies based on reactive milling, complex plasma powder processing techniques and high temperature consolidation using spark plasma sintering and hot induction pressing.
- Coatings - Improving the wear resistant coating for high speed machining of titanium, investigating corrosion resistant TiNi alloy coating.
- Products- Novel super hard materials (carbides, borides, and nitrides), nano-powders, hydrogen storage materials, deformable MAX phase conducting ceramics, advanced metal matrix composites, special purpose shape memory alloys (advanced ferrous and non-ferrous).

Rolling Mechanics Group

- Atomic to macro scale modelling of hot and cold rolling processes.
- Optimisation of rolling processes, development of high strength metals, thin strip rolling, product quality (surface roughness, thickness, and shape), friction, lubrication and wear, and the contact mechanics of rolling processes.
- The mechanics of micro rolling process.
- Study on strip edge cracks and waves.

Engineering Alloy Design and Characterisation

- Design of new thermo-mechanical processing schedules for HSLA, TRIP, strip-cast steels, and Ti alloys.
- Optimisation of micro alloying and utilisation of clustering phenomena to improve the properties of steels, and the application of atom probe tomography.
- Developing advanced, high strength steels for automotive applications.
- Phase transformation and mechanical behaviour.

Polymer Research Group

- High performance polymeric materials; electroactive polymers; biomedical polymeric materials.
- Environment-friendly materials especially for wastewater.
- Development of novel membranes and photocatalytic particles such as titanium dioxide or tungsten trioxide, etc. for wastewater treatment.

Research Partnerships

EM has a wide network of collaborating universities and industry partners, both in Australia and overseas. The list includes, but is not limited to: BlueScope, CSIRO, BHP Billiton, DSTO, Sydney University, Monash University, ANSTO, UNSW, Swinburne University, Deakin University, Australia; University of Delft, Netherlands; McMaster University, Canada; Los Alamos National Laboratory, USA; Oak Ridge National Laboratory, USA; McGill University, Canada; Institute for Metal Physics, National Academy of Science, Ukraine; Beijing University of Science and Technology, China; Tata Steel, Europe; Korean Advanced Institute of Science and Technology, Korea; Nanjing University, China; Baosteel, China; POSCO, Korea.

For more information: http://eis.uow.edu.au/engineering-materials/index.html

Professor Brian Monaghan

Professor Brian Monaghan has been an active lecturer and researcher in materials engineering at the University of Wollongong for more than ten years. He is a Pyrometallurgist who believes passionately that if the sustainability, energy, and greenhouse gas issues currently facing the planet are to be addressed, then we need a strong engagement from materials engineering and applied sciences. He is currently working on high temperature chemistry, with a particular focus on metal processing, and is also a senior member of the Steel Research Hub as well as Leader of the PYROmetallurgy Group.

PhD Student Profile: Apsara Jayasekara

Apsara completed a Bachelor of Science in Chemistry at the University of Peradeniya, Sri Lanka, and is now working on her PhD at the University of Wollongong (UOW). Her research project is on the kinetics of coke analogue reactivity in CO_2 with a particular focus on the effect of mineralogy on the reaction kinetics. This information will ultimately be used to optimise (minimise) coke usage in power generation and blast furnace iron making.

Her PhD project is an excellent example of a classical scientific approach to an important industrial problem of carbon usage in industry, and developed out of previous collaboration with industry partners BlueScope and BHP Billiton.

Although Apsara is just at the start of her research career, her work has been presented at national and international conferences, won awards for presentations, and is in the process of preparing her work for journal publication.

SUSTAINABLE BUILDINGS RESEARCH CENTRE

Director: Professor Paul Cooper

The Sustainable Buildings Research Centre (SBRC) is a multi-disciplinary facility that hosts a wide range of research and industry collaborations to address the challenges of making buildings sustainable. Our mission is to assist in the rapid decarbonisation of our built environment. Buildings have major economic, environmental and social impacts on our community and the planet, and between a quarter and half of all greenhouse gas emissions result from our construction and use of buildings.

The SBRC is located in one of the most sustainable buildings in Australia. The SBRC building is one of the very few Six Star Green Star buildings in the Australian Higher Education Sector, and is the first building in the Illawarra. It is also on track to become the very first building to achieve Living Building Challenge accreditation in Australia.

The SBRC includes a unique range of research and testing facilities, including the net-zero energy SBRC building itself, which is a Living Laboratory with a 160kWp photovoltaic renewable energy system, a 'plug-and-play' micro-grid and a large suite of mobile research equipment.

In addition, the award-winning 'Illawarra Flame' Solar Decathlon House is located right next to the SBRC, and forms an integral part of the SBRC test and demonstration facilities. Team UOW won the Solar Decathlon China 2013 competition with the highest overall score in the history of all Solar Decathlons.

Objectives:

- Research, collaborate, and link with industry to meet the challenge of improving the performance of our new and existing building stock.
- Better understand how people design, build and operate their buildings, and to change our day-to-day practices for increased energy efficiency and reduced environmental impacts of our buildings.
- Pioneer new approaches to retrofitting of existing buildings to create more effective places to live and work.

Research and training project examples include:

- Development and testing of new Building Integrated Photovoltaic Thermal (BIPVT) systems, including a $0.47M ARENA-funded research project with BlueScope and the Fraunhofer Institute. New systems are tested using our unique rooftop, alt-azimuth, solar tracking test rig.
- Energy efficiency improvement and upgrading of the homes of low income, older Australians. This work includes the $2.3M 'Energy Efficiency in the 3rd Age' project, with a consortium of agencies and Aged Care providers.
- Natural ventilation and low energy ventilation systems to optimise energy efficiency and Indoor Environmental Quality (IEQ). This area of research ranges from optimisation of Building Management Systems (BMS), through to improvement of IEQ in Residential Aged Care Facilities.
- New materials and systems for buildings including Phase Change Material (PCM) thermal storage systems, cladding, insulation, etc.
- Our work on improving the climate resilience of buildings includes our research on Retrofitting for Bushfire Resilience and theoretical and experimental research on hail damage from storms.
- Social and cultural research including the impact of social behaviour and attitudes towards the uptake of sustainable retrofit technologies.
- Electricity demand-side management & on-site energy generation for buildings, micro-grids, on-site generation systems (PV and wind), smart meters, storage systems, etc.
- Distributed retrofitting – a proactive program to demonstrate and test retrofit technologies on existing buildings on the UOW campus and in the local community.
- Technical training and up-skilling of students, engineers, para-professionals, and tradespeople in energy efficiency and sustainable retrofit technologies through our wide range of Continuing Professional Development, undergraduate and postgraduate courses.

Collaboration:

The SBRC is collaborating with a wide range of partners. Examples include our work with our key industry partner, BlueScope, with whom we are developing advanced Photovoltaic Thermal roofing technologies, and our collaboration with Warrigal on the improvement of environmental and dementia-friendly performance of aged care facilities.

The SBRC offers a range of product testing capabilities, and consulting expertise in the areas of building thermal performance measurement and modelling, distributed generation, and understanding of human factors associated with energy efficiency technology adoption.

A dedicated public display and industry exhibition area is also provided within the SBRC facility.

For more information: http://sbrc.uow.edu.au

Professor Paul Cooper

Paul Cooper is the Director of the Sustainable Buildings Research Centre. He was also the Academic Coordinator of Team UOW, who won the Solar Decathlon China 2013 competition.

Professor Cooper has been involved in research on buildings, energy systems, energy efficiency and fluid mechanics over the past thirty years. He holds a Bachelor's Degree in Electrical Engineering, a Masters in Science and Technology Studies and a PhD in heat transfer, all from Imperial College, London. In the mid-1980's he was a research fellow in the Built Environment Research Group (BERG) and the Research in Building (RIB) group at the University of Westminster, before joining the Faculty of Engineering at the University of Wollongong in 1988.

His research and demonstration projects have included the development of a large solar heating scheme for municipal housing in London; renewable energy research on small scale wind and ocean wave energy systems; the fluid mechanics of ventilation processes; and the development of the 'Illawarra Flame' Solar Decathlon house. Professor Cooper was the Head of the School of Mechanical, Materials and Mechatronic Engineering at the University of Wollongong up until July 2010, when he took up his present appointment as Director of SBRC.

PhD Student Profile: Massimo Fiorentini

Massimo first came to the University of Wollongong in 2010 on a Master's degree internship from his Italian university, to work with Professor Paul Cooper on Ocean Wave Energy Conversion systems. After returning to Italy and working for ABB for two years, Massimo won a PhD scholarship in 2012 to become one of the leaders in Team UOW for the Solar Decathlon project and to commence his PhD under the supervision of Professor Paul Cooper and Dr Zhenjun Ma. His research project is on the development of advanced control and optimization strategies for building energy management.

In Team UOW, Massimo played a vital role in the design, development, commissioning and control of the solar-assisted air conditioning system of the 'Illawarra Flame' house. This novel system, featuring an air-based Photovoltaic-Thermal (PVT) system and a centralised active Phase Change Material (PCM) thermal energy store, was judged as world-class by the juries of the Solar Decathlon competition and subsequently won the AIRAH Denis Joseph Award for Innovative Use of Solar Energy in HVAC&R in 2013. Massimo also won a competitively- awarded scholarship from CSIRO – Energy Transformed Flagship and he is actively collaborating with CSIRO on the development of his Model Predictive Control systems for the SBRC and Illawarra Flame.

GEOQUEST ENVIRONMENTAL ENGINEERING RESEARCH

Leader: Professor Long Nghiem

Environmental Engineering is based on several key aspects relating to society's interaction with the environment. This includes the development of engineering solutions to environmental problems which impact on our land, water, air quality, and provision of clean water and air for domestic, industrial, and agricultural purposes. Our research is developed on the principle of sustainability and centres on water quality and treatment as well as water resource engineering.

Objectives:

- Develop advanced water treatment technologies to maximise the use of alternative and traditional water sources for a secured water supply.
- Recover energy and nutrients (e.g. phosphorus and nitrogen) from wastewater.
- Integrate renewable energy to current water and wastewater treatment processes for a carbon neutral treatment system.
- Explore alternative approaches such as coastal reservoirs to capture, store, and protect water resources, and to promote our understanding of the impact of sediment transport in rivers, estuaries, and coastal waters on the water supply.

Research projects include:

- Novel high retention membrane bioreactors for sustainable water reuse: process performance and optimization.
- Assessment and optimisation of N-nitrosamine rejection by reverse osmosis for planned portable water recycling applications.
- Optimising nanofiltration and reverse osmosis filtration processes for water recycling: effects of fouling and chemical cleaning on trace contaminant removal.
- Biosolids management: odour and volume reduction.
- Co-digestion of wastewater sludge and organic waste for biogas production.
- A novel carbon neutral desalination process based on forward osmosis (FO) and membrane distillation (MD), energy and resource recovery from wastewater.

Industrial Partners and Collaboration

Environmental Engineering has a strong research program in water engineering.

Collaborating institutions include:

- Industry partners: Sydney Water, Trility, Veolia Water and Water Secure, Shoalhaven Water, Orica Australia, and Hatch.
- Overseas research universities/institutes: Yale University, Technical University of Munich, University of Tokyo, Colorado School of Mines, and Shanghai Advanced Research Institute.
- Public sector: Department of Industry, Department of Environment, Climate Change and Water (New South Wales), Roads and Maritime Services (RMS).

For more information: http://smah.uow.edu.au/geoquest/index.html

Professor Long Nghiem

Professor Long Nghiem is the leader of the Strategic Water Infrastructure Laboratory and Deputy Director of the GeoQuest Research Strength. In 2010, Professor Nghiem received the prestigious 2010 Vice-Chancellor Award for Research Excellence for Emerging Researchers. His specialised research expertise covers a range of membrane processes including pressure driven membrane filtration, forward osmosis, membrane distillation, facilitated transport membrane, membrane electrolysis, and membrane bioreactors. These processes can be applied to industries such as water treatment, biotechnology, and food processing. His current work focuses on the development of a membrane platform for securing a reliable potable water supply and the recovery of energy and nutrients from wastewater. Since 2009, he has secured over $1 Million in competitive research grants and over $1 Million in commercial research funding. Professor Nghiem has supervised to completion 11 PhD and five MPhil student projects. He currently supervises ten PhD students and two Postdoctoral Research Fellows.

PhD Student Profile: Ashley Zaracostas

Ashley Zaracostas is currently a PhD student in the School of Civil, Mining and Environmental Engineering. Ashley completed a Bachelor of Engineering (Environmental) with first class honours, at the University of Wollongong in 2013. Her honours thesis focussed on the removal of trace contaminants from wastewater by membrane bioreactor for safe water recycling. During her undergraduate studies, Ashley participated in an internship program at Shoalhaven Water, which developed her interest in water treatment technologies. Ashley commenced her PhD in 2014 and her research project involves the sustainable recovery of water, energy and nutrients from wastewater using membrane-based technology. Ashley's research will focus on a hybrid forward osmosis – membrane distillation system. This novel desalination process can enhance the recovery of resources from wastewater, and has significant potential to become a carbon neutral treatment system.

ARC CENTRE OF EXCELLENCE FOR ELECTROMATERIALS SCIENCE /INTELLIGENT POLYMER RESEARCH INSTITUTE

Director: Professor Gordon Wallace

The Intelligent Polymer Research Institute (IPRI) is key research strength at the University of Wollongong and is a load note of the Australian Research Council (ARC) Centre of Excellence for Electromaterials Science (ACES) and lead note of the Australian Fabrication Facility (ANFF) – Materials node.

Researchers work with materials in the nano-domain (that is, with particles as small as one billionth of a millimetre) where electronic conductivity is vastly higher than in larger structures. Their challenge is to make materials at these nanodimensions and assemble them into larger structures (micro or macro) that retain the special characteristics of the nanocomponents, resulting in improved functionality.

IPRI is renowned for expertise in the electrochemistry of organic conductors; especially when those conductors are used in the applications of artificial muscles, photovoltaics, batteries, and biomedical applications.

Objectives:

- Create new electromaterials that will stimulate advances in the fields of energy conversion (including artificial photosynthesis), energy storage and bionic systems.
- Develop the science of electromaterials at both the nano- and macro-dimensions.
- Integrate these novel electromaterials into devices such as solar cells and supercapacitors, lightweight batteries, artificial muscles, fuel cells and bionic implants.
- Introduce and disseminate new expertise in electromaterials into the Australian workforce.

Programmes include: Electro-materials Design and Synthesis

- Electromaterials Design and Synthesis
- Energy Conversion
- Energy Storage

Energy Conversion

- Artificial Muscles
- Polymer Solar Cells
- Polymer Fuel Cells

Energy Storage

- Polymer Batteries and Capacitors
- Textile/Fiber Batteries

Bionics

- Improved electrode - nerve cell interactions
- Controlled drug release for Epilepsy control
- Muscle regeneration

For more information: http://ipri.uow.edu.au/index.html

Professor Gordon Wallace

Professor Wallace is currently Executive Research Director of the ARC Centre of Excellence for Electromaterials Science (ACES). His research interests include organic conductors, nanomaterials and electrochemical probe methods of analysis. A current focus involves the use of these tools and materials in developing biocommunications from the molecular to skeletal domains in order to improve human performance via medical Bionics.

Professor Wallace completed his undergraduate (1979) and PhD (1983) degrees at Deakin University and was awarded a DSc from Deakin University in 2000. He was appointed as a Professor at the University of Wollongong in 1990 and was awarded an Australian Research Council (ARC) QEII Fellowship in 1991 and an ARC Senior Research Fellowship in 1995. In 2002 he was appointed to an ARC Professorial Fellowship. In 2006 he was awarded an ARC Federation Fellowship.

He is a Fellow of the Royal Australian Chemical Institute (RACI). He was elected as a Fellow of the Australian Academy of Technological Sciences and Engineering in 2003 and a Fellow of the Australian Academy of Science in 2007. He was elected as a Fellow of the Institute of Physics (UK) in 2004.

He received the Inaugural Polymer Science and Technology award from the Royal Australian Chemical Institute (RACI) in 1992. He was awarded an ETS Walton Fellowship by Science Foundation Ireland in 2003. He received the RACI Stokes Medal for research in Electrochemistry in 2004.

Professor Wallace has published more than 700 refereed publications and a monograph (three editions) on inherently conducting polymers for intelligent material systems. He has supervised 84 PhD students to completion.

PhD Student Profile: Shannon E. Bakarich

Shannon Bakarich completed a Bachelor of Nanotechnology (Honours) at the University of Wollongong in 2011. He developed a new class of tough hydrogel materials for use in bionic and soft robotic applications during his honours research. Hydrogel is similar to jelly in that it is a soft material with a high water content, but unlike jelly it can withstand large stresses without mechanical failure. Shannon commenced his post graduate studies at the Intelligent Polymer Research Institute (IPRI) in 2012. Throughout his PhD project he developed methods for processing new tough hydrogel materials into functional devices using 3D printing technology. From the success of this research Shannon has been invited to visit Harvard University for 3 months to collaborate with world leading hydrogel experts.

Shannon is conducting his research under the supervision of Professors Geoffrey Spinks, Marc in het Panhuis and Dr. Sina Naficy. He chose to perform a research project with IPRI at the Australian Institute of Innovative Materials because of its access to state-of-the-art facilities and the professional atmosphere at the University of Wollongong's Innovation Campus.

RESEARCH CENTRE FOR GEOMECHANICS AND RAILWAY ENGINEERING

Director: Professor Buddhima Indraratna

The Centre for Geomechanics and Railway Engineering (GRE) has been built around several inter-disciplinary research phases to undertake advanced research into the design and performance of major infrastructure such as dams and transportation systems. It is one of the three nodes of the Australian Research Council (ARC) Centre of Excellence in Geotechnical Science and Engineering. Researchers at the Centre have successfully secured many ARC (linkage and discovery) grants, in addition to funding from the Cooperative Research Centre (CRC) for Railways, and government and industry organisation. The total annual funding for the Centre now exceeds $3 million. The proven high- level research from a team of focused academics, research fellows and high calibre PhD students places the GRE Research Centre on top of the region in many key research and development areas.

Objectives:

- Establish an inter-disciplinary research team to contribute to the innovative development of sustainable surface and sub-surface infrastructure.
- Undertake challenging ground structure interaction projects.
- Conduct fundamental and applied research on modern ground improvement techniques.
- Improve the quality of research and training of postgraduate students with strategic research directions, with a focus on current industry trends.

Key research areas of include:

Soft Soil Engineering and Ground Improvement

- Stabilising soft clay embankments using prefabricated vertical drains combined with vacuum preloading.
- Chemical stabilisation of problematic soils, including erodible, dispersive, collapsible, and unstable soils.
- Use of synthetic materials to improve subsurface drainage and reduce track deflection.
- Stabilisation of soft and weak foundation soils using native vegetation that exploits root suction.

Rail Track Engineering and Transport Geotechnics

- Dynamic modelling and prediction of track performance.
- Automated monitoring of track defects.
- New materials for track components for increased ballast and sub-ballast performance.
- Assessment of rail-ballast-foundation interaction.
- Behaviour of granular materials under cyclic loads including particle degradation and cyclic densification
- Effect of slope movements on rail tracks and highway cuttings.
- Railway sub-ballast filtration under cyclic conditions.

Environmental Geotechnics, Filtration and Drainage

- Dams and foundation engineering.
- Offshore reclamation with blended waste materials.
- Design and construction of granular filtration for embankment dams.
- Remediation of acid sulphate soils to prevent corrosion of track components.
- Role of filtration in eroded soil retention.
- Stability analysis of embankment dams and internal piping and erosion assessment.

Rock Engineering and Mining Geomechanics

- Geomechanics and mine planning.
- Jointed rock engineering.
- Rock excavations including tunnelling and mining.
- Minimisation of geo-hazards and geo-environmental impact.
- Landslide hazards and risk management.

Computation and Numerical Geomechanics

- Deep foundations and pile dynamics.
- Earthquake effects on foundations.
- Numerical and computational geomechanics.
- Constitutive modelling of geomaterials.
- Stability assessment of embankments and Transport systems

For more information: http://eis.uow.edu.au/gre/index.html

Professor Buddhima Indraratna

Professor Buddhima Indraratna (PhD, FTSE, FIEAust, FASCE, FGS, FAusIMM, DIC, CEng, CPEng) is an internationally acclaimed geotechnical researcher and consultant. After graduating in Civil Engineering from Imperial College, University of London, he obtained a combined Masters degree in Soil Mechanics and Engineering Seismology also from Imperial College, and subsequently earned a PhD in geotechnical engineering from the University of Alberta, Canada. His outstanding professional contributions encompass innovations in railway geo-technology, soft clay engineering, ground improvement, environmental geo-technology and geo-hydraulics, with applications in many aspects of transport infrastructure, embankments and dam engineering. Under his leadership, the Centre for Geomechanics and Railway Engineering at the University of Wollongong has developed into a world class institution for ground improvement and transport geomechanics, undertaking national and international research and consulting jobs.

Recognition of his efforts is reflected by numerous prestigious Awards, such as the ISSMGE Ralph Proctor Lecture - 2016 in Transport Geotechnics. He is the author of six books and over 500 publications in international journals and conferences, including more than 45 invited Keynote lectures worldwide. In the past, several of his publications have received outstanding contribution awards from the International Association for Computer Methods and Advances in Geomechanics (IACMAG), Canadian Geotechnical Society, and Swedish Geotechnical Society. He is a Fellow of the Australian Academy of Technological Sciences and Engineering (FTSE), one of the highest honours awarded for professional engineers in Australia.

PhD Student Profile Early Career Researcher: Ana Ribeiro Heitor

Ana Heitor, an early career researcher at the University of Wollongong, received a Licentiate degree (New University of Lisbon) in 2004, a Master Degree (Kyoto University) and Doctoral Degree (University of Wollongong) in Geotechnical Engineering in 2009 and 2012, respectively. From 2004 to 2006 she also worked in consultancy and construction companies in Portugal.

During her PhD study, undertaken under the auspices of an ARC linkage project, she was honoured in the Young Geotechnical Professional Competition (2010) and with the AGS NSW Research Student Award (2012) for her innovative research work on the investigation of cost effective and non-destructive testing methods for evaluating the compaction efficiency of reclamation fills at Penrith Lakes. Her research work is also showcased in a number of scholarly academic publications, including journals and international conference proceedings.

She joined the Centre for Geomechanics and Railway Engineering at University of Wollongong as a lecturer in July 2012 and is currently working on two ARC Projects encompassing the characterisation of compacted granular wastes and compacted soil stabilised with chemical agents. Her research interests are mainly focussed on non-destructive laboratory testing, soil improvement and stabilisation, small and large strain behaviour of compacted soil and granular wastes and liquefaction analysis of partially saturated ground.

ENGINEERING ASSET MANAGEMENT GROUP

Leader: Associate Professor Richard Dwight

This Group provides research that supports a unique postgraduate education program. Our research outcomes deliver to industry methods of sustaining their strategically significant infrastructure cost effectively. The group members are actively engaged in a number of fundamental and applied research projects in collaboration across the world with industries in various areas of railways, energy pipeline, steel industry, utilities, wind turbines and SMART Grid. This research covers all aspects of engineering asset management from component life analysis and system reliability engineering and maintenance program development to management system structure and performance measurement and management.

Objectives:

- Enable industry and society to sustain the infrastructure assets required to achieve a safe liveable and economically viable environment.
- Drive a scientific approach to engineering asset management focused on achieving outcomes for industry.
- Become a well-known and competitive research group providing the long-term education and research needs of industry.

Research Projects include:

- Prediction-Based Decision Support Framework for Energy Pipelines.
- Pipeline Operational Life Prediction by Neural Networks.
- Benchmarking Pipeline Corrosion for Life Prediction.
- Predicting Service Potential of Railway Bridge.
- Improved Railway Noise Management.
- Railway Noise Reduction.
- Integration of Condition Monitoring Data into Railway Asset Management.
- A System for Condition Based Operation of Wind Turbines.
- Integration of Condition Monitoring Data into Railway Asset Management.
- Benchmarking Energy Pipeline Risk Focused on Integrity Management.

For more information: http://eis.uow.edu.au/mmm/engineering-asset-management/index.html

ENGINEERING AND MATHEMATICS EDUCATION RESEARCH GROUP

Leader: Professor Tim McCarthy

Engineering and Mathematics Education Research Group (EMERG) is a group that spans across the Faculty of EIS bringing together Engineering and Mathematics researchers who have also demonstrated track records in scholarly research in the growing field of Engineering and Mathematics Education Research. Members of EMERG have been recognised for their teaching excellence with a number of Office of Learning and Teaching (OLT) citations and research funding. In the last five years we have been the lead institution and received over $1.2M in nationally competitive OLT grants in addition to our work as collaborating investigators on four other research projects led by other institutions. There are currently nine PhD students working on Engineering and Mathematics Education research projects.

Research Projects Include:

- Inspiring mathematics and science in teacher education.
- Indigenous student support through Indigenous perspectives embedded in engineering curricula.
- Understanding and improving the engineering laboratory experience.
- The Virtual Design Workshop: an on-line adaptive resource for engineering students.
- Creating and modifying mathematical learning resources and learning designs for use in developing countries.
- Improving mathematics education in the Middle East: a focus on technology, learning design and professional development.
- Non-Response in Australian Educational Surveys.
- An evidence based model for developing undergraduate engineering mechanics education.

For more information: http://eis.uow.edu.au/emerg/index.html

ARC CENTRE OF EXCELLENCE FOR GEOTECHNICAL SCIENCES AND ENGINEERING

Leader: Professor Buddhima Indraratna

The ARC Centre of Excellence for Geotechnical Sciences and Engineering (CGSE) was established in 2011 through the award of an Australian Research Council grant worth over $20 million. The Centre is expected to operate over a seven year period with further cash funding from industry, universities, and NSW Science leveraging. It is pioneering new scientific approaches to geotechnical engineering design to underpin Australia's energy and transport infrastructure, resulting in increased productivity and sustainability of the nation's major export industries.

It was formed by merging three of the most active and successful geotechnical research centres in Australia: the Centre for Geotechnical and Materials Modelling (Newcastle), the Centre for Geomechanics and Railway Engineering (Wollongong), and the Centre for Offshore Foundation Systems (Western Australia).

The Centre of Geomechanics and Railway Engineering at the University of Wollongong focuses on large- scale laboratory experiments and advanced computational methods in Geotechnical engineering, and for the first time in Australia the Centre will combine experimental and numerical researchers into a cohesive national team. Their combined strengths will generate a powerful capability for understanding the fundamentals of, and applying Geomechanics to, engineering practice. Researchers from the University of Wollongong will lead exciting projects in the fields of transport infrastructure and ground improvement.

This will lead to many new opportunities for research students at the international leading edge of Geotechnical Engineering. The Centre is developing a major outreach program to bring this exciting field to the public.

For more information: http://www.uow.edu.au/eng/research/geotechnical/index.html

AUSTRALIAN POWER QUALITY & RELIABILITY CENTRE (APQRC)

Leader: Professor Sarath Perera

The objective of the APQRC is to work in conjunction with industry to improve the quality and reliability of the electricity supply for the benefit of all consumers. This objective is achieved through research activities in the areas of distribution and transmission system power quality, reliability and renewable energy systems.

Research Group Projects:

- Power quality surveying methodologies, data compression, analysis, reporting and data mining.
- Power system harmonics, voltage fluctuations and flicker and voltage unbalance.
- Power quality emission assessment.
- Equipment immunity to power quality disturbances.
- Impact of distributed generation and renewable energy sources on power quality.
- Distribution system reliability improvement.
- Modelling of renewable energy generation systems.
- Distributed generation integration with electricity networks and energy storage.

For more information: http://www.elec.uow.edu.au/apqrc/

AUTO COOPERATIVE RESEARCH CENTRE

Leader: Professor Shi Xue Dou

Automotive Australia 2020 CRC has the overarching aim of assisting the Australian automotive industry to improve its global competitiveness through the development of new technologies and capability sought by Australian and overseas vehicle producers. Researchers from University of Wollongong headed by Professor Shi Xue Dou are leaders in the Vehicles Electrification Program. The program is designed to position the Australian industry in key elements of the global trend towards electric vehicles. In this effort, University of Wollongong has partnered with colleagues from Swinburne University of Technology, University of Technology Sydney and a few Australian and international industry partners, such as Redarc Ltd, Malaysian Automotive Institute, and Baosteel Company. The scope of the research is to advance knowledge and technology in several key areas, such as battery materials, electrolytes, catalysts, battery management systems and safety, and efficient energy recovery in light and heavy vehicles.

Key Research Programs Include:

- Lithium-Air Batteries for Electric Vehicle.
- Development of Advanced Electrodes and Electrolytes for Lithium Ion Batteries.
- Design and Prototyping of an on-Vehicle Battery Management System.
- Development of Battery Charge, Mechanical and Thermal Management Systems.
- Development of Advanced Battery Module Packing Technology.
- Efficient Energy Recovery in Light and Heavy Vehicles using Thermoelectric Materials and Modules.

For more information: http://www.autocrc.com

DEFENCE MATERIALS TECHNOLOGY CENTRE

Leader: Dr Stephen Van Duin

The Defence Materials Technology Centre (DMTC) is a multi-partner collaborative research centre aimed at providing the defence industry with materials and manufacturing solutions to enhance Australia's defence capabilities. A research node of DMTC was established at UOW and is conducting research into materials and production techniques associated with the fabrication of land, marine, aerospace, and personnel survivability platforms.

Welding and joining play a key role in the fabrication of all defence platforms and in an attempt to progressively improve performance, capability, and availability; it is likely that new challenges will arise in joining technology, particularly with the higher strength materials and lighter weight structures that can be used. As the strength of these materials increases, weldability issues can dictate whether fabrication is feasible and what procedural constraints will be imposed. In addition, the requirement for improved productivity and sustainable manufacturing in Australia mean that advanced welding processes and automated manufacturing technologies must be evaluated.

Researchers at UOW are also developing new functional and structural materials. These range from high performance ceramics for more powerful sonar devices, to higher strength steels for the next generation of Australian naval vessels. This research underpins a stronger in-country supply chain and better operational capability for future defence acquisitions.

Selected DMTC Research Projects include:

- Weldability and subsequent performance of high strength structural steels for naval ships.
- Weldability and performance of existing and alternative armour materials for protective land based personnel vehicles.
- Development of high strength hull steels for submarines.
- Advanced automated welding processes and monitoring for improved productivity.
- Lean additive manufacturing using GTAW robotic deposition of titanium aerospace components.
- Lean automation and rapid robotic programming for land and marine platforms.
- Single crystal piezoelectric ceramics for high performance sonar.

For more information: http://dmtc.com.au/

AUSTRALIAN RESEARCH COUNCIL RESEARCH HUB FOR AUSTRALIAN STEEL MANUFACTURING

Leader: Mr Oscar Gregory

The Steel Research Hub will be the centrepiece for collaborative steel research in Australia, striving to deliver breakthrough product and process innovations that will enable the Australian steel industry to compete on a global stage.

With cash funding of $12M over five years and led by the University of Wollongong (UOW), the Hub brings together key industry partner BlueScope and five other industry partners, and leading universities in Queensland, NSW and Victoria to drive its collaborative, cross-disciplinary research program.

We have projects in the following four programs:

- Managing Innovation In The Steel Industry: Involving researchers from UOW and BlueScope, this is an overarching research program which focuses on elucidating and reducing the risks to successful commercialisation of key process and product innovations.
- Market-Focused Product Innovation: This program, involving Cox Architecture, Bisalloy Steels, BlueScope and Lysaght, and researchers from UOW, RMIT and Swinburne, will develop improved high strength hot rolled products in particular, plate steel for Bisalloy will design "self-cleaning" coated steel and will explore innovative uses of steel in multi-storey buildings.
- Innovative Coating Technologies: In this program, researchers at UOW, the University of Queensland and RMIT will work with BlueScope on the fundamentals of coating technology to stabilise manufacturing processes.
- Sustainable Steel Manufacturing: With foci on both economic and environmental sustainability, this program draws researchers from UOW, UQ and the University of Newcastle to work with BlueScope and Arrium (OneSteel) on enhanced productivity and flexibility of raw material usage in steelmaking, lower greenhouse gas emissions and greater recycling of plant waste.

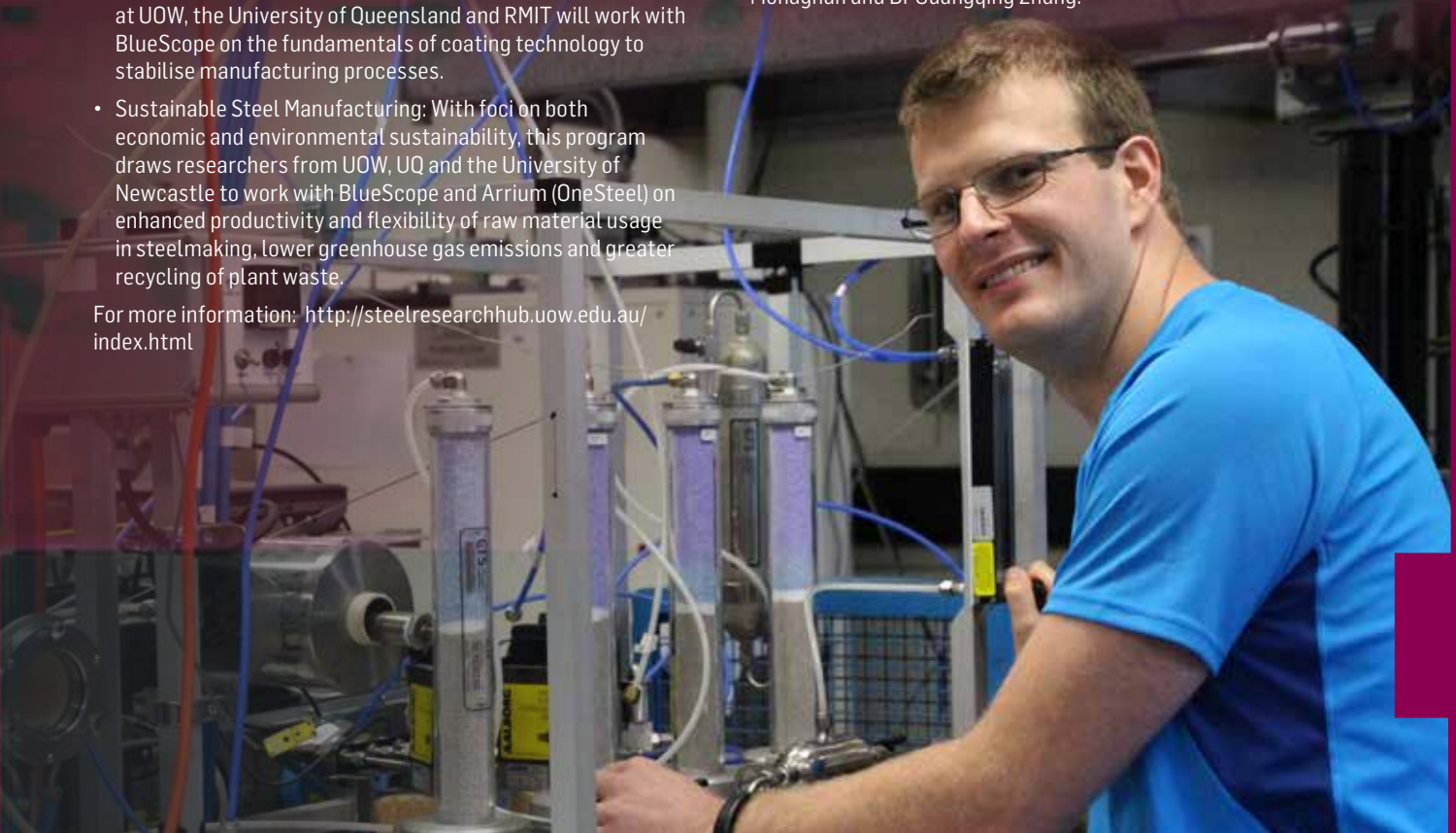
For more information: http://steelresearchhub.uow.edu.au/index.html

PhD Student Profile: Phillip Drain

Phil first came to the University of Wollongong (UOW) in 2006 to study Materials Engineering as part of the BlueScope cadet program. During the 5 years with BlueScope Phil acquired technical and operations experience in blast furnace ironmaking, ore preparation and sintering. This work experience led to Phil researching the topic "Blast furnace hearth refractory and coke ash mineral interactions" for his honours in 2010. Phil was awarded the Australasian institute of Mining and Metallurgy G.B O'Malley Medal (2011) and the UoW MM Metals Prize (2010) for this project.

In 2011 Phil accepted a process engineering role with BHP Billiton Worsley Alumina and continued this research on kinetics of blast furnace hearth refractory and coke ash reactions part time completing this in 2013. Phil's roles with Worsley Alumina included lead commissioning engineer for Calciner 6, production execution coordinator, process engineering and acting various technical and production superintendent roles over the period 2011-2014.

In late 2014 Phil won a PhD scholarship through the new Steel Research Hub based at the University of Wollongong. Phil's research project on "The Effect of Ti on the kinetics of phosphorus removal during BOS Steelmaking" is funded by BlueScope, Arrium and the Australian Research Council. Phil's current research started in February 2015 under the supervision of Professor Brian Monaghan and Dr Guangqing Zhang.



RESEARCH LABORATORIES AND FACILITIES

The Faculty of Engineering and Information Sciences research is supported by well-equipped laboratories and workshops and a highly skilled team of professional staff.

The use of resources by external collaborators from industry is encouraged and enquiries are welcome.

Special facilities include:

- 100 kW, 3000rpm, 1000Nm 4-quadrant dynamic dynamometer
- 100 pF, 100 kV standard capacitor and 1000:1 voltage divider
- 100kN 8801 Axial Servohydrolic Dynamic Testing system (Tensile, bending, fatigue, CTOD)
- 100kN INSTRON universal testing machine
- 10kW gyrotron for microwave processing
- 2D Experimental Pneumatic motion stage with Festo compressor
- 350 MHz Oscilloscope with probes to measure 150 A & 1kV
- 3D laser scanning microscope system
- 3D Magnetic manipulation/levitation system
- 3D printing systems
- 3D Scanner
- 3kW diode laser
- 3M EVM series portable air quality logging systems (incl. Particulates, VOC, COx , NOx)
- 4.5 kW Chroma Electronic Loads
- 5 kW Terra Solar Array Simulators
- 5000kN Avery compression machine
- 500kN INSTRON universal testing machine
- Adsorption and desorption equipment for mine gas research
- Advanced computer controlled welding systems
- Agilent ICP-OES 710
- Agilent Technologies E4980A Precision LCR Meter, 20 Hz to 2 MHz
- Aim & TTi 1604 digital multimeter
- Amedeo Hand Arm Rehabilitation robot
- Anton Paar Zeta Potential Analyser
- Arching and flow rate indicizers
- Atomic force microscope
- Aurora Scientific force sensor 300C
- Back pressure shear box apparatus
- Ball milling machine
- Biogas meter 5000
- Bruel & Kjaer Sound Intensity measurement system (2270-G4)
- Cable bolt tensioner
- California instruments 30 kVA programmable arbitrary waveform generator
- Carbon and sulfur analysis
- CETR Pin on disc wear tester for high temperature testing
- CH Instrument electrochemical testing station CH604
- Characterisation facilities for semi-conductor and scintillator based radiation detectors
- Chemo-mechanical synthesis equipment
- Clean room for semi-conductor radiation detector assembly and investigation
- CO_2 laser engraving system (lab 6.225)
- CO-CO_2 infrared gas analyser
- CO-CO_2-CH_4 infrared gas analyser
- Compression testing machines (10, 50, 500, 900 and 5000 kN capacity)
- Computer cluster for Monte Carlo radiation transport simulations (GEANT, EGS, Beam, Pinnacle, MCNP)
- CSM Scratch tester, model: Revetest Xpress, 0-200N
- Cube 3D printers
- Cyclic filtration apparatus (240mm in diameter)
- Cyclic simple shear apparatus
- DARwIn-OP Humanoid Robot
- Data Taker DT80, DT85M and DT800 Stand Alone data loggers
- Desk-top servo-press DT-3AW micro manufacturing system
- Dielectric Elastomer actuation and testing system
- Differential scanning calorimetry –DSC, Perkin Elmer
- Digital Instruments Dimension 3000 Atomic Force Microscope
- Dilatometor
- DOF motion table
- Dryer oven 150 °C
- dSPACE data logger DS1104
- Dual mode lever arm force measurement system
- Dustiness testing via AS4156 and I.S. EN15051
- Dynamic/impact testing and calibration of bulk materials for DEM simulation modelling
- E-corder 410 DAQ and analysis system
- E-corder 821 DAQ and analysis system
- High temperature furnaces up to 1800°C, four of which have controlled atmosphere
- Electric discharge assisted mechanical milling
- Electrochemical polymer deposition system
- Electron back scattering diffraction unit
- Electron beam evaporation facility with XPS, auger, x-ray modules
- Electronic DAQ system designed laboratory for medical devices (fast picoseconds resolution VCR, FPGS programming and testing equipment)
- Electrospinning apparatus
- Epoxy laminated infusion system
- Falcon Haptic device

- Fast and slow gas desorption apparatus
- Field emission gun scanning electron microscope with EDXS and EBSD
- Filtered arc deposition system
- Flexible rolling mill
- Fluorescent microscope
- Forward osmosis systems
- Four lab scale reverse osmosis systems
- Friction stir welding system
- Full scaled quarter car test platform
- Fully instrumented 750J Charpy impact tester
- Function generators
- Gas chromatograph for gas analysis
- GBC X-Ray diffraction machine -angle setup (1.G08)
- GDS controlled tri-axial apparatus
- GDS cyclic process simulation apparatus
- Glass-bell carbon coater by arc plasma
- GLEEBLE thermo-mechanical simulator
- GPS Differential data logger
- Graphite furnace heating up to 2000 °C for reducing atmosphere/vacuum
- GW Instek DC power supply GPC-3030D
- GW Instek Oscilloscope GDS-2104
- Hardness testing
- Helmholtz coils
- High DC power (600V)
- High heating rate TGA
- High magnetic field materials processing and characterisation system
- High Pressure Tri-axial Apparatus
- High resolution SEM/EBL system
- High Resolution Thermographic Camera (640x480 and 320x240) with video capture function.
- High speed video and cine cameras
- High temperature roller on disc friction and wear test rig
- High temperature sessile drop measurement equipment
- High-speed high-voltage power amplifier - TREK model 10/10B-HS
- High-temperature laser-scanning confocal microscope
- Hille 100 and 25 experimental rolling mills
- Horizontal and vertical tube furnaces heating to 1600 °C
- Horizontal furnace heating to 1200 °C
- Horizontal vibration table
- Hydraulic Instron mechanical properties testing station with heating (tensile, bending, and fatigue)
- Hydro system
- ICP-OES Spectrometer for chemical analysis
- Impulse plasma sintering press
- Innovative mini rolling rig
- Innovative water generating system
- Instrumented Charpy V Noch Testing machine
- JOEL 6000 Bench top SEM
- Keyence VHX-1000 digital microscope

RESEARCH LABORATORIES AND FACILITIES continued

- Lab scale ion exchange columns
- LABEC large capacity furnace
- Lakeshore Gaussmeter (460 3-channel)
- Large capacity drop hammer machines - unique
- Large sample TGA
- Large scale CNS direct shear test machine
- Large scale consolidatometer (650 mm in diameter for soft soil testing)
- Large scale cyclic prismoidal tri-axial rig with unrestrained sides (600x600x800 mm)
- Large scale cylindrical tri-axial apparatus with dynamic actuator (300 mm in diameter)
- Large-scale direct shear tester with variable shear rate and displacement
- Laser displacement measurement system
- Laser micromachining system –ALPHA Series Ultra-compact Micro-machining System, Oxford Lasers
- Latest robotic and automation systems
- Leica DMR Optical microscope with digital camera system
- Low-load tensile testers
- Lubricant emulsion machine
- Magnetic ball mills
- Magnetic properties and physical properties measurement systems (MPMS and PPMS)
- Major analytical instruments
- Mechanical testing
- Membrane bioreactor systems
- Membrane distillation systems
- Metal hot press machine
- MFT-5000 multi-functional high temperature tribometer
- Micro cross wedge rolling mill
- Micro tensile testing machine
- Micro-Epsilon laser displacement sensors optoNCD1700
- Micron
- Mini centrifuge (12, 1.5 mL)
- MLU-1064FS-P01 micro laser soldering system
- MTS
- MTw Development Kit (10 sensors) Wireless motion trackers set
- Muffle furnace with tube furnace capability, heating to 1200 °C
- Muffle furnaces heating to 1200°C
- Multi-function Outburst Research Rig for mine gas research
- Multi-zone furnace
- MVN BIOMECH 3D Motion suit for Human Kinematics
- Nanoindenter+AFM
- Netzch Heat Flow Meter (300 mm x 300 mm Sample size)
- Nikon-Joel NeoScopeII Bench top SEM with EDS
- Nuclear spectroscopy shielded room for radiation detector investigation
- Oculus VR Head Mounted Display
- Omni Haptic device
- Optical microscopes with digital camera and touchpad
- Optical microscopy and metallography
- Overhead drill rig for short encapsulation pull testing of bolts and cable bolts
- Ozonation system
- Panalytical X'pert X-Ray diffraction machine, axes, in situ protective heating
- Parallel anaerobic digesters (28 L each)
- Parallel pilot scale anaerobic digesters
- Particle and bulk material characterisation, including laser diffraction particle size analyser
- Personal dust samples for mine environment control
- PET computer control gantry for relocating different designed PET detector modules
- Phantom design and fabrication laboratory (mechanical machinery tools, Autocad station)
- Pilot scale equipment
- Pilot scale membrane bioreactor
- Pilot scale membrane distillation rig
- Pilot scale reverse osmosis rig
- Pilot scale screw conveyor rig for biosolids handling research
- Pin-on-drum abrasive wear tester
- Plasma cleaner
- Plasma nitriding system
- Plenary ball mill
- PMM 7000 EMI pre-compliance receiver and PMM L3-64 three-phase 64 A artificial mains network
- Portable weather stations
- Power Amplifiers (Sinocera YE5873H, YE5872H)
- Power loggers for distribution boards capable of simultaneous measurement of up to 30 single phase loads
- Power quality analysers including Hioki 3198 Power Quality Analysers, Dranetz-BMI Power Xplorer PX5 and Elspec G4500 BLACKBOX Portable Power Quality Analyser
- Precision balance for measuring dust and gas mass down to one micron
- Projet 3510 HDPlus
- Rame Hart Goniometer
- Refractory testing
- Retrotecc High Capacity Blower Door systems for building air permeability testing
- Rheometer
- Ring shear apparatus
- Robotis Bioloid; Humanoid robot frame

(and associated motor kits)

- Rock bolting single and double shear testing apparatus
- Rock cable bolting load cells, 30 t, 60,
- Rock core drilling equipment
- Rock core end cutting machine
- Rock core end lapping machines
- Roll pair cross and shifting rolling mill
- Roofing test Rig (3x3m area capacity, adjustable azimuth & elevation, integral meteorological sensors)
- Room temperature magnetic stirrer
- Sequencing batch reactor coupled with sludge digestion
- Setaram uSC microcalorimeter
- Shimadzu GC-MS
- Shimadzu HPLC
- Shimadzu IC
- Shimadzu LC-MS
- Shimadzu TOC/TN analyser
- Shimadzu UV Spectrophotometer
- Simulation research hub comprising 8- and 12-core workstations
- Slew bearing condition monitoring test rig
- Small scaled 3-stories building
- Specialised experimental systems
- Spin coater
- Static/cyclic tri-axial apparatus
- Stereomicroscope Nikon SMZ1000
- Struers automatic metallography grinding and polishing system
- Struers metallography sample hot mounting system (150 °C)
- t and 100 t capacity Table drill
- Tektronix PA4000 Power Analyser
- Temperature controlled magnetic stirrer
- Terahertz facility
- Testso 480 Loggers equipped with probes for Indoor Environment Quality & HVAC Measurement
- Texture goniometer
- TF1400 controlled atmosphere furnace
- Thermal analysis suite (DSC, dilatometry, DTA)
- Thermal testing water supplies (16k W thermal capacity, controlled flow, measured flow pressure and temperature)
- Thorlabs optical table (PTM51508, PTP603) and instruments
- TIG Additive manufacturing facility
- Treatment Planning Systems for Radiation Therapy (Pinnacle, Eclipse and HDR brachytherapy)
- TSI Flow Hoods for HVAC balancing
- Tube furnace
- Ultra high vacuum pulsed laser deposition (UHV-PLD) system
- Ultra-fast strip cooling system
- Ultrasonic cleaner
- Ultrasound bath
- Ultra-thin strip asymmetrical rolling mill
- Unsaturated tri-axial apparatus
- UV radiation system
- Vacuum oven
- Vacuum temperature controlled desiccator
- Velleman K8200 3D printer
- Vickers hardness testers
- Virtuix Omni Directional Treadmill
- VU Spectrometer
- Wear testing machines
- Welding fume measurement system
- X-ray diffraction

Electron Microscsopy Centre

- Scanning Transmission Electron Microscopes (STEM)
- A probe corrected JEOL JEM-ARM200F STEM with a Cold Field Emission Gun, Centurio SDD detector and Gatan Quantum 963 SE imaging filter
- JEOL JEM-2011 LaB6 conventional STEM with JED 2300 EDS detector and Lorentz lenses
- Scanning Electron Microscopes (SEM)
- JEOL JSM-7001F analytical thermal field emission gun SEM with EDS and EBSD detectors
- JEOL JSM-7500FA cold field emission gun – SEM with EDS detector and transmission stage
- JEOL JSM-6490LA tungsten filament, variable pressure SEM with EDS and CL detectors
- Optical microscopes
- Leica DM 2500M upright microscope
- Leica DM 6000M upright microscope
- Leica M 205A upright stereo microscope
- Two fully equipped samples preparation laboratories
- Data processing laboratory

Please note the following equipment is located at collaborating hospitals

- Modern radiation oncology modalities:
- LINAC
- Brachytherapy equipment
- CT scanners
- PET
- MRI

RESEARCH DEGREES

Students may undertake the following Degrees

Doctor of Philosophy

Duration: 4 Years Full-Time (or Part-time equivalent)

The PhD is an internationally recognised qualification for postgraduate research of the highest standard.

Applicants should have completed a Master degree or a Bachelor degree with first or second class honours. The research programme typically takes 4 years of full time study, and includes a major thesis describing the original research of the candidate which is then presented to a panel of examiners of international standing.

Doctor of Philosophy (Integrated)

Duration: 4 Years Full-Time (or Part-time equivalent)

The PhD (Integrated) integrates a traditional PhD thesis with one year of coursework, comprising generic research training and discipline specific content into a single degree.

The coursework provides candidates with the opportunity to develop their research skills while allowing additional time to develop a detailed research topic. This provides greater certainty and better outcomes in the thesis.

The PhD Integrated is ideal for applicants who aspire to graduate with a PhD and who:

- want a flexible programme which includes a selection of 'taught' subjects included in a specific discipline area of their interest;
- need further time and to develop a detailed research proposal; or
- need to develop their research training skills in order to demonstrate their capacity to undertake a major research thesis.

Master of Philosophy– Research

Duration 2 years Full-Time (or Part-time equivalent)

This degree is intended for those who wish to extend their knowledge in a chosen discipline. Some coursework may be undertaken to strengthen their knowledge in the chosen topic and candidates must submit a thesis that contains significant advanced study.

Applicants should have a Bachelor degree with Honours or equivalent to enter this program.

Professional Development

Under appropriate circumstances, some research may be undertaken in industrial or other laboratories. In such circumstances students may have an industrial supervisor and a University supervisor. Some attendance at the University is required including participation in research seminars and discussion. Interested candidates should enquire for further details.

A feature of postgraduate research training in the Faculty is personal development in a range of skills that make graduates more effective when they are employed, after completing their degrees. HDR students are also encouraged to attend faculty- based and centrally-funded research seminars and workshops covering a range of generic and discipline- based research skills and professional development needs.

Postgraduate Coursework Degrees

Duration 1 and 2 year program.

For many decades, the Faculty of Engineering and Information Sciences has developed postgraduate coursework degrees in the areas of: Computer Science and Information Technology; Engineering Asset Management; Rolling Stock Engineering; Electrical Power Engineering; Electrical Traction Networks; Materials, Mechatronic, Mechanical, Civil, Mining, Environmental, Computer, Electrical and Telecommunications Engineering; Mathematics and Applied Statistics; Medical and Radiation Physics, and Applied Physics.

The Faculty is one of the largest sites of ICT research and equipped with well-designed laboratories, practical implementation of skills and an emphasis on innovation to ensure graduates have the expertise to meet modern engineering, mathematics, physics and ICT challenges. Coursework programs are flexible, with many subjects offered at times convenient to people in full-time employment.

We offer part-time Master degrees via distance education in Engineering Asset Management, Electrical Power Engineering, Electrical Traction Networks and Rolling Stock Engineering for the busy professional engineer working in industry.

Wollongong has a distinguished research reputation, particularly in collaboration with industry, both in Australia and internationally. This world-class research has led to the creation of a number of Centres of Excellence, which has attracted a critical mass of researchers engaged in significant, well-funded projects with superior equipment infrastructure.

These programs provide training in research and also give greater depth of understanding in specialist areas of the above disciplines. They may involve a combination of research dissertation and coursework subjects which are chosen from the relevant specialisations.

Admissions

All applications for Research degrees are made via the web. To apply please proceed http://www.uow.edu.au/future/index.html applicants may nominate an agent as their representative but their representative must still submit an online application.

Language Competency

All classes are conducted in English; therefore non-native English speakers must demonstrate competence in the language by presenting the results of one of the following tests.

Doctor of Philosophy and Master of Philosophy

- with IELTS (International English Language Testing System) for a minimum score of 6.5 overall and minimum 6 in all bands (reading, writing, listening, and speaking);
- TOEFL (Test of English as a Foreign Language) with 88 (internet based examination) with not less than 18 in writing; 18 in reading; 18 in listening and 18 in speaking;
- Wollongong College Australia, English for Tertiary Studies (ETS) score of 65%.

Doctor of Philosophy Integrated

- with IELTS (International English Language Testing System) for a minimum score of 6.0 overall and minimum 6.0 in all bands (reading, writing, listening, and speaking);
- TOEFL (Test of English as a Foreign Language) with 79 (internet based examination) with not less than 18 in writing; 18 in reading; 18 in listening and 18 in speaking;
- Wollongong College Australia, English for Tertiary Studies (ETS) Pass (weighted average mark of 50 and at least 50 in each subject.

Master of Engineering or Information Sciences (coursework)

- with IELTS (International English Language Testing System) for a minimum score of 6.0 overall and minimum 6 in all bands (reading, writing, listening, and speaking);
- TOEFL (Test of English as a Foreign Language) with 79 (internet based examination) with not less than 18 in writing; 18 in reading; 18 in listening and 18 in speaking;
- Wollongong College Australia, English for Tertiary Studies (ETS) score of 50%.

Students who have completed two years study in an English speaking country over the previous 4 years do not need English requirements.

Students may apply to complete the English requirement at the University of Wollongong College, information available at http://www.uowcollege.edu.au/ Scholarships:

Generous University and Government scholarships are available for research based postgraduate programs in the Faculty of Engineering and Information Sciences at the University of Wollongong. Information and application procedures can be found at the following website: http://www.uow.edu.au/future/index.html

Scholarships

The University of Wollongong offers a wide range of research scholarships and awards to eligible Domestic and International Higher Degree Research students. The UOW HDR scholarships are in the form of allowances to assist candidates in meeting their living costs while they undertake their research. They can include: Annual Stipends, Living Allowances and Tuition Fee costs.

For more information: http://www.uow.edu.au/research/rsc/prospective/index.html

Working with Industry

The University of Wollongong's Faculty of Engineering and Information Sciences is committed to strong links with industry that deliver mutually beneficial and innovative outcomes.

Companies and organisations from around the world have made substantial investments in the Faculty by sponsoring research, licensing technologies, supporting students through scholarships, providing industry projects for student research, guest lecturing and so much more.

Partnerships with industry help modernise teaching and learning by fostering an exchange of ideas and developing people with the skills and competencies needed as new innovations transform markets and industries.

It is our goal to enhance and build strategic partnerships between the Faculty and industry to deliver real-world solutions.

Benefits to Industry

Industry engagement helps companies advance their research and development efforts by connecting with the University of Wollongong's ground-breaking research activities. Industry partners can:

- leverage up to four times their cash contribution in commonwealth funds;
- develop links with one of Australia's leading research universities through direct collaboration;
- access opportunities to recruit our high-performing students;
- access research and development tax concessions.

Benefits to the University and Students

Our valuable partnerships with industry help drive the Faculty's research excellence and deliver solutions to current industry challenges.

These partnerships provide:

- opportunities for current students to engage with real-world problems and develop their employability skills;
- synergies that improve knowledge transfer between theory and application-based research;
- support to ensure that our infrastructure, laboratories, equipment, and industry capability remain up-to-date and relevant to industry's needs;
- an interface between staff and industry ensuring that staff, and therefore their expertise and teaching, are enriched by current industry practice.

COMMISSION AND COLLABORATIVE RESEARCH

Commissioned Research

Our Innovation and Commercial Research Team delivers engagement with the University researchers through the facilitation of strong and positive relationships with government bodies, the commercial realm, industry, communities and our academic research facilities.

Website: http://www.uow.edu.au/research/icr/commresearch/index.html

Contact: Bruce Thomson
Email: brucet@uow.edu.au
Phone: 61-2-4221 4486

Collaborative Research Projects Through ARC Linkage Programs

The Australian Research Council (ARC) projects scheme provides support for collaborative research and development projects between higher education organisations and industry that aim to acquire new knowledge through innovation. For eligible projects the Council will award grants in the range of $50,000 to $300,000 per annum. As a minimum, the industry partner's cash contribution is 20% of the total budget.

website: http://www.arc.gov.au/ncgp/lp/lp_default.htm

Sponsoring Scholarships, Prizes and Events

There are a number of ways that your business or organisation can make a difference to students and the university by:

Assisting our students - provide benefits for students in need of financial support Engaging with our community - support opportunities for the community to link with the university.

Access motivated and high performing students by sponsoring:

- prizes and awards for best in subject or best final-year project;
- corporate Scholarships are industry-specific scholarships that raise the profile of an industry partner with our talented pool of students;
- work Integrated Learning Scholarships that include an ongoing placement over summer or winter break, or a one to three-day placement during the academic session;
- events and activities that are targeted at encouraging more primary and secondary students to take STEM (Science, Technology, Engineering and Math) subjects at school.

Continuing Education for Staff

Degrees for Industry Professionals and Continuing Professional Development (CPD) Short Courses We offer interdisciplinary, career-oriented courses enhanced by strong industry links to support the rapid development and evolving needs of industry.

Industry Relevance

These postgraduate industry courses maintain a firm focus on the current and future needs of industry and continuing education for engineers in the workforce. Our teaching is backed by leading research and industry experts exploring real-world problems in the fields of engineering asset management, electrical power engineering, electrical traction networks, rolling stock engineering, energy efficiency and bulk materials handling.

Career Development

Whether you want to qualify for a new profession, develop further in your current role or change careers altogether, our specialised postgraduate engineering programs can help you to gain a competitive edge in your professional and personal development. UOW can also deliver these courses as part of a corporate training package and expressions of interest are welcome.

Postgraduate Courses

- Rolling Stock Engineering
- Engineering Asset Management
- Electrical Power Engineering

Short Courses

- Bulk Materials
- Grid Connected Renewable & Distributed Generation

Website: http://eis.uow.edu.au/industry-and-partnerships/index.html

Contact: Rachel Weine
Email: rweine@uow.edu.au
Phone: 61-2-4221 4566

AWARDS AND ACHIEVEMENTS

Established in 1951, the University of Wollongong (UOW) has been recognised by Federal and State Governments and by independent analysts as being at the pinnacle of higher education in Australia. Throughout our 60 year history, we have built an international reputation for world-class research and exceptional teaching quality. In fact, 2013 was the sixth year in a row that employers ranked our graduates as some of the most career-ready in the world. We are in the top 2 per cent of universities world-wide and we are aiming higher every day. Here is a cross section of awards and achievements bestowed on UOW.

Top 2% of universities in the world

- 283rd in the world – QS World University Rankings 2014/2015
- 282nd in the world – Times Higher Education World University Rankings 2014/2015
- 329th in the world – Academic Ranking of World Universities (ARWU) 2014
- 314th in the world for research quality - 2014 Leiden Ranking
- Globally ranked as one of Australia's best modern universities
- 26th in the world – QS Top 50 Under 50 Rankings 2014
- 33rd in the world – Times Higher Education Top 100 Under 50 Rankings 2014
- Globally rated a five-star university
- 5 Star rating – QS World University Rankings 2014
- 5 Star rating in the 2015 Good Universities Guide for Student Retention and Getting a Full-Time Job

Top 100 in the world for global graduates

- 8th year in a row that employers have ranked our graduates in the top 100 universities in the world – QS World University Rankings Graduate Employers Survey 2013/14
- Top tier rankings in every discipline
- Top tier rankings in every discipline category – Australian Government's Learning and Teaching Performance Fund 2008

Recognised For Education And Training

- Winner of the national Education and Training Award at the Premier's NSW Export Awards 2013.

Excellence in Research

The Australian Research Council - Excellence in Research for Australia (ERA) ranked Interdisciplinary Engineering in the Faculty of Engineering and Information Sciences as "well above world standard" which reflects the Faculty's strong multidisciplinary approach.

Engineering also received "above world standard performance" for the following areas:

Condensed Matter Physics, Other Physical Sciences (Medical Radiation Physics), Civil, Manufacturing, Materials and Mechanical Engineering.

General Enquiries

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Web: eis.uow.edu.au

Research Student Enquiries

Uniadvice

Tel: 1300 367 869 Australia
Tel: + 61 2 4221 3218 International

Email: uniadvice@uow.edu.au

University of Wollongong NSW 2522 Australia
Web: http://www.uow.edu.au

This brochure has been prepared by the University of Wollongong (UOW) for the purpose of providing industry, university partners and potential postgraduate students with research and admissions information.

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