UNSW AUSTRALIA

School of Civil and Environmental Engineering **Annual Report 2015**

Never Stand Still | Engineering | Civil and Environmental Engineering



No 1 in Australia

"Our research and teaching delivers not just the latest development in engineering models and methods, but those that will be utilised by our next generation of leaders."

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UNSW AUSTRALIA 2052

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ABOUT US

The UNSW School of Civil & Environmental Engineering is ranked as Number 1 in Australia and in the world's top 20 (QS World University Rankings 2014-6).

We are the largest School in the UNSW Faculty of Engineering, itself the pre-eminent centre for engineering studies and research in Australia, and the first University of choice for NSW's top students. From our foundation in 1949, the School has pursued excellence and innovation in education and research, and our alumni are to be found as leaders and decision makers in industry, government and the community.

With over 2,600 current students, we play a leading role in the delivery of undergraduate and postgraduate degree programs – with a focus on sustainability as well as core engineering knowledge, preparing our students to confidently face the challenges of contemporary global society. We believe that civil and environmental engineers are uniquely placed to understand, meet and solve those challenges.

The School is at the forefront of fundamental and applied research across the breadth of civil and environmental engineering with three internationally acclaimed research centres – in infrastructure (CIES), water (WRC) and transport (rCITI) and with several other vibrant, cutting-edge research hubs. Our academic staff are recognised world leaders in their fields, supported by over 75 full time researchers.

Each year we work with or on behalf of over 100 industry and government organisations on specific industry related projects and have won millions of dollars in federal funds in order to pursue investigations into issues of national importance.

We continue to forge new links with industry and community partners to ensure a continuing real-world focus for both our teaching and our research.

MESSAGE FROM HOS

Dear Friends and Colleagues

This Annual Report marks yet another great year of achievement for our School.

In 2015 there continued to be strong demand for all our teaching and research programs, with our student enrolments sizable by both national and international norms. We actively promote a culture of teaching excellence, and so I was especially delighted when three staff members were awarded UNSW Vice-Chancellor's Awards for Teaching Excellence in 2015, for the fourth year course Planning Sustainable Infrastructure. This ground breaking course also won the 2015 Australasian Association for Engineering Education Award for Excellence in Engineering Education Engagement.

The School continues to provide one of the largest global research contributions to Civil, Environmental and Geospatial Engineering knowledge and practice– with staff working within eight research centres and hubs. In the highly anticipated biennial round of research ranking by the Australian Government, the School received the highest possible five point ranking in Excellence for Research in Australia (ERA) 2015 – confirming our 'outstanding performance well above world standard.'

In 2015 the School won almost $5 million in highly sought after ARC grants – a record fourteen grants in total. In fact, almost half of our academic staff were recipients of major research grants – a testament to our collective focus on high impact, socially useful and innovative research.

As engineers we see it as vital that our research impacts both within the framework of our teaching and with delivery of quality outcomes to the community and industry. The School is not just a witness to the industry, it is a force that helps shape the industry. I am proud of the sheer breadth of our engagement with industry through our research and teaching activities, our industry partner program, and industry advisory committee (IAC). I am equally grateful for the support industry has shown us through the funding of academic and /or research positions (in particular Advisian, Ansto & PSM); provision of scholarships, sound advice through the IAC, and engagement with our students.

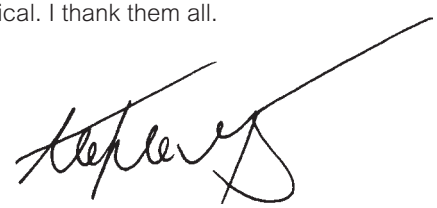


In 2015 I continued to work closely with our hard working and lively student organisations CEVSOC and SURVSOC, helping them to strategize and organise – to become more than social clubs. CEVSOC activities now generate not just a sense of belonging and community, but turn students into mentors and leaders confident enough to communicate with industry leaders.

In 2015 we also worked with the Faculty's Women in Engineering Development team and WiE student society as we all seek to address the profession's gender imbalance. In 2015, 22% of our undergraduates were women – with a record number of 392 enrolled – not yet equal by any means but perhaps approaching critical mass.

Meanwhile our alumni won top awards – six of our alumni were listed in 2015 Engineers Australia Top 100 . We congratulate William Cox, Dr Mehreen Faruqi, A/Prof Stuart Khan, Grant King, Dave Stewart and Em Prof Elizabeth Taylor.

I am delighted that the QS International Ranking system has recognised the enormous efforts and achievements of this School in continuing to rank us as Number One in Australia and in the world's top twenty. A strong and successful School does not happen without the efforts of all its staff; academic, research, professional and technical. I thank them all.



Stephen J Foster, Head of School

SCHOOL MANAGEMENT COMMITTEE



L- R back (standing) Ian Turner, Richard Stuetz, Stefan Felder, Nasser Khalili, Chris Rizos,
L-R sitting: Chongmin Song, Brian Uy, Kurt Douglas, David Carmichael, Stephen Foster (HoS), Anthony Dever
Absent: Martin Andersen, Mario Attard, Ron Cox, Steven Davis, Linlin Ge, Kristy Guia, Travis Waller, Betty Wong

The School Management Committee represents the peak decision-making body in the School with all key decisions relating to finances, staffing and overall direction debated and ratified by this group. The SMC is chaired by the Head of School and is made up of the Chairs of the School's major committees, the Associate Head (Academic), the School Business Manager, the Student Centre Manager, the Directors of UNSW Centres based within the School, and other discipline group leaders.

2015 SCHOOL MANAGEMENT COMMITTEE MEMBERS

Chair & Head of School:	Professor Stephen James Foster
Associate Head (Academic):	Associate Professor Mario Attard
Admin:	Betty Wong
Business Manager:	Anthony Dever
Student Centre Manager:	Kristy Guia
School Committee Chairs	
Research Management Committee (RMC):	Professor S Travis Waller
Computing & IT (CIT) and Educational Technology Committee (ETC):	Professor Chongmin Song
Teaching and Learning Committee (TLC):	Dr Steven Davis
External Relations Committee (ERC):	Co-Chairs Associate Professor Ron Cox & Dr Kurt Douglas
International Relations Committee:	Associate Professor Linlin Ge
School Centre Directors	
rCITI:	Professor S Travis Waller
WRC:	Professor Richard Stuetz & Professor Ian Turner
CIES:	Professor Brian Uy
CWI:	Dr Martin Andersen
Discipline Group Leaders:	Professors David Carmichael; Nasser Khalili; Chris Rizos

The School Executive Group is an advisory group to the Head of School. It meets monthly with the Head of School to discuss key and current issues on matters of strategy, planning and policy directions for the School.

2015 School Executive Group Members:
Professor Stephen James Foster, HoS
Associate Professor Mario Attard
Professor David Carmichael
Mr Anthony Dever
Professor Nasser Khalili
Professor Richard Stuetz
Professor Ian Turner
Professor Brian Uy
Professor Travis Waller

The **School Board** is chaired by the Head of School and comprises all academic and research staff in the School, together with student and professional and technical staff representatives. The Board meets twice a year; it provides advice to the Head of School about academic governance arrangements, on the quality of the School's learning and teaching, and on research activities.

It also provides advice to the Head of the School about the School Committee structure. Committee Chairs report to the Board on the outcomes of committee activities, on decisions, and on strategic direction.

The Head of School reports to the Board on the management of the School and related activities and issues and direction.

THE **BIG** PICTURE



School Statistics 2015

Academic Staff	48
Professional & Technical Staff	29
Research Centre Academic Staff	75
2015 Enrolments	
Higher Degree Research Students	214
Postgraduate Coursework Students	618
Undergraduate Students	1813
Equivalent Full Time Students (EFTSUs)	1811
2015 Graduates	
Higher Degree Research Students	29
Postgraduate Coursework Students	285
Undergraduate Students	321
2015 Funding	
ARC Grant Funds awarded in 2015	$4.9M
Total Grant Funding received in 2015	$12.4M
Research Publications	467*
Recurrent Income	$19.3M

*provisional as at March 2016

A KEY ECONOMIC AND SOCIAL SOLUTION



UNSW Vice-Chancellor Ian Jacobs visited the School in April, to learn more at firsthand about the endeavours of one of UNSW's largest Schools – whose activities and aims are already strongly aligned with his own ambitious and visionary ten year strategic plan for UNSW.

The UNSW 2025 Strategy is based on three priorities: academic excellence in research and education; a commitment to social engagement, and achieving global impact. Presentations from the School impressed the V-C with our current work and achievements in all three priority areas.

After an extensive consultation process, Professor Jacobs launched the UNSW 2025 strategy in October "UNSW's ambition for the next decade" he said, "is to be a global leader of change and innovation with an altruistic wish to improve people's lives through academic excellence, social engagement and global impact."

The strategy was supported by new research from a Deloitte Access Economics report *The Economic Contributions of Australia's Research Universities, the UNSW example.* By quantifying the contribution of university research to the economy, the study found that universities play an increasingly important role in driving innovation, productivity and increasing living standards.

The research output of UNSW alone is estimated to have contributed $15 billion to the Australian economy in 2014. The university sector as a whole contributed some $160 billion in knowledge and technology, or about 10% of GDP. This is more than Australia's entire mining sector.

"In pure economic terms, universities are a smart investment,' said Professor Jacobs, 'They are essential for driving innovation, productivity and jobs for the future. Rather than being a funding challenge, universities are a key economic and social solution.'

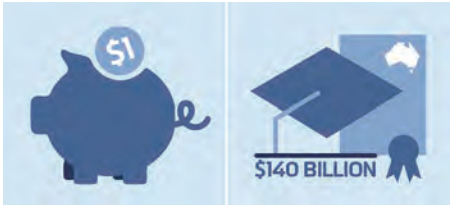
Yet, of course, it is about more than just the dollars. 'A great university, which is a global leader in discovery, innovation, impact, education and thought leadership, can make an enormous difference.' Professor Jacobs said.

We look forward to an exciting decade ahead.
See https://www.2025.unsw.edu.au/

Here's how universities make a difference to the economy



10% of GDP in 2014 was attributed to the impact of university research
$160 billion was generated by knowledge and technology from university research in 2014



Every $1 invested in university research produces a $5-$10 return to the economy
$140 billion is what all university qualified workers in the economy added to GDP in 2014

UNSW Australia's contribution



$1.76 billion was contributed to the Australian economy in 2014 through UNSW's operations, and student and visitor spending
11,700 full-time jobs created by UNSW operations, and student and visitor spending in 2014



$15b added to GDP in 2014 from the impact of UNSW research on knowledge and technology
$204m added to GDP in each year from the UNSW graduating class of 2013 (undergraduate students)

Credit: Deloitte Access Economics Report *The Economic Contributions of Australia's Research Universities*



A REMARKABLE YEAR

In the highly anticipated biennial round of research ranking by the Australian Government's Excellence in Research for Australia (ERA), the School received the highest possible five point ranking in ERA 2015 –confirming our *'outstanding performance well above world standard.'*

ERA identifies and promotes excellence across the full spectrum of research activity in Australia's higher education institutions, and measures the quality of research produced by Australian universities against world standards.

"This result reflects the hard work and energy of all in the School over these past years" said Head of School Professor Stephen Foster, "as well as the excellent research that we do and the respect in which it is held."

In the 2015 QS international Rankings, announced in April, the School was awarded the top place in Australia and no 14 in the world. For the Head of School Professor Stephen Foster this is no cause for complacency - 'We would like to consolidate this year's result going forward and, indeed, continue to move upwards globally. To this end we will continue to develop our research, teaching and engagement strategies.'

UNSW itself has a 5+star ranking with QS, based on its achievements in eight categories: research, teaching,facilities, access & inclusivity, employability, internationalisation, specialist excellence, and innovation.

The School's top ERA ranking followed a year of successful Australian Research Council (ARC) grant applications.

In July 2015 fourteen academic staff involved in seven industry-supported research projects across the spectrum of civil, environmental and geospatial engineering were awarded ARC Linkage funds of $2.23 million. Under the Linkage scheme, industry partners must make a significant cash and/or in-kind contribution to their projects. The collaboration is essential to transforming industries, building communities and strengthening the Australian economy.

School industry linkage partners included Boral Concrete; China Construction Steel Structure Corp. Ltd; China University of Mining And Technology; Jiangsu Crelead Information Technology; Mincarb Pty Ltd; NSW Office of Water; OneSteel Reinforcing P/L; OzHarvest; and Tsinghua University, Beijing.

UNSW itself was once again the highest achieving university in Australia for ARC Linkage with 32 successful projects.

Later in the year, in an equally competitive national field, the School was awarded a hefty $2.65M in ARC Discovery and LIEF Grants. Over twelve academic staff were involved in six Discovery and one LIEF Grant announced by the Minister for Education & Training, Senator Simon Birmingham at the end of October 2015.

For a full description of the School's successful Discovery and Linkage projects please see the Research Section of this report.



AT THE VANGUARD OF A GLOBAL MOVEMENT

In November 2015, global advisory firm Advisian (formerly Evans & Peck) formally expressed its high level of satisfaction with Professor Travis Waller and his team at the Research Centre for Integrated Transport Innovation (rCITI) by signing up to support the Advisian Professor for Transport Innovation Chair into the future.

Advisian Principal Ian McIntyre says the decision to continue to support the position was easy. "In just four short years, Travis and his team have managed to successfully establish a thriving research group from scratch – that's no mean feat!"



Professor Mark Hoffman, Dean of UNSW Engineering, Professor Travis Waller from the Research Centre for Integrated Transport Innovation and Steve Porter, Advisian's Managing Director, Asia Pacific.

The energetic and rapidly growing four-year-old rCITI was established to pursue high level, integrated, interdisciplinary transport solutions and was a joint initiative of UNSW, NICTA (the national ICT lab) and Advisian. A global headhunt for a suitable Centre Director lured the highly esteemed Professor Waller to Australia from his homeland in the United States, and funding from the Australian Research Council and Transport for NSW swiftly followed.

The Centre is at the vanguard of a global movement to more closely align academic research with real-world problems and has formed close partnerships with companies in industry, government agencies and non-profits.

rCITI currently has won more than $5 million in external funding "Our largest sponsor has been Transport for NSW." Professor Waller says. "We have developed a series of analytical tools to help them anticipate and deal with disruptions, and make real-time decisions; like when to change the lanes on the Sydney Harbour Bridge."

Pairing academia with industry is not new, but with the results so often win-win, it is rapidly gaining even more momentum as a global trend. For Advisian, knowledge-sharing is the most beneficial aspect of the collaboration. "Advisian has a proud history of developing innovative and novel approaches to many of our clients' challenges. As such, we're always keen to be involved in activities that can move the 'knowledge frontier' forward," McIntyre says. "With the help of academia, we hope to improve the standard of conversation about transportation and urban planning in government, business, the press and the general public."

Professor Waller is thrilled that the relationship with Advisian continues to flourish and that, with its help, rCITI's research will continue to be used in a highly practical sense. "In my opinion, engineering research is only engineering research if it makes an impact out in the world," he says. "We need to be solving a problem. We need to be tackling some issue. Otherwise what are we doing it for?"



High achievers: some of the WRL Projects Team:: Back L-R: Dan Howe, Mathieu Deiber, Chris Drummond, Brett Miller, Jamie Ruprecht
Front L-R: James Carley; Priom Rahman, Grantley Smith, Doug Anderson, Will Glamore

A MODEL WORTH REPLICATING

WRL's Projects Team – unique, unified & useful

Hailed as a shining example of the kind of research environment he would love to see emulated across the Faculty by the Dean of Engineering Mark Hoffman, the Water Research Laboratory (WRL) has been in the business of solving real-world industry problems for over 50 years.

Central to this success has been WRL's Projects Team.

The 15-person team is headed up by Principal Engineer Grantley Smith who says they are completely unique. He's right, no other water consulting group in Australia has the combination of data collection capabilities and analysis, physical laboratories and numerical modelling techniques that they can offer.

"The atmosphere at WRL is very collaborative. When clients come to us with a problem that we can't solve first-hand we can always approach our academic colleagues for advice and assistance," says Smith.

For Duncan Rayner, who has worked at WRL since he graduated from UNSW six years ago, this is one of the most enjoyable things about working in the team. "I can walk down the hallway and speak to the most accomplished groundwater and coastal engineers and researchers in Australia," he says. "There's definitely a culture that you can speak with anyone about any problem."

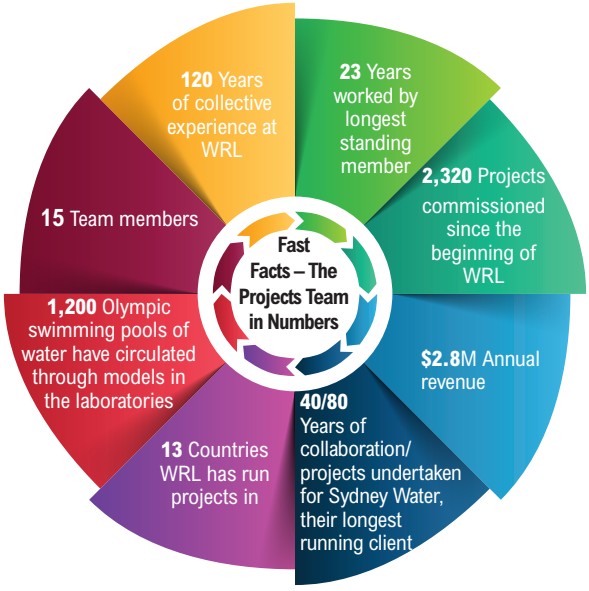
Smith says the interface between WRL and industry has benefits that flow both ways. "Our unique position also means we can help transform the 'blue-sky' research of our colleagues into practical solutions for the real issues facing government and industry," he says.

Dr Will Glamore has worked at WRL for almost 15 years and his energy and love for the work he does is palpable. A Principal Research Fellow, who recently won a prestigious Green Globe award, Glamore believes, more than anything else, that WRL's success can be attributed to their strong group mentality.

"We have a really unique collaborative team environment that's actually quite unique in academia. It's really important to emphasise that our success is because of the people we have working together."

The team's long-standing reputation for top-end, independent and cutting-edge research precedes them and Smith says they are always busy. "As soon as the lights went back on at the start of the year we had people ringing up looking for assistance."

It really is no wonder the Dean is keen to see this model replicated.



TEACHING EXCELLENCE AWARDS FOR INNOVATIVE AND INSPIRING COURSE



Professor Martin Nakata and Mer Island engineer Doug Passi are shown the prize winning sustainability plans by students Camille Mekwinski and Sarah Hayes.

For the second year running a School teaching team has won a prestigious UNSW V-C Award for Teaching Excellence.

Stephen Moore, Richard Stuetz, Taha Rashidi and Ruth Fisher, together with Professor Martin Nakata (Nura Gili), Associate Professor Iain MacGill (Electrical Engineering) and Elsie Edgerton-Till (Event Manager) received the highly regarded teaching excellence award for "Approaches to teaching that influence, motivate and inspire students to learn", in the fourth year environmental engineering course CVEN4701 Planning Sustainable Infrastructure 2013 – 2015.

CVEN4701 Planning Sustainable Infrastructure challenges fourth year students to research and design sustainable and synergistic infrastructure in the areas of water and waste management, transport and energy. Begun in 2012 with hypothetical development scenarios, the course progressed in 2015 to engagement with a real client: the community on Murray (Mer) Island, home of Eddie Mabo.

Student groups enthusiastically participated in a Design Competition to best meet the needs of this remote community, following briefings with clients from Mer Island. At the end of Semester, students and their design posters were questioned by industry, client and academic judges at a well-attended public Showcase Event held at Nura Gili, the UNSW Centre for Indigenous Programs. The winning group was then able to present their solutions in person on Murray (Mer) Island, marking the start of a long term relationship between UNSW and Mer Island, and deepening the dialogue about moving towards sustainable infrastructure.

On behalf of the team, Stephen Moore has also been awarded the Australasian Association for Engineering Education 2015 Award for Excellence in Engineering Education Engagement for the course. The award was granted in recognition of their fostering an excellent standard of successful engagement with stakeholders in Australasian Engineering Education. The award also recognises a collegiate approach to quality learning and teaching practice and a sharing of educational expertise.

Quoting just one student who undertook the course: "In general, I can say that this course confirmed why I am studying environmental engineering... I think it is essential that the professional function is always about improving and enhancing the development of society, respecting people's differences, traditions and beliefs, talking and humbly understanding one another… CVEN4701 - Planning Sustainable Infrastructure proved to me that this is possible."

Congratulations to Stephen and the team!

AWARDS AND PRIZES

NSW Premier's Prize for Science & Engineering



Warm congratulations to UNSW **Scientia Professor Mark Bradford** (pictured above with NSW Premier Mike Baird) who was awarded the *Excellence in Engineering & Information & Communications Technology* category prize in the 2015 NSW Premier's Prizes for Science & Engineering. These Prizes seek to recognise excellence in science and engineering, and reward leading researchers for cutting-edge work that has generated economic, environmental, health, social or technological benefits for New South Wales.

Mark Bradford is an Australian Laureate Fellow, Professor of Civil Engineering and a Scientia Professor at UNSW Australia. He is the founding Director of UNSW's Centre for Infrastructure Engineering and Safety (CIES), and is currently its Director of Research. Mark has been proactive in embedding university research into industry practice, especially through design standards and textbooks. Having built a team of critical mass through his Federation and Laureate Fellowships in the areas of steel and steel-concrete structural engineering, Mark has been concentrating in recent times on progressing these disciplines into the broader paradigms of sustainable and low-carbon full-life cycle structural engineering practice, which is a challenge of immense significance in the construction sector.

NSW Green Globe Award Winners



Staff at the School's Water Research Laboratory (WRL) were awarded the 'Natural Environment Sustainability' award for their project, *Big Swamp Recovery – Evidence Supporting Innovation* at the **NSW Green Globe Awards**. The NSW Government's Green Globe Awards are the leading environmental awards in NSW, celebrating excellence, leadership and innovation in sustainability. Accepted by **Dr William Glamore, Principal Research Fellow** (pictured above with co-winners Bob McDonald and Tanya Cross from Greater Taree City Council), the project was recognised for research innovation and on-ground excellence.

WRL engineers including Jamie Ruprecht and Duncan Rayner worked in collaboration with Greater Taree City Council, to research methods and develop innovative plans to restore Big Swamp, a degraded site recognised as one of the worst acid hotspots in the country. The Big Swamp Recovery Project is a great example of collaborative evidence based decision-making supported by cutting edge research to correct a major environmental problem.

Team leader Dr William Glamore said, 'This award recognises the high level of innovation that can be achieved when researchers partner with forward thinking government partners. We are very lucky to collaborate with the staff at Greater Taree City Council who are willing to work at the frontier of restoration science. The on-ground results are incredible!'

Staff at the Water Research Laboratory are world experts in the fields of wetland restoration, eco-hydraulics and environmental hydrodynamics. This award complements the 2013 National Heritage Trust's Conservation Award and the 2014 Engineers Australia's Excellence Award to Dr Glamore's team for wetland restoration research at other research sites in NSW.

More information about the Big Swamp project is at: www.wrl.unsw.edu.au

Teaching Excellence Awards Winner



In 2015 popular and inspirational teacher **Stephen Moore** collected his second UNSW V-C Award for Teaching Excellence – the first UNSW academic to ever do so. Stephen was part of an award-winning team which delivered a groundbreaking fourth year environmental engineering course in Sustainable Infrastructure working closely with a Torres Strait Island community. See p11 for more details. On behalf of the team, Stephen Moore was also awarded the Australasian Association for Engineering Education 2015 Award for Excellence in Engineering Education Engagement.

2015 Royal Australian Chemical Institute (RACI) Environment Medal



Scientia Professor T David Waite was awarded the 2015 Royal Australian Chemical Institute (RACI) Environment Medal in recognition of his exceptional research, international standing and wide-ranging contribution to the field of environmental chemistry.

Professor Waite is a specialist in environmental chemistry with particular expertise in the behaviour of elements such as iron, manganese, copper, silver and uranium in natural and engineered systems. He has published over 300 peer-reviewed articles in a number of international scientific journals, and has been awarded over $16M in research funding for his work on water quality and treatment technology issues. The impact of his work is multifaceted and ranges from application of improved technologies for water treatment through to better approaches to land management, mineral extraction from tailings deposits and management of radioactive wastes.

One of the World's Most Influential Scientific Minds 2015



Associate Professor Tommy Wiedmann, Convenor of the School's Sustainability Engineering Initiative, was named among the world's most influential scientific researchers in a new analysis of thousands of academic papers by Thomson Reuters. The "Highly Cited Researcher" list and the "World's Most Influential Scientific Minds 2015" report are based on the number of cited research papers an academic published from 2003 to 2013. They identify the best and most influential scholars from among the world's estimated nine million researchers who publish upwards of two million papers each year. Tommy Wiedmann was one of four researchers listed from UNSW.

Continuing National and Global Research Leadership

In 2015 School **Professors Chris Rizos** and **Brian Uy** were appointed to the Engineering and Environmental Sciences Research Evaluation Committee (REC) for Excellence in Research for Australia (ERA). ERA is the national assessment system that evaluates the quality of the research conducted at Australian universities. Professor Rizos was also elected Bureau member of the International Union of Geodesy and Geophysics (IUGG), a major honour.

In 2015 **Professor Ashish Sharma** was elected President-elect for the International Commission on Statistical Hydrology (ICSH); **A/Prof Stuart Khan** was appointed to the UN Water Quality and Health Technical Advisory Group (WQTAG) of the UN's World Health Organisation (WHO) and **Dr William Glamore** was appointed to the NSW Government's Williamtown Expert Panel and invited to Chair the Water Working Group.

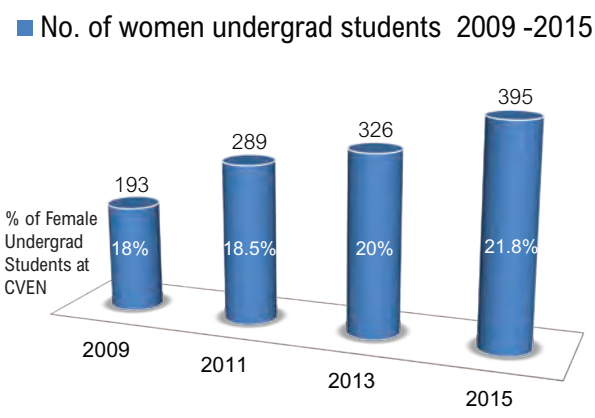
WiE PROGRESS



According to Engineers Australia's 2015 statistical overview, the average proportion of women studying undergraduate engineering at universities in Australia in 2014 was under 15%. In the work force only about 13% of engineers are female.

CVEN BE Degrees Semester 2 2015	Females*/total	% female
BE Civil	157/812	19.3%
BE Civil with Architecture	44/169	26%
BE/BE (civil/enviro)	46/125	36.8%
BE/BE (civil/commerce)	51/325	15.7%
BE/ BE (civil/mining)	10/118	8.5%
BE Environmental	36/74	48.6%
BE Surveying	9/59	15.3%
Other Combined degrees	39/116	33.7%
Total	392/1800	21.8%

UNSW Engineering, however, has one of the highest proportions of female students in NSW and this has been growing steadily for the past six years. The Faculty's WiE Development Manager Dr Alex Bannigan reports that total undergraduate female enrolments across the Faculty have grown from 19% in 2010 to 21.3% in 2015.



The School of Civil & Environmental Engineering, the largest School in the Faculty, has similar growth figures; from 18% in 2009 to 21.8% female participation in our undergraduate degrees in 2015. (For postgraduate students the CVEN figure is higher – at 25% for coursework and 27% for PhDs.)

This small but steady increase is mainly due to renewed attention to the cause, and to the goal of a more gender equal profession. In the last five years the School and the Faculty have made concerted efforts to raise awareness of the profession as a rewarding, varied and exciting career for women and to actively recruit women to our degrees. At the School we have been assisted in these efforts by our industry advisory committee and our alumni.

In fact, in real numbers, within our expanding student population, we have actually doubled the number of women undergraduate students since 2009 – from 193 enrolled in 2009 to 392 in 2015.

A central element of the UNSW Women in Engineering Program is maintaining contact throughout the lifecycle, from school student to professional engineer, and enabling an active pipeline in which women at each stage inspire and mentor those following them.

It was great to note that in 2015 a speed networking night with industry (image above) attracted many of our CVEN alumni, as did an industry mentoring program.

We look forward to working with WiE staff, students and our alumni to achieve the UNSW Engineering target of 30% female participation by 2020.

STUDENT **PROFILE**



Cassandra Murphy

Engineers Without Borders



Cassandra Murphy is a current Environmental Engineering undergraduate who is part of a new wave of young professionals passionate about balancing commercial concerns with the altruism of sustainability and global justice. Feeding the industry with vitality and optimism, students like Cassie Murphy are active and organised, combining idealism with problem solving.

Growing up, Cassie watched her father, a UNSW Science and Engineering alumnus, enjoy an exciting and varied career in project management across the globe. Now as a UNSW student herself, in her fourth year of study, she is active academically and practically.

As a committed member of the UNSW chapter of *Engineers Without Borders* (EWB), in 2015 Cassie organised an inter-university competition for Appropriate Technology. Students from various universities were asked to design a prototype for a water re-use system or a wind turbine, tailored to the needs of a particular village in mountainous Nepal. The Sandikhola hill top community experience water and energy shortages throughout the year, exacerbated by a lengthy dry season, making the community vulnerable to both seasonal fluctuations and global climate change. Appropriate technology could make the day to day lives of these people more secure and a little bit easier.

This competition produced great work from students across NSW. Six teams worked within a tight time frame and a budget to offer a prototype solution for Sandikhola. A successful awards night was held in October 2015 at the Michael Crouch Innovation Centre– an inspiring new UNSW Centre which serves as a platform for student innovation. Next year the UNSW chapter of EWB hopes to expand on the success of this competition.

Engineers Without Borders is marked by its unique focus on Appropriate Technologies. These are contextually designed systems that are not only sustainable, but economically viable and environmentally kind. These are systems built around considerations of local cultural and gender mores. These are technologies that are intuitive, encouraging a participatory attitude within the community of which it will become a part, through the smooth and efficient reticulation of knowledge. Engineering students working with EWB can become acquainted with the demands of working with developing economies and even volatile situations.

To promote the humanitarian possibilities of engineering and the importance of science and technology in education the UNSW EWB chapter organises outreach programs to high schools. It was in one of these interactive problem- solving sessions that Cassie herself first found out about *Engineers Without Borders*. Now she is out there, spreading the word, fighting the good fight.

As for the future? “I find natural systems very interesting, especially water and soil,” says Cassie, “as they are often very intricate, overlapping but perfectly balanced cycles. Currently there is a lot of focus on sustainability in the areas of water infrastructure and building performance, but I’d really like to see soil being valued in the same way.”

Cassie Murphy prizes the very earth we walk on. The School is proud of the efforts of Cassie Murphy and her fellow EWB members who are concerned about disadvantage and sustainability and are prepared to do something about it. The UNSW, engineering, and wider community can only benefit from such enthusiastic, committed and organised students.

OUR **PEOPLE**



CVEN ACADEMICS 2015

	**Acworth,** R. Ian Professor BSc Leeds, MSc, PhD Birm, FGS	Research Interests: Investigation of groundwater dynamics & hydrochemical processes in the coastal zone: Development of field instrumentation & analysis methods in groundwater studies: Electrical methods in the investigation of groundwater & salinity: Relationship between Palaeoclimate & dryland salinity.
	**Akbarnezhad**, Ali Lecturer BE AUT, Tehran, PhD NUS	Research Interests: Sustainable Construction: Sustainability Assessment: Information Modelling: Construction Technology: Non-Destructive Tests: Health Monitoring: Concrete Technology: Design for Deconstruction
	**Andersen,** Martin Senior Lecturer MSc in Engineering, PhD DTU, Denmark	Research Interests: Investigations of physical & geochemical processes at the surface water groundwater interface; groundwater dynamics in the coastal zone; reactive flow & transport modelling; developing methodologies for using heat as a tracer of groundwater flow; karst hydrology.
	**Attard**, Mario Associate Professor Associate Head – Academic BE PhD MHEd UNSW, MIEAust, CPEng	Research Interests: Finite Strain Isotropic & Anisotropic Hyperelastic Modelling: Fracture in Concrete & Masonry: Crack Propagation due to Creep: Ductility of High Strength Concrete Columns: Buckling of Sandwich Columns: Lateral Buckling of Thin-Walled Beams.
	**Birk**, Carolin Lecturer BEng DEng Dresden	Research Interests: Numerical modelling of wave propagation in unbounded domains: Soil-structure interaction, fluid-structure interaction: Longitudinal railway track-structure interaction: Artificial boundary conditions for diffusion: Fractional calculus.
	**Carmichael**, D G Professor BE MEngSc USyd, PhD Cant, CPEng, FIEAust, MASC	Research Interests: Management, systems applications of optimisation, synthesis: Identification & analysis: Contracts & disputes: Project delivery: Construction operations: Project management & management functional areas including risk, economics, finances, people resources & scope: Construction management: Problem solving & decision making.
	**Castel**, Arnaud Associate Professor BE, MEngSc, PhD Toulouse	Research Interests: Durability of construction materials - Steel corrosion in concrete, concrete pathologies, SCM's: Concrete construction in chloride environment -Performance & service life design of reinforced/prestressed concrete affected by steel corrosion: Repair & Strengthening using CFRP - Failure analysis & modelling of CFRP strengthened beams including reinforcing steel corrosion.

	**Cox**, Ron Associate Professor Co-Chair, External Relations Convenor, ACCARNSI BE PhD UNSW, FIEAust	Research Interests: Climate change adaptation for settlements & infrastructure: Coastal engineering & coastal zone management: Stability, design & safety of coastal structures: Application of sand filled geo-containers in coastal protection: Environmental monitoring & modelling: Desalination plant brine disposal: Hydraulics of water & wastewater treatment plants: Flood hydraulics & floodplain management: Life safety, emergency warning & evacuation.
	**Davis,** Steven Lecturer Chair, Teaching & Learning Committee BE PhD UNSW	Research Interests: Stochastic Systems: Evolutionary Programming: Parallel Computing Applications to Civil Engineering: Online Assessments
	**Dixit**, Vinayak Senior Lecturer MT Institute of Technology, Delhi, PhD University of Central Florida	Research Interests: Behaviour under Risk & Uncertainty in Transportation Systems: Transportation Modelling & Simulation: Traffic Flow Theory: Traffic Safety: Workzone Management Strategies: Experimental Economics.
	**Douglas,** Kurt Pells Sullivan Meynink Senior Lecturer of Rock Mechanics, Co–Chair External Relations BE (Hons1)USyd, PhD UNSW	My main interests lie in the field of rock mechanics. Predicting strengths of large-scale rock masses (hundreds of meters) continues to be a major challenge. I am attempting to improve our understanding using laboratory tests, field studies & numerical methods. I am also currently involved in an ARC & Industry sponsored project researching erosion of rock spillways & backward erosion of embankment dams.
	**Felder**, Stefan Lecturer Dipl.-Ing. RWTH Aachen, PhD UQ	Stefan is an expert in hydraulic engineering and environmental fluid mechanics. His research interests include: Physical modelling of turbulent flows; Design optimisation of hydraulic structures; Energy dissipation and aeration in high-velocity free-surface flows and hydraulic jumps; Air-water mass transfer across hydraulic structures; Design of instrumentation and advanced data processing tools.
	**Foster,** Stephen Professor Head of School BE NSWIT, MEngSc PhD UNSW, MIEAust, FIEAust	Research Interests: I research the behaviour of structural systems (buildings and bridges) construct-ed of reinforced and prestressed concrete. I'm particularly interested in bringing new and advanced materials technologies to the engineering of structures. My interests are in the use of high and ultra-high performance concretes, fibre-reinforced concretes and geopolymer concretes and in use of carbon fibre technologies for strengthening and repair of structures and structural systems. I develop physical-mechanical models for use in advanced computational and numerical tools such as FEM and for their use in the study of behaviour of concrete structures that are subjected to extreme events such as overload, fire, impact and blast loading.

	**Gao**, Wei Associate Professor BE HDU, ME PhD Xidian, MIIAV, MAAS	Research Interests: Uncertain modelling & uncertain methods: Vehicle-bridge interaction dynamics: Wind and/or seismic induced random vibration: Train-rail-sleeper-foundation-tunnel/bridge system: Stochastic nonlinear system: Vehicle dynamics & vehicle rollover: Structural optimization & control: Smart structures: Stability & reliability analysis.
	**Gardner**, Lauren Senior Lecturer BS ArchE, MSE, PhD U Texas at Austin	Research Interests: Network modelling for multi-domain integrated systems: congestion pricing models accounting for uncertainty, the role of real-time information & adaptive pricing: Sustainability models integrating transportation & electricity systems: developing network-based optimization models to predict the role of global transport systems in the spread of contagious disease.
	**Ge**, Linlin Associate Professor, Chair, International Relations Committee BE, MSc Wuhan, PhD UNSW	Research Interests: I combine remote sensing with GPS & GIS to produce cost-effective & highly reliable maps. Integrating radar & optical remote sensing with GPS & GIS, we measure the subtle change on the surface of the Earth with minimum latency using data collected from satellite, airborne & UAV platforms.
	**Hamed**, Ehab Senior Lecturer BSc MSc PhD Technion	Research Interests: Viscoelasticity of concrete & composite materials, Creep buckling of concrete domes & shells, Strengthening of concrete & masonry structures with composite materials (FRP), Nonlinear dynamics of concrete structures.
	**Harvey**, Bruce Senior Lecturer BSurv (Hons 1), GradDip Higher Ed, PhD UNSW	Research Interests: Least Squares analysis of surveying measurements is my main interest, but I also investigate alternative analysis methods & the latest measurement technologies. Are there better ways to analyse surveying measurements & can we improve Least Squares, L1 norm & topological grid searches?
	**Johnson**, Fiona Senior Lecturer BE, PhD UNSW	Research Interests: statistical hydrology & modelling; climate change impacts on water resources systems; bias correction methods that can be applied to climate model simulations; models for design rainfalls & flooding; models for regionalisation of rainfall data, questions on stationarity of large to extreme rainfalls & the impacts of climate change on these events & the resulting implications for engineering design.
	**Khalili,** Nasser Professor Associate Dean, Research, UNSW Engineering BSc Teh, MSc Birm, PhD UNSW	Research Interests: Mechanics of unsaturated soils: Flow & deformation in double porosity media: Numerical methods applied to geotechnical engineering: Pavement engineering.
	**Khan**, Stuart Associate Professor BSc (Hons 1) USyd, PhD UNSW, MIEAust.	Research Interests: Advanced Water & Wastewater Treatment & Analysis: Trace Chemical Contaminants in Water: Chemical Risk Assessment: Probabilistic Chemical Exposure Assessment: Water Recycling & Seawater Desalination: Sustainability Assessment & Risk Assessment: Environmental Fate Modelling: Water Quality Impacts of Extreme Weather Conditions.

	**Khoshghalb**, Arman Lecturer BEng, MEng, Sharif University of Technology, Tehran, PhD UNSW	Research Interests: large deformation analysis in geomechanics, advanced numerical methods in geomechanics, mechanics of unsaturated soils & coupled analysis of porous media.
	**Lim**, Samsung Associate Professor BA, MA (Mathematics) Seoul, PhD U Texas at Austin	Research Interests: I conduct geospatial information science & research that allow us to improve the way we view, understand, design, plan, manage, analyse, interpret, & extract spatio-temporal information such as patterns & trends of geospatial data. I investigate spatial information extraction from lidar (known as light detection & ranging) & aerial/satellite data e.g. data segmentation & classification, digital elevation modelling, feature extraction, building edge detection, & change detection.
	**Moore,** Stephen Director, Environmental Engineering Studies BE UNSW, MEngSc Adel., CPEng, MIEAust	Research Interests: Development of environmental material accounting techniques, such as Material Flux Analysis, for regional & corporate environmental management systems; Simulation & decision analysis applied to waste management systems.
	**Rashidi**, Taha Hossein Senior Lecturer BSc MSc Sharif UT Tehran; PhD UI Chicago	Research Interests: Travel Behaviour Analysis: Transportation Planning: Activity-Based Travel Demand Modelling: Housing Search & Land Use Modelling: Integrated Land-Use & Transportation Models: Goods Movement Modelling: Microsimulation Modeling Methods for Urban Activities.
	**Rizos**, Chris Professor BSurv (Hons), PhD UNSW	Research Interests: How geospatial technology such as satellite-based positioning, modern geodesy & digital mapping is used for science, & by society in general; Political issues related to GNSS and geospatial information management; Modern geodesy's technologies & applications; Australia's new mapping datum; The technology & applications of satellite-, wireless- & inertial-based sensors for high accuracy positioning; The use of GNSS (GPS, BeiDou, Galileo, QZSS) for all classes of uses from Navigation to Geodesy; GNSS receiver design; GNSS positioning infrastructure.
	**Roberts**, Craig Senior Lecturer BSurv, University of South Australia, PhD UNSW	Research Interests: High precision GPS/GNSS positioning and leveraging CORS infrastructure for practical application to surveying and geospatial engineering. The implications of kinematic 3D datum modernisation for professional and mass market users. GPS for cadastral surveying. Kinematic positioning with robotic total stations.
	**Russell,** Adrian Associate Professor Chair, Technical Services BE, PhD UNSW, PGCert Bristol	Research Interests: Unsaturated soils: Fibre reinforced soils: Particle crushing in granular media: In situ testing of soils: Constitutive modelling of soils: Wind turbine foundations.

	**Senetakis**, Kostas Lecturer Dipl. Civil Engineering, MSc and PhD, Aristotle University, Thessaloniki	Expertise in Earthquake Engineering, Experimental Soil Dynamics and Micro-mechanics. Main research interests: Geotechnical Earthquake Engineering: Experimental Soil Mechanics and Dynamics: Pavement Engineering: Engineering Geology: Particulate Media - Micromechanics of Soils - Contact Mechanics & Tribology: Fracture Mechanics.
	**Shen**, Johnson Xuesong Lecturer BEng, MSc Nanjing, PhD Hong Kong Polytechnic University	Research interests: Rapid As-Built Field Modelling in Construction; Sustainable Construction Operations; Construction Automation and Robotics; Structural Health Monitoring; Dynamic Data-Driven Project Management
	**Song,** Chongmin Professor Chair, Computing, IT & Ed Tech Ctte BE ME Tsinghua, DEng Tokyo	Research Interests: Scaled Boundary Finite-Element Method: Dynamic Soil-Structure Interaction: Structural Dynamics & Earthquake Engineering: Wave Propagation: Fracture Mechanics: Elasto-Plastic-Damage Constitutive Modelling: Finite Element Method, Boundary Element Method.
	**Stuetz,** Richard Professor Co-Director, Water Research Centre BSc, PhD UNSW	Research Interests: On-line instrumentation for monitoring water & wastewater quality: Biological monitoring for process control: Biotreatment of odours & volatile emissions: Bioprocesses for water & wastewater treatment: Biodegradation of micropollutants.
	**Taiebat**, Hossein Senior Lecturer PhD USyd	Research Interests: Behaviour of embankment dams under earthquake loading: Large deformation analysis and post failure deformation of slopes and embankments: Bearing capacity of foundations on unsaturated soils: Caisson foundations: Vertically loaded anchors: Shallow foundations under combined loading: Numerical modelling & liquefaction analysis.
	**Tangaramvong,** Sawekchai (Ball) Lecturer BEng, Chulalongkorn, MEngSc, PhD UNSW, Grad Cert (Ed) RMIT	Research interests: Development of advanced computational models & analyses of practically-motivated inelastic structures. Optimal design of new structures & cost-effective rehabilitation of damaged ones. Adoption of integrated (complementarity) mathematical programming & nonlinear engineering mechanics concept to map the complete responses of structures in the presence of elastoplastic strain-softening materials, high-order geometric nonlinearity, limited ductility, nonassociativity, contact, high-impact loading & uncertainty.
	**Turner,** Ian Professor, Director, Water Research Laboratory BSc (Hons) USyd, MEnvEngSc UNSW, PhD USyd	Research Interests: Coastal Engineering & Coastal Management; Innovative coastal measurement & monitoring techniques; Sediment transport at the beachface; Modelling of coastline variability & change spanning storm, seasonal, annual & decadal time-scales; Assessment of coastline adjustment to a changing climate.

	**Uy**, Brian Professor & Director of CIES BE (Hons 1), PhD UNSW	Research Interests: Composite steel-concrete structures, critical infrastructure protection systems, deconstruction techniques, rehabilitation & strengthening techniques, steel structures, structural health monitoring, structural systems, sustainable construction materials.
	**Valipour**, Hamid Senior Lecturer BE, MEngSc, PhD UNSW	Research Interests: Structural Mechanics including reinforced concrete & steel, steel-concrete, timber & timber-concrete composite materials: Behaviour of structures subjected to extreme loading scenarios such as seismic action, critical member loss, impact, blast and explosion: Computational mechanics and non-linear finite element modelling of structures: Constitutive modelling of concrete and timber.
	**Vandebona,** Upali Senior Lecturer BSc (Eng) Ceylon, MEng AIT, PhD Monash	Research Interests: Modelling of Transport Systems: Development of simulation & animation models for light rail train systems & bus services. Facility Location: Environmental considerations related to transport facility location: Demand Modelling: Analysis of public awareness & attitudes related to transport systems: Air Transport: Intelligent Transport Systems: Signage systems.
	**Waite**, T David Scientia Professor, Deputy Dean, Research, UNSW Engineering BSc Tas, GradDip RMIT, MAppSc Monash, PhD MIT, FRACI	Research Interests: Separation processes involving colloids & particles in water & wastewater treatment; redox chemistry at the solid-solution interface; photochemistry in aquatic systems; hydrogeochemistry; theoretical & experimental studies on the fate & effects of chemical pollutants; interactions between trace elements & microbiota in aquatic systems.
	**Waller**, S Travis Advisian Professor of Transport Innovation. Chair, Research Management Cmte BSc Ohio State, MSc, PhD Northwestern	Research Interests: Transportation network modelling, particularly systems characterized by dynamics, uncertainty & information; large-scale integrated transport optimization & planning. Specific applications or problem domains include Dynamic Traffic Assignment (DTA), routing algorithm development, network equilibrium, stochastic optimization, integrated demand/supply modelling, network design, adaptive equilibrium, system analysis of public-private partnerships, & bi-level optimization of transport networks.
	**Wang**, Jinling Associate Professor BSc, MSc Wuhan, PhD Curtin	Research Interests: Global Navigation Satellite Systems - GNSS (GPS, Glonass, Galileo, BeiDou System-BDS) & their Integration: Multi-Sensor Integration for Positioning, Mapping & Navigation: Statistical Theory & its Applications in Positioning, Mapping & Navigation.
	**Wiedmann**, Tommy Associate Professor MSc, PhD Ulm	My main research question is how to achieve human wellbeing without increasing environmental impacts. My expertise is in integrated sustainability assessment & environmental footprint analysis. I develop & apply environmental input-output analysis as part of a holistic concept to life cycle assessment, industrial ecology & sustainable consumption & production research.

ARC **LAUREATE**

	**Bradford,** Mark ARC Laureate Fellow UNSW Scientia Professor BSc BE PhD USyd, DSc UNSW, CPEng, CEng, MASCE, FIEAust, MIStructE	Research Interests: Structures subjected to elevated temperatures, curved members, arches, steel structures, composite steel-concrete structures, concrete structures, numerical methods, stability, viscoelastic effects, non-discretisation techniques, design codes, structural retrofit.

ARC FUTURE **FELLOWS**

	**Bellie,** Sivakumar Associate Professor ARC Future Fellow UNSW Water Research Centre	Research Interests: Water resources assessment, planning, and management. Sivakumar's research focuses on simplification and generalization in hydrologic modeling, especially using nonlinear dynamic and scaling theories
	**Collins,** Richard ARC Future Fellow UNSW Water Research Centre	Research Interests: Environmental Molecular Geochemistry of trace elements (metals, metalloids and actinides) in both natural and engineered systems. Research covers aspects related to metal(loid) bioavailability and speciation, redox chemistry and biogeochemical transformations assessed through field/laboratory studies, computational approaches (e.g. DFT) and X-ray Absorption Spectroscopy.
	**Marshall**, Lucy Senior Lecturer & ARC Future Fellow BE, MEngSc, PhD UNSW	Research Interests: I use computer models to simulate rainfall & runoff processes in catchments, working to improve hydrologic forecasts through improved catchment model structures & methods for model calibration & uncertainty assessment. I quantify new conceptualizations of hydrologic processes & develop methods for model diagnostics & uncertainty analysis (especially via Bayesian statistics & multi-model methods).
	**O'Carroll**, Denis Associate Professor ARC Future Fellow B.A.Sc. Civil Engineering Ottawa, M.S., Clarkson, PhD., U Michigan	Research Interests: Transport of nanoparticles in the environment – in particular evaluating the fate of engineered nanoparticles that have leached out of commercial products (e.g., release from sunscreens, tennis racquets) and their ecotoxicity, in order to inform human and ecological health risk assessments and to assist regulators to develop appropriate legislation.
	**Sharma,** Ashish Professor ARC Future Fellow BE Roorkee, MTech IIT Delhi, PhD Utah State	Research Interests: Stochastic hydrology: Synthetic generation of seasonal streamflow; Medium to long-term probabilistic forecasting: Stochastic downscaling of hydrologic variables under climate change scenarios: Radar rainfall estimation: Rainfall runoff model & parameter uncertainty assessment in a Bayesian framework: Water Resources Management: new developments in statistics to solve water problems.

ARC DECRA

	**Garg,** Shikha ARC DECRA Fellow Senior Research Associate UNSW Water Research Centre	Research interests: Extracellular electron transfer: Biogeochemical process :Environmental microbiology : Pollutant transformation
	**Li,** Xiaomin ARC DECRA Fellow Water Research Centre (WRC)	Research interests: Extracellular electron transfer: Biogeochemical process: Environmental microbiology : Pollutant transformation
	**Thai,** Huu-Tai ARC DECRA Research Fellow Centre for Infrastructure, Engineering & Safety (CIES)	Current research: assessing the system reliability of concrete-filled steel tubular frames designed by advanced analysis.
	**Zhao,** Gaofeng ARC DECRA Fellow Centre for Infrastructure, Engineering & Safety (CIES)	Research: investigation of fracturing rock using the microscopic and macroscopic coupled numerical model, e.g. Distinct Lattice Spring Model (DLSM), Lattice Boltzmann Method (LBM), and Particle based Manifold Method (PMM).

CONGRATULATIONS:

2015 saw the promotion of three of our rising stars Lauren Gardner, Fiona Johnson and Taha Rashidi to Senior Lecturer. A great result for the School and acknowledgement and recognition of their contributions to research, teaching and service to the School, Faculty of Engineering, UNSW and the profession.





CVEN FAREWELLS

In 2015 we farewelled Dr Carolin Birk – an award winning teacher and brilliant researcher - as she returned to Europe to take up a professorship in structural analysis at the University of Duisburg-Essen. We wish her all the very best for the future.

CVEN WELCOMES

Associate Professor Denis O'Carroll

A warm welcome to Associate Professor Denis O'Carroll. He comes to us as an ARC Future Fellow and for four years he will be focusing on his research into nanoparticles and groundwater remediation. After that period Denis will become an Associate Professor at CVEN. He is here to stay and has been here before. Denis spent a sabbatical at the Water Research Laboratory four years ago. This relationship proved so fertile that he was encouraged to apply for an ARC fellowship. Despite the intensely competitive nature of these grant applications he was successful and so has returned to continue and deepen his relationship with the School.

What drew him to CVEN initially was its "significant research strengths and its global potential" as demonstrated in its willingness to engage in the "novel" field of nanotechnology. Denis sees his ARC grant as a significant opportunity, allowing him to fully focus on research in this nascent field. For example, the field work to be conducted by Dr O'Carroll and CVEN's Dr Martin Andersen will investigate how naturally occurring nanoparticles scavenge groundwater contaminants. Research such as this has the potential to set new horizons for other researchers and marks CVEN as a leader in nano-knowledge.

Associate Professor O'Carroll brings with him an impressive academic and industry resume, an international reputation, extensive experience and the courage to work in an emerging field that is, at times, regarded with scepticism as well as excitement. He has journeyed across the seas because he knows he will be supported here, able to contribute his strengths to the pool of expertise that already exists in CVEN, where he has become an integral part of the Connected Waters Initiative team.

As current particle transport models have failed to accurately predict nanoparticle transport in groundwater, this lack of basic scientific understanding leaves a gap in industry knowledge. While Denis will miss teaching, he is excited to concentrate on research over a prolonged length of time. This focus will allow him and his collaborators to regularly publish leading edge work in top journals, leading the science and creating viable new knowledge in groundwater remediation and the fate of engineered and naturally occurring nanomaterials.

Nanotechnology is an open vista of possibilities. Industry is currently investing billions of dollars in an attempt to revolutionise electronics and discover the economic potential of nanomaterials. Meanwhile Denis and his CWI compatriots will look at the fate of a range of products that emit nanoparticles and asking



where do they go? What effect do they have? Are they dangerous? This is another case of industry and academia working symbiotically.

It is always through team work that Denis believes the best results are achieved. It is one of the things he most loves about his work: that it is not done in isolation but in connection. His passion to protect the environment is also made real and effective by another connection: between laboratory and field. "When we go out to a site and we inject our nanoparticles, that we have spent years developing in a lab, and we come back a year later and we see significant contaminant degradation, that's amazing, I love that."

While Denis is here, his unique knowledge will be passed on to the post graduate students he will mentor and supervise, deepening the nanoparticle expertise of the School. We at the School look forward to getting to know Denis better and to seeing his research unfold and yield results.

CVEN CONGRATULATES

Associate Professor Stuart Khan

The School of Civil and Environmental Engineering has good reason to be very proud of its academic staff. They are high achievers within and without the university, well respected by industry, community and government. But 2015 was particularly successful for Associate Professor Stuart Khan. First he was awarded a Hans Fischer Fellowship to the Technical University of Munich. Then he was appointed to the World Health Organisation's Water Quality and Health Technical Advisory Committee. Then he was named as one of Engineers Australia's Top 100 Most Influential Engineers. While several of our alumni regularly feature in this list, Stuart is the first academic staff member to ever be so honoured.

All these honours are evidence of a blossoming career born of a passionate and disciplined commitment to envisioning a better world. A guiding principle for this academic is to be of service: service above and beyond the call of mere duty. His various voluntary roles on regulatory bodies and providing expert advice to government have provided a platform for the international recognition of his work. CVEN would like to congratulate Stuart and wish him well in these new roles, while he continues to be a respected and vital member of our teaching staff.

Stuart is grateful that he works in a university culture that allows academics the flexibility to follow opportunities. He recognises that the current Head of School, Professor Stephen Foster, supports staff to spread their wings. He does this by finding ways to provide freedom without compromising the quality of teaching. In this way Stuart knows that his accolades are shared by the School.

As a Hans Fischer Fellow, Dr Khan will be involved in research that will improve the application of the Water Framework Directive across Europe. These binding directives will seek to reduce the trace chemical contamination that can be discharged from sewage treatment plants. This is industry leading work and Stuart enjoys the high regard in which science is held in Germany, where train stations display not ads for ipods but portraits of Nobel Prize winners.

Stuart has always displayed a willingness to participate in public discussion. His voluntary work as a member of the Water Quality Advisory Committee (WQAC) to the National Health and Medical Research Council and his expert advice provided to the NSW Government enquiry into coal seam gas water remediation are testament to this drive on a local level. But as his expertise becomes more widely recognised his drive to serve the community can expand to international arenas. As one of only two academics appointed to WQAC, Stuart



was involved in the rolling review of the *Australian Drinking Water Guidelines*. Now, as an advisor to the World Health Organisation, he will assist in drafting international guidelines to be published in 2020, with recommendations for water quality risk management across the globe. Stuart Khan's influence is growing.

Engineers Australia selected Stuart Khan for the Panel's Pick of the 2015 Top 100 Engineers - a category created for people who influence and inspire. "In addition to his teaching responsibilities," noted the selection panel, "Khan has been involved in government and community engagement. In particular he has promoted the importance of recycling as a future water supply strategy."

We again congratulate Associate Professor Stuart Khan and recognise that, just as he feels privileged to work at the School, the School is privileged to have him.

RESEARCH, ADJUNCT AND VISITING ACADEMIC STAFF (SCHOOL)

Emeritus Professors
John Black
Robin Fell
Ian Gilbert
Francis Tin Loi
John Trinder
Somasundaram Valliappan

VC'S Post-Doctoral Research Fellows
Alfredo Anceno
Huichao Chen

ANSTO Post-Doctoral Research Fellow
Andrew Kinsela

Professorial Visiting Fellows
Bruce Forster
David Hui
Kourosh Kayvani
William Arthur Kearsley

Senior Visiting Fellows
Tao Chen
Jean Rueger

Visiting Fellows
Fei Guo
Haiyang Liu
Junyu Liu
Taku Nikaido
Jianjun Song
Yunlong Teng
Zhaorui Wang
Yun Zhao
Xinhui Zhu
Yan Zhu

Adjunct Professors
Scott Hensley
Matthew McCabe

Adjunct Associate Professors
James Aldred
William Leslie Peirson
Kevin Michael Rosso
Alan Seed

Adjunct Senior Lecturers
Kenneth Doust
Ramesh Govind
Gregoire Mariethoz

Adjunct Lecturers
Christopher Blenkinsopp
Francois Flocard
Jacqueline Thomas

SCHOOL ADMINISTRATION



The School's administration team had another successful year in meeting the high demand for advice and requests from all stakeholders associated with our School.

The Student Office implemented a number of new processes to improve efficiencies across the School as outlined in the Student Centre Report on page 56.

The School made improvements to the online Teaching Allocation interface to enable more reports and sorting functionality. The improvements have allowed academic staff to more easily view and identify when updates are needed. We also introduced an online Demonstrator Claim Report so that sessional staff could enter their fortnightly claim online. The system has enabled sessional staff to claim from anywhere using a web browser. It has reduced paperwork and saved time for financial staff when processing the claim with UNSW's Finance system. The team continued to provide financial, administration, office accommodation, health and safety, and other workplace support to staff and students.

The School replaced 80 lab computers to HP z230 which is a more powerful model desktop to enable faster processing and enhanced software efficiency. We also replaced scanners in both computer labs and purchased an MPS A3 colour multifunction printer for lab 201.

Working with the Faculty, the team launched a new School website. The new website provided major visual improvements to attract potential students. It also has improved navigation and offered better access to news and video content. We also launched an online Research Student Management system for administrative, finance and IT staff to streamline student data. The system integrates central and local records so that staff can access and update data more efficiently.

Other projects included an online Assessment Planning system for academic and administrative staff to improve communication and data collection for course assessment requirements and an online Term Planning system for academic and administrative staff to enable effective data communications which was essential for teaching room and equipment planning.

The team has continued to provide a high level of service to staff and students.

Anthony Dever, School Manager

PROFESSIONAL STAFF

STUDENT SERVICES MANAGER

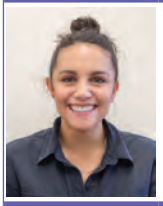


Kristy Guia
Student Services Officer

ADMINISTRATIVE STAFF



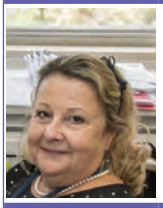
Les Brown
Administrative Assistant



Lena Comino
Administrative Officer



Olivia Huang
Student Services Officer



Patricia McLaughlin
Administrative Officer



Renata Melis
Administrative Officer



Hannah Rizzo
Administrative Officer

EXECUTIVE ASSISTANT



Betty Wong
EA to Head of School

BUSINESS



Anthony Dever
Business Manager



Lekana Toubia
Administrative Officer - Finance



Danny Wu
Administrative Assistant-Finance

EXTERNAL RELATIONS



Dr Mary O'Connell
External Relations Manager



Tricia Tesoriero
External Relations Projects P/T

WEB / IT STAFF



Kate Brown
Web/IT Coordinator



Patrick Vuong
Computer Systems Officer



Xiaobo Ni
Web Developer

PROFESSIONAL OFFICERS



Dr Gautam Chattopadhyay
Laboratory Manager



Paul Gwynne
Manager

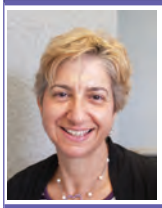


Hugh McMullen
OHS & Facilities Officer



Dr Yincai Zhou
Professional Officer SAGE

CENTRE MANAGERS



Irene Calaizis
CIES



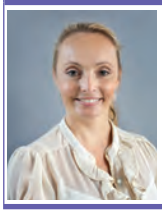
Maria Lee
rCITI



Grantley Smith
WRL



Robert Steel
WRC Kensington



Patricia Karwan
WRC and CIES Administrative Officer

SENIOR TECHNICAL OFFICERS



Anthony Macken



Rudino Salleh



William Terry

TECHNICAL OFFICERS



John Gilbert



Rob Jenkins
Water Research Laboratory



Ron Moncay



Kelvin Chun H Ong



Larry Paice
Water Research Laboratory



Greg Worthing



Tim Weston

LEVEL 3 **WORKPLACE SAFETY** COMMITTEE 2015

The provision of a safe work environment for all School staff and students remains the School's highest priority. The School is committed to protecting the health and safety of all staff, students, visitors and contractors. The School consults staff and students in implementing safety practices and systems within the workplace. Inspections and training, combined with a wide range of communication methods, ensure that all staff and students are informed of their responsibilities.

The School of Civil and Environmental Engineering has a Workplace Safety Committee in accordance with the Work Health and Safety Act 2011. Committee representation covers all work groups within the School, including the Head of School, Academics, Laboratory Managers, IT, Administration, Postgraduates and Undergraduates. Membership also includes Centre Representatives, a First Aid Officer, and the Chief Warden (Emergency Control Organisation.)

The physical areas covered by the Committee include:
Civil and Environmental Engineering Main Building H20
Civil and Environmental Engineering Laboratory Block – Vallentine Annexe H22
Water Research Centre – Vallentine Annexe H22
Heavy Structures Laboratory, Randwick R9
Water Research Laboratory, Manly Vale

The School consults with all staff and students on WHS issues as they arise, through the School's Level 3 Health and Safety Consultation Committee. Minutes of the meetings are posted on the School HS noticeboard and on the School's Intranet.

2015 Committee Membership

Chair: Paul Gwynne – Chair (Infrastructure Lab and First Aid),

Deputy Chair: Les Brown (Admin. and IT),

Secretary and Chief Warden: Hugh McMullen (HS and Facilities Officer),

Deputy Chief Wardens: Gautam Chattopadhyay & Bill Terry

Members and Representation for 2015:

Stephen Foster (HoS), Irene Calaizis (CIES), Larry Paice/Hamish Studholme (WRL), Gautam Chattopadhyay/Kelvin Ong (WRC- Kensington), Ali Akbarnezhad (Academic), Ron Moncay/John Gilbert (Heavy Structures Lab), Patricia Karwan (WRC), Xabier Vazquez Campos (Postgraduate Rep.), Catrionia Tate (Undergraduate Rep.) Rohan Singh-Panwar (advisory) Emergency Control Organisation and First Aid Officers: Richard Berndt, Gautam Chattopadhyay, Kristy Guia, Paul Gwynne, Patricia Karwan ,Kelvin Ong, Bill Terry.



Our congratulations to Infrastructure Laboratory Manager & Safety Officer Paul Gwynne, who celebrated 25 years of service at the School in 2015.

Congratulations also to Stephen Moore on his silver anniversary.



CVEN **SPONSORS**

Several School academic positions are currently funded through the generosity of industry including:

The Australian Nuclear Science and Technology Organisation (ANSTO) – a public research organisation – provides funding support for a Senior Research Fellow (Dr **Andrew Kinsela**) at the School's Water Research Centre

Advisian- (formerly Evans & Peck) the independent consulting business of the WorleyParsons Group – supports the Advisian Professor for Transport Innovation **S Travis Waller, Director** of the Research Centre for Integrated Transport Innovation (RCITI)

Pells Sullivan Meynink Pty Ltd, a high profile firm of specialist geotechnical consultants, provide funding support for the position of Pells Sullivan Meynink Senior Lecturer of Rock Mechanics, Dr **Kurt Douglas**.



VALE

David H Pilgrim, (1931 – 2015)



In 2015 we also said goodbye to one of our first alumni and founding academics, Professor David Pilgrim, who had served the School for over thirty-five years.

David graduated with a first class honours degree in civil engineering in 1953 – in only the second year of UNSW graduates, and started in the School as a lecturer in 1958. He retired as Professor and Head of Water Engineering in 1993. His area of expertise was Surface Water Hydrology involving runoff processes, flood estimation and runoff yield.

David obtained his PhD from UNSW in 1967 – his topic was 'The development of a radioactive technique for tracing surface runoff on a small catchment,' - his supervisor, the inimitable founding Head of School, Crawford Munro. David's doctoral work brought him international recognition in his area. The linking of his tracer studies with recognized flood routing procedures was a particularly important contribution. David was awarded a DSc from UNSW in 1984 for his outstanding publications record in hydrology and run-off modelling.

David Pilgrim had many achievements throughout his career; to list just one he was the Editor of the 1987 *Australian Rainfall and Runoff*. This work had one of the greatest impacts on water engineering in Australia of any book authored by Australians. His service to science, especially hydrology was recognized by the award of Member of the Order of Australia (AM), in 1988. In 2009 David was inducted into Engineer Australia's National Committee on Water Engineering Hall of Fame.

As well as his research achievements, David was also an excellent teacher, as many of our alumni will be able to attest, and a kindly and collegial-based member of staff. He was 'a man with a wonderful mind and deep empathy' recalled one. 'A humble, polite, soft-spoken and learned colleague' said another. It was always a team effort with the Pilgrims at home, as David's wife Devona often accompanied him on his flood runoff research trips on many a dark and wet morning.

We extend our best wishes and sincere condolences to Devona, and to all of David's family. We are grateful for David's life and his great work. He will be missed.

Esca Kitchen (1922 – 2015)



Esca Kitchen was one of the founding academics of the School – he taught civil engineering materials at the School for over twenty-five years, from 1954 – 1981.

Esca grew up in Molong, NSW and went to school in Bathurst. He was 17 when war broke out, and very soon enlisted in the army. He was a member of Z Special Force. On returning from the War, he completed an engineering degree at the University of Sydney. After graduation he worked for local government in Sydney and in regional areas, before coming to join the new School at the new and exciting university.

Esca Kitchen was quietly spoken but he was also a lecturer who did not put up with any nonsense, as Emeritus Professor Ian Gilbert recalled. 'Esca taught me Civil Engineering Materials II in 1971 and he once threw me out of the class for talking.' There were no grudges held. As Ian noted, Esca was well liked and well respected by all his peers.

Edward Ronald Whitmore (1925 - 2015)



Ron Whitmore joined the Royal Navy as a 15 year-old in 1940, was promoted to Commander in June 1968 and subsequently became the Australian Hydrographer later that year.He retired from the Royal Australian Navy (RAN) in February 1975.

In 1974, UNSWSchool of Surveyinginvited Ron to devise a syllabus in Hydrography and Law of the Sea. He taught hydrographic surveying for 17 years. Bruce Harvey, who lectured alongside Ron in the late '80s, found him a most memorable colleague - ' a very nice person and an old school gentleman.' Chris Rizos, who was an undergraduate student of Ron's, recalls him as a man of impressive achievements, and a very prominent personality in the navigation world.

Ron will be sadly missed by his many friends across the globe.

Dr Hossein Taiebat (1959 - 2016)



The School has lost a marvellous teacher and a beautiful human being. Dr Hossein Taiebat passed away in January 2016 after a long and courageous struggle to survive bone marrow cancer.

Born in Iran, young Hossein Taiebat was always an engaging and enquiring spirit. Not surprisingly he was also a brilliant student. He completed his BSc in Civil Engineering at the Isfahan University of Technology, graduating with first class honours and the University High Rank award in 1985. He then worked as a design engineer and project manager for several years in Iran before coming to Australia with his family in 1992. While still working part time in industry, and then later in academia, Hossein undertook an ME and then a PhD at the University of Sydney – researching in the field of geotechnical engineering, his topic being "Three-dimensional liquefaction analysis of offshore foundations."



After teaching at USyd and UTS, Hossein came to the School in January 2008. He was an immediate asset - both for his colleagues and for our students. As noted in the School's 2015 teaching excellence booklet, Hossein's 'careful and meticulous preparation of teaching material for his courses, aims to balance formal lectures with self-directed learning and research, and with critical thinking and problem solving, for it is these skills that produce exceptional graduates - better equipped to evolve with the ever-changing geotechnical industry.'

In formal and informal feedback students consistently rated Hossein very highly as an educator. They also rated him very highly as a human being, something shown by the hundreds of student tributes posted onto social media, and also, most poignantly, in small bouquets of flowers and notes of grief and respect left on his office door after his passing.

Repeated themes in their tributes were not just his inspiring and engaging lectures – clarifying and explaining often difficult material, but Hossein's warmth and kindness, his care for them, his patience, and his welcoming smile. Well summed up by one student

'As many of his students will remember, not only was he an outstanding lecturer, but also a truly inspirational role model. His charm, kind heart, welcoming personality, and most of all, his unique smile will always be embedded deep within our hearts.'

Acting Dean Professor David Waite recalled in a message to the Faculty, 'Hossein was a superb teacher and highly regarded student mentor who, despite his severe illness, continued to provide support to students and staff in the School until just before Christmas. His energy, compassion, love of life and engaging character will live in the memories of all who knew him.'

On behalf of the School, Head of School Professor Stephen Foster extended his sincere condolences to Hossein's wife Giti and daughter Dena.

As the message left on Hossein's office door says, 'There are special people in our lives who never leave us … even after they are gone.'

OUR **RESEARCH**







RESEARCH MANAGEMENT REPORT

The School's Research Management Committee (RMC) manages and supports research activities within the School, including research undertaken by both the staff and the School's postgraduate research students, and liaises with and contributes directly to the Faculty's Research Management Committee. In 2015, the RMC met every month to oversee and progress all research related aspects of the School's operation.

Five out of Five - School research found to be well above world standard



In December 2015, the RMC was pleased to note that the Australian Government's Excellence in Research for Australia (ERA) had given the School the highest possible five point ranking–confirming our *'outstanding performance* ***well above world standard.'***

The result reflected the hard work and energy of all in the School over these past years, as well as the excellent research that we do and the respect in which it is held.

Postgraduate Research Student Management

An important aspect of the Committee's work involves the management of the School's postgraduate research student program. At the end of Semester 2 2015, the School had 214 higher degree research students enrolled in either ME (19) or PhD (195) programs. 2015 also saw 21 of our PHD students and 8 ME students successfully graduate. Their achievements and those of their leading research supervisors approach scholarly critical mass – certainly the School now provides one of the largest regular, consistent and scholarly contributions towards civil, environmental and geospatial engineering knowledge across Australasia and the world.

Management of all this vital research activity within the School involves the assessment of applications to undertake higher degrees within the School, the formulation of specific research plans for each student accepted into the program, the nomination of suitable supervisors, reviewing the progress of students at regular intervals, making recommendations on progress to the Faculty's Higher Degree Committee, and finally nominating examiners when the thesis is completed and, where necessary, following up on the examination process.

Each student is assigned a review committee of three academic staff chaired by a member of the RMC. The review committee meets to interview the student and supervisor(s) at 6 or 12 monthly intervals, depending on the student's progress, and, at these reviews, the student is invited to present a brief seminar outlining progress since the last review. Most academic staff and several research only staff participated in the student review panels in 2015. Much of the heavy work load in this area is carried by the School's Postgraduate Coordinator Associate Professor Arnaud Castel and the Postgraduate Research Student Administrator Ms Pattie McLaughlin.

RMC Committee Membership 2015	
Prof S. Travis Waller	Chair, RMC & rCITI Director
A/Prof Arnaud Castel	Deputy Chair, Postgrad Research Student Coordinator, WRL Research Director
A/Prof Samsung Lim	Deputy Research Student Coordinator
Prof Brian Uy	CIES Director
Prof Mark Bradford	CIES Research Director
Prof Richard Stuetz	WRC Co-Director
Dr Martin Andersen	WRL/CWI Representative
Dr Vinayak Dixit	RCITI Representative
A/Prof Adrian Russell	Practicum Scholarships
Dr Wei Gao	Taste of Research Coordinator
Prof David Carmichael	
A/Prof Linlin Ge	
Prof Ashish Sharma	
Ms Patricia McLaughlin	HDR Student Administrator

Research Student Poster Forum

The School organised an industry/research afternoon at UNSW's CBD campus in February 2015. We invited industry and government colleagues to hear from our leading engineering researchers, and to see the emerging and innovative work being undertaken by just some of our PhD scholars – all of them working to solve a wide range of engineering challenges in the fields of construction, geotechnical engineering, geospatial engineering, hydrology, management, materials, ocean and coastal engineering, structural engineering, surveying, sustainability, transport, waste management and water treatment.

Industry and academic judges then conferred prizes for the best performance in research presentation – Melissa Duell receiving the top award for best performance overall for her poster on 'The impact of uncertainty on strategic network design projects.' Other winners in the following categories were:



Research Student Poster Forum Winners: L-R Albert Saputra, Xiang Li, Conrad Wasko. Melissa Duell (Overall winner), James de Burgh, Head of School Professor Stephen Foster, Amin Pasha, Seyedkomeil Hashemiheidari

James de Burgh, Structural Design Engineering; Melissa Duell, Transport Engineering Prize; Seyedkomeil Hashemiheidari, Research Student Peer Prize, *and* Industry Choice Prize; Xiang Li, Environmental Engineering; Amin Yousefnia Pasha, Geotechnical Engineering; Albert Saputra, Structural Analysis Engineering; Conrad Wasko, Water Engineering

Research Grants

The RMC also provides input to the preparation and coordination of research grant applications. This includes ranking the School's applications for internal Faculty Research Grants (FRGs) and UNSW Major Research Equipment and Infrastructure Initiative (MREIIs) and reviewing applications for competitive external grants such as the Australian Research Council (ARC) Grants and from industry.

In 2015 UNSW won the largest number of ARC grants in the country – leading its peers in the Group of 8 – a coalition of Australia's leading research universities. Not surprisingly 2015 also saw the School continue on its ARC success story – with over half of our academic teaching staff involved in winning a total of almost $5 million in Discovery, Linkage, and LIEF Grants. Fuller details of the ARC funded research projects are provided in pp32-35.

The RMC also administered the 2015 School Minor Equipment Grants Scheme (SMEG). This scheme is designed to provide and maintain School academic staff and researchers with a world-class research environment to attract and retain a critical mass of research excellence and investment in equipment (and critical software). It is a strategic investment to enable our researchers to work at the cutting edge of local, national and international research.

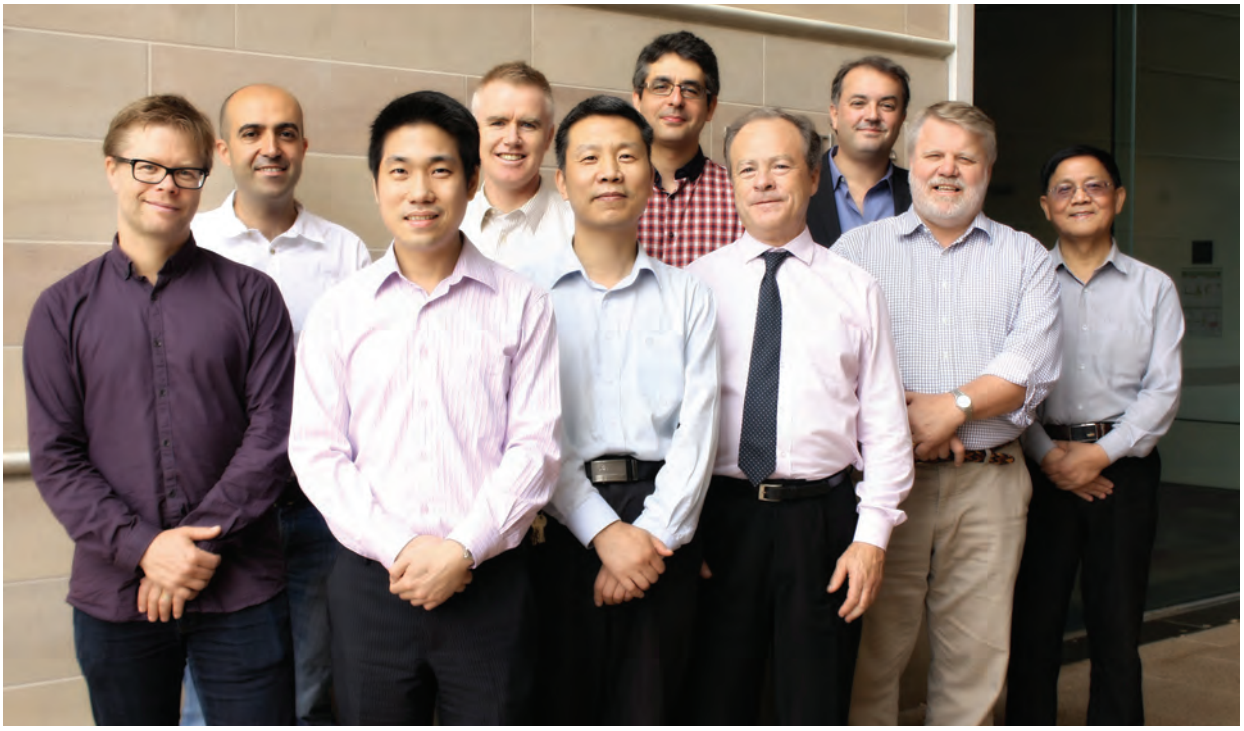
In 2015, $350,000 was awarded by the RMC to over twelve academic staff for a range of new equipment – to support ongoing and new research projects in all our research hubs and centres

Growth in Research 2000 - 2015

Publications	2000	2005	2010	2015
Books	4	5	5	3
Chapters in Books	7	7	11	22
Refereed Journal Articles	73	90	183	356
Refereed Conference Publications	104	83	68	86
Total	188	185	267	467
ARC Grants (year announced)	0	$2.13M	$1.75M	$4.9M
Total Research Income	$4.0M	$6.9M	$15.1M	$12.4M
Higher degree research students	90	90	90	214
No. ARC Discovery Projects awarded	n/a	5	3	6
No. of ARC Linkage & LIEF	n/a	2	2	8
Total Grants	n/a	7	5	14

AUSTRALIAN RESEARCH COUNCIL DISCOVERY, LIEF AND LINKAGE GRANTS 2015

2015 was a remarkable year for the School, with our academic staff winning a record total of 14 ARC grants: totalling $4.9M. Full project details are listed here.



ARC Discovery Winners: L-R: Dr Martin Andersen, Dr Ehab Hamed, Dr Sawekchai Tangaramvong, A/Prof Denis O'Carroll, A/Prof Wei Gao, Dr Hamid Valipour, Prof Mark Bradford, A/Prof Arnaud Castel, Prof Ian Gilbert, Prof Yong-Lin Pi.
Absent: Prof Chongmin Song & ARC LIEF grant winners: A/Prof Adrian Russell, A/Prof Tommy Wiedmann

Chief Investigator(s) CVEN Staff in **bold**	Project details	Total awarded
ARC Discovery Projects		
Professor Andrew Baker**; Associate Professor Denis O'Carroll; Dr Martin Andersen**	The contribution of organic matter in groundwater to the global terrestrial carbon budget is unknown. This project aims to determine the processes that control the amount of groundwater organic matter by using six research bore-fields and laboratory facilities to analyse the concentration and character of both dissolved and colloidal organic matter. This is designed to determine the rate and extent of both the biological and the physiochemical processes determining groundwater organic matter concentration. By quantifying the environmental conditions under which groundwater is a carbon source or sink, the project could guide policy to enable the management of the groundwater resource as part of the carbon economy.	$473,300
Professor Mark Bradford; Dr Hamid Valipour	This project aims to deliver a novel composite steel–timber system that alleviates many of the environmental concerns of the industry, while improving efficiency by using lighter materials. It aims to develop a unique composite system comprised of steel I-section beams and prefabricated timber slabs, with shear connection being provided by bolting or screws. The project plans to assess the structural system experimentally and numerically, and to craft guidelines for the safe and efficient design of these members. The novel lightweight composite system would enhance the speed of construction, allow for deconstructability and reuse and, because plantation timber sequestrates carbon dioxide, have a low carbon footprint.	$435,000

Chief Investigator(s) CVEN Staff in **bold**	Project details	Total awarded
Associate Professor Arnaud Castel; Professor Abhijit Mukherjee	The project aims to develop models and methods to enable the early detection of active steel corrosion. Most of Australia's critical infrastructure is located on or near the coast in high saline conditions and is exposed to a high risk of reinforcing steel corrosion. Our ability to design and monitor such structures is crucial. The first part of the project aims to develop an innovative finite element model to improve the prediction of both active steel reinforcement corrosion and the time to concrete cracking in a chloride environment. It then plans to develop a non-destructive method, combining ultrasonic waves-based technology and acoustic emission, to detect active steel corrosion before any damage is visible on the structure.	$370,000
Associate Professor Wei Gao; Professor Yong-Lin Pi; Dr Sawekchai Tangaramvong	This project aims to develop a high-performance tool for the dynamic safety assessment of softening structures. The assessment of structures that exhibit softening, either at constitutive level or structural level, is essential for design and rehabilitation purposes, especially when the inevitable uncertainties in the system parameters need to be accounted for. This project aims to develop an advanced and unified framework that can model both stochastic and nonstochastic processes for these purposes. An advanced mixed finite element model underpins this framework, and both formulation and solution algorithms are based on mathematical programming formalism. The developed computational tool would be able to perform pure stochastic, pure nonstochastic, hybrid uncertain analyses and dynamic reliability assessment of structures.	$390,000
Emeritus Professor Ian Gilbert; Dr Ehab Hamed	This project seeks to improve understanding of the long-term structural behaviour of precast concrete sandwich panels and thus facilitate their use in civil engineering applications. These panels offer many advantages over traditional concrete panels mainly due to their excellent thermal insulation and their use in civil and industrial engineering applications is expanding. Nevertheless, the literature reveals a lack of confidence in their design due to the absence of reliable numerical models and test data of their long-term structural behaviour. This project aims to provide insight into the nonlinear long-term behaviour of such panels by developing new theoretical models that will be validated by laboratory testing.	$330,000
Professor Chongmin Song	This project aims to establish an innovative numerical framework for the computer simulation of systems of engineering structures subject to dynamic loadings. Scaled boundary polytope elements and an octree algorithm for mesh generation are proposed for adaptive nonlinear dynamic analysis at multiscales. It is anticipated that the numerical modelling and simulation will be performed automatically from the material meso-structures to achieve reliable predictions at minimum human and computational efforts. The intended outcome of this project is an innovative technology for numerical simulation and a rational predictive tool useful for the planning, design and management of engineering structures, and for the virtual testing of materials.	$390,000



ARC Linkage Winners: Back L-R: Prof Brian Uy, Prof Richard Stuetz,Prof David Waite,A/Prof Arnaud Castel,Dr Hamid Valipour Front L-R Dr Ali Akbarnezhad, Dr Fiona Johnson, Prof Stephen J Foster, Dr Vinayak Dixit.

Absent from Pic: Prof Mark Bradford, Dr Peter Kovalsky, Dr Binghao Li, Dr Taha Rashidi, Prof Chris Rizos, Prof Ashish Sharma, Prof S Travis Waller.

Chief Investigator(s) CVEN Staff in **bold**	Project details	Total awarded
ARC Linkage Projects		
Prof Mark Bradford, Prof Brian Uy, Prof Yanlin Guo, Prof Li Xian Dai **Industry Partner Organisations** TSINGHUA UNIVERSITY, BEIJING; CHINA CONSTRUCTION STEEL STRUCTURE CORP. LTD	This project plans to investigate the use in building frames of composite steel-concrete members that use high-strength steel (HSS) instead of mild steel (MS). HSS is finding increased use in construction, and HSS has a much greater strength-to-weight ratio than MS, leading to lighter composite structures, less material usage and smaller foundations. Overall, this reduces the cost and carbon footprint of steel-framed buildings. The investigation is planned to involve physical testing, numerical studies, developing structural models and crafting design guidance for T-beams, columns and joints. The major intended outcome of the project is design guidance that will support the expanded use of HSS.	$380,000
A/Prof Arnaud Castel, Prof Stephen Foster, Dr Ali Akbarnezhad, Dr Redmond Lloyd **Industry Partner Organisations** BORAL CEMENT LIMITED	The aim of this project is to determine the fundamental mechanics of early age thermal cracking in mass concrete elements and in members with high cement contents, and to develop a tool to predict early age cracking. Early age thermal cracking in concrete due to heat of hydration and thermal gradients is a major engineering problem and is undesirable for durability and structural performance, as well as aesthetics and project economics. The research outputs include new theories and relationships from which advanced engineering models will be derived that will support improved design and construction of mass concrete elements.	$299,000
Prof Stephen Foster, Dr Hamid Valipour, Mr Graeme McGregor **Industry Partner Organisations** ONESTEEL REINFORCING PTY LIMITED	The aim of this project is to develop the fundamental understanding needed to design and construct high-strength concrete columns with high-strength steel reinforcement, with the intended outcome of providing design rules for adoption by engineers and Standards bodies. With significant innovations in Australian steel bar technology, strengths grades of 750 mega pascal, and higher, are becoming available. These high-strength steels can be used in reinforced concrete building construction and would increase the competitiveness of Australia's manufacturing industry and enable the export of high-value-added technologies. Significant efficiencies in construction costs and in carbon emissions are possible.	$190,000
Dr Fiona Johnson, Prof Ashish Sharma, Dr Shahadat Chowdhury, Mr Richard Beecham **Industry Partner Organisations** NSW DPI (WATER)	The project aims to develop a new method for understanding drought drivers in eastern Australia and how well these are portrayed by climate models. The intended outcome of the project is to provide a framework for evaluating climate models on their representation of drought drivers and then use this information to develop improved downscaling schemes. Traditional downscaling approaches do not capture changes in variability in rainfall and evaporation at inter-annual and inter-decadal timescales. This project aims to address this problem by providing a comprehensive drought downscaling framework which will provide inputs to water sharing plans that can be used to assess the future risks of droughts in catchments across New South Wales.	$300,000

Chief Investigator(s) CVEN Staff in **bold**	Project details	Total awarded
Prof Chris Rizos, Dr Binghao Li, A/Prof Serkan Saydam, Dr Qiang Wang, Prof Jian Wang **Industry Partner Organisations** CHINA UNIVERSITY OF MINING AND TECHNOLOGY; JIANGSU CRELEAD INFORMATION TECHNOLOGY	This project aims to research a robust high accuracy positioning system for underground mining environments to improve worker safety and mine efficiency. Positioning in underground mining environments is a key requirement in ensuring the safety of mine workers. It is also a critical technological capability in resolving mine productivity bottlenecks. Australia is one of the largest mining nations and is a leader in mining-related research and development and this project intends to support the growth of the valuable mining sector by addressing a significant engineering challenge.	$353,000
Prof T David Waite, Prof John Fletcher, **Dr Peter Kovalsky** **Industry Partner Organisations** MINCARB PTY LTD	This project aims to develop capacitive deionisation (CDI) for the decontamination of water. The specific goals are firstly to identify applications where CDI could cost-effectively make brackish, contaminated water usable. The project then intends to optimise CDI design and operating conditions to remove particular ions of concern and to develop approaches to energy recovery. The main outcome is intended to be a photovoltaic-powered CDI unit that is capable of stand-alone operation with optimal energy recovery and inbuilt monitoring, and control technology enabling cost-effective and sustainable operation.	$560,000
Dr Vinayak Dixit, Dr Taha Rashidi, Prof S Travis Waller, Mr Gopi Krishnan **Industry Partner Organisations** OZ HARVEST LIMITED	This project aims to develop an innovative holistic mathematical model of the vehicle routing problem for a charity-based food rescue and distribution system. Such a model would aim to maximise societal benefits while constraining costs, and would need to take into account the demand profile for donors and receivers, and the equitable distribution of food. The model developed is designed to mathematically represent the system in a consistent framework so as to develop optimisation models and techniques. The project also seeks to understand the factors that influence the demand to donate to food rescue by organisations and individuals and the demand to request food by welfare agencies.	$152,000
ARC LIEF		
Associate Professor Thomas Wiedmann; Prof Manfred Lenzen; Dr Steven Kenway; Prof Paul Lant; Dr Anthony Halog; Prof Pascal Perez; Dr Robert Crawford; A/Prof Mark Diesendorf; Dr Maria Balatbat; Prof Gary Monroe	Enhanced modelling capacity for the Industrial Ecology Virtual Laboratory: This project aims to enable Australian research leaders working on the integrated sustainability assessment of policies, products and projects to collaborate in the Industrial Ecology Virtual Laboratory (IELab). It seeks to develop and implement an enhanced modelling capability and suite of online analytical tools to support sustainability scientists and analysts from Australia and abroad conducting research projects of national and international significance. In particular, the project would provide policy-makers, investors and communities with detailed and tailored information to help make better decisions about a sustainable future. By upgrading IELab hardware and analytical and modelling software, the project would be versatile and flexible and remain up to date.	$260,000

Several academic staff are also involved in successful ARC projects administered by other universities. We congratulate

A/Prof Adrian Russell – for **LIEF grant LE160100206** administered by UQ for a National rock, concrete and advanced composite testing capability.

Prof Richard Stuetz for an **ARC Linkage Project** administered by the University of Wollongong which aims to develop management approaches to enable the use of anaerobic co-digestion — the conversion of organic wastes and wastewater sludge to biogas for electricity production.

Prof Brian Uy for an **ARC Linkage Project** administered by Curtin University of Technology, WA which aims to develop technologies to monitor the health of Australia's ageing infrastructure with the use of a unique laser ultrasonic device.

GRANTS 2015 — $12.44M

Centre for Infrastructure, Engineering & Safety (CIES)

Researcher(s)	Research Topic	Granting Organisation	Value at 2015
A Akbarnezhad	Industry Research	Boral Cement	$ 53,350
A Akbarnezhad	Faculty Research Grant (FRG)	UNSW Engineering	$ 29,265
MA Bradford	An Innovative and Advanced Systems Approach for Full Life-Cycle, Low-Emissions Composite and Hybrid Building Infrastructure	ARC Laureate Fellowship including Faculty of Engineering & UNSW support ARC FL100100063	$446,518
Chongmin Song	From CAD and digital imaging to fully automatic adaptive 3D analysis	ARC Discovery DP150103747	$132,328
A. Russell	Internal erosion of soils: microstructural modelling	ARC Discovery DP150104123	$111,970
MA Bradford	Buckling capacity of high-strength steel flexural members	ARC Discovery DP150100446	$132,328
S Foster, H Vali Pour	Rotation Capacity of Joints in SFRC Moment Resisting Beams and Frames	ARC Discovery DP150104107	$91,612
B Uy	The behaviour and design of innovative connections to promote the reduction and reuse of structural steel in steel-concrete composite buildings	ARC Discovery DP140102134	$178,274
A Russell, N Khalili	Shallow foundations in unsaturated soils: mechanistic design through numerical modelling, analysis and experimental investigation"	ARC Discovery DP140103142	$136,327
W Gao, Y-L Pi, F Tin-Loi	Stochastic geometrically nonlinear elasto-plastic buckling and behaviour of curved grid-like structures	ARC Discovery DP140101887	$141,571
G Ranzi (USYD), A Castel, R I Gilbert, D Dias-da-Costa	Stiffness degradation of concrete members induced by reinforcement corrosion.	ARC Discovery DP140100529	$50,000
C Song	A high-performance stochastic scaled boundary finite-element framework for safety assessment of structures susceptible to fracture	ARC Discovery DP130102934	$119,792
RI Gilbert	Control of cracking caused by early-age contraction of concrete	ARC Discovery DP130102966	$114,347
N Khalili	Dynamics analysis of unsaturated porous media subject to damage due to cracking	ARC Discovery DP130104918	$108,902
L Ge	Advanced techniques for imaging radar interferometry	ARC Discovery DP130101694	$119,792
G Zhao	Dynamic fracturing in shale rock through coupled continuum-discontinuum modelling	ARC DECRA DE130100457	$171,520
T Thai	Reliability assessment of concrete-filled steel tubular frames designed by advanced analysis	ARC DECRA DE140100747	$127,562
A Russell	An earthquake shaking table to investigate soil-structure interactions	ARC LIEF Grant LE150100130	$400,000
MA Bradford	Climate adaptation technology and engineering for extreme events.	CSIRO / Flagship Collaborative Research Program	$127,300
N Khalili	Experimental investigation and constitutive modelling of weak rocks subject to mechanical and moisture degradation	ARC Linkage LP140101078	193,822
B Uy	Development of novel viscoelastic sprayed material for the effective blast resistance of critical and resource infrastructure	University of Western Sydney / ARC Linkage Project Shared Grant-LP140100030	$59,480
H M Goldsworthy, E Gad, B Uy, S Fernando	Development of efficient, robust and architecturally-flexible structural systems using innovative blind-bolted connections	ARC Linkage LP110200511	$30,000
S Foster; E Hamed; Z Vrcelj	Advanced Composite Structures	Cooperative Research Centre for Advanced Composite Structures Ltd (CRC-ACS)	$83,265
S Foster; A Castel	Performance based Criteria for Concretes: Creating Pathways for Low Carbon Concrete Manufacture with Existing Standards	Cooperative Research Centre for Low Carbon Living Ltd(CRC LCL)	$228,189
A Castel	Equipment to develop a world class laboratory for carrying out durability tests at the material and structural level	MREII (UNSW Major Research Equipment and Infrastructure Initiative Scheme	$160,969

Researcher(s)	Research Topic	Granting Organisation	Value at 2015
K Senetakis	Interferometer which applies the white light interferometry principle to capture and quantify surface characteristics of materials, including soil particles and rock samples.	MREII (UNSW Major Research Equipment and Infrastructure Initiative Scheme	$118,900
S Tangaramvong	FRG Grant	Faculty of Engineering	$30,000
K Senetakis	FRG Grant	Faculty of Engineering	$30,000
E Hamed	Coupled hygrothermal-creep effects in adhesively bonded lap joints	UNSW Goldstar Award	$40,000
Industry funded research undertaken by various CIES Projects team	Various		$188,084
Total			**$3,955,467**

NCCARF
National
Climate Change Adaptation
Research Facility
Adaptation Research Network
SETTLEMENTS AND INFRASTRUCTURE

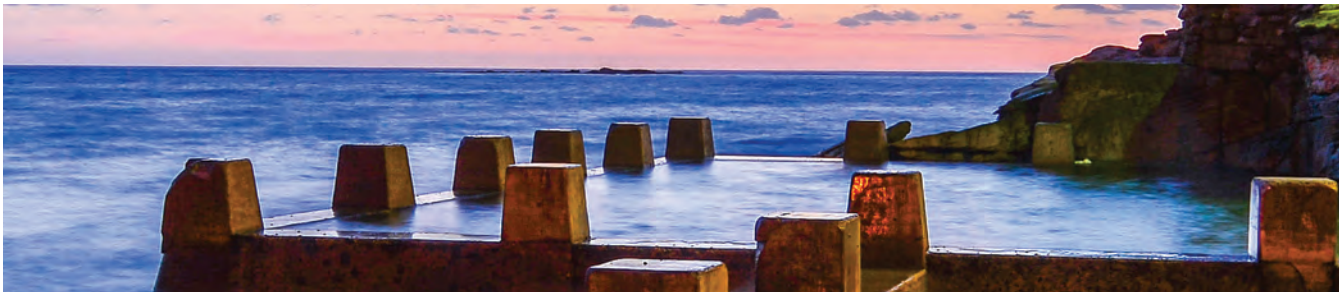
ACCARNSI

Researchers	Research topic	Industry partners	2015 Income
Sydney Institute of Marine Science (SIMS)/ACCARNSI	Coastal Processes and Responses	Climate Adaptation Research Hub – NSW Office of the Environment and Heritage (OEH)	$190,300
ACCARNSI	Phase 2 project	NCCARF Phase 2 (Griffith University)	$223,393
ACCARNSI	Phase 2 project	NSW Office of the Environment and Heritage (OEH)	$10,000
Total			**$423,693**

CONNECTED WATERS

The Connected Waters Initiative Research Centre

CVEN Researchers within CWI	Granting Organisation	2015 Income
Martin S. Andersen	NCRIS - Department of Education	$424,000
Martin S. Andersen	Cotton R& D Corp - PhD Scholarship	$15,085
Martin S. Andersen	Ecological impacts of gas extraction & coal mining	$357,605
Martin S. Andersen	ARC Linkage P130100177 Baker,Andrew & Andersen (50%)	$25,864
Total		**$822,554**



Research Centre for Integrated Transport Innovation (rCITI)

Senior Investigator(s) / Advisor(s) / Researcher(s)	Subject Area / Research Topic	Granting Organization(s) / Industry Sponsor(s)	Value 2015
Prof S. Travis Waller	Adaptive Stochastic Dynamic Traffic Assignment	DP150104687 Australian Research Council / Discovery Project	$90,000
Prof Michiel Bliemer, Prof S. Travis Waller, Prof David Hensher, Dr Vinayak Dixit, Prof Elisabet Rustrom, Prof Stephane Hess, Prof Hans Van Lint.	Investigating Travel Choice Behaviour: A New Approach	DP150103299 University of Sydney / Australian Research Council - Discovery Project Shared Grant	$53,376
Prof Raina MacIntyre, Dr Lauren Gardner, Dr Anita Heywood	Real Time Models To Inform Prevention And Control Of Emerging Infectious Diseases	APP1082524 National Health & Medical Research Council, Project Grant	$85,466
Dr Vinayak Dixit	Assessing Reliability And Benefits Through Smart Technologies	Stamen Engineering Group	$20,000
Dr Vinayak Dixit	Traffic Science Innovations	Stamen Engineering Group	$34,898
Dr Vinayak Dixit	Dynamic Traffic Modelling Using Aimsun	Medulla Soft Technologies Pvt Ltd (India)	$10,000
Prof S. Travis Waller, Dr Vinayak Dixit	Review of Managed Motorway Control Technology System.	Roads and Maritime Service	$75,000
Prof S. Travis Waller	A Collaboration to Develop and Deploy Novel Integrated Network Techniques to Enhance the NSW Transport System.	Transport for NSW	$500,000
Prof S. Travis Waller, Prof Michiel Bliemer, Dr Vinayak Dixit, Prof Michael G Bell, Dr Alexandre Torday	Methodologies for the Incorporation of Congestion Propagation and System Reliability into Transport Network Models for Consistent Multi-Scale Planning.	LP130101048 Australian Research Council - Linkage Project / TSS-Transport Simulation Systems Australia P/L - ARC Linkage Project Industry Partner Contribution	$160,139
Prof S. Travis Waller, Dr Vinayak Dixit, Dr Lauren Gardner, Dr Taha Hossein Rashidi, Mr Bruce Jeffreys	Integrating Network Modelling with Observed Choice Data for Multi-Criteria Optimization of Complex Carshare Systems: Cost, Mobility and Transit Usage	LP130100983 Australian Research Council - Linkage Project/ GoGet CarShare - ARC Linkage Project Industry Partner Contribution.	$192,376
rCITI Total			**$1,221,255**

Surveying and Geospatial Engineering

Researcher(s)	Research Topic	Granting Organisation	2015 Income
Chris Rizos	Next Generation Australian and New Zealand Datum	Cooperative Research Centre for Spatial Information	$37,000
Chris Rizos	Underground Mine Environments	ARC Linkage Project - ARC contribution	$53,440
Chris Rizos	Underground Mine Environments	ARC Linkage Project - Industry Partner contribution	$30,000
Chris Rizos	ERA-EE REC	Earnings from being member of the ARC's ERA panel on Environment and Engineering - Personal contribution	$17,041
Chris Rizos	Testing Locata Technology	Cooperative Research Centre for Spatial Information	$29,111
Jinling Wang	Indoor Positioning and Navigation with Beidou Pseudolites	China Hunan Engineering Research Center of Navigation Instrument	$114,100
Total			**$280,692**

water@UNSW water research centre

Water Research Centre

Kensington Campus Hub Investigators	Research Topic	Granting Organisation	Cash (ex GST)
D. Waite, X. Wang, G. Leslie (UNSW), X. Huang, X. Wen (Tsinghua University), H. Bustamante (Sydney Water Corporation), J. Guan (Beijing Origin Water Technology)	Optimisation of nutrient removal, membrane fouling and sludge dewatering in hybrid coagulation/submerged membrane bioreactor treatment of wastewaters	ARC Linkage LP100100056, APAI (2), Beijing Origin Water Technology Company Ltd, Sydney Water Corporation, Water Quality Research Australia Ltd	$14,291
R. Henderson, A. Baker (UNSW), J. Bridgeman (University of Birmingham)	Monitoring organic matter in drinking water systems using fluorescence spectroscopy: improved early warning, process optimisation and water quality	ARC Linkage Project LP100200259, APAI, Hunter Water Corporation, Melbourne Water Corporation, Queensland Bulk Water Authority, Water Quality Research Australia Ltd	$1,360
D. Waite (UNSW)	Physic-chemical controls on growth, toxicity and succession of Microsystems and Anabaena species in water supply reservoirs. Scholarship for Anna Yeung	WQRA - Water Quality Research Australia Ltd	$2,632
R. Collins (UNSW)	Exploiting natural processes to effectively remediate acidified coastal environments	ARC Linkage Project LP110100480, Tweed Shire, NSW Cane Growers, NSW Sugar Milling Co-Op Scholarship	$28,155
R. Collins (UNSW)	Aluminium mobility and geochemistry in Acid Sulfate Soils using novel exchange techniques and Accelerator Mass Spectrometry. Scholarship	AINSE - Australian Institute of Nuclear Science and Engineering	$3,796
R. Collins (UNSW)	Iron- A solution for uranium resource recovery and pollutions response	Australian Research Council / Future Fellowships FT110100067	$82,221
B. Sivakumar (UNSW)	Development of generic catchment classification framework in hydrology	Australian Research Council / Future Fellowships FT110100328	$86,724
R. Stuetz (UNSW)	Litter management strategies to reduce odour emissions from poultry litter	Poultry CRC/Nutrition and Environment Research Program	$54,911
A. Sharma, J. Evans, A. Sen Gupta (UNSW), A. Chanan, G. Singh (State Water Corporation), M. Bari, J. Luo (Bureau of Meteorology), F. Chew (CSIRO), L. Band (University of North Carolina at Chapel Hill)	A decadal to inter-decadal streamflow prediction system	ARC LP130100072, State Water Corporation, Bureau of Meteorology	$191,127
A. Anceno (UNSW)	Multi-functional reactor systems for liquid and gas phase treatment of agroindustrial and municipal effluents: toward pollution and odour abatement with energy cogeneration	UNSW VC PostDoc Support	$9,997
D. Waite, G. Leslie (UNSW), X. Wang (Tsinghua University), J. Guan (Beijing Origin Water Technology), C. McInnes (Water Research Australia), P. Spencer (Water Corporation of WA), N. Riethmuller (Power and Water Corporation)	Innovative hybrid membrane-based pre-treatment strategies for remote community groundwater supplies	ARC LP130101107, Beijing Origin Water, Water Research Australia, Water Corporation of WA, Power and Water Corporation	$216,572
T. Wiedmann (UNSW), R. Zito, S. Lehmann (UniSA), A. Berry (CSIRO), O. Vitkovskaya, J. Ting, L. Oxlad (SA Department of Environment, Water and Natural Resources), P. Donaldson (Renewal SA), K. Rouse (SA Water), N. Nelson (Sydney Water), L. Partridge (AECOM)	Integrated ETWW demand forecasting and scenario planning for precincts	CRC for Low Carbon Living Ltd	$96,014
A. Sharma, F. Johnson, Y. Liu, L. Marshall (UNSW), H. Moradkhani (Portland State University), S. Muddu (Indian Institute of Science), Q. Wang, D. Robertson (CSIRO)	Reducing flood loss - A data-assimilation framework for improving forecasting capability in sparsely gauged regions	ARC Discovery Grant DP140102394	$178,274

Kensington Campus Hub Investigators	Research Topic	Granting Organisation	Cash (ex GST)
A. Sharma (UNSW), S. Muddu (Indian Institute of Science)	What will the future be? Projecting environmental change in a warming world for semi-arid landscapes	Dept. of Industry / AISRF - Australian-India Strategic Research Fund	$104,420
S. Khan (UNSW), Partner Organisations: WaterFutures, Griffith University, National Measurements Institute, SA Water, Melbourne Water, WaterCorp, SouthEast Water	SP4-Validation protocols (integrated testing strategy) for multi-barrier approach in water recycling	Water Research Australia Ltd - SP4/Water Recycling Centre of Excellence	$126,536
R. Stuetz (UNSW), Partner Organisations: University of SA, Sydney Water Corp., SA Water, Prospect Water Partnership, Degremont, Suez Environment, Hunter Water	Beneficial reuse of solids from wastewater treatment operations	CRC for Low Carbon Living Ltd	$414,876
A. Sharma (UNSW)	Flood inundation data assimilation - Scholarship for Sahani Pathiraja	CSIRO - Commonwealth Scientific and Industrial Research Organisation / Postgraduate Studentship	$14,385
T. Wiedmann (UNSW), University of Melbourne, University of SA, AECOM, Aurecon, Sydney Water, Bluescope Steel	Integrated Carbon Metrics (ICM) – a multi-scale life cycle approach to assessing, mapping and tracking carbon outcomes for the Built Environment	CRC For Low Carbon Living Limited	$191,206
R. Stuetz (UNSW)	Exploratory investigation of taste and odour compounds in water supply by GC-MS olfactory analysis - Honours Scholarship for Lily Liu	Water Research Australia Limited / Scholarship Honours	$3,000
R. Stuetz (UNSW)	Energy Benchmarking for efficient, low carbon water recycling operations	CRC For Low Carbon Living Limited	$2,000
S. Westra (Uni. Adelaide), F Johnson (UNSW), F Zwiers (Uni of Victoria, Canada), H. Fowler (Uni Newcastle Upon Tyne, UK), G. Lenderink (Royal Netherlands Meteorological Institute)	A spatial extremes framework for predicting subdaily rainfall intensity	University of Adelaide / ARC Discovery Project shared Grant – DP150100411	$76,138
R. Crawford (Uni Melbourne), T. Wiedmann (UNSW). A. Stephan (Belgian National Fund for Scientific Research, Free University of Brussels (French))	Improving the environmental performance of Australian construction projects	University of Melbourne / ARC Discovery Project Shared Grant – DP150100962	$25,406
M. Hadjikakou (UNSW)	Our 'foodprint' matter – Australian diets and their environmental, economical and health impacts	Australian Academy of Science / WH Gladstones Population and Environment Fund	$12,000
B. Stanford, G. Johns (Hazen and Sawyer), S. Khan, T. Wiedmann (UNSW)	Methodology for a comprehensive analysis (TBL) of alternative water supply projects compared to direct potable reuse	Hazen and Sawyer & Water Research Australia / WateReuse Research Foundation Subcontract	$136,866
J. P. Alvarez Gaitan (UNSW)	Chemicals Life Cycle Study	Think Brick Australia (Clay Brick and Paver Institute)	$9,500
S. Maleknia (UNSW)	Addressing odour abatement and assessment knowledge gaps using PTR - TOFMS	Department of Agriculture, Fisheries and Forestry (QLD) / RIRDC Research Funding R&D Program	$21,900
L. Marshall (UNSW)	Paxton Catchment Improvement Program: Peer Review	Hunter Water Corporation / State Government Contract	$3,013
A. Sharma, M. Hasan (UNSW)	AMSI / BOM project	Bureau of Meteorology	$17,000
R. Collins, S Tsarev (UNSW)	"Redox activated" clay barriers for uranium reduction and immobilisation	Australian Synchrotron / X-ray Absorption Spectroscopy Beamline Access	$956
T. Wiedmann (UNSW), C. Dey (Uni Sydney)	Virtual laboratory and research tools user support enhancement project	QCIF - Queensland Cyber Infrastructure Foundation Limited	$30,714
N. Le Minh, X. Wang (UNSW)	Odour analysis	The Odour Unit	$2,430
S. Khan, J. McDonald (UNSW)	Trace Organics analysis	Water NSW	$10,500
S. Dever (UNSW)	Workshop delivery	University of Queensland	$6,121
S. Khan, J. McDonald (UNSW)	Trace Organics analysis	University of Melbourne	$12,960
N. Le Minh, X. Wang (UNSW)	Odour analysis	OMPA - Odor Management Project Alliance	$5,160
R. Henderson, Y. Shutova (UNSW)	LCOCD analysis	RMIT	$4,620
N. Le Minh, X. Wang (UNSW)	Odour analysis	The Odour Unit	$10,000
Kensington Campus Hub Total			**$2,207,781**

Water Research Centre

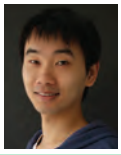
Northern Beaches WRL Hub Researchers	Research topic	Industry partners	2015 Income
James Carley, Matt Blacka, Ian Turner, Ron Cox, Ian Coghlan, Francois Flocard, Erica Davey, Kristen Splinter, Mitchell Harley, Jamie Ruprecht, Duncan Rayner, Chris Drummond	Coastal Engineering and Climate Change	Aurecon Pty Ltd, Australian Nuclear Science and Technology Organisation (ANSTO), Bega Valley Shire Council, Byron Shire Council, City of Gold Coast, Coasts and Ports 2015 c/- Tonkin & Taylor Ltd, Darwin Ports Corporation, Department Of Commerce (For Clarence Valley Council),GHD, Gosford City Council, Hunter Water Corporation, HWL Ebsworth, James Quille c/- Giles Tribe Architects, Kingborough Council, Moyne Shire Council, NSW DPI, Crown Lands Division, Coastal and Infrastructure Group, Office of Environment and Heritage, Peat Swamp Steering Committee at ANU, Stephen Crosby & Assoc. Pty Ltd, Sydney Institute of Marine Science (SIMS), Tonkin & Taylor Ltd, Tweed Shire Council, US Army Corps of Engineers, UTZ Sanby Architects, Worley Parsons, Wyong Shire Council.	$956,243
Brett Miller, Bruce Cathers, Grantley Smith, Bill Peirson, Nathan Guerry, Francois Flocard, Stefan Felder	Civil Engineering Hydraulics	Sydney Water Corporation, Drying Green Alliance, ACO Polycrete Pty Ltd, Cardno (NSW/ACT) Pty. Ltd, Worley Parsons.	$316,300
Will Glamore, Duncan Rayner, Jamie Ruprecht, Martin Andersen, Priom Rahman, Ian Coghlan	Estuaries and Wetland Restoration	Bega Valley Shire Council, Department Of Commerce (For Clarence Valley Council), Greater Taree City Council, Newcastle Coal Infrastructure Group, North Coast Local Land Services, NSW Department of Primary Industries (Fisheries), Shoalhaven City Council, NSW Office Of Environmental And Heritage: Parks And Wildlife Division, Sydney Institute of Marine Science (SIMS), Transport for NSW (Maritime Management Centre)	$680,091
Grantley Smith, Ron Cox, Brett Miller, Nathan Guerry, Priom Rahman	Floodplain Management, Water resources and Stormwater	Cardno (NSW/ACT) Pty. Ltd, City of Newcastle, Department of Environment, Land, Water and Planning, Drying Green Alliance, NSW Department of Planning and Environment, NSW Office of Environment and Heritage, Sydney Water Corporation, Toowoomba Regional Council, Warringah Council, Water NSW	$334,716
Doug Anderson, Martin Andersen, William Glamore, Grantley Smith, Brett Miller, Ian Acworth, Priom Rahman	Groundwater resources	Office Of Water Science (Commonwealth), Australian Nuclear Science and Technology Organisation (ANSTO), Kingborough Council, Newcastle City Council, Newcastle Coal Infrastructure Group, NSW Department of Planning and Environment, NSW Trade & Investment, WA Department of Water	$354,790
William Glamore, Brett Miller, Duncan Rayner, Jamie Ruprecht, Priom Rahman, Grantley Smith, Ian Coghlan	Water Quality in Rivers, Estuaries and Coastal Waters	Sydney Water Corporation, Cargill, John Holland Group Pty Ltd, Manly Golf Club, NSW Environmental Protection Authority	$431,905
Stefan Felder	Experimental investigation of near-critical flows in hydraulic structures	2015 Faculty Research Grant Program/Early Career Researcher Grants Program	$35,000
Chief Investigator: Ian Turner Contributing researchers: J Middleton, K Splinter,(UNSW) A Reniers (TU Delft), M Davidson (U. Plymouth), C Blenkinsopp (U. Bath)	Beach Erosion and Recovery: Quantifying the Hazard	ARC Discovery Project DP150101339	$157,776
Chief Investigator: Ian Turner (UNSW Lead), Contributing researchers: T Baldock (UQ), D Callaghan (UQ), P Nielsen (UQ), C Blenkinsopp (U. Bath), R Ranasinghe (DTU)	Assessing and enhancing the resilience off Australian beaches to sea level rise.	ARC Discovery Project DP140101302	$36,000
Denis O'Carroll		ARC Future Fellowship	$ 226,973
Total Northern Beaches Campus WRL Hub 2015			**$3,529,794.00**
Total WRC			**$5,737,575.00**

RESEARCH STUDENTS

Name *Topic* Supervisor/s	
	Ademir **Abdala Prata Jr** *Assessment of odours emission rate* [Stuetz, Richard; Timchenko, Victoria]
	Syed **Abu Shoaib** *The relative importance and characteristics of Input Uncertainty in Hydrology* [Marshall, Lucy A; Sharma, Ashish]
	Mohamadamin **Afshar** *Early Age Thermal Cracking of Concrete* [Castel, Arnaud; Akbarnezhad, Ali]
	Alireza **Ahmadian Fard Fini** *Predicting delay and minimizing its impact in construction context* [Waller, S Travis; Akbarnezhad, Ali]
	Alireza **Akbarzadeh-Chiniforosh** *A novel theoretical method of non-destructive health monitoring of structures* [Valipour, Hamid; Akbarnezhad, Ali]
	Ruken **Alac Barut** *Integration of InSAR with GPS & Geophysical Modeling* [Rizos, Chris]
	Bandar Salman M **Alharbi** *Modernised vertical datums* [Rizos, Chris]
	Muhammad **Ali** *Hydrology, water resources* [Bellie, Sivakumar]
	Zeinab **Aliabadian** *Dynamic fracture of rock by continuum - discontinuum coupled model* [Zhao, Gaofeng]
	Golnaz **Alipour Esgandani** *Numerical modelling of unsaturated soils under earthquake loading* [Khoshghalb, Arman]
	Rebecca Jane **Allan** *Backward erosion piping of dams* [Douglas, Kurt J]

Name *Topic* Supervisor/s	
	Abdulaziz Saud **Almohssen** *Tracking subcontractor reputation* [Davis, Steven R]
	Muwaffaq Awadh O **Alqurashi** *Quality control in GNSS/ INS/vision integration for 3D mapping* [Wang, Jinling]
	Raed **Alsalhi** *Traffic flows in urban networks* [Dixit, Vinayak]
	Abdulmajeed Sulaiman **Alsultan** *Urban traffic network design* [Dixit, Vinayak; Waller, S Travis]
	Nima **Amini** *Transport modelling* [Gardner, Lauren; Waller, S Travis]
	David **Arbis** *Modelling Strategic Interactions of Driver Manoeuvres* [Dixit, Vinayak; Hossein Rashidi, Taha/ Xiong, Zhitao]
	Hossein **Asefi** *A multi-objective optimisation approach for solving a Green Two - echelon Integrated Waste Collection Location - Routing Problem (G - 2E - IWCLRP)* [Lim, Samsung]
	Abdolreza **Ataei** *Steel and composite structures* [Bradford, Mark A]
	Seyed Mahdi **Babaee** *Durability of geopolymer concrete in marine environments* [Castel, Arnaud]
	Yun **Bai** *Coupled thermo-chemo-flow-deformation analysis of multiphase multi-porous media.* [Khalili, Nasser]
	Noor Adnan Sadik **Baktash** *Creep in unsaturated soils* [Khoshghalb, Arman; Khalili, Nasser]

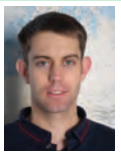
Name *Topic* Supervisor/s	
	Khalegh **Barati** *Construction resources networks tracking and management* [Shen, Xuesong]
	Robert **Bertuzzi** *Estimating rock mass strength and stiffness with particular interest in the load on a tunnel lining.* [Douglas, Kurt J]
	Melissa Anne **Bracs** *Monitoring and modelling coastal variability on a regional scale: implications for the establishment of a national coastal observing network* [Turner, Ian L]
	Guido Esteban **Carvajal Ortega** *Reliability assessment and management for direct potable water recycling* [Khan, Stuart J; Roser, David]
	Juan Carlos **Castilla Rho** *Agent-based modelling of managed groundwater systems* [Andersen, Martin S; Mariethoz, Gregoire]
	Mohana Naga **Chakkam** *Macroscopic modelling for large urban networks* [Dixit, Vinayak; Waller, S Travis]
	Yingyue **Chang** *Development and application of biomimetic high valence state iron complexes for contaminant oxidation* [Miller, Christopher J; Waite, T David]
	Guangwu **Chen** *City-scale Carbon Footprint accounting and decarbonisation policy analysis* [Wiedmann, Thomas]
	Kai **Chen** *Stochastic modeling and geometric analysis for vision-based indoor* navigation [Wang, Jinling]
	Nan **Chen** *Multilayer network analysis* [Dixit,Vinayak; Gardner, Lauren]
	Shuyang **Cheng** *Integration of GNSS precise point positioning and inertial navigation system* [Wang, Jinling]

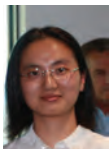
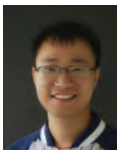
Name *Topic* Supervisor/s
 Dipayan **Choudhury** *Assessment and correction of climate drift in decadal predictions from a hydrological viewpoint* [Sharma, Ashish; Sen Gupta, Alex/ Mehrotra, Rajeshwar/ Bellie, Sivakumar]
 Jin Jerry **Dang** *Durability of construction materials, low -carbon concrete technology, time-dependent behaviour* [Shen, Xuesong]
 James Matthew **de Burgh** *Modelling and analysis of concrete building and tunnel structures in fire* [Foster, Stephen J]
 Dilina **Dissanayake** *Automated image-based modelling for elastoplasticity and damage analysis* [Song, Chongmin]
 Duy Minh **Do** *Stochastic interval analysis of structures with a mixture of random and interval uncertainties* [Gao, Wei]
 Nicolas Ian **Donnelly** *Next generation datum for Australia and New Zealand: Accounting for deformation* [Rizos, Chris]
 Xi **Du** *Damage and fracture development in jointed rocks* [Khalili, Nasser]
 Zheyuan **Du** *New synthetic aperture Radar Interferometry for Earth surface deformation detection.* [Ge, Linlin]
 Mark Wayne **Dunlop** *Odour emissions from poultry litter.* [Stuetz, Richard]
 Sajjad **Eghdamirad** *Assessing the impact of uncertainty in hydrology through numerical climate modelling* [Johnson, Fiona M; Sharma, Ashish]
 Farj **Elhadayri** *Constitutive modelling of lightly cemented unsaturated soils.* [Khalili, Nasser]
Manuel **Fabiao Dionizio** *LIDAR for carbon accounting* [Trinder, John C]

Name *Topic* Supervisor/s
 Jinwen **Feng** *Advanced methods for structural analysis, structural safety and reliability, structural dynamics and optimisation* [Gao, Wei; Li, Guoyin]
 Ligaya Leah **Figueroa** *Development of a GeoWeb Tool for Education Resource Planning and Management in the Philippines* [Lim, Samsung]
 Ruth Margaret **Fisher** *Optimisation of biosolid management.* [Stuetz, Richard; Moore, Stephen]
Jean **Foerster** *Natural resource projects [Carmichael, DG]*
 Elizabeth Lucy **Freeman** *Coastal engineering* [Splinter, Kristen D; Cox, Ron]
 Kang **Gao** *Advanced methods for structural analysis, structural safety and reliability, structural dynamics and optimisation* [Gao, Wei]
 Omid **Ghaffaripour** *Numerical algorithms for penetration problems in variably saturated porous media* [Khoshghalb, Arman]
 Maryam **Ghareh Chaei** *Mechanical and durability properties of ultra high performance geopolymer mortar and concrete using fly ash* [Akbarnezhad, Ali]
 Mohammadmahdi **Gharib** *Numerical modelling for service life prediction and performance evaluation of deteriorated reinforced concrete structures due to climate change impacts* [Foster, Stephen J]
 Milad **Ghasrikhouzani** *Disaggregate behavioural land use modelling: Integration of housing search, job search and households' dynamics* [Waller, S Travis; Hossein Rashidi, Taha]
 Nassim **Ghosni** *Fibre reinforced concrete structures* [Valipour, Hamid; Foster, Stephen J]
 David Kristopher **Green** *Probabilistic analysis in computational mechanics with applications in civil engineering.* [Gao, Wei; Douglas, Kurt John]

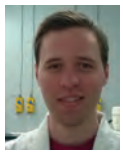
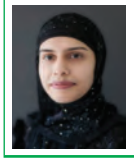
Name *Topic* Supervisor/s
Thomas Anthony **Grinter** *Implementing a PPP service within CORSnet-NSW* [Roberts, Craig A]
 Dinesh Mahanama **Habaragamu Arachchige** *Durability of Geo-Polymer Concrete with respect to Alkali Aggregate Reaction (AAR)* [Castel, Arnaud]
 Nor Zetty Akh **Haji Abdul Hamid** *Advanced Management of Geocoded Address for Spatially Enabling Government: A Case in Brunei Darussalam* [Lim, Samsung]
 Landon James Szasz **Halloran** Groundwater [Andersen, Martin S; Rau, Gabriel C]
 Ahmed W A **Hammad** *Multi-Objective Optimisation* [Akbarnezhad, Ali; Rey, David]
 David Soedibyo **Hartanto** *Durability of FRP-concrete and FRP-steel lap-joints* [Hamed, Ehab]
 Mohammad Mahadi **Hasan** *Hydrology* [Johnson, Fiona M; Sharma, Ashish]
 Seyedkomeil **Hashemiheidari** *Evaluating bridges subjected to extreme loading* [Bradford, Mark A]
 Asif **Hassan** *Mobile Phone Distraction and Traffic Safety* [Dixit, Vinayak; Waller, S Travis]
 M. Mahmudul **Hassan** *Climate change adaptation* [Peirson, William L]
 Mohammad Nurul **Hassan** *Demand estimation for public transportation* [Waller, S Travis; Hossein Rashidi, Taha]
 Amirhossein **Hassanieh** *Development of steel-timber composite system for large scale construction* [Valipour, Hamid]

Name *Topic* Supervisor/s	
	James Emerson **Hayes** *Olfactory analysis of ardorous emissions* [Stuetz, Richard]
	Huan **He** *Dynamics and micromechanics of biogenic sand* [Senetakis, Konstantinos]
	Ke **He** *Numerical Modelling of Cracking in Embankment Dams* [Song, Chongmin]
Ian Edward James **Henderson** *The use of innovative anchors for the achievement of composite action for rehabilitating existing and deployment in demountable steel structures* [Uy, Brian]	
	Nina **Homainejad** *Applications of UAVs for disaster management* [Rizos, Chris]
	Ying **Hong** *BIM adoption criteria: measuring potential advantages of BIM before implementation* [Akbarnezhad, Ali]
	Daniel **Howe** *Coastal engineering* [Blenkinsopp, Christopher E; Turner, Ian L]
	Panpan **Huang** *Precise GNSS positioning methods* [Rizos, Chris]
Edward Malcolm **James** *Pavement systems on soft soils* [Oeser, Markus; Russell, Adrian]	
	Divya **Jayakumar Nair** *Logistics of surplus food rescue and distribution* [Dixit, Vinayak; Hossein Rashidi, Taha]
	Sisi **Jian** *Network modelling* [Dixit, Vinayak; Waller, S Travis]
	Chao **Jiang** *Hydraulic fracture* [Zhao, Gaofeng; Khalili, Nasser]

Name *Topic* Supervisor/s	
	Chao **Jiang** *Mechanism and kinetics of ferrous iron oxidation and ferric iron reduction in photolysed natural waters* [Garg, Shikha; Waite, T David]
	Nor Hidayaty Bint **Kamarulzaman** *Characterisation of Odourants from natural rubber processing* [Stuetz, Richard; Moore, Stephen]
	Tae Ho **Kang** *Piggy Back Modelling* [Sharma, Ashish]
	Ananta Alex **Karki** *Parking Optimization* [Dixit, Vinayak; Hossein Rashidi, Taha]
	Nicka **Keipour** *Development of a reliable nonlocal model for flexibility-based frame elements with strain-softening materials* [Valipour, Hamid]
	Hammad Anis **Khan** *Concrete technology* [De Silva, Premalatha; Castel, Arnaud]
	Mohammad Zaved Kaiser **Khan** *Hydrology* [Sharma, Ashish]
	Mst Shakera Karim **Khan** *Catchment classification and its application in environmental flow management* [Bellie, Sivakumar]
	Mohammad **Khoshini** *Fault Rupture Propagation through Soils* [Khalili, Nasser]
	Seokhyeon **Kim** *Flood forecasting* [Johnson, Fiona M; Sharma, Ashish]
	Nathan Luke **Knight** *Fault detection and quality control measures for satellite positioning* [Wang, Jinling]
	Yumi **Kobayashi** *Life cycle assessment and risk assessment.* [Peters, Gregory; Khan, Stuart J]

Name *Topic* Supervisor/s	
	Hung Viet **Le** *Fate of volatile Organo-Sulfur compounds in odour assessment.* [Stuetz, Richard]
	Seul Ki **Lee** *Estimation of microsimulation models (car following).* [Dixit, Vinayak; Waller, S Travis]
	Seung Ho **Lee** *Remote Sensing Satellite Image using hybrid methods.* [Rizos, Chris]
	Calvin Pengfei **Li** *Quantifying the importance of flood events for the replenishment of groundwater resources.* [Andersen, Martin S; Rau, Gabriel C]
	Chenyang **Li** *Traffic Microsimulation and Choice Modelling* [Dixit, Vinayak; Hossein Rashidi, Taha]
	Dongxu **Li** *Structure Engineering - composite structures* [Uy, Brian]
	Jingwan **Li** *Hydroclimatology* [Evans, Jason P; Sharma, Ashish; Johnson, Fiona]
	Liyuan **Li** *SAR and optical imagery registration* [Ge, Linlin]
	Shijin **Li** *Internal erosion of soils: Microstructural modelling* [Russell, Adrian]
	Xiang **Li** *Advanced characterisation of dissolved organic nitrogen in drinking water sources* [Henderson, Rita K; Khan, Stuart J]
	Xun **Li** *Equity in transportation system* [Dixit, Vinayak; Waller, S Travis]
	Zeyu **Li** *Vision-based Mapping and Navigation* [Wang, Jinling]

Name *Topic* Supervisor/s
 Lei **Liu** *Noise and vibration analysis using the scaled boundary finite element method* [Song, Chongmin]
Qingxiang **Liu** *Imagery-based modelling* [Trinder, John]
 Xuefen **Liu** *Vulnerability analysis and evacuation simulation* [Lim, Samsung]
 Youtian **Liu** *InSAR Technique for Earthquake Studies* [Ge, Linlin]
 Xueqing **Lu** *Risk* [Davis, Steven R]
 Gough Yumu **Lui** *Photovoltaic powered UV diode disinfection of drinking, surface, and groundwater.* [Corkish, Richard; Roser, David]
 Xiaoming **Ma** *Application of nanoparticulate zero valent iron to remediation of contaminated benthic sediments.* [Waite, T David]
 Thi Ngoc **Mac** *Time dependent behaviour of slopes* [Khalili,Nasser]
 Pradeep **Maheshwari** *Optimisation of coagulant addition to submerged membrane bioreactors using computational and experimental methods.* [Waite, T David]
 Tuo **Mao** *Transport network modelling and optimisation* [Dixit, Vinayak]
 Saeed **Masoumi** *Multiscale modeling of FRP-Concrete interface* [Valipour, Hamid]
 Afshin **Mellati** *The Iterative Limit and Shakedown Analysis of Structures using A Scaled Boundary Finite Element Method* [Tangaramvong, Sawekchai; Tin Loi, Francis Shay Khiet]

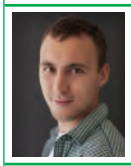
Name *Topic* Supervisor/s
 Hugh David **Miller** *Nanotechnological improvements to ultra-high-performance concrete.* [Akbarnezhad, Ali; Foster, Stephen J]
 Ditiro Benson **Moalafhi** *Regional Climate Modelling for Hydrological Applications* [Evans, Jason P; Sharma, Ashish]
 Hamed **Moghaddasi Kelishomi** *Constitutive modelling of weak rocks subject to mechanical and moisture degradation* [Khoshghalb, Arman; Khalili, Nasser]
 Zaizatul Zafflina **Mohd Zaki** *The effect of group wave on wave setup at estuaries* [Peirson, William]
 Masoud **Moradi** *Structural mechanics and numerical methods* [Valipour, Hamid]
 Zahra **Moussavi Nadoushani** *Estimation of life cycle carbon of residential and office buildings* [Akbarnezhad, Ali]
 Angus Lachlan **Murray** *Structural Engineering / Concrete Technology* [Castel, Arnaud; Gilbert, Raymond Ian]
 Nur Kamaliah **Mustaffa** *Sustainability: Carbon emissions in construction.* [Carmichael, David G]
 Azwan **Mustapha** *Dimension reduction.* [Sharma, Ashish]
Jannatun **Nahar** *Bias correction of general circulation models.* [Johnson, Fiona]
 Ali **Najmi** *Developing a Real - time Operational Planning Model for Sustainable Development of Urban Freight Transportation.* [Waller, S Travis; Hossein Rashidi, Taha]
 Bushra **Naseem** *Surface water hydrology.* [Sharma, Ashish]

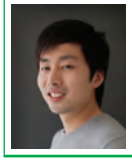
Name *Topic* Supervisor/s
 Thi Thu Ha **Nguyen** *Hydrology.* [Sharma, Ashish]
 Tuan Anh **Nguyen** *Infrastructure projects - options, risk, Vietnam.* [Carmichael, David G]
Nur Fadhillah **Norzahari** *Stem classification and modelling from LIDAR for a semi-automated forest inventory.* [Lim, Samsung; Turner, Russell]
 Farshid **Nouri** *Progressive collapse of outrigger - braced tall structures assigned to earthquake loads.* [Valipour, Hamid]
 Amin **Noushini** *Low carbon concrete design.* [Castel, Arnaud; Gilbert, Raymond Ian]
 Daniel John **O'Shea** *Finite element implementation of intrinsic field tensors for the analysis of orthotropic materials.* [Kellermann, David C; Attard, Mario M]
 Sahani Darshika **Pathiraja** *Improving the use of Data Assimilation for Flood Forecasting.* [Sharma, Ashish; Marshall, Lucy A]
 Meghdad **Payan** *Study of small strain dynamic properties of saturated and unsaturated soils.* [Khoshghalb, Arman]
Steven Edward **Pells** *Erosion of rock in spillways.* [Peirson, William L; Douglas, Kurt J]
 Weebadda Arachchilage S **Perera** *Improving quality performance in Australian building construction through productive construction environments.* [Davis, Steven R]
 Mark Aaron **Peterson** *Ground water resources in fractured rock aquifers using geochemical and isotopic methods.* [Andersen, Martin S; Cendon, Dioni]
Brett Dean **Pflugrath** *Passage of fish through hydraulic structures.* [Peirson, William L; Cathers, Bruce]

Name *Topic* Supervisor/s
 Thanh Hung **Pham** *Flood forecasting in sparsely gauged catchments.* [Johnson, Fiona M; Marshall, Lucy A]
 Matthew Sean **Phillips** *Beach recovery following storm erosion.* [Harley, Mitchell D; Splinter, Kristen D]
 Bambang **Piscesa** *Ductility of reinforced concrete frames.* [Attard, Mario M]
 Mohammad Masud **Rana** *Behaviour of post-tensioned composite steel-concrete slabs.* [Uy, Brian]
 Edward Nguyen **Robson** *General equilibrium model to evaluate economic impact of transport projects.* [Dixit, Vinayak; Waller, S Travis]
 Eytan **Rocheta** *Simulating persistence in future rainfall: correcting GCM bias in regional climate models.* [Evans, Jason P; Sharma, Ashish]
 Hongyan **Rong** *Production of oxidants on photolysis of silver halides: kinetics, mechanism and technology optimization.* [Garg, Shikha; Waite, T David]
 Arvin **Saket** *Ocean energy.* [Peirson, William L]
 Albert Artha **Saputra** *Computational mechanics and structural analysis.* [Song, Chongmin]
 Czar Jakiri Soriano **Sarmiento** *Modernisation of the Philippines Geodetic Datum using GNSS and SAR Techniques.* [Rizos, Chris]
 Neeraj **Saxena** *Route Choice under Stop-and-Go Conditions.* [Dixit, Vinayak; Waller, S Travis]
Salvatore **Scaturro** *CFD modelling of negatively buoyant jets.* [Peirson, William L; Cathers, Bruce]

Name *Topic* Supervisor/s
 Samad M E **Sepasgozar** *Technology adoption decision making in construction management.* [Davis, Steven R; Carmichael, David G]
 Armaghan **Severi** *Aeration due to hydraulic structures.* [Felder, Stefan M; Peirson, William L]
 Babak **Shahbazi** *Shallow foundations in unsaturated soils: understanding mechanistic behaviour through analysis and experimental investigation.* [Russell, Adrian]
 Siavash **Shahsavaripour** *Developing freight logistic plan and optimized transport network system.* [Waller, S Travis; Hossein Rashidi, Taha]
 Kiran **Shakeel** *Mode choice behaviour modelling with adaptive data collection method.* [Waller, S Travis; Hossein Rashidi, Taha]
 Ariel Tal **Shammay** *Odour abatement in sewer networks.* [Stuetz, Richard]
 Sara **Shirowzhan** *Development of 3-D urban form metrics using Lidar in GIS environment.* [Lim,Samsung; Trinder, John]
 Joshua Andrew **Simmons** *Real-time forecasting of storm impacts on a high energy coastline.* [Splinter, Kristen D; Turner, Ian L]
 Richard Frank **Stanaway** *Development geodetic ref system of dynamic transformation parameters to relate the ITRF to static regional dynamic datum.* [Roberts, Craig A]
 Lijuan **Su** *Lateral and post buckling with shear effects.* [Attard, Mario M]
 Adnan **Sufian** *Multi-scale modelling of granular material.* [Russell, Adrian]

Name *Topic* Supervisor/s
 Liran **Sun** *Remote Sensing Applications in Natural Disaster Monitoring.* [Rizos, Chris; Trinder, John]
 Yingying **Sun** *Iron and copper-mediated oxidant production in natural and engineered aquatic systems.* [Pham, An Ninh; Waite, T David]
 Yuting **Sun** *LCA, LCC applications.* [Carmichael, David G]
 Zhicheng **Sun** *Fracture analysis by using the scaled boundary finite element method.* [Song, Chongmin]
 Reza **Taheriattar** *Sustainability and adaptable/ flexible infrastructure.* [Akbarnezhad, Ali; Carmichael, David G]
Mohammad Ridhwan **Tamjis** *Satellite imagery processing.* [Lim, Samsung]
 Wangwang **Tang** *Removal of arsenic, fluoride, nitrate from groundwater by capacitive deionisation.* [Waite, T David]
 Yating **Tang** *The analysis of uncertainties in Hydrological models.* [Marshall, Lucy A]
 Yi **Tang** *Numerical modelling of foundation on unsaturated soils.* [Taiebat, Hossein]
 Soo Huey **Teh** *Integrated carbon metrics in the built environment and assessment of indirect carbon flows in Australia. Sustainability assessment program.* [Wiedmann, Thomas; Moore, Stephen]
 Tiffany Li Lee **Teo** *Risk assessment of exposure to chemical contaminants in swimming pools.* [Khan, Stuart J]
 Arash **Tootoonchi** *Numerical modelling of behaviour of unsaturated soils under large deformation.* [Khoshghalb, Arman]
Mohammadali **Torbaty** *Computational hydraulics and computational fluid mechanics.* [Yeoh, Guan Heng; Cathers, Bruce]

Name *Topic* Supervisor/s	
	Thao Minh **Tran** *Performance and sustainability of membrane coupled with upflow anaerobic sludge blanket process.* [Le Clech, Pierre; Stuetz, Richard]
	Sergey **Tsarev** *Biogeochemistry* [Collins, Richard N]
	Siti Aisyah Binti **Tumiran** *Hydrology* [Bellie, Sivakumar; Lim, Samsung]
	Feng Sheng **Wang** *Deformation monitoring and remote sensing.* [Harvey, Bruce R; Rizos, Chris]
	Jia **Wang** *Steel and composite structures.* [Uy, Brian]
	Junchao **Wang** *Computational mechanics.* [Song, Chongmin]
	Kai **Wang** *Implications of extracellular electron transfer by marine and freshwater phytoplankton.* [Waite, T David]
	Rumman **Waqas** *The development of efficient, robust and architecturally flexible structural systems using blind bolted connections.* [Uy, Brian]
	Fubara George **Warmate** *Conditional Random Field Approach to Urban Growth Monitoring using Multisource Remote Sensing Data.* [Rizos, Chris; Trinder, John]
	Conrad Dominic **Wasko** *Hydroclimatology* [Sharma, Ashish]
	Phillip John **Watson** *Improved Techniques to Estimate Trend, Velocity and Acceleration from Sea Level Records* [Cox, Ron]
	Wang **Wei** *Physical, chemical processes in water resources dam.* [Andersen, Martin S]

Name *Topic* Supervisor/s	
	Tao **Wen** *Transport network modelling.* [Gardner, Lauren; Waller, S Travis]
	Frances **Wiig** *Using L-Band SAR to detect and map subsurface archaeology in desert environments.* [Trinder, John; Rizos, Chris]
	Kasun Pradeepa **Wijayaratna** *Modelling disrupted transport network behaviour.* [Dixit, Vinayak; Waller, S Travis]
	Dinusha **Wijesekara** *Prediction of Strong Ground Motions by Advanced Numerical Modelling of Seismic Wave Propagation.* [Song, Chongmin]
Indika Same **Wijesiri Pathirana** *Use of innovative anchors as shear connectors in composite steel-concrete beams for the rehabilitation of existing structures and deployment in new structures.* [Uy, Brian]	
	Binhua **Wu** *Advanced methods for structural analysis, structural safety and reliability, structural dynamics and optimization.* [Gao, Wei]
	Hao **Wu** *Optimisation of excess sludge dewatering and phosphorus recovery in submerged membrane bioreactors.* [Wang, Yuan; Waite, T David]
	Tingsong **Xiang** *Scaled boundary finite element analysis of plates and shells.* [Song, Chongmin]
	Wei **Xiao** *Biogeochemical processes in natural waters.* [Bligh, Mark W; Waite, T David]
	Guowei **Xing** *Generation of Oxidative Products in Quinone-mediated Cu/H2O2 system.* [Waite, T David]
	Weiwei **Xing** *Computational mechanics.* [Song, Chongmin; Tangaramvong, Sawekchai]
	Chengwei **Yang** *Non-deterministic analysis of linear and nonlinear structures.* [Tangaramvong, Sawekchai; Gao, Wei]

Name *Topic* Supervisor/s	
	Yang **Yang** *Upheaval buckling.* [Bradford, Mark A]
	Nazly **Yasmin** *Hydrology* [Bellie, Sivakumar]
	Anna Chi Ying **Yeung** *Factors influencing the growth and toxicity of cyanobacteria in drinking water supplies.* [Neilan, Brett A; Waite, T David]
	Amin **Yousefnia Pasha** *Study of soil-water characteristic curve in deformable porous media.* [Khoshghalb, Arman; Khalili, Nasser]
	Jeffrey Huijie **Yu** *Contaminant degradation by supported Ag nanoparticles.* [Waite, T David]
	Fang **Yuan** *Climate change impacts on coastal shoreline erosion processes.* [Cox, Ron]
	Nur Syahiza **Zainuddin** *Sources and mobility of arsenic in alluvial river sediments.* [Andersen, Martin S]
	Junqi **Zhang** *Computational mechanics.* [Song, Chongmin]
	Xiang **Zhang** *Transport modeling.* [Waller, S Travis; Rey, David]
	Yang **Zhang** *Natural hazards analysis.* [Lim, Samsung]
	Peiyuan **Zhou** *Ionosphere modelling for precise GNSS positioning.* [Wang, Jinling]
Yuening **Zhou** *Research on China-Australia construction supply chain.* [Davis, Steven R]	

Congratulations to RESEARCH 2015 GRADUATES

Name *Topic* [Supervisor/s]

PhD



Hossein **Aghighi**
Markov random field models for classification of remote sensing data and super-resolution mapping. [Trinder, John]



Ali **Amin**
Post Cracking Behaviour of Steel Fibre Reinforced Concrete: From Material to Structure. [Foster, Stephen J]



Mohammad Amin **Asadi Zarch**
Developing and projecting a new ecohydrolic aridity index for a nonstationary climate. [Bellie, Sivakumar; Sharma, Ashish]



Xiaojun **Chen**
Development of the scaled boundary finite element method for dynamic soil-structure interaction analysis in the time domain. [Song, Chongmin; Birk, Carolin C]



Melissa **Duell**
Strategic Traffic Assignment: Models and Applications to Capture Day-to-Day Flow Volatility. [Gardner, Lauren; Waller, S Travis]



Yue **Huang**
Nonlinear long-term behavior of high-strength concrete wall panels. [Hamed, Ehab; Foster, Stephen J]



Wei **Jiang**
Seamless Precise Positioning through the Integration of Satellite, Terrestrial Ranging and Inertial Technologies.[Rizos, Chris]

Name *Topic* [Supervisor/s]



Mani **Khezri**
Generalised RKP-FSM and its application in analysis of thin plates with abrupt rigidity changes and generally laminated composite plates. [Bradford, Mark A]



Kai **Luo** *Long-term analysis of structural behaviour and stability of concrete-filled steel tubular arches.* [Gao, Wei; Pi, Yong Lin]



Kashif **Mahmud**
Groundwater modelling, heterogeneity, transport processes, contaminated sites. [Mariethoz, Gregoire; Sharma, Ashish]



Md Ahsan **Parvez**
Fatigue behaviour of steel-fibre-reinforced concrete beams and prestressed sleepers. [Foster, Stephen J]

Xue **Shi**
Uncertain analysis of engineering structures, structural reliability analysis, structural dynamics. [Gao,Wei; Pi, Yong Lin]



Yulia **Shutova**
Monitoring of organic matter in drinking water treatment systems using fluorescence spectroscopy. [Henderson, Rita K; Baker, Andrew B]



Xabier **Vazquez Campos**
Geomicrobiological aspects of the (bio) leaching of weathered low-grade uranium ore. [Neilan, Brett A; Waite, T David]



Lili **Wang**
Enantiospecific fate of polycyclic musks in biological wastewater treatment processes and the environment.
[Khan, Stuart J; Stuetz, Richard]

Name *Topic* [Supervisor/s]



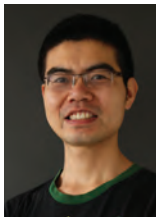
Bei **Wang**
Chemical assessment of emissions from sewage collection facilities.
[Stuetz, Richard]



Di **Wu**
Interval analysis framework for structural safety assessment. [Tangaramvong, Sawekchai; Tin Loi, Francis]



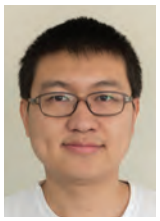
Yongjia **Xin**
Effect of Ca and Fe(III) on membrane fouling under conditions typical of submerged membrane bioreactor treatment of wastewaters. [T David Waite]



Peijie **Yin**
Micromechanics of Unsaturated Flow in Fractured Porous Medium. [Zhao, Gaofeng]



Zhenghua **Zhang**
Phosphorus removal and membrane fouling and cleaning in iron-dosed submerged membrane bioreactor treatment of wastewaters. [Waite, T David; Leslie, Greg]



Jianbei **Zhu**
In-Plane Nonlinear Localised Lateral Buckling of Pipelines and Rail Tracks under Thermal Loading. [Attard, Mario M; Kellermann, David]

Name *Topic* [Supervisor/s]

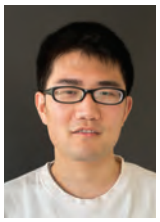
ME or MPhil

Dennis Robert **Entriken**
The Development of GIPSICAM v3 - a mobile mapping system for rapid road asset data capture. [Rizos, Chris]

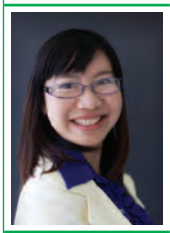
Barun Lal **Karna**
Advanced characterisation techniques to assess seawater organic matter removal by dissolved air flotation (DAF). [Le Clech, Pierre; Henderson, Rita K]



Edward Tah Dah **Kearney**
The design, application, and assessment of rapid-response airborne lidar for monitoring of storm induced beach erosion.
[Turner, Ian L]



Li **Liu**
Road Extraction from Airborne Lidar Data and Integrated Remote Sensing Data. [Lim, Samsung; Trinder, John C]



Thi Ngoc **Mac**
A bounding surface viscoplasticity model for soils. [Zhao, Gaofeng; Khalili-Naghadeh, Nasser]



You **Shao**
A fusion approach to building-boundary extraction using airborne LIDAR data and multi-spectral images. [Lim,Samsung; Trinder, John C]



Ke **Wang**
The applicability of mathematical morphology algorithm for tropical cyclone eye and water body boundary extraction in SAR data. [Trinder, John; Lim, Samsung]

Xinlei **Zhang**
Alternative Project Management Practices in Earned Value and Black-Scholes. [Carmichael, David G]

CERSA 2015







The Committee at work: L-R: Zheyuan Du, Yating Tang, Xiang Li, NeerajSaxen and Milad Ghasri

CERSA COMMITTEE 2015

President - Dilina Dissanayake
Vice President - Edward Robson
Secretary - Neeraj Saxena
Treasurer - Milad Ghasri
ARC delegate - Guido Esteban Aquiles Carvajal Ortega
Health and Safety representative - Xiang Li
Teaching and learning Representative - Saeed Masoumi
Social Media Coordinator - Dinusha Wijesekara, Zheyuan Du
General committee members - Nima Amini , Khalegh Barati, Yating Tang, Arvin Saket

The Civil and Environmental Engineering Research Students Association (CERSA) represents the interests of postgraduate research students in the School. Our aims are to create a unified body to develop friendship among ourselves, to collectively represent our interests and to develop mutually beneficial relations with the School.

CERSA EVENTS 2015

CERSA organised a variety of events during 2015
March - Board Games Night + EGM
April - BBQ
May - Board Game Night
July - Trivia Night
September - Table Tennis
October/November - AGM & EGM
November - Picnic to Coogee
November - WRL get together











OUR **TEACHING**



THE **TEACHING** AND **LEARNING** REPORT

The Teaching and Learning Committee (TLC) of the School is responsible for all academic matters relating to all undergraduate and postgraduate coursework programs; these involve:

- encouraging teaching quality,
- providing teaching aids to staff,
- monitoring courses through student focus group surveys,
- interaction with student representatives of CEVSOC and research student demonstrators through CERSA,
- setting policy regarding academic aspects of undergraduate and postgraduate examinations and enrolments,
- providing a focal point for student assistance in undergraduate and postgraduate coursework matters.

The major drive behind the Committee's agenda is to improve the learning experience of students. The members of the committee in 2015 were:

Teaching and Learning Committee 2015

Dr Steven Davis	Chair
Stephen Moore	Deputy Chair & Environmental Eng Program Coordinator
Associate Professor Mario Attard	Associate Head (Academic) Civil Engineering Program Coordinator Structures Teaching Representative
Kristy Guia	Student Services Manager
Dr Lauren Gardner	Civil with Architecture Program Coordinator Transport Teaching Representative
Dr Bruce Harvey	Surveying Teaching Representative
Dr Arman Khoshghalb	CIT & ET (Computing & Ed Tech Services) Liaison Geotechnical Representative
A/Prof Stuart Khan & Dr Martin Andersen	Water and Environmental Teaching Representative
Dr Hossein Taiebat	Postgraduate Coursework Coordinator
Dr Hamid Valipour	Year 1 Coordinator
Dr Johnson Shen	Year 2 Coordinator
Dr Ehab Hamed	Year 3 Coordinator
Dr Taha Rashidi	Year 4 Coordinator
Dr Ali Amin	Industrial Training Coordinator
Dr Fiona Johnson	Elite Student Coordinator
A/Prof Jinling Wang	Faculty IRC Rep



Teaching Excellence:

It was an excellent year for teaching at the School – with three academic staff Stephen Moore, Dr Taha Rashidi and Prof Richard Stuetz – as well as School demonstrator and PhD candidate Ruth Fisher – awarded the prestigious UNSW V-C Award for Teaching Excellence for their innovative work on the fourth year course CVEN4701 Sustainable Infrastructure. (More about this course is in the Big Picture section of this report). On behalf of the team, Stephen Moore also collected the Australasian Association for Engineering Education 2015 Award for Excellence in Engineering Education Engagement. Our congratulations to Stephen and the team. This is the second UNSW Vice Chancellors Teaching Excellence Award for Stephen – a unique achievement.

Innovation in Postgraduate Coursework Masters

In 2015 our MEngSc students started giving presentations on their research theses, adding a new dimension to their learning – challenging students to really explain and share their findings, insights, suggestions and fuller understanding of their topic. These Masters presentations were interspersed with the existing program of undergraduate honours presentations so that both groups of students could benefit from the experiences of the other.

In 2015 five new postgraduate courses were also developed and approved to begin teaching in 2016:

Dr Kostas Senetakis who joined the School in 2014 brought his global expertise to a brand new course - CVEN9526 Earthquake Engineering and Foundation Dynamics - an advanced course in earthquake analysis and design with particular emphasis on foundation dynamic - suitable for those in the Geotechnical Engineering and/or Structural Engineering specialisation within the Masters of Engineering Science degree.

Four new courses in the engineering construction and project management area have been developed which explore latest industry and best practices within construction and civil engineering infrastructure activities. The courses are CVEN9741 Engineering Construction; CVEN9742 Professional Civil Engineering; CVEN9743 Construction Engineering Practices and CVEN9744 Civil Engineering Practices.

School Teaching Initiative Grant Scheme (STIGS)

In 2015 the Committee continued with the innovative **School Teaching Initiative Grant Scheme (STIGS)** – the aim being to develop and implement innovations in School teaching and learning, and to support the improvement of the student experience through teaching related activities. The six successful 2015 projects – involving twelve teaching staff – included:



- Arman Khoshghalb and Hossein Taiebat have produced educational videos for the Soil Mechanics class. The first group of videos demonstrate soil mechanics laboratory procedures. After being introduced to the laboratory techniques on the videos the students are much better prepared to practice the procedures for themselves in the laboratory. Other videos provide students with worked examples of how to design footings, retaining walls, piles, and other geotechnical structures according to Australian standards.
- Ali Amin has used a teaching grant to run a field trip to the Southern Highlands where students were able to have hands-on experiences with real construction equipment. (see page 57)
- Steven Davis has created online assessment tools for fault trees and event trees. These tools allow the students to draw the trees inside the assessment tool and provide detailed feedback to each student



Steve Davis



The online assessment platform developed as part of the Teaching Initiative Grant enabled Dr Lauren Gardner and Dr Taha Rashidi to generate personalized road design assignments for the 700 students in the course. “The platform also provided a means for the students to submit all course assignments online, and for the lecturers to automate the marking process and provide rapid but still personalized feedback,” explained Dr Lauren Gardner, “none of which would have been possible for such a large class under the traditional assignment submission process.”

based on their individual answers, which would be difficult to do otherwise in such a large class. ‘Traditional online assessment is about multiple choice or simple calculations, says Dr Davis, ‘but engineering is about building and understanding models. These assessment tools get to the heart of students’ ability to create models.’

- Richard Stuetz, Stephen Moore, An Ninh Pham and Lila Azouz created an e-learning platform to provide students a foundation on a variety of different common unit processes employed in water and wastewater treatment. This enables them to use a flipped classroom strategy where the lower order thinking skills (remembering, understanding, applying) are incorporated into the online component, thus freeing up classroom time for higher order thinking skills (analysing, evaluating, creating). They have also signed an MOU with Sydney Water to gain access to their water and wastewater treatment plants in order to take photography and video footage for inclusion in the e-learning lessons.

- Taha Hossein Rashidi and Lauren Gardner have risen to the challenge of teaching one of the School’s largest ever classes (over 700 students) with a grant to implement online assessment for their course. The first of their assessment tools allows students to design roadway geometry in a 3D environment. The second allows students to use an Agent-based Demand and Assignment Model in their road network design assessment.

- Sawekchai Tangaramvong and Wei Gao introduced a steel beam design competition in their Structural Behaviour and Design class. Students work in teams to fabricate their beams from a set of steel plates and pop rivets. The challenge is to design the beam to most effectively take advantage of the limited resources and carry the maximum load. The ultimate decider for the competition is the laboratory test and so students must consider everything in their design, from beam cross section to placement of web stiffeners.

UNSW Learning and Teaching Innovation Grant



Following on from Dr Johnson Shen’s success last year, Dr Ali Akbarnezhad was awarded a UNSW Learning and Teaching Innovation Grant to create a Real-time Teaching Feedback and Student-Lecturer Communication System.

Our policy is that every successful L&T Innovation Grant application will receive matching funding from the Teaching & Learning Committee. We were delighted to be able to support Dr Akbarnezhad’s project which aims to build intelligent systems for digital feedback and questions from students during a lecture using their smartphones. The proposed system will provide lecturers with an easy to use tool for collection of detailed feedback on lecture notes, rather than relying on collection of feedback at the end of the semester.

School Teaching Equipment Grants

In 2015 the Committee also actively sought applications for and administered School Teaching Equipment Grants, approving four

- Virtual Teaching Equipment for Water and Wastewater Analysis: The aim is to produce short videos demonstrating how to prepare samples and the application of advanced analytical instruments for the analysis of solid liquid and gas samples. The equipment was purchased with a 2014 teaching equipment grant, and has been of great benefit for the on-campus students. The videos have been especially designed so that distance students can fully benefit from the equipment. (Richard Stuetz,

Stuart Khan, James MacDonald, Nhat Le)

- Updated Geotechnical compasses, clinometers, rock picks, hand lenses, and other equipment was purchased for use during geotechnical mapping exercises during student field trips. (Hossein Taiebat)
- Catchment Simulation using an augmented reality sand box to develop a real-time integrated augmented reality (AR) system to physically create topography models which are then scanned into a computer and used as background for a variety of graphics effects and simulations. This allows students to improve their understanding of catchment processes and flow behaviour - material currently covered in CVEN3501 Water Resources Engineering. (Fiona Johnson)
- Interactive Traffic Simulation Platform – for transport courses. Purchase of multiple traffic simulation software for students to be used for civil engineering practice, demonstration purposes and class projects. The aim is to incorporate these simulations in a game based environment to provide students an understanding of the theoretical underpinnings through experiencing the phenomena through simulation and virtual reality. (Vinayak Dixit and Taha Rashidi)

The Committee also supported the student organisation CEVSOC nights including

- Industrial Training and fourth year elective night: where industry speakers explained to third year students what industry expect from them in regards to Industrial Training, and fourth year students from different areas of Civil and Environmental Engineering spoke about what they did on their training.
- Alumni night: Another successful event whereby our current students were able to meet School alumni and hear about their experiences. There were both recent graduates and graduates from many years ago.
- Thesis/Practice Night: Fourth year students told third year students about their experiences in Thesis and the fouth year practice courses to help them with their decision making.
- What Happens After Graduation? Night – a new offering from the ever innovative CEVSOC – at this event speakers from industry, university, and Engineers Australia shared with students what they can expect “in the real world.”

All in all, it was another busy, active and inspired year for the dedicated teachers at the School and the hardworking Committee.



STUDENT CENTRE REPORT



2015 was a year of big changes for the Student Centre team. Some permanent staff took leave so it was a year of learning, training and making our systems better and easier to work with.

In addition to new staffing, all of the undergraduate and postgraduate programs changed. This involved us needing to update all online material, and adjusting a great number of our administrative processes. In 2015 we implemented new policies and procedures to make our distance exams, term planning, Honours calculations and exam planning systems easier to manage. We also updated all School forms to ensure students are more aware of the processes and rules behind School decisions.

The team has worked on refreshing our current student webpages to enable students to make their own choices with course selection. The new webpages also include online forms to have clashes, overloads and postgraduate internal program transfers organised. This has sped up processing time and reduced emails going back and forth. The webpage also includes a 'Key Dates' section of upcoming University and School events.

The Student Office has also worked on new initiatives with our colleagues at the School of Computer Science and Engineering including a Postgraduate Coursework Advising session involving 6 key University departments as well as a Conversational English workshop for international and local students. This is to be launched in Semester 1, 2016.

It has been a challenging year with the ever-increasing student numbers therefore getting through enquiries, results, exams, term planning and our other regular duties, as well as the initiatives above has been a great accomplishment.

Kristy Guia
Student Services Manager

2015 Enrolments and Graduates

Undergraduate	**Enrolled**	**Graduated**
3620, 3707 BE Civil Engineering	812	185
3624, 3635 BE Civil with Architecture	171	19
3625, 3707 BE Environmental	74	15
Combined Degrees	**Enrolled**	**Graduated**
3146 BE Civil/BE Mining	123	2
3621,3703/4,3763 BE BA (Civil/Arts)	18	4
3626,3703/4 BE BA (Environmental/Arts)	3	0
3631 BE Civil/ BE Enviro	127	10
3715 BE/BCom	342*	54
3730 BE BSc (Civil/Science)	49	4
3735 BE BSc (Environmental/Science)	16	1
3742, 3746, 3707 BE Surveying & Geoinfo Systems	59	6
4776/4777/4778 BE/LLB (Engineering/Law)	19	4
Total Undergraduates	1813	304
Postgraduate Coursework	**Enrolled**	**Graduated**
5338, 5341/7320, 7338 Grad Dipl / Grad Cert	25	10
8338 & 8538 MEngSc	488	236
8539 MEngSc (Extension)	68	39
8621 ME Coursework (new)	37	0
Total	618	285
Higher Degree Research	**Enrolled**	**Graduated**
ME Research	19	8
PhD	195	21

*325 Civil, 15 Enviro, 2 SAGE



CVEN4102 Construction Lab

At the School of Civil & Environmental Engineering our fourth year construction students at the School are able to engage with state-of-the-art modelling equipment in Dr Johnson Shen's lab classes. Introducing design theory and best practice in engineering construction methods and operations planning, his course CVEN4102 Operations & Projects also provides students with a construction teaching lab where remote controlled models of earthmoving equipment including a Hydraulic excavator, an articulated dump truck and a wheel loader demonstrate efficiencies in excavation, loading and hauling cycles. Dr Shen has been the winner of several School and UNSW grants and awards for his innovative teaching practises.



Dr Ali Amin was awarded a School Teaching Initiative Grant in 2015 which facilitated his taking students enrolled in **CVEN2101 Engineering Construction** out of the class room and into live construction environments. Students were taken on tours of the Darling Harbour Live and Four Points by Sheraton redevelopments as well as an activity based excursion to the Southern Highlands where they were exposed to heavy machinery; performed brick laying, fencing and setting up formwork for a slab on ground. One student commented "Everything about the field trip was enjoyable since it was very hands on." Another affirmed that "Receiving hands on experience showed us the practical side of what we learn in lectures."

New degree programs developed in 2015

New undergraduate dual award degree

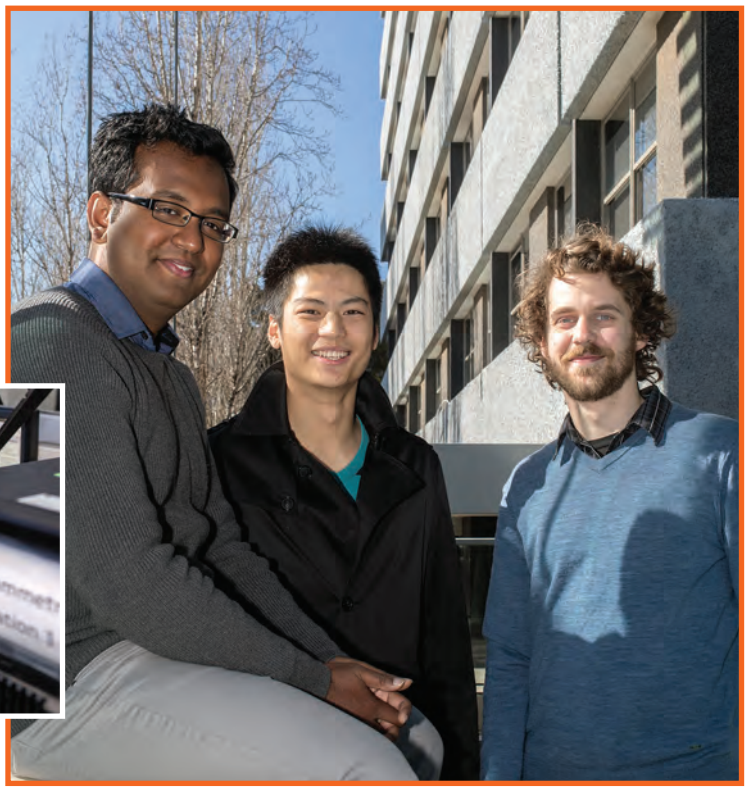
Thanks to our hardworking surveying academics and with crucial support from the surveying industry, a new undergraduate dual award degree in civil engineering and surveying was developed and approved for commencement in 2016. The innovative UNSW



Bachelor of Civil Engineering and Bachelor of Surveying (five years) is designed to equip students for a career as a professional engineer and as a professional surveyor. This will allow students great flexibility in their future careers. Graduating students will be eligible for accreditation as Civil Engineers with Engineers Australia, as well as Surveyors through the Institution of Surveyors NSW and the NSW Board of Surveying and Spatial Information (BOSSI).

New MEngSc

2015 saw the development of an exciting new MEngSc - in Sustainable Systems. This new discipline will explore how engineers can discover and implement holistic and effective solutions to unsustainable practices. The program structure strongly encourages holistic thinking and multidisciplinarity, working across a range of disciplines including sustainable systems engineering, industrial ecology, sustainability and environmental sciences and sustainability management. Associate Professor Tommy Wiedmann, Convenor of the School's Sustainability Engineering Initiative, says that the degree is taking engineering to the next level.



Three CVEN geotechnical honours students had articles published in academic journals of the highest ranking (Q1). More unusual still is that all were lead authors with the research projects largely driven by the students themselves, indicating an inspiring level of motivation and confidence in these young geotechnical engineers; Adnan Sufian, Chao Jiang and David Green (above). For an honours student to be published is highly unusual, so to have three publications is testament to the ambition of the students and the supportive and ambitious engineering academic culture at CVEN. 'When a high school leaver contemplates university studies they expect to embark on an extensive knowledge learning exercise,' says A/Prof Adrian Russell-of the geotechnical group. "But in research intensive schools like CVEN the students can also be part of the knowledge creation process, with their discoveries reaching top international journals, taking a place on university library shelves around the world for generations to come."



STUDENT AWARDS AND PRIZE WINNERS



Student Prizes

Alexander Wargon Prize Best performance in the Structures Discipline: **Karina Siems**

Jacob N Frenkel for the best achievement in Civil Engineering for a first year student: **Charlie Zeng**

Welding Technology Institute Of Australia Prize for the best performance in CVEN2302 OR CVEN3303: **Steven Quach**

The Engineers Australia Civil and Structural Engineering Prizefor the best performance in Structural design in the final year of the degree: **Jeremy Rajendram**



The Full Time Class Of 1962 Civil Engineering And Alumni Prize: Highest WAM for local female at the end of 3rd year: **Camellia Wong** (pictured).

The JK Geotechnics Prize for the best performance in CVEN2201/CVEN3202 Soil Mechanics in the Civil Engineering or Environmental Engineering BE programs: **Monica Laut**

The Crawford Munro Memorial Prize for the best performance in CVEN3501 Water Resources Engineering: **Tomas Beuzen & Camellia Wong**

The ASI Undergraduate Steel Design Award for the best performance in CVEN3301 and CVEN3302: **Camellia Wong**

Assoc Of Public Authority Surveyors The GMAT student with the best total mark in all year 1 courses. **Eryan Chen**

Consulting Surveyors NSW – Land Development Awarded to the graduating SAGE student with the best total mark in Cadastral and Land Development courses: **Jerom Vanderstappen**

SSSI - For Photo & R S: Awarded to the student with the best total mark in the Photogrammetry and Remote Sensing course: **Belinda Serafin**

R.S. Mather Memorial Prize for outstanding performance in Geodesy. **Belinda Serafin**

EGM Memorial Prize for outstanding performance in GIS courses: **Hawk Cheong**

The Bossi Medal for the best performance in the final year of the Bachelor of Surveying & Spatial Information Science: **Henry Deng**

Maurice Maughan Prize Awarded to the student with the best total mark in GMAT2500 and GMAT2550: **Hannah Pearce & Tom Bernstein**

Institution of Surveyors New South Wales Incorporated Prize for the best performance by a graduating student in the BE in Surveying and Spatial Information Systems program: **John Nguyen**

University Medal Winners

In addition to prizes, one of the most distinguished awards to be bestowed on an undergraduate is the University Medal. The Medal indicates outstanding academic performance, significantly above the minimum requirements for Honours Class 1.



Jonathan Chan, BE Civil Honours Class 1 and The University Medal (left)

Anh Duc Tran, BE Civil Honours Class 1 and The University Medal (pictured above with Pro Chancellor Dr Jennifer Alexander with Dean Mark Hoffman looking on)



Year 4 Industry sponsored prizes:

1. The Civil & Environmental Engineering Transport Discipline Prize, sponsored by AECOM presented by Ben William -awarded to Jonathan CHAN

2. The Civil and Environmental Engineering Civil with Architecture Discipline Prize, sponsored by ARUP presented by Craig Leech - awarded to Tom BANH

3. The Civil and Environmental Engineering Structures Discipline Prize, sponsored by Aurecon - presented by Dr Kourosh Kayvani - awarded to Jeremy RAJENDRAM

4. The Civil and Environmental Engineering Construction Management Discipline Prize, sponsored by Brookfield Multiplex - presented by Laurie Foy - awarded to Mitchell RYAN

5. The Civil and Environmental Engineering Practice Prize, sponsored by Cardno - presented by Tim Sullivan awarded to Karina SIEMS

6. The Civil & Environmental Engineering Water Discipline Prize, sponsored by GHD - presented by Andrew Chitty - awarded to Tomas BEUZEN

7. The Civil & Environmental Engineering Geotechnical Discipline Prize, sponsored by PSM - presented by Dr Gareth Swarbrick- awarded to Anthony FERRARO

8. The Civil and Environmental Engineering Environmental Discipline Prize, sponsored by Royal HaskoningDHV - presented by A/Prof Ron Cox - awarded to Koren FANG

9. The Civil and Environmental Engineering Surveying Discipline Prize, sponsored by RPS – presented by Cameron Miles - awarded to Henry DENG

ANNUAL MAURICE MAUGHAN PRIZE IS LAUNCHED



Sarah Barry, a daughter of Maurice Maughan – a senior tutor who worked at UNSW's School of Surveying from 1966 to 1975 – and her husband John Fairburn have donated money towards a prize in her father's memory – the Maurice Maughan Prize to the best-performing first year surveying student.

Maughan was highly regarded by his academic peers, and also praised for his talent at Bridge and squash. Associate Professor Tony Robinson (BSurv '62, PhD '74) was one of Maughan's colleagues and shared an office in a demountable with him, where the Rex Vowels Theatre now stands. Robinson lauds Maughan as "one of the best mathematical brains that our School of Surveying has had".

In 2015 the prize was awarded for the first time – to joint winners Hannah Pearce and Tom Bernstein.





Top Scholars

Winner of Deans Awards 2016 for studies completed in 2015

The Dean's Awards are highly prestigious awards offered by the Dean of the Faculty of Engineering. They are designed to recognise the Faculty's high-achieving students – those who have a minimum High Distinction average (an overall cumulative myUNSW WAM of 85). Dean's Awards are just one way we offer our students recognition for their hard work as they progress along the way.

Mr Ahmed Nashwan Abdul Matheen, Bachelor of Environmental Engineering, Stage 3

Mr Ming En Chin, Bachelor of Engineering (Environmental) / Bachelor of Arts, Stage 3

Mr Josiah Blas Fajardo, Bachelor of Engineering (Civil) / Bachelor of Laws, Stage 3

Mr Anthony Ignatius Ferraro, Bachelor of Engineering (Civil) / Bachelor of Laws, Stage 4

Mr Jefry Halim, Bachelor of Engineering (Hons) in Civil Engineering, Stage 1

Ms Sarah Elizabeth Hayes, Bachelor of Engineering (Environmental) / Bachelor of Commerce, Stage 4

Mr Jianan Jiang, Bachelor of Civil Engineering, Stage 1

Mr Jason Waihay Ko, Bachelor of Engineering (Civil) / Bachelor of Commerce, Stage 3

Mr Jason Lam, Bachelor of Civil Engineering, Stage 2

Ms Monica Laut, Bachelor of Civil Engineering / Bachelor of Environmental Engineering, Stage 3

Mr Aaron Ponnampalam, Bachelor of Engineering (Hons) in Civil Engineering / Bachelor of Commerce, Stage 1

Ms Dan Su, Bachelor of Engineering (Hons) in Civil Engineering, Stage 1

Mr Clinton Ngo Tran, Bachelor of Engineering (Hons) in Civil Engineering / Bachelor of Commerce, Stage 1

Mr Athethan Vigneswaran, Bachelor of Engineering (Civil) / Bachelor of Commerce, Stage 2

Ms Camellia Wong, Bachelor of Civil Engineering, Stage 3

Mr Charlie Zeng, Bachelor of Engineering (Hons) in Civil Engineering / Bachelor of Commerce, Stage 1



CIVIL AND ENVIRONMENTAL ENGINEERING SOCIETY (CEVSOC)

Presidents Report 2015



CEVSOC took on the challenge in 2015; to learn from the past, grow in new directions, and develop in areas beneficial to students and staff alike.

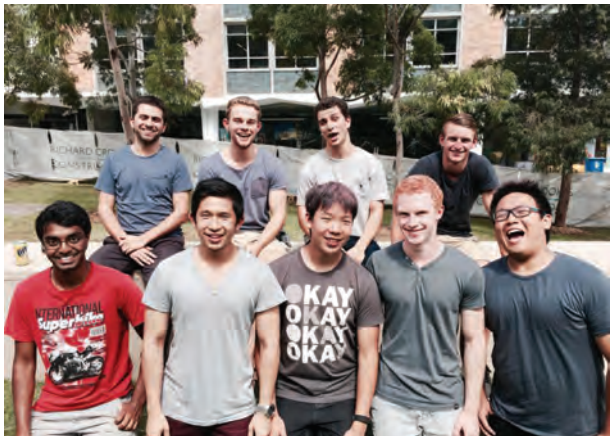
Student numbers increased by almost 25% to 2178 members, before a shift in policies meant a new direction with our advertising - 604 members are now following our new and improved page, engaged actively through social media outlets Snapchat and Instagram – allowing immediacy of connection and distribution of photos and media. Expansion and new direction has allowed the cultivation of balance between social and personal development throughout the year, with the implementation of new events and cementing of old.

CEVSOC had gears turning even prior to the commencement of the semester; where many dedicated CEVSOC'ians gave up their time during O-Week to share experiences, and help promote the beneficial community that is CEVSOC. This keen enthusiasm had a flow on effect to our 5th annual "First Year Camp" – being sold out with 120 first years onboard. With engineering challenges, trivia, and nights filled with social activities all within the camps imaginative theme of "World Domination", a huge influx followed of younger participants within the CEVSOC community and committee involvement.

The office bearers for 2015 are as follows:

President: Christopher Mundy
Vice President: Gregory Aouad
Secretary: Karina Baumber
Treasurer: Alex Warren
WHS Representative: Joe Zheng
Arc Delegate: George Chard
Sports Representative(s): Mary Hadjiangeli
Year reps: Jess Vorreiter, Grace Carpp, Braydon Witham, Zoe McLaughlin, Hannah Shilling, Claudia Burbidge, Shabab Jahan, Stef Sjobeck
Promotions Manager: Adam Refki

2015 saw both the return of some old favourites and the integration of new favourite events within our calendar. Return of the Cardno Cup and CEVSOC's Got Talent enabled a new breadth of individuals exposing themselves to both industry and new personal challenges. The coveted Cardno Cup trophy sadly fell to the Cardno/ Staff team – but saw the development of the CEVSOC Social Soccer Team. Everything from singing and guitar solos, to vibrant skipping displays were evidence of the diversity our community holds at CEVSOC's Got Talent – being then challenged to give selflessly, by hosting a "Shave for a Cure BBQ" with almost a dozen staff and students losing those curly locks to raise over $500 for the Cancer Council. Further expansion of CEVSOC's community came with our annual cruise – sharing the night with PSYCHSOC to enjoy some fine dancing, and frolicking on the high seas.





CEVSOC's staples, the Alumni Night, Thesis Information Night, and IT & Electives Night were complemented with a new "What Happens After You Graduate?" information evening. The opportunity for Engineers Australia, our Industry Representatives from PB/WSP and our own PhD Academics to offer their insights within this transitional stage finds a niche spot in our comprehensive calendar of events, opening a platform and forum for discussion.

Reflecting on such a successful 2015, CEVSOC is now pushing the boundaries further than ever before and is looking for a strong start to another successful year in 2016. With development towards a balanced array of events catering for the many facets of university life – CEVSOC has never looked better for students, staff, alumni and industry.

Christopher Mundy
CEVSOC President 2015



SURVEYING SOCIETY (SURVSOC)

At the Surveying Society's Annual General Meeting in Oct 2015 the following office bearers were elected

Survsoc Office Holders:

President: Luke Chidzey
Vice president: Luke Haavisto
Treasurer: Jacky Chan
Arc Delegate: Conor Molloy
Secretary: Hannah Pearce
Industry rep: Tim Cook
4th year rep: Mitchell Bradac
3rd year rep: Angus Baxter
2nd year rep: Karats Eisenmenger

2015 had been a good year for Survsoc with organisation of SURVSOC hoodies, BBQs, Pub crawl etc. The finances are in good shape. They plan to keep up the good work next year. Year reps are going to have a greater role in planning and social media, and organizing social events.



YEAR 4 DINNER

The School's industry-subsidised annual Year 4 dinner was once again held at the Sheraton on the Park at the end of the academic year, and a good time was had by all. Students, staff and industry partners celebrated the end of four years of hard work, learning and achievement with dinner and dancing.

Industry sponsored prizes were awarded at the dinner to outstanding students in several disciplines (see p60 for full list). Our congratulations to them and to all our wonderful students, and thanks to our generous industry sponsors for their continuing support.


























INDUSTRY AND COMMUNITY

INDUSTRY ADVISORY COMMITTEE

The Industry Advisory Committee is an important means by which links between the School and industry are maintained. Members of the IAC are drawn from private sector, government and consultant organisations. Its main function is that of "sounding board" for the School in regard to undergraduate and graduate programs, and research directions.

The IAC membership represents a broad cross section of relevant industry sectors at a senior and influential level. This year, 2015, we welcomed Paul Harcombe, NSW Deputy Surveyor-General to our Committee to replace retiring member Mark Gordon, Principal Surveyor, RMS . We also farewelled Dr Mehreen Faruqi whose busy program as a NSW MLC prevented her from continuing in her IAC role.

The IAC and the School have taken a long term approach to improving the standing of the School within the awareness and perception of possible future students, their parents, teachers and careers advisers. As a consequence, the School now reaches out to these groups in several practical ways: Presentation of maths prizes in primary schools, Year 10 visits to engineering projects and activities as an alternative form of "industry work experience" for high school students, and sponsorship of attendance by school careers advisers at industry awards dinners for engineering excellence. Each of these means of outreach continues to receive very favourable feedback from participants.

In keeping with one of our new and ongoing tasks – a commitment to raise the community profile and the enrolment levels of surveying and geospatial degrees - in 2015 careers advisers were invited to the Surveying Big Night Out; the NSW EISSI (Excellence in Surveying and Spatial Information) Awards.

In 2015 the Committee also continued its investigations into the almost systemic ways in which students are being turned away from studying higher level maths in our secondary schools. This has included consultation with careers advisers and with the Universities Admission Centre (UAC). These revealed facts that dispel several myths about the HSC Maths courses and their ATAR which have a disturbing currency amongst teachers, parents and possible students. A paper setting out the facts as identified by the Committee has been compiled as a basis for ongoing conversations with people who influence students in regard to the mathematics that they study, or do not study, in secondary schools.

Along with numerous other professional and industry groups, the Committee regards this as a serious crisis and will continue to actively promote the study of extension mathematics in schools.

An energetic engagement with the School community will continue wherever industry input can be of assistance.

Ian McIntyre
Chairman

Ian **McIntyre** Principal and Service Lead, Contractual Services, Advisian 	As a consultant for nearly 30 years, Ian has advised in relation to project delivery processes on a wide range of infrastructure, building and systems integration projects throughout Australia and South East Asia. His previous experience was in project management and construction engineering for a contractor on major civil engineering and multi disciplinary projects throughout Australia and in Hong Kong. He is frequently retained in "trouble shooting", independent review and due diligence roles and has considerable experience in analysis of the reasons for project delivery problems, and of the factors which are typically associated with successful project delivery strategies leading to successful project outcomes. He is an experienced expert witness in relation to project performance issues.
Deirdre **Agnew** Student Careers Advisor 	Deirdre has worked in banking, insurance broking and market research in the UK. She has also been employed in public relations/events management role for international conferences at the University of the Witwatersrand. She taught at Hornsby Girls' High School, before moving into careers counselling. She spent fifteen years at St. Ignatius' College, Riverview and has been at St. Aloysius College at Milsons Point since 2005. Deirdre is also a director of Australian Careers Advice, a professional careers consultancy.
Eric **de Rooy** General Manager, Service Delivery - Sydney Water 	Eric was appointed General Manager, Service Delivery, Sydney Water in July 2012, prior to which he was General Manager, Maintenance from November 2008. Since joining Sydney Water in January 1975 as a trainee civil engineer, Eric has worked in many of the asset-related areas, including construction, design, treatment operations/maintenance, capital projects and network operations. In 1998 Eric took up the role of Water Networks Manager and was later appointed as Manager Strategic Operations in 2004. He was appointed as the General Manager of the new Service Delivery Division in 2012, with responsibility for the planning, operation, maintenance and renewal of all of Sydney Water's service related assets.
Laurie **Foy**, Regional Director, Construction + Development, Brookfield Multiplex 	Laurie has over 30 years construction industry experience gained both locally and in South East Asia. Laurie joined Brookfield Multiplex in 1991 to lead the Sheraton on the Park project. Since then he has provided leadership to teams on some of Brookfield Multiplex's most challenging projects, among them the $287m Parramatta Justice Precinct, the $360m BER Schools Program and more recently, Lifehouse at RPA and the Charles Perkins Centre at the University of Sydney. Laurie works closely in skills training of junior staff members and is also involved in development of opportunities for long term unemployed in the Indigenous population



IAC School Members

Left to Right: Professor Stephen J Foster (Professor, Head of School); A/Prof Ron Cox (Co-Chair, External Relations Committee, Convenor, ACCARNSI); Dr Kurt Douglas (Co-Chair, External Relations Committee); Dr Mary O'Connell (Manager - External Relations)

Dr James **Glastonbury**, Engineering Director, Laing O'Rourke



For his PhD in geotechnical engineering at UNSW James developed slope risk management tools that have been used by various agencies for better managing landslide risk, igniting a passion for innovation which has remained to this day.
He now works with a global team of technical specialists that seek smarter ways to do things, to challenge traditional practice. He relishes the conversations he has with clients about how new ideas and technologies could be integrated into projects to provide greater efficiency, quality and performance,

Andrew **Johnson** Principal, ARUP



Andrew leads an integrated buildings design team in the Sydney Arup office delivering bespoke high level multi-disciplinary design to achieve better and more sustainable buildings.
Andrew is a structural engineer with a passion for design philosophies combining innovation with efficiency in holistic building or structural solutions, and his experience designing and delivering projects in Australia, the UK, and around the world for nearly 20 years.
His specific structural expertise includes tall buildings, hybrid structures, long-term serviceability of structures, seismic analysis and design, and long-span lightweight roof structures.

Dr Kourosh **Kayvani** Building Structures Leader and Head of Innovation Aurecon



Dr Kourosh Kayvani is Aurecon's global Head of Innovation. Over a 20+ year career, he played key roles in the design of many innovative and award-winning structures including Wembley National Stadium (Arch and Roof), London; the ANSTO OPAL Reactor Building, Lucas Heights, NSW; and the State Hockey Centre, Sydney Olympic Park, Sydney.
Kourosh has been listed in Engineers Australia Top 100 most influential engineers in 2009 in recognition of his Engineering Expertise. He is also a Laureate of the IABSE Prize awarded by the International Association for Bridge and Structural Engineering for his contribution to design of long span structures worldwide. Kourosh is a Fellow of Engineers Australia, a Director of the Australian Steel Institute (ASI) and a Director of the Association of Structural Engineers, NSW (ASCE).

David **Kinniburgh** Global Market Leader – Transportation GHD



David Kinniburgh is responsible for overseeing the development and delivery of GHD's global transportation strategy. David has worked with GHD for more than 17 years and has strong experience ranging from concept development to detailed design and construction management, predominantly in the transportation sector. Previously, he was the Operating Centre Manager for GHD's Sydney operations, responsible for business in Sydney, Wollongong, Dubbo and Orange.

Paul **Harcombe** NSW Chief Surveyor Land and Property Information NSW Office of Finance & Services



Paul Harcombe holds a Bachelor in Surveying from UNSW and a Master of Geomatics from the University of Melbourne. He is a Fellow of the Institution of Surveyors Australia (now the Surveying & Spatial Sciences Institute SSSI). In 2010 he was awarded the SSSI President's Medal for services to the industry. Paul is also a Fellow of the Institution of Surveyors NSW Incorporated. The University of Melbourne awarded Paul in 2010 with the Thornton Smith Medal for his outstanding contribution to the engineering profession in the field of geomatics.
Paul is a member of the NSW Board of Surveying and Spatial Information which regulates land and mining surveying activities and advises Government on Spatial Information matters.

Garry **Mostyn** Principal, PSM



After nearly twenty years in private and public practice, and ten as a UNSW academic, Garry joined PSM in 1997 as a Principal Consultant. Garry's fields of specialist expertise include slope engineering; foundation engineering; rock mechanics; geotechnical risk analysis; and forensic engineering. He has authored or co-authored over 60 journal and conference papers. He has worked on major projects throughout Australia and in Thailand and PNG. He has been an active member of several national and international code and practice committees and been involved at the highest levels of the Australian Geomechanics Society and the International Society for Rock Mechanics.

Iain **Scoular**, General Manager, Group Services, CIMIC



Iain graduated from UNSW with an Hons degree in civil engineering in 1980. Leighton has a long and proud partnership with UNSW having offered engineering scholarship programs and prizes worth a total value of over $750,000 since 2004, and Iain has been at the heart of it all. He was also one of the leaders responsible for establishing the award winning MEngSc in project management developed by the School for the Leighton Group. In April 2015 Leighton Holdings became CIMIC Group Ltd.

Athena **Venios**, Technical Director – Transport Group, AECOM



Athena graduated from UNSW with a BE (Civil) Honours degree in 1997. She currently manages a team of 240 consulting professionals at AECOM servicing the transport market in NSW, including roads (including bridges and tunnels), aviation, rail, ports & marine.

EXTERNAL RELATIONS COMMITTEE REPORT 2015



ERC 2015 Back L-R: Mary O'Connell, Sawekchai Tangaramvong, Kurt Douglas, Lauren Gardner. Front L-R Craig Roberts, Ron Cox, Tricia Tesoriero. Absent: Fiona Johnson, Kristen Splinter

Associate Professor Ron Cox **Co-Chair**
Dr Kurt Douglas **Co-Chair**
Dr Lauren Gardner
Dr Fiona Johnson
Dr Mary O'Connell **External Relations Manager**
Dr Craig Roberts
Dr Kristen Splinter
Dr Sawekchai Tangaramvong **Scholarships Officer**
Ms Tricia Tesoriero **Special Projects Administrator**

The strategic objectives of the External Relations Committee (ERC) of the School of Civil & Environmental Engineering (CVEN) include the development of effective outreach and marketing programs, as well as building and maintaining strong relationships with industry and our alumni community.

ERC members represent and promote the School at many presentations and functions on and off campus. These include UNSW and Engineering Information Days, UNSW Open Day, High School visits on and off campus, the Indigenous Australian Engineering Summer School and UNSW Nura Gili Winter School, and working closely with the **Women in Engineering** camp – an annual week-long event coordinated by the Faculty of Engineering's WiE Development Manager Dr Alex Bannigan.

UNSW Engineering aims to achieve a 30% female participation rate by 2020, (currently Faculty and CVEN average is 21%– while the Australian average is just 16%.) During the year the ERC supported the new cross-Faculty WIE student organisation– with three of our industry partners Bouygues, Brookfield Multiplex and WSP/Parsons Brinckerhoff participating in the WiE industry networking night. Our alumni also generously responded to our call for the WiE speed networking event in October. We successfully nominated the WiE executive team for a 2015 Faculty of Engineering Student Service Award. We also successfully nominated alumni Ms Erin Cini, (BE Environmental (Hons) '06) for the 2015 UNSW Engineering's Maria Skyllas-Kazacos Young Professional Award for Outstanding Achievement.

Dr Kristen Splinter at High school information day at CVEN





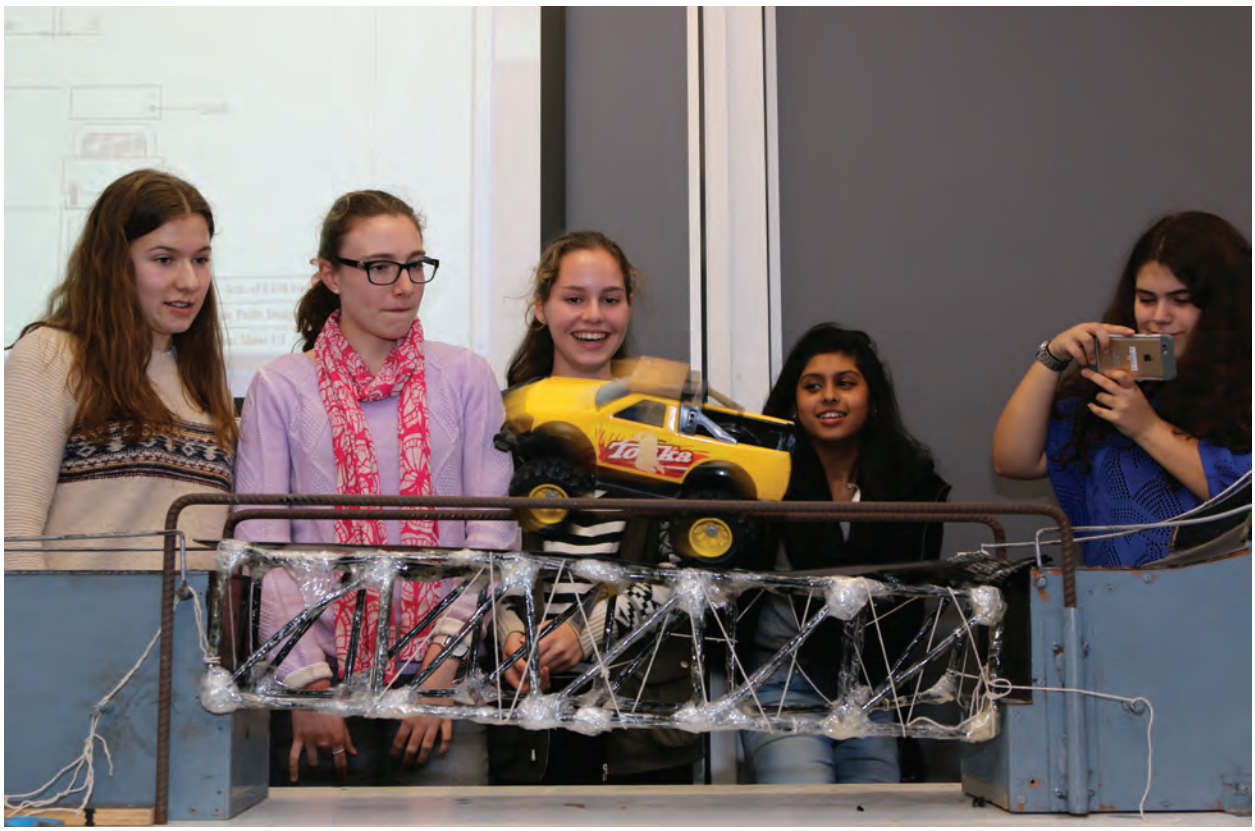
As well as liaising with the School's Industry Advisory Committee, the ERC administers the **Industry Partner Program** and within that portfolio organises an annual Industry Partners Careers Market for our third and fourth year students, an Elite Student/Industry Breakfast at Sydney's Botanic Gardens, a Year 10 work experience week, and the Maths Primary Prize. In 2015 the ERC welcomed Bouygues Construction to our Industry Partner program.

2015 saw the continuation of **promotion of the Surveying degrees** following the integration of the School of Surveying and Geospatial Engineering(SAGE) into CVEN in 2013. New flyers promoting the SAGE degrees were mailed to all NSW careers advisers, and a video was also commissioned and made. The work done by surveying academics and the School's Teaching & Learning Committee enabled a new dual award program civil engineering/ surveying to be developed and approved in time for 2016 entry. At the **Careers Advisors Association of NSW and ACT** Annual October Conference in Darling Harbour, Drs Kurt Douglas and Craig Roberts ably represented the School with a stall focusing particularly on getting the surveying message across.



In 2015 the ERC produced a **Teaching Excellence @ Civil & Environmental Engineering** booklet which showcased thirteen teaching stars of the School as well as featuring the student CEVSOC team and the School's Student Services team, who work hard to support and improve our student experience. The booklet was mailed out to our list of NSW careers advisers and secondary schools, as well as to every student who has come on a Year 10 work experience week – and has had several hundred downloads from the Web.

The annual Year 10 work experience week was held in June. In 2015 the week included tours to Four Points Hotel Construction site, Laing O'Rourke's 'Innovation Space', UNSW's Water Research Laboratory at Manly Vale, Sydney Water Treatment Plant, Centennial Park, Seacliff, Anzac and Sydney Harbour Bridges, and Lend Lease's development at Darling Harbour. In 2015 we accepted 60 students from 59 high schools in Sydney and regional NSW including Griffith, Forbes, Newcastle, Coffs Harbour, Wagga Wagga, Grenfell, Illawarra, and the Central Coast. Student feedback comments remain **overwhelmingly positive** – One young participant wrote, 'This work experience was honestly one of the



best experiences of my life and I am glad to be a part of it and to share aspects of this - maybe sparking other people's interests towards engineering as it sparked mine.' Our special thanks goes to all the industry support especially from Advisian, ARUP, PSM, Brookfield Multiplex, Laing O'Rourke, LendLease, Sydney Water, Royal HaskoningDHV, Manly Water Researach Laboratory and the Water Research Centre for making the time to inspire the interest of these potential engineers.

A total of 83 NSW primary schools participated in the **CVEN and Faculty of Engineering Maths Primary Prizes** ably coordinated by Tricia Tesoriero. Members of the School's Industry Advisory Committee, School staff and some illustrious alumni presented 264 students with their awards at end of year ceremonies, further raising the profile of the profession to hundreds of young people, their families and community. *See full list of winners page 72.*

The ERC continues to develop the School's relationship with graduates through the Annual Report and the annual **CVEN Alumni newsletter** - distributed to all engineering alumni through the University's magazine *UNSWorld*. The 2015 alumni newsletter profiled our latest alumnus addition to EA's annual Top 100- William (Bill) Cox - BE Civil Hons 1988, Aurecon's MD – Australia & New Zealand, as well as acknowledging the great ambition of current student Rachel McVittie to become our first woman Indigenous graduate.

The ERC also provides support for Alumni group reunions –in 2015 we hosted a morning tea and tour for a group of alumni who started at UNSW in 1965 – they had gathered back on campus to celebrate fifty years of friendship. In 2015 we began our series of Inspiring Alumni posters for internal story telling amongst our large student community.

For further information on external relations, alumni, the IAC and School Industry Partnership Program contact Dr Mary O'Connell at m.oconnell@unsw.edu.au



ABOUT OUR INDUSTRY PARTNERS

The School has strong active links with industry and is very committed to continuing and developing these ties. Our Industry Partners Program is one of the ways these relationships are maintained and nurtured.

The annual Industry Partners Careers Market is an important activity where Industry Partner representatives meet with Year 3 and Year 4 students. This allows Industry Partners to identify students for industrial training placements or graduate employment. The School also hosts an annual Elite Student Breakfast at the Sydney Botanic Gardens where our top students engage with Industry Partner representatives in a relaxed setting. The School will also directly email career information on behalf of Industry Partners to all relevant undergraduate and postgraduate students.

Funds raised through the Industry Partners Program are administered by the School's External Relations Committee and used to raise the profile of the profession at primary and secondary schools. We do this in a variety of ways ; including delivering a Primary School Mathematics Prize, running a highly sought after Year 10 work experience tour of engineering sites, and through building relationships with careers advisers.

Our thanks to our Industry Partners:

Advisian, ANSTO, ARUP, Aurecon, Bouygues Construction, Brookfield Multiplex, CPB (Leighton Contractors), JK Geotechnics, Laing O'Rourke, Pells Sullivan Meynink (PSM), SMEC Australia, Taylor Thomson Whitting (TTW), WSP/Parsons Brinckerhoff.

Industry supporters who provide student prizes, scholarships and/or other assistance:

AECOM, Cardno, GHD, Hindmarsh, Royal HaskoningDHV, RPS.

WELCOME TO NEW INDUSTRY PARTNER Bouygues Construction Australia

In 2015 we were delighted to have Bouygues Construction join the industry partner program. The Bouygues Group has been present in the Australian construction and engineering markets for over 30 years, initially through its specialist engineering division VSL and more recently its civil engineering business. The 3 core business streams of Bouygues Construction Australia cover:

- Civil Engineering (principally transport infrastructure) through the expertise of civil works specialist Bouygues Travaux Publics
- Building (including health, education, commercial and residential, sports and leisure) through the expertise of Bouygues Batiment International
- Resources infrastructures (mining, oil and gas) through the expertise of DTP Terrassement, the earthworks division of Bouygues Construction





Wheeler Heights Public School Maths Prize winners

2015 MATHS PRIZE CERTIFICATES

Alexandria Park Community School
Christina Le
Theodore Sanuri
Thuhid Shoumik
Ruby Voorn

Annandale North Public School
Alex Austin-Evans
Rupert Dobbin
Merryn Quang
Peter Sandbach

Australian International Academy
Layth Al-somai
Layth Alobedy
Nour Hussein
Ayaan Shaik

Avondale School
Liam Bennett

Balgowlah North Public School
Isabella Rigatos

Balmain Public School
Caterina Li
Charlie Ragg

Bankstown West Public School
Sophia Fang
Jeslyn Lee
Helen Mi
Jason Nguyen

Beauty Point Public School
Cairistiona Clarke
Kaia Hole
Witty Leung
Teyah Wallis

Beecroft Public School
Olivia Lim

Bellevue Hill Public School
Rafael Deubler
Calev Gay
Aiden Lee
Omri Weininger

Belrose Public School
Sebastian Elston
Samuel Johnston
Elliot Powell
Ishan Shah

Berowra Public School
Jai Carlson
Matthew Clayton
Kamden Hogarth
Ryan Jones

Cammeray Public School
Joe Kerruish
Laurence Lancaster
Aidan McNamara
Luke Palmer

Carlingford Public School
Rishabh Mukherji

Chifley Public School
Shino Nakamoto

Cowra Public School
Jacqueline Long
Archie Osborne

Crescent Head Public School
Mia Powick
Jessica Terrasson

Croydon Public School
Jesse Callander
Sophie Chin
Cheryl He
Arno Lam

Daceyville Public School
Praise Barry
Lucy Lu
Joshua Ly
Cyril Subramanian

Double Bay Public School
Maria Argyrous

Eastlakes Public School
Johan Huq
Rajit Rahman
Isaiah Delos Santos
Weiji Angela Sun

Epping Heights Public School
Evelyn Moon
Aaryan Pahwa
James Rundle
Nathan You

Epping North Public School
Sam Xie

Glenhaven Public School
Natasha Stanbridge

Harbord Public School
Dylan George
Hannah Kelsey
Oonagh O'Dwyer
Jesse Steele

Jasper Road Public School
Catherine Ahn
George Bao
Martin Kim
Lily Wu

Kambora Public School
Moses Dorsey
Thomas Hawkeswood
Raul Lyons
Ike Morris

Kensington Public School
Anni Dong
Tri Nguyen
Charlotte Voon
Adem Yerlikaya

Loquat Valley Anglican School
Elke Black
Gisele Horsfall

Manly West Primary School
Arran Darling
Sophie Grcev
Grace Hyland
Fionn McMorrow-Dermody

Middle Harbour Public School
Pak Boonyubol
Flynn Henry
Tadhg Nolan
Kanan Toyoda

Mosman Public School
Julian Lee

Mount Colah Public School
Daniel Jeong
Arav Pokharna
Ethan Rock
Jessica Wood

Narrabeen North Public School
Joel Connor
Coen Harding

North Haven Public School
Zane Holliday
Luke Merrill

Northmead Public School
Samantha Gonzales
Lindsey Kim
Wolf Kumaran-Eriksson
Wethmi Rupasinghe-Arachchig

Pennant Hills Public School
James Hanselmann

Picnic Point Public School
Aldora Bui
Kamran Kumar
Andy Lin
Joshua Lui

Randwick Public School
Caelen Noesjirwan
Corey Last

Roselea Public School
Ved Dhiman
Samuel Lim

St Christopher's Catholic Primary
Angus Ho
Dominic Stoddart
Jack Tesoriero
Eric Vu

St Declan's Catholic Primary School
Caitlin Hollis
Gabrielle Jackson
Syre Gian Napoles
Isabella Wu

St Joseph's Catholic Primary School
Joshua Cohen
Sean Conroy
Thomas McLachlan

Tacking Point Public School
Cooper Coad
Brodie Ferrett

Tagai State College, Mer Island, Torres Strait
Maxine Aitken
Mataio Bon
Benjamin Mabo
Udiwad Tapim

Toongabbie West Public School
Aysha Ponthuveetil Faisal
Darren Pradhan

Turramurra Public School
Taylor Collings
Alyssa Fan

West Pennant Hills Public School
Emily An
Aedan Campbell
Annabelle Edwards
Nicholas Posener
Ella Simons

Wheeler Heights Public School
Ethan Baillie
Kye Burns
Cian Hay
Toby Neal

Woollahra Public School
Maxim Crossman
Alex Fan
Liam Highducheck
Jack Lin

Wollondilly Anglican College
Piper Rudd

Congratulations to our 6 Alumni in Engineers Australia Top 100, 2015



William Cox BE Civil Hons '88 Managing Director - ANZ Aurecon

Dr Mehreen Faruqi, MEngSc '94. PhD '00 Member of Legislative Council, NSW Parliament

Dr Stuart Khan PhD '03 Associate Professor - UNSW Civil & Environmental Engineering

Grant King BE Civil '77 Managing Director, Origin Energy

David Stewart MEngSc '99 Director-General, Qld Dept of Premier and Cabinet.

Em Prof Elizabeth Taylor, AO, BE Civil '78 Chair RedR Australia and RedR International

New industry sponsored scholarships for women

In another great UNSW Engineering initiative to encourage more women to study engineering, 10 new Engineering scholarships were created for females in 2015 to be offered to high school leavers starting uni in 2016. These include a new Arup Women in Engineering Scholarship open to Electrical, Mechanical and Manufacturing, Civil & Computer Engineering while Hindmarsh have also generously provided for a Women in Civil Engineering Scholarship.

We are grateful for the generous support of long time industry partner ARUP, and welcome new WiE supporters Hindmarsh.

For Hindmarsh, the decision to support a scholarship specifically for a woman student in civil engineering was "a great opportunity to encourage the participation of women in the field' said National Manager, People & Performance – Nicole Ashe. "At Hindmarsh we value diversity and equal opportunity, and as such, felt this scholarship was a springboard for women to feel supported in their pursuit of accomplishment within the industry".





Three of a kind: former Australian and World Iron Man, John Holt (BSurv '75), A/Prof Bill Kearsley (BSurv '63, MSurvSc '70, PhD '77) and Mark Taylor, former captain of the Australian Cricket Team (1994-1999), and a surveying graduate of UNSW (B. Surv,'88; Hon DSc, '99) at the 2015 Australia Day Seminars held by the Institution of Surveyors NSW.

The seminars were opened by the Institution's Patron, NSW Governor His Excellency the Honourable David Hurley, AC, DSc (Ret.), who spoke of his experiences in the use of maps in regions of conflict, and the vital role accurate and reliable maps played in these zones.

ALUMNI VISIONARY



Emeritus Professor Elizabeth Taylor, AO

BE Civil 1978 UNSW
Chair of RedR Australia
Chair: Accreditation Board of Engineers Australia

Since graduating from UNSW as a Civil Engineer, Elizabeth Taylor has led a distinguished and diverse career- spanning maritime and structural design and construction, academia and, presently, quality assurance of defence procurement.

In 2004, Elizabeth was appointed an Officer of the Order of Australia for her service to engineering education, her commitment to professional associations, and to promoting and enhancing the status of women in engineering.

Engineers Australia have included Elizabeth on their list of Australia's 100 Most Influential Engineers no fewer than 10 times since 2004 and also made Elizabeth an Honorary Fellow in 2011.

The following are extracts from Prof Taylor's 'Occasional Address' delivered at the June 2015 Graduation ceremony.

"I chair the Board of RedR Australia, a highly respected provider of competent and committed experts, from engineers to child protection officers, relieving suffering in times of disaster.

Relieving suffering is a sophisticated enterprise. Supporting the physical, mental and emotional needs of people after a disaster is underpinned by high technology, complex logistics, serious politics and the need for a coherent multi-faceted, multi professional response. Water and sanitation, shelter and refugee camp design, structural reviews to determine shelter after an earthquake; ground water analysis in times of drought, floods and hurricanes, and war, each with their specific characteristics, needs and challenges – from my perspective, engineering expertise is critical.

I also chair the Accreditation Board that accredits engineering programs across Australia and have the privilege of seeing the innovative curriculum that is keeping our new graduates ready to engage in our constantly shifting future.

In my professional life I witness the amazing work of young engineers operationalizing our digital future across a very complex environment. And at the same time maintaining our existing infrastructure. They are savvy, committed, innovative.

I believe that it is helpful to have a compass, a platform from which to consider your career – where you would like to see the future? What do you stand for? How does engineering facilitate this future?

My own compass is the Earth Charter which says. … *we must recognize that in the midst of a magnificent diversity of cultures and life forms we are one human family and one Earth community with a common destiny. We must join together to bring forth a sustainable global society founded on respect for nature, universal human rights, economic justice, and a culture of peace.*

Having participated in the creativity of our profession I am confident that we, and particularly our young engineers, have the necessary innovative thinking and passion to achieve just such a vision for the future."



OUR **CENTRES** & **HUBS**

NCCARF

National
Climate Change Adaptation
Research Facility

Adaptation Research Network
SETTLEMENTS AND INFRASTRUCTURE



The Australian Climate Change Adaptation Research Network for Settlements and Infrastructure (ACCARNSI) is in Phase 2 (2015 to 2017) of its activities based within the School's Water Research Laboratory with partner nodes located at the Griffith Centre for Coastal Management, Canberra Urban and Regional Futures, and the University of South Australia. Covering a broad canvas of climate adaptation themes for Settlements and Infrastructure, ACCARNSI's priority currently lies in supporting the NSW State and Federal Governments as they seek climate adaptation strategies to protect and manage Australia's coastline and associated infrastructure.

Investment in Australia's climate adaptation research future continues to be a key focus of ACCARNSI's activities in 2015. ACCARNSI's first Early Career Researcher Forum and Workshop (ECR) of Phase 2 was held at the Griffith University Gold Coast campus in July 2015 and hosted by ACCARNSI partner, the Griffith Centre for Coastal Management. The focus of the July Forum was Coastal Planning, Management and Communities.

ECR Forums create a space for early career researchers and practitioners to share their research and work, learn about the breadth of research taking place in the Climate Adaptation space, participate in National Adaptation Research Plan reviews and establish vital networks to build and expand their research and practice. ACCARNSI has seen the careers of many of its Phase 1 ECR participants flourish not only in research but also in government and business roles. The next ECR Forum is to be held at the University of Canberra in February 2016 with hosts



Canberra Urban and Regional Futures will focus on Urban and Regional Planning as well as Coastal and Urban Governance.

Over the past year, the ACCARNSI team has been very active with each of its four nodes undertaking capacity building projects, in the coastal, planning and infrastructure space, both nationally and internationally.

ACCARNSI Convenor, Associate Professor Ron Cox, in his role as a member of the NSW Coastal Expert Panel, has through 2014 and 2015 been advising Minister Rob Stokes, the Minister for Planning and Environment on NSW coastal policy reform. The draft Bill and supporting documentation is presently available for public comment. For more information on the Coastal Management Reforms' public consultation process visit http://www.environment.nsw.gov.au/coasts/coastreforms.htm.

Researchers from the Coastal Planning, Management and Communities Node and the Coastal Settlements and Infrastructure Node attended the Australasian Coasts and Port Conference in Auckland to present their research on the potential role of non-government finance for coastal protection projects in Australia. The team at Canberra Urban and Regional Futures who host the Urban and Regional Planning, Coastal and Urban Governance Node are currently leading a collaborative research project with the ACT Government Environment and Planning Directorate, exploring the revitalisation of commercial centres, and the retrofitting of older housing stock, for climate change adaptation and long term sustainability.

The latest paper by ACCARNSI's Urban and Regional Infrastructure Node examines the potential impacts of a changing climate on regimes for road pavement management, using the case study of a north-south transect through rural South Australia, from Hawker in the Flinders Ranges to Goolwa at the Murray Mouth. The paper is part of a special issue of the journal Transport Policy on 'Adaptation Strategies of Transportation Infrastructures to Climate Change'.

In November 2015, ACCARNSI participated in AdaptNSW showcasing research projects funded under the NSW Office of Environment and Heritage's Climate Adaptation Research Hub (CARH). Alongside its partner, the Sydney Institute of Marine Science (SIMS), ACCARNSI leads CARH's Coastal Processes and Responses Node which is currently undertaking projects in the assessment and risk management of, and adaptation responses to, the impacts of climate change on coastal and estuary zones. The aim is to improve our knowledge base of impact assessment, risk management and adaptation responses. It will inform management decisions and actions taken by local communities and councils in the coastal zone.

For more information on the Climate Adaptation Research Hub visit http://www.climatechange.environment.nsw.gov.au/Adapting-to-climate-change/Adaptation-Research-Hub/Coastal-Node.

For more information on ACCARNSI visit https://www.nccarf.edu.au/settlements-infrastructure/ and subscribe online to receive our e-newsletter and member alerts.

CIES

- STRUCTURAL ENGINEERING
- GEOTECHNICAL ENGINEERING
- PAVEMENT ENGINEERING
- ADVANCED ENGINEERED MATERIALS
- COMPUTATIONAL MECHANICS



Centre for Infrastructure, Engineering & Safety (CIES)

As Australia's premier high level research group in structural engineering, geotechnical engineering, engineering materials and computational mechanics, our success is not only measured by the excellent track record in attaining competitive research grant funding but also in the assessment of our activities on the key dimensions of Research Relevance and Impact.

In 2015, CIES continued to engage with and to promote the application of research outcomes and deliverables to industry and to provide an outstanding research and learning environment.

Some of our highlights included:

CIES member expertise - CIES Director appointed to Australian Research Council (ARC), College of Experts for 2016-2018

CIES Director Professor Brian Uy has been appointed to the ARC College of Experts from 2016-2018 and will serve on the Engineering, Information and Computing Sciences (EIC) Panel.

Members of the ARC College of Experts assess and rank ARC grant applications submitted under the National Competitive Grants Programme, make funding recommendations to the ARC and provide strategic advice to the ARC on emerging disciplines and cross-disciplinary developments.

This is Brian's fourth major appointment to ARC research assessment panels spanning a ten year period. He was previously a member of the ARC College of Experts for Engineering and Environmental Sciences from 2007-2009 and served as the Deputy Chair in 2009. He then followed this with a three year term on the Selection Advisory Committee for the Australian Laureate Fellowships program from 2011-2013. Most recently he



was a member of the Excellence in Research Australia (ERA) Research Evaluation Committee on Engineering and Environmental Sciences.

CIES Research Impact: CIES & UNSW the first Tertiary Institution member of National Precast Concrete Association Australia (NPCAA).





Dr Hamed was prompted to contact the NPCAA after seeing a news story on the new Sandwich Panel Recommended Practice in the CIA (Concrete in Australia) magazine. He saw this as an opportunity for CIES to engage with the precast industry and to contribute to the industry by providing structural solutions that are more economic, durable, environmentally friendly and sustainable.

Precast concrete walling is a great alternative to traditional construction techniques. The benefits offered by precast walling along with the growing availability of mobile cranes and the rising cost of bricklaying, have seen precast panels becoming the product of choice in the Australian construction market. In many cases, however, precast concrete wall panels are used blindly to some extent without adequate research findings to support methodologies.

Through NPCAA, Dr Hamed was invited to give a presentation about his work in their August 2015 meeting at Brisbane, where he aims to gain interest from industry about his research activities.

Research Leadership - CIES Workshop - on the Engineering of Advanced Cementitious Materials and Durable Structures.

In August 2015, CIES hosted this important workshop which attracted high profile National and International speakers and attendance from industry leaders, CIES academics and research staff and visiting members of fib (International Federation for Structural Concrete).

The workshop was an opportunity for recent research advances in this important area to be shared with a group of key influencers from both the academic and industry spheres.

Geotechnical Group Highlights

Some of the year's highlights for the geotechnical group within CIES were the successes of their up and coming young researchers. At the 2nd Australasian Conference on Computational Mechanics, (ACCM) held in Brisbane from Nov 30 to Dec 1 2015, three young CIES researchers received awards. The ACCM2015 Best Paper Award - Early Career Researcher was awarded to Babak Shahbodagh (supervised by Nasser Khalili) and Di Wu (supervised by Wei Gao). The ACCM2015 Best Paper Award was won by postgraduate student Adnan Sufian (supervised by Adrian Russell).

In July 2015 Associate Professor Adrian Russell delivered a Keynote Lecture at the "Australian Academy of Science Elizabeth and Frederick White Conference", at the University of Melbourne. His lecture was titled "Micromechanics of soil-structure interaction".The conference aimed to advance, at the most fundamental level, the state-of-the-science in the observation, modelling and simulation, and prediction of geomaterial failure. The meeting introduced to Australian researchers new directions in the study of geomaterial failure, through: (a) new technologies for high-resolution, spatial and temporal measurements of internal structure and deformation; (b) complex networks and optimisation tools in data mining for granular media; and (c) recent discoveries and new questions uncovered in the detection and early prediction of failure arising from (a,b).

Research Leadership – New reference text provides a unique focus on the treatment of serviceability aspects of design.

Emeritus Professor Ian Gilbert, Deputy Director of the Centre for Infrastructure Engineering and Safety, has

published the second edition of his book *Design of Prestressed Concrete to AS3600-2009* (CRC Press in Florida, USA). The book (co-authored with Professors Neil Mickleborough -Hong Kong University of Science and Technology and Gianluca Ranzi - University of Sydney), contains the most up-to date and recent advances in the design of modern prestressed concrete structures, as well as the fundamental aspects of prestressed concrete behaviour and design that were so well received in the first edition. The text is written for senior undergraduate and postgraduate students of civil and structural engineering, and also for practising structural engineers.

The work has gained much from the membership of Professor Gilbert on committees of Standards Australia and the American Concrete Institute and his involvement in the development of AS 3600-2009 over the past 35 years. *Design of Prestressed Concrete to AS3600-2009* is a valuable source of information and a useful guide for students and practitioners of structural design.

CIES member expertise - Cracks and Crack Control in Concrete Structures

Every year the Concrete Institute of Australia (CIA conducts educational programs which aim to increase knowledge through the dissemination of fundamental and applied information for the benefit of the concrete and construction industry in general.

The programs aid in the facilitation of communications, sharing of knowledge and experience and provide an opportunity for peers within the concrete industry to interact and network.

CIES's Deputy Director and Emeritus Professor Ian Gilbert was invited to present the CIA series of workshops on "Cracks and Crack Control in Concrete Structures" across all 6 capital cities during October 2015.

With his concrete expertise in cracking, crack control requirements, and the practical implications of these, Ian provided his extensive research and knowledge in these areas to provide delegates with specific information that can be applied to create better concrete outcomes for designers, suppliers, placers, contractors, project managers, and asset owners.

Professor Gilbert has been an active member of Standards Australia's Committee BD-002 for over 30 years, responsible for the on-going development of the Australian Standard for Concrete Structures AS3600. Ian is also an active member on the Australian Standards committee BD-090 for Concrete Bridges AS 5100.5. He is the author of five text books on the analysis and design of reinforced and prestressed concrete and over 350 technical publications. As the Chairman of Durability Task Group 6, Ian has led the development of Z7-06 – Cracks and Crack Control.

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Emeritus Professor

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School of Materials Science & Engineering

Professor Gangadhara Prusty

School of Mechanical Engineering

Dr Mahmud Ashraf

School of Engineering and Information Technology (SEIT), UNSW Canberra.

Adjunct Member

Dr James Aldred, Adjunct Associate Professor – CIES - School of Civil & Environmental Engineering, UNSW

Visiting Academics

Professor Xiaotong Peng, School of Civil Engineering and Architecture, University of Jinan, China

A/Professor Qu Hui, School of Civil Engineering, Yantai University, China

A/Professor Bazyar Mansoor Khani, Department of Civil Engineering, Faculty of Engineering, Yasouj University, Iran

A/Professor Chao Zhang, School of Information Engineering, Inner Mongolia University of Science and Technology, China

A/Professor Zhaoqiu Liu, School of Civil Engineering, Yancheng Institute of Technology, China

A/Professor Dunja Peric, School of Civil Engineering, Colorado Kansas State University, USA

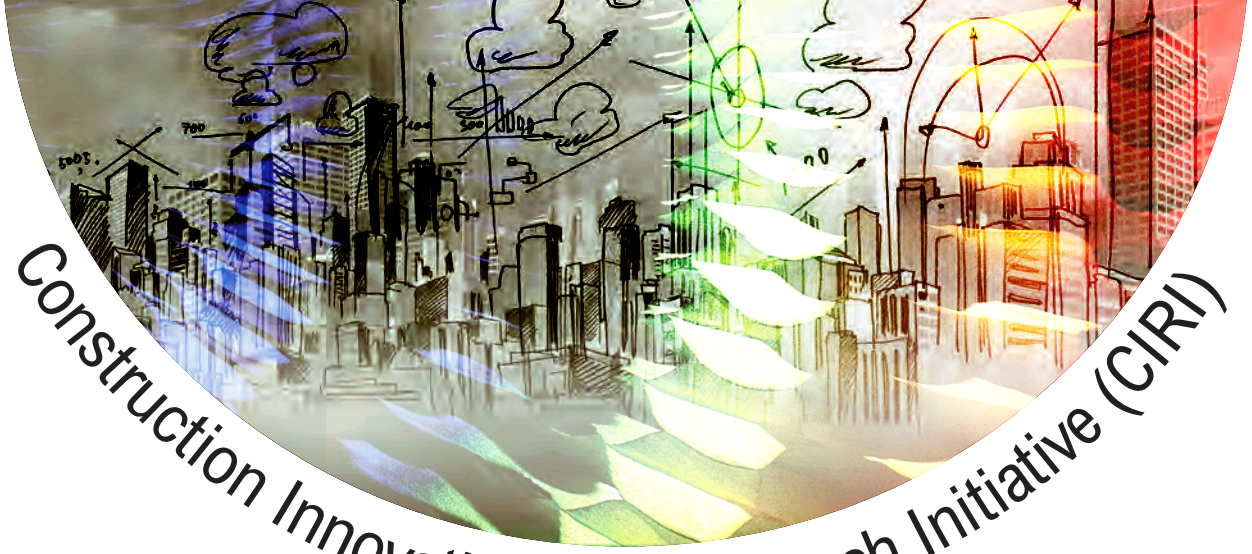
A/Professor Dr Tengfei Xu, Faculty of Civil Engineering, Southwest Jiaotung University, China

A/Professor Guangyue Ma, Wuhan University of Technology, China

A/Professor Chen Wu, College of Civil Engineering, Fujian University of Technology, China

Dr Yiqian He, Department of Engineering Mechanics, Dalian University of Technology, China

Dr Zihua Zhang, Ningbo University, China



Construction Innovation and Research Initiative (CIRI)



CIRI Academic Staff L-R: Dr Johnson Shen, Prof David Carmichael, Dr Steven Davis, Dr Ali Akbarnezhad

About Us

Construction is the world's largest industry and its efficiency is of obvious importance. The UNSW School of Civil and Environmental Engineering is a world resource centre for academic research in this field. The School's Construction Innovation and Research Initiative (CIRI) is engaged in industrial research on major construction projects in the region and has research partnerships with some of the industry's most successful organisations.

The aims of the Construction Innovation and Research Initiative are to:

- Train elite level professionals in the field through specially-designed undergraduate, Master's and PhD programs in construction engineering and management,
- Work on theoretical and practical research projects that will advance the current practice of the construction industry,
- Create a culture of creative curiosity in a new generation of construction professionals,
- Operate world-class research laboratories, including an automation laboratory, sustainable materials laboratory and sustainable design studio, and
- Offer independent expert consultancies to address critical issues in various areas, such as resource management and information technology in construction.

CIRI's research benefits from the 'laboratory' provided by its close relationship to industry, as well as the state-of-the-art research laboratories in the UNSW School of Civil and Environmental Engineering.

Teaching Excellence

CIRI places considerable emphasis on quality teaching to train elite professionals in the field. In 2015, the construction engineering and management group led by Professor Carmichael was awarded a Vice Chancellor's Award for Teaching Excellence in recognition of its contribution to Leighton industry master program. The work was also Highly Commended in Engineers Australia's annual excellence awards.

New Teaching Laboratory



Dr Johnson Shen was awarded a UNSW Learning and Teaching Innovation Grant to develop a new teaching laboratory on scaled earthmoving construction.

Students in his fourth year course CVEN4102 Operations & Projects work within a construction teaching lab where remotely controlled models of earthmoving equipment including an Hydraulic excavator, an articulated dump truck and a wheel loader demonstrate efficiencies in excavation, loading and hauling cycles.

Developing New Teaching Tools

Dr Ali Akbarnezhad was awarded a UNSW Learning and Teaching Innovation Grant to develop an intelligent system for real-time collection of detailed student feedback and interaction with students in large classes. The proposed system will provide lecturers with an easy to use tool for collection of detailed feedback on lecture notes.

Field Experience

Dr Ali Amin was awarded a School Teaching Initiative Grant which facilitated him to take Year-2 students out of the class room and onto live construction environments. Students were taken on tours of the Darling Harbour Live and Four Points by Sheraton redevelopments as well as an activity based excursion to the Southern Highlands where they were exposed to heavy machinery; performed brick laying, fencing and setting up formwork for a slab on ground. One student commented "Everything about the field trip was enjoyable since it was very hands on". Another student said, "Receiving hands-on experience showed us the practical side of what we learn in lectures".

Visiting Appointments

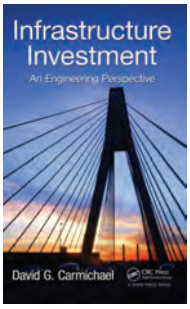
Professor Carmichael accepted appointments of Distinguished Adjunct Professor Asian Institute of Technology (Bangkok), Visiting Professor The University of British Columbia (Vancouver) and Visiting Professor Chulalongkorn University (Bangkok).

Professor Carmichael was part of the Judging Panel for the Civil Contractors Federation Awards, awards recognizing outstanding work by CCF members from small to large-scale civil engineering projects.

Grant Success

In 2015, CIRI academics were involved in a number of funded research projects aimed at tackling some of the most challenging issues faced by the construction industry. These include an industry funded project ($103,000) led by Dr Akbarnezhad aimed at minimizing the early age cracking of concrete; and an ARC Linkage project (ARC fund: $299,000) awarded to Dr Akbarnezhad and his colleagues at the School of Civil and Environmental Engineering. Furthermore, Dr Akbarnezhad was awarded an "International Young Scientist" Fellowship by Natural National Science Foundation of China to conduct joint research with academics from Tongji University.

Scholarly Works



Professor Carmichael's recently published book, 'Infrastructure Investment: An Engineering Perspective (CRC Press, Taylor and Francis, London, 2014) has broken new ground. The book is an original contribution to investment viability analysis under uncertainty. Existing texts have not ventured into this territory. The formulations given provide interesting insight into investment viability calculations, and will be of use to practitioners engaged in investigatory work, especially those looking at investment risk. The material presented on options analysis opens up this area to all users, breaking the confines of existing financial options analogies.



A new research book co-authored by Dr Akbarnezhad was published in 2015 (CRC Press-USA).

The book titled "Microwave-assisted concrete technology" is co-authored with Associate Professor Gary Ong of the National University of Singapore. This book lays the foundation as the reference book for modern construction practitioners on microwave technology applied in day-to-day construction industry.

Highlighted publications

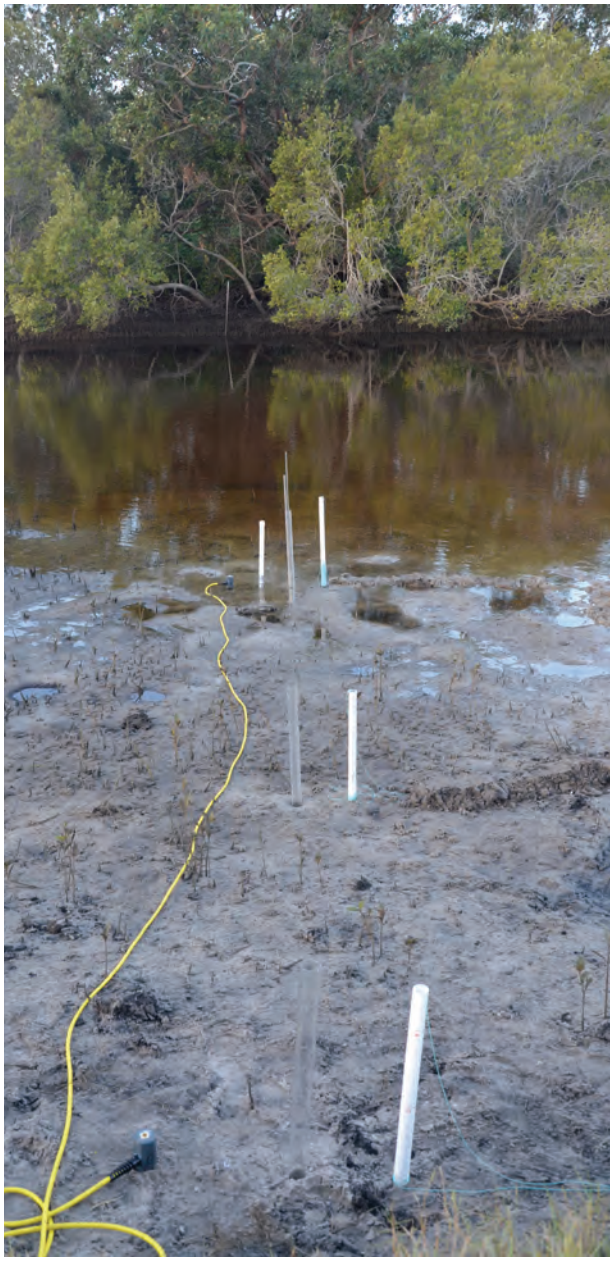
The CIRI group is active in publishing. Three papers singled out by peers for recognition were the following:

A paper published by Dr Shen (co-authored by Khalegh Barati) was selected as "Top 10 Best Conference Papers" in the 32nd International Symposium on Automation and Robotics in Construction and Mining (ISARC2015) and invited for publication in the Elsevier Journal of Automation in Construction.

Professor Carmichael with co-author Dr S. Mahdi Hosseinian received Emerald's Outstanding Paper of 2014 Award for their paper 'Optimal Sharing Arrangement for Multiple Project Outcomes', published in the Journal of Financial Management of Property and Construction (Vol. 19, No. 3, pp. 264-280).

Professor Carmichael's paper 'Management efficiency performance of construction businesses: Australian data' was selected to appear in the publication 'Built Environment and Property Management - A Focus on Australia'. This volume is part of Emerald Gems which brings together some of the most highly cited, read and innovative research in its field. Built Environment and Property Management A Focus on Australia is a unique collection of articles that represent the very highest level of scholarship in the field, providing an unparalleled insight into the built environment and property management industry.

CONNECTED WATERS



The Connected Waters Initiative Research Centre (CWI) operates a wide portfolio of groundwater-related research projects across the faculties of Science, Engineering and Law. The CWI has faculty staff in the Schools of Biological, Earth and Environmental Sciences (BEES), Civil and Environmental Engineering (CVEN), Mining Engineering (MINE), and the Faculty of Law. In 2015, the School of Petroleum Engineering (SCOPE) became affiliated to the centre. New faculty staff in 2015 included the arrival of ARC Future Fellow Denis O'Carroll (CVEN), and the appointment of Dr Hamid Roshan (SCOPE). The CWI also welcomed new affiliate staff Dr Pauline Treble and Dr Karina Meredith (both ANSTO).



CWI Founding Director Ian Acworth retired in 2015, but remains an active centre researcher in his new Emeritus Professor position. You can read about all our staff and our research here: www.connectedwaters.unsw.edu.au

The CWI team continued to expand the Centre's research portfolio. In 2015, successful proposals to the Australian Research Council (ARC) included the Linkage and Discovery Rounds. The CWI team now holds ARC funding which includes the only groundwater-related ARC Future Fellowship (O'Carroll), an ARC DECRA (Holley), several ARC Linkage (Baker, Andersen, Holley, with affiliates Meredith and Treble) and Discovery grants (Baker, Andersen, O'Carroll). Non-ARC funding focuses on coal seam gas related research funded by the Cotton Research Development Corporation (CRDC) (Kelly, Andersen, and CWI affiliate Cendon), and the Department of Environment Office of Water Science (Andersen, and affiliate Eberhard). The CWI continues to manage the NCRIS Groundwater Infrastructure program for the Federal Government (Department of Education, Andersen).



In 2015, CWI staff and students were able to celebrate numerous achievements which included invited plenary talks, best presentation awards, and national and international prizes. Wendy Timms and Andy Baker were invited plenary speakers at the Australian Groundwater Conference and 13th Australasian Environmental Isotope Conference (AEIC) respectively. Postgraduate researchers Charlotte Iverach, Scott Cook and Juan Carlos Castilla won best early career research presentations at the AEIC and Australian Groundwater Conference. Undergraduate honours research student Gurinder Nagra was awarded the American Geophysical Union 2015 David E. Lumley Young Scientist Scholarship for Energy and Environmental Science. In August, Ian Acworth received the NSW International Association of Hydrogeologists (IAH) Woolley Award for lifetime achievement.



The CWI is a cross-faculty research centre, and after three years being managed by the Science Faculty team, the CWI rotates back to Engineering in 2016. Martin Andersen takes over as the new Centre Director, supported by a management team of Denis O'Carroll (CVEN), Cameron Holley (LAW) and Andy Baker (BEES).

CWI People

Director

Professor Andy Baker (BEES)
BSc Bristol, PhD Bristol

Associate Director

Dr Martin Andersen (CVEN)
MSc, PhD DTU Denmark

Academics

Emeritus Professor Ian Acworth (CVEN)
BSc Leeds, MSc PhD Birm, FGS

Associate Professor Bryce Kelly (BEES)
BSc(Hons) UNSW, PhD UNSW

Dr Cameron Holley (LAW)
BSc (Env)/LLB (1st Hons) Griffith University; Grad Dip in PLEAT UQ; PhD ANU

Dr Denis O'Carroll (CVEN)
BASc. Civil Engineering, Ottawa: M.S.,Clarkson: PhD.U Michigan University of Western Ontario, Canada

Dr Gabriel Rau (CVEN)
Dipl.-Ing. Universität Stuttgart (Germany), PhD UNSW

Dr Wendy Timms (MINE)
BSc Newcastle, BSc(Hons1) ANU, PhD UNSW, MIEAust, MAusIMM

Post-doctoral Researchers

Dr Richard Crane (MINE), Dr Mark Cuthbert (CVEN),Dr Hamid Roshan (CVEN), Dr Helen Rutlidge (BEES)

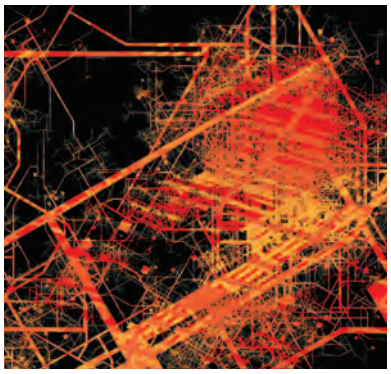
Professional Staff

Iwona Buscek (CVEN), Evan Jensen (MINE), Dayna McGeeney (CVEN), Mark Whelan (MINE)

RCITI

Research Centre for Integrated Transport Innovation

THE UNIVERSITY OF NEW SOUTH WALES





About Us

The Mission of the Research Centre for Integrated Transport Innovation (rCITI) is to be a world-leading organisation in integrated interdisciplinary research and development.

This is being achieved through a range of research initiatives made possible by the group's investigation of sustainable approaches to transport infrastructure and operations, as well as its extensive liaison with government and industry.

Research based around five pillars

rCITI's vision is to reshape the field of multi-modal transport engineering and planning, by introducing new innovative techniques and technologies. This will enhance society by integrating methodologies across disciplines and contextual considerations.

The Centre bases its research activities around five core research pillars:- Transport Planning – ITS Communications – Infrastructure – Energy/Fuel – Computational Sustainability.

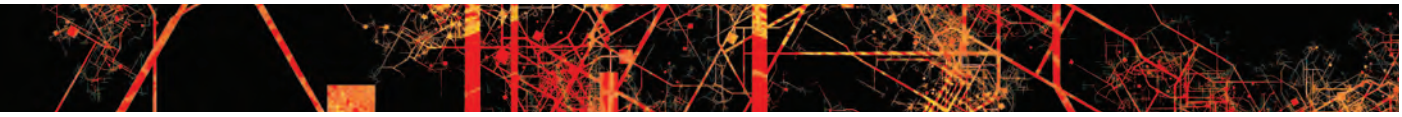
Overview

The centre continued to thrive in 2015 under Professor Travis Waller's leadership. Some of the highlights have been:-

- Award of two Australian Research Council (ARC) Discovery projects;
- Award of one ARC Linkage project;
- Award of one Australian National Health and Medical Research Council (NHMRC) project;
- Establishment of TRACSLab@UNSW;
- Award of Vice-Chancellor's Award for Teaching Excellence for 2015 for "Approaches to teaching that influence, motivate and inspire students to learn, in CVEN4701 Planning Sustainable Infrastructure 2013 – 2015";
- Renewal of the Advisian Professor of Transport Innovation Chair.

The collegiate and supportive relationship between students and researchers has helped make the transportation program at rCITI an effective community. This in turn has fostered many further research collaborations, as well as providing opportunities for professional and personal development. Other UNSW Faculties/Schools/Centres such as Art & Design, Aviation, Built Environment, Business, Civil & Environmental Engineering, Computer Science Engineering, Electrical Engineering & Telecommunications, iCinema, Mathematics, Medicine, Mechanical & Manufacturing Engineering, Mining Engineering and Psychology have all been involved in collaborative research with rCITI. Partnerships with local and international universities have been developed - these include: University of Sydney, Monash – Melbourne, University of Texas at Austin, Georgia State University, DELFT University of Technology – Netherlands, University of Leeds – UK. The impact of these research endeavours and others are being realised as the researchers present their findings at international and national conferences, in addition to publishing in quality publications.

Thanks to the passion and various interests of our researchers and students, rCITI has been able to sustain its ongoing growth and progress in dealing with multidisciplinary transport issues. By teaming with world leading researchers across multiple interdisciplinary boundaries rCITI is able to conduct leading research in travel choice, econometrics, experimental economics, visualization, and transport network analysis.





TRACSLab@UNSW

Dr Vinayak Dixit and Dr Zhitao Xiong were involved in the establishment of the TRACSLab@UNSW in January 2015. The TRACSLab (Driving Choice Simulation Laboratory) is a unique world-first facility built to assist the rCITI team in its comprehensive analysis of travel choice. This will be done by re-designing the fundamental choice assumptions so to support the emerging transport issues of sustainability, reliability and Intelligent Transport Systems (ITS) in our communities. The networked driving and bicycle simulators will be used for traffic modelling and collective interactions.

Transport themed art installation at UNSW Climate - Change Forum

Researchers Charlotte Wang and Dr Melissa Duell from rCITI, CVEN and Alex Byrne from UNSW Art & Design contributed to the UNSW Climate Change Festival (Thursday 29 October 2015) with a transport-themed sculptural exhibit. This was a multi-disciplinary project bringing together the disciplines of engineering, art and design in a sculptural installation. This exhibit is the first project arising from a joint venture to facilitate an exchange of ideas between traditionally disparate bodies of knowledge, to raise awareness, and to develop and implement practical, locally applicable solutions for a sustainable Sydney.

37th Australasian Transport Research Forum (ATRF 2015)

rCITI and Transport for NSW's Bureau of Transport Statistics organised and hosted the 37th Australasian Transport Research Forum (ATRF 2015) conference at the UNSW CBD Campus 30 September – 2 October 2015. ATRF is the main forum for transport planning, policy and research for both the public and private sectors in Australasia. This event brought together over 200 of the region's leading transport professionals from academia, government and the private sector to hear and see 91 presentations and 55 posters in the latest research and initiatives.

Recognition

A number of our staff were recognised for their outstanding work:-

- Dr Lauren Gardner and Dr Taha Hossein Rashidi were acknowledged by the Faculty and School for their contribution to research, teaching and service, with their promotion to Senior Lecturer;
- Dr Taha Hossein Rashidi, together with Dr Stephen Moore, A/Prof Richard Stuetz, Ruth Fisher, Prof Martin Nakata, A/Prof Iain MacGill and Elsie Edgerton-Till were awarded a Vice-Chancellor's Award for Teaching Excellence for 2015 for "Approaches to teaching that influence, motivate and inspire students to learn, in CVEN4701 Planning Sustainable Infrastructure 2013 – 2015";
- Prof S. Travis Waller - announced as Advisian Chair for Transport Innovation
- rCITI would like to recognise, thank and wish the following people all the best in their new endeavours:
  - Lavy Libman (CSE) for his association and collaboration to the rCITI team in the wireless communications for intelligent transportation systems (ITS) research space. (2011-2015)
  - Rob Fitzpatrick (NICTA) for his commitment in providing guidance and direction to rCITI, as a member of its steering committee (2011-2015).



Staff

The core rCITI staffing grew to 19 professionals. This was comprised of 5 continuing academics, 6 contract/adjunct/conjoint academics, 7 researchers and one centre administrator. We were very pleased to welcome the following new staff to the rCITI team in 2015:-

Dr Melissa Duell (Research Associate), her research interests are in network systems models that quantify previously intangible policy implications, particularly in the area of sustainability.

Dr András Bóta (Research Associate), his research interests are in applications of graph theory and network science on real-life problems.

The rCITI group published 51 research papers in journals and proceedings in 2015. Throughout 2015, the core academic staff supervised and supported 27 PhD students, 4 Masters by Research, 4 Research by Coursework and 20 Honours students. In addition, rCITI hosted four visiting students including 1 Practicum Exchange Program student, 1 Research Internship student, and 2 visiting students.

Current projects for the rCITI group in 2015 are listed in the Grants Income pages in Our Research section of this Report.

Staff List:

Director

Prof. S. Travis Waller, Advisian Professor of Transport Innovation

Deputy director

Dr Vinayak Dixit, Director - TRACSLab@UNSW, Senior Lecturer

Academics

Dr Lauren Gardner, Senior Lecturer

Dr Taha Hossein Rashidi, Senior Lecturer

Dr Upali Vandebona, Senior Lecturer

Dr Ken Doust, Adjuct Senior Lecturer

Dr Chen Cai, Conjoint Lecturer

Assoc Prof. Jay Katupitiya, Head of Mechatronics, UNSW School of Mechanical and Manufacturing Engineering

Dr Lavy Libman, Senior Lecturer, UNSW School of Computer Science and Engineering

Prof. Claude Sammut, Head of the Artificial Intelligence Research Group and Deputy Director of the iCinema Centre for Interactive Cinema Research

Dr Steven Most, Senior Lecturer, ARC Future Fellow and UNSW School of Psychology

Researchers

Dr András Bóta,Research Associate

Dr Melissa Duell, Research Associate

Dr Hanna Grzybowska, Research Associate

Dr Mojtaba Maghrebi, Research Associate

Dr Emily Moylan, Research Associate

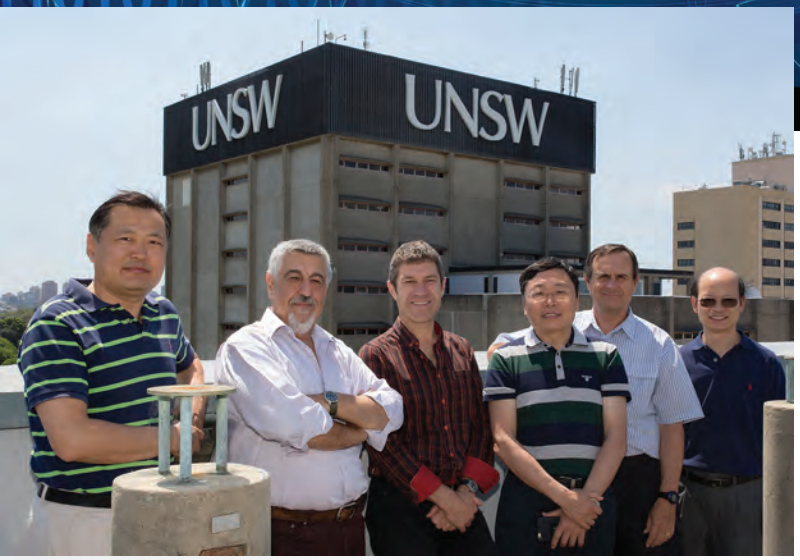
Dr David Rey, Research Associate

Dr Zhitao Xiong, Research Associate

Centre manager

Ms Maria Lee

The Surveying and Geospatial Engineering (SAGE) group



L-R: Dr Yincai Zhou, Prof Chris Rizos, Dr Craig Roberts, A/Prof Jinling Wang, Dr Bruce Harvey, A/Prof Linlin Ge

The *Surveying and Geospatial Engineering* (SAGE) group comprises the following staff: Professor Chris Rizos; Associate Professors Linlin Ge, Samsung Lim, and Jinling Wang; Senior Lecturers Dr Bruce Harvey and Dr Craig Roberts; Professional and Research staff Dr Yincai Zhou, Dr Mazher Choudhury, Dr Binghao Li, Dr Yong Li, Dr Alex Ng, and Dr Jean Li.

The SAGE group is responsible for providing the teaching for the BE in Surveying, BE in Geospatial Engineering and the dual BE Civil Eng/B Surv undergraduate degree programs; as well as for the MEngSc (Geospatial Engineering) postgraduate program. The undergraduate programs qualify student graduates for registration as cadastral or mining surveyors, the two discipline areas that are regulated by state governments.

SAGE staff and postgraduate students also conduct research in the various sub-disciplines of *geospatial technology and applications*. Surveyors and other geo-professionals use a range of new geospatial technologies such as Global Navigation Satellite Systems (GNSS), satellite imagery, laser scanning, unmanned aerial systems, and IT tools to create complex layers of interconnected geographic information. Maps are constructed using imaging systems on airborne and satellite platforms, permitting the natural and built environment to be viewed in 3D. Geospatial information constantly reveals new insights about our world and our place in it, and is now seen as absolutely critical for decision-making. *The SAGE group educates a new breed of surveyor on how to use emerging geospatial technologies to solve surveying problems*.

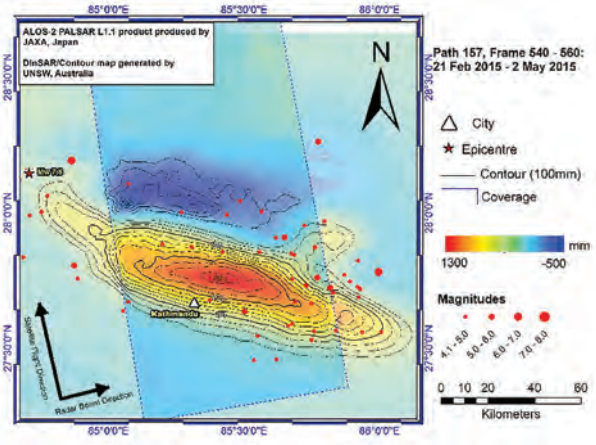
Professor Chris Rizos stepped down as president of the *International Association of Geodesy* (IAG), after a four-year term, and continues to make contributions to geodesy. Chris was elected to the Bureau of the IAG's parent body, the *International Union of Geodesy & Geophysics* (IUGG). Chris is currently the president of the *Australian Institute of Navigation*. He is also a member of the *Australian Academy of Science's National Committee on Earth Sciences*. Chris continues to pursue his research interests in navigation, precise positioning and geodesy, supervising more than six research students.

A/Prof Jinling Wang was the General Chair/Convenor for a successful international conference, the 9th International Symposium on Mobile Mapping Technology (MMT2015), 9-11 December 2015, at the UNSW Kensington campus. This was the first time this conference series was hosted in Australia. The MMT2015 Symposium featured keynote speakers, expert panel discussions, oral and interactive poster sessions, technical case studies, pre-symposium workshops and a trade exhibition. There were 296 registered participants, 75% of them from overseas. Full details can be found at the conference website: www.mmt2015.org.

A/Prof Samsung Lim was on *Special Study Program* leave from July 2015. Samsung was appointed a Visiting Professor in the Department of Energy Resources Engineering, Seoul National University, South Korea, from 20 July 2015 to 30 January 2016. He collaborated with Prof Hyeong-Dong Park (Head of Department) on an

investigation of the potential of *EO-1 Hyperion hyper-spectral satellite imagery* for integrated management of land, water, vegetation and natural resources.

A/Prof Linlin Ge and Dr Scott Hensley (NASA's Jet Propulsion Laboratory) ran a joint UNSW-NASA *short course on radar remote sensing* for postgraduate students from across UNSW from 28 September to 2 October 2015. In addition to presenting the principles and diverse applications of imaging radar, this year's short course also dealt with NASA missions under



development such as NISAR, the dedicated U.S. and Indian interferometric radar mission intended to study hazards and global environmental change.

Linlin and his team applied advanced interferometric radar analysis to data acquired by the Japanese ALOS-2 satellite for mapping ground surface deformation as a result of the *Nepal earthquake*. The Mw=7.8 earthquake occurred on 25 April 2015 (UTC). Based on the satellite remote sensing results, the team issued a warning of



the threat of strong aftershock before the occurrence of two of them, the M7.4 event at 07:05:19 UTC and the M6.3 event at 07:36:53 UTC, both on 12 May 2015.

A continuing interest of the SAGE group has been the use of *unmanned aerial systems* (UASs) for teaching & research. Four UASs have been purchased by the School, namely the Sensefly Swinglet, eBeeRTK, Phantom 3 Pro and Vulcan Octocopter. The School holds the UAS Operators Certificate from CASA (Australia's Civil Aviation Safety Authority), Dr Yincai Zhou is the Chief Remote Pilot, and the School boasts four other staff



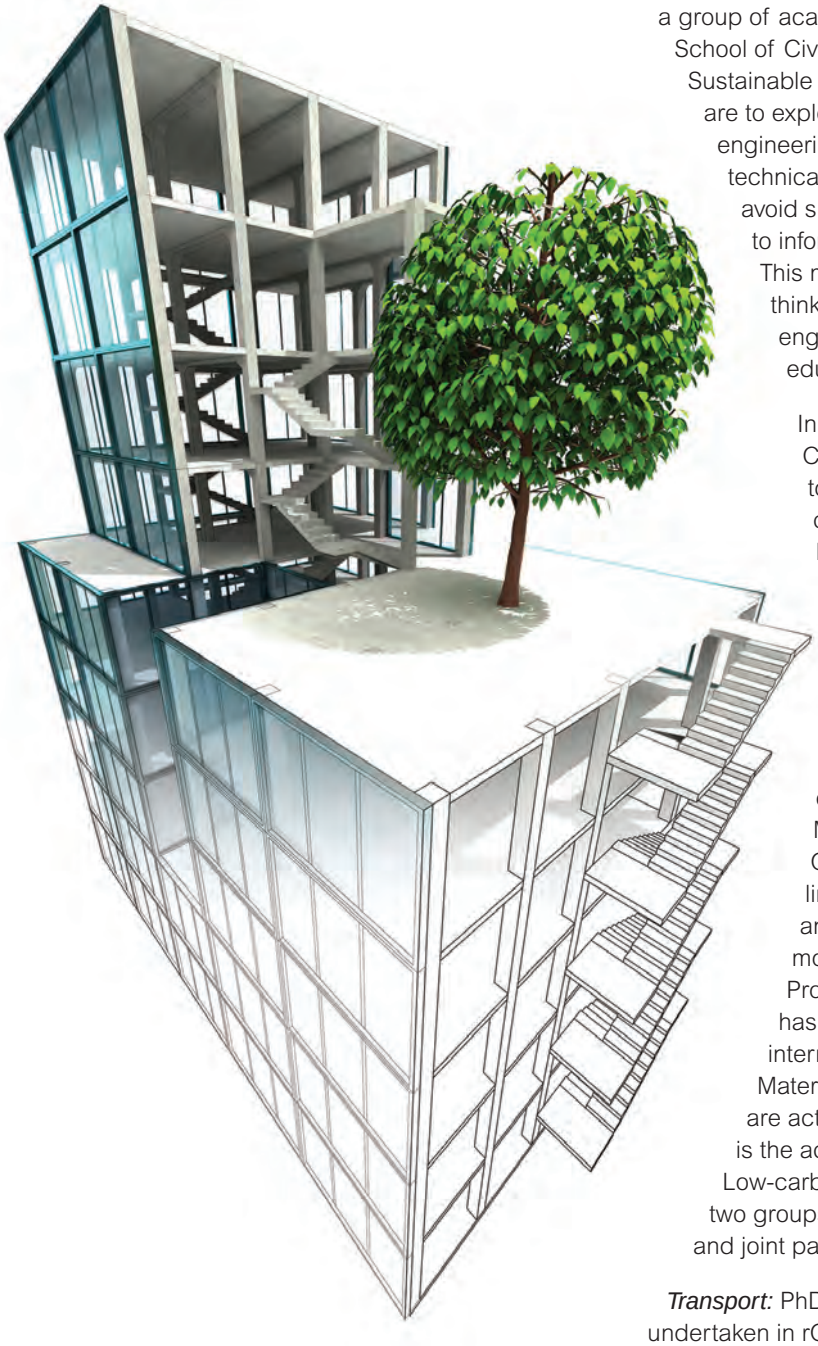
qualified as Remote Pilots. UASs have been operated to collect aerial images, from which 3D surface point clouds, aerial maps and 3D building models have been produced from the images. The UASs have been used by SAGE and other School staff for thesis projects in surveying & civil engineering, including: coal stockpile volume estimations; wetland monitoring; investigations into height accuracy of UAS mapping for construction sites; mine site deformation monitoring; and water processing plant 3D modelling from UAS images.

Dr Bruce Harvey and Dr Craig Roberts are incorporating these UAS devices into their senior undergraduate teaching course as well as use of the School's new Leica C5 laser scanner. SAGE would like to ensure that our graduates have performed hands-on projects with the range of new technologies in use by modern SAGE professionals.

Dr Craig Roberts was appointed by the NSW Minister for Finance, Services and Property as the Education representative on the NSW Board of Surveying and Spatial Information, which administers the registration and compliance of land and mining surveying in NSW and advises the Minister accordingly.

In 2015 SAGE staff and students attended 12 international and 8 national conferences and seminars where they made presentations. SAGE has played a special role in organising the IGNSS Symposium, held on the Gold Coast, 14-16 July 2015. This conference series was started in 1995 by Professor Chris Rizos. SAGE staff and students have supported all the IGNSS conferences over the past 20 years.

Sustainable Engineering Initiative



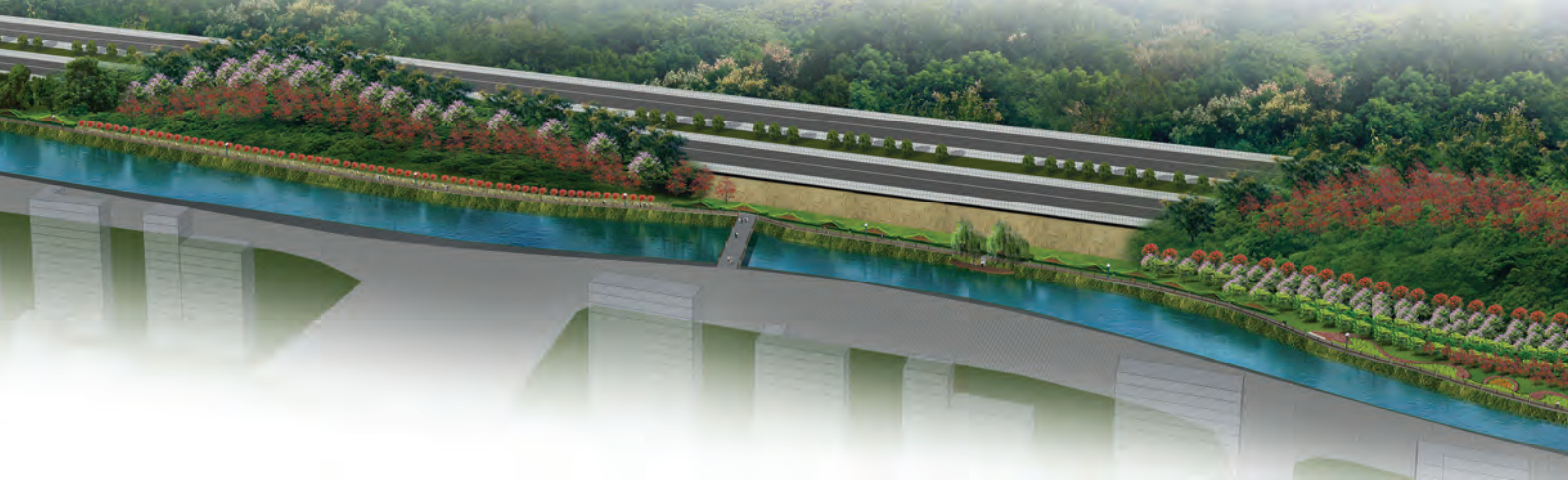
Activities and Achievements for 2015

In response to the challenges of climate change, resource constraints, urban population growth and endangered ecologies, a group of academic researchers and educators at the UNSW School of Civil and Environmental Engineering have formed the Sustainable Engineering Initiative (SEI). The aims of the SEI are to explore, assess and resolve issues of sustainability in engineering problems; to consider the interactions between technical, ecological, social and economic systems and avoid shifting problems from one area to the other; and to inform and support corporate sustainability initiatives. This means adopting concepts such as life cycle thinking, industrial ecology and sustainable systems engineering as important elements in research, education and work practice.

In 2015 the various research areas of the School of Civil and Environmental Engineering came together to discuss opportunities for extending and collaborating in sustainability-related research. Possible synergies, gaps and new opportunities related to sustainability research were identified and are being pursued. The key points of the discussion and ongoing activities can be summarised as follows:

Construction & Materials: The whole life cycle modelling of construction activities and construction materials in Building Information Models (BIM) undertaken by the Sustainable Construction Program could be integrated or linked with Precinct Information Modelling (PIM) and whole-economy life cycle assessment (LCA) modelling pursued by the Sustainability Assessment Program (SAP) of the School. Considerable research has been done on the emissions-cost-production interrelationship and sustainability reporting tools. Material recycling is an important issue: which materials are actually replaceable or being reused already? What is the actual effect on the extraction of natural resources? Low-carbon concrete LCAs are undertaken and needed in two groups, SAP and CIES. Efforts have been synthesised and joint papers are in preparation.

Transport: PhD research on economic modelling for transport undertaken in rCITI is based on data derived from the Australian Industrial Ecology Virtual Laboratory (IELab), a collaborative, e-research platform managed by SAP. This infrastructure can be used for triple bottom line and life cycle assessments of any industry, any product group or any place in Australia. Questions around freight transport and supply chain management could potentially be useful for the construction group.





Hydrology/Water-Sustainability links: Empirical hydrological or hydro-meteorological research and modelling can inform environmental impact assessment (and thus LCA). Climate change scenarios could be evaluated in terms of impacts on surface water, agriculture and the wider economy. This can inform climate change adaptation projects and has implications for urban water supply options, energy needs and their associated carbon footprint. Eco-hydrology can helps by describing the interaction of water with (natural) landscapes and ground-surface water interactions. The SAP team is currently developing a triple bottom line assessment model for different water supply options, including water recycling. The sustainable use of biosolids from wastewater treatment is being explored in a project funded by the CRC for Low Carbon Living.

Surveying & Geospatial Engineering are the disciplines that underpin sustainability research. For example, GIS can inform ***where*** land & resource use and related impacts occur. A number of students are doing sustainability-related research in remote sensing.

Transition to sustainability: Interest was expressed in more fundamental research around transition to sustainability. This could include investigating questions such as e.g. What does a no-growth economy look like? How can sustainability scenarios for Australia be quantitatively evaluated? What are possible sustainable pathways for different economic sectors and regions? An Honours thesis project has been set up to employ economy-wide input-output modelling to explore a range of technological, social and economic scenarios formulated under the CRC for Low Carbon Living and to explore outcomes in relation to the total carbon footprint of Australia.

For more information on the Sustainable Engineering Initiative, participating groups and researchers, please visit http://www.engineering.unsw.edu.au/civil-engineering/research/unsw-research-centres-and-research-hubs/sustainable-engineering-initiative-sei

water@UNSW
water research centre

About Us

The UNSW School of Civil and Environmental Engineering has a 65 year history of leading development of water technology in Australia. Apart from maintaining the largest postgraduate and undergraduate teaching programmes in water engineering in Australia, the School remains active in leading Australian fundamental water research:

- surface and groundwater hydrology – ongoing Australian leadership of the quantifying of rainfall, runoff and groundwater flows at catchment scales (This history includes development of the lead Australian design document, *Rainfall and Runoff*, now published and developed by Engineers Australia).
- public health and water treatment – fundamental investigations of the chemistry and microbiology of water for urban use have been a focus of within the Centre for nearly 30 years.
- civil and environmental hydraulics – practical Project-based and theoretical hydraulics research undertaken using the unique large-scale facilities of the Water Research Laboratory at Manly Vale.

There are two primary centre nodes: at Kensington with staff and students accommodated within the Vallentine Annex; and, at the Water Research Laboratory at Manly Vale.

Centre activities are grouped around three dominant research themes:

1. Water Supply

Australia is a continent of low rainfall and its development and economic robustness is constrained by presently available and potential water supplies.

2. The Coast

Over 86% of the Australian community live in the coastal zone with consequent environmental impact and climate vulnerabilities.

3. Sustainability

To maintain Australia's current level of population and economic growth, water and contamination management need innovative solutions in terms of environmental, energy and social considerations.





2015 WRL Highlights

Message from the Director

These are just a few highlights of the activities undertaken at WRL during the past 12 months. In my new role as WRL Director, I am especially proud of the breadth and depth of leadership that my WRL colleagues have delivered during the year. In 2015 WRL undertook more than 50 diverse water research projects in collaboration with industry, university and government partners.

From our base at the UNSW campus located in Manly Vale on Sydney's northern beaches, WRL's hydraulics laboratories, fieldwork and computing resources are all key facilities of Australia's top-ranked Civil & Environmental Engineering School and Engineering Faculty; with UNSW now ranked a 'Top 50' University (QS 2015) world-wide.

UNSW's tag line 'never stand still' has never been more apt. As the university sector in Australia strives to build stronger engagement with industry and governments, and to positively impact the broader well-being of all communities, it is my firm belief that WRL has a key and growing role to play within the Australian water engineering sector. In the words of our Dean, Professor Mark Hoffman, at the 2015 official launch by NSW Minister for Planning Rob Stokes of WRL's new large-scale wave flume, *"WRL is a model of the kind of research engagement I would love to see across the Faculty of Engineering and the University; doing research work of high excellence while also solving real-world problems for industry and government"*.

On a personal note, my special thanks to WRL Manager Grantley Smith for his support and advice this past year, and to Associate Professor Ron Cox for standing in for me during my absence from WRL while working in the UK in the latter part of 2015. We look forward to working with many of you during the year ahead. Please don't hesitate to be in touch.

Professor Ian Turner
Director

February



Professor Ian Turner was appointed as the new WRL Director.
With over 25 years of research experience, highly respected in industry and academia, Ian is well suited to continue WRL's strong developments in water engineering nationally and internationally, and to strengthen WRL's profile for excellence in water engineering research.

March



Senior Research Associate Dr Kristen Splinter is one of the many women featured in the recent publication "Women in Oceanography: A Decade Later", which outlines a broad view of the types of research that oceanographers conduct, and provides advice for young women at the beginning of their careers.

"WRL is a model of the kind of research engagement I would love to see across the Faculty of Engineering and the University; doing research work of high excellence while also solving real-world problems for industry and government"

April



Sydney Storm Damage at Narrabeen
Waves offshore Sydney reached a massive 14.9 m, causing major erosion up and down Sydney's coastline. Here's a before and after look at the damage at Narrabeen Beach, taken from WRL's permanent coastal imaging station. The first of these "maximum variance" images shows the beach as it was Saturday 18th April, just before the storm hit. The second image is at high tide the following Wednesday – what a difference in only four days! More details of WRL's coastal imaging expertise is at:http://ci.wrl.unsw.edu.au/



The spilling of Manly Dam received saturation coverage in the media (pun intended). For the record, overtopping of the Manly Dam which services WRL occurs about once every 5 years. The last time the dam spilled was in July 2011: http://www.wrl.unsw.edu.au/news/manly-dam-overtopping

NB: The existence of Manly Dam is the reason that WRL is located at this site - a large pipe delivers water directly from the dam to our labs.

May

Improving Flows of the Shoalhaven River at Shoalhaven Heads
Under a combination of natural offshore wave and river flow conditions, the entrance to the Shoalhaven River estuary at Shoalhaven Heads is gradually filling with sediment. impacting the local economy, water based activities and the amenity of Shoalhaven Heads village. The Shoalhaven Heads Estuary Taskforce, an advisory committee of Shoalhaven City Council, was created to investigate options that would remediate this issue. WRL's study addresses the current concerns of the Shoalhaven Heads community and uses existing data to develop a novel solution.

Entrance Management Policies for Far South Coast ICOLLs
WRL commenced a project to assist Bega Valley Shire Council in a review of Entrance Management Policies for a number of ICOLLs (Intermittently Closed and Open Lakes and Lagoons) along the Sapphire Coast including Wallaga Lake, Cuttagee Lake, Bega River, Back Lake, Curalo Lagoon and Wonboyn Lake.

June

The UNSW School of Civil and Environmental Engineering welcomed ARC Future Fellow Denis O'Carroll who joined the WRL academic staff from the University of Western Ontario, Canada. Associate Professor O'Carroll brings new expertise to WRL, with his research focused on the transport of nanoparticles in the environment. His research at UNSW will focus on evaluating the fate of engineered nanoparticles that have leached out of commercial products as diverse as sunscreens and tennis racquets and their ecotoxicity. This information can assist regulators develop appropriate legislation to balance the tremendous benefits with potential risks of nanotechnology.

July

Opening of New Large-Scale Wave Flume Research Facility
On the 20th July Professor Mark Hoffman, Dean of UNSW Engineering, hosted the opening of WRL's new large-scale wave flume. The Honourable Robert Stokes MP, NSW Minister for Planning, formally opened the flume, which at 44 m long and 1.6 m in depth, significantly extends WRL's fundamental and applied research capabilities. The new flume's wave generator is a paddle type, and is powered by a 30 kW hydraulic piston system. The system is capable of generating both monochromatic and irregular wave spectrums, as well as producing pre-recorded (storm) wave sequences.



August

El Niño and La Niña will Exacerbate Coastal Hazards Across Entire Pacific
An international team of researchers from 13 different institutions specialising in coastal monitoring pooled their resources and datasets to form a first-of-its-kind database of shoreline variability across the entire Pacific Basin. A total of 48 sites were assembled in the database that covers over 40 years of data from six different regions of the Pacific – Australia, New Zealand, Japan, Central Pacific (Hawaii), North-Eastern Pacific (Oregon, Washington and British Columbia) and California. Led by Drs Mitchell Harley and Kristen Splinter of WRL, the purpose of the study was to investigate potentially similar patterns of shoreline variability and identify links to climate drivers such as El Niño/ The findings have been published in *Nature Geoscience*: http://www.nature.com/ngeo/journal/v8/n10/full/ngeo2539.html

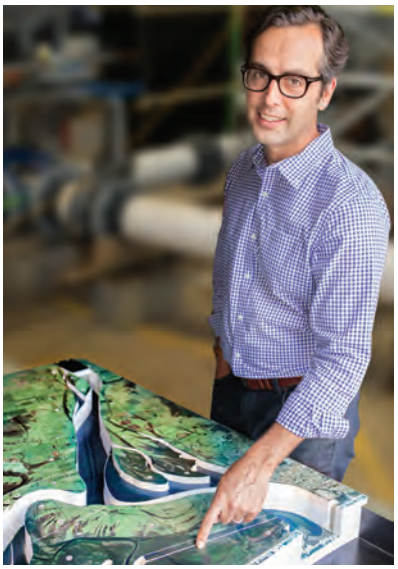
Grantham Floods Commission of Inquiry
WRL Principal Engineer and Manager, Grantley Smith, was called by Commissioner Walter Sofronoff as an expert witness to the Grantham Floods Commission of Inquiry. The Commission reinvestigated the devastating flooding in the township of Grantham in the Lockyer Valley during January 2011 where 12 people's lives were taken by the floodwaters. Grantley's report is on the Commission's public record. The report is based on WRL's extensive research on the flood hazard vulnerability of people, vehicles and buildings recently published to support the Australian Emergency Management Institute's *Handbook 7: Managing the floodplain: best practice in flood risk management in Australia.*

September

Four WRL staff won the Kevin Stark Memorial Award for the paper, "Estimating Water Levels and Wave Heights inside Fringing Reefs during Extreme Conditions", presented by Principal Engineer Matt Blacka at the 2015 Australasian Coasts and Ports Conference held in Auckland, New Zealand. Along with Matt, the award was received by A/Prof Ron Cox, Senior Research Associate Dr Kristen Splinter and Senior Engineer Dr Francois Flocard for their work on extreme water levels in the Cook Islands.



October



WRL Wins NSW Green Globe Awards
Presented by the NSW Minister for the Environment and Heritage, Mark Speakman, WRL's project *Big Swamp Recovery – Evidence Supporting Innovation* won the 'Natural Environment Sustainability' category at the NSW Government's Green Globe Awards. Accepted by Dr William Glamore, Principal Research Fellow, the project was recognised for research innovation and on-ground excellence. The award was shared with industry partners Greater Taree City Council.

WRL's engineering team of Dr Will Galmore, Mr Jamie Ruprecht and Mr Duncan Rayner worked in collaboration with Greater Taree City Council to develop innovative plans to restore Big Swamp, a degraded site recognised as one of the worst acid hotspots in the country.

November

Waves Across Shore Platforms
WRL Director Professor Ian Turner joined his colleagues and long-time collaborators from the Coastal Processes Research Group at Plymouth University (PU) to assist with the installation of field equipment at Freshwater West Beach located in Pembrokeshire National Park, a remote corner of southwest Wales, part of The 'Waves Across Shore Platforms (WASP)' research project led by PU's Professor Gerd Masselink.

December

WRL welcomed Ben Modra as a Principal Coastal Engineer on the WRL Projects Team. Ben gained his engineering experience through many years of coastal engineering practice at the NSW Government's Manly Hydraulics Laboratory. Ben is also Secretary of Engineers Australia's NSW Coastal Ocean and Port Engineering Panel (COPEP).

Dr William Glamore was appointed as an Independent Expert to the EPA's Williamtown Contamination Incident Expert Panel and is Chair of the Water Working Group (WWG).

Hydrology at WRC

In a series of firsts for the WRC hydrology research team, the online June 2015 edition of ***Nature Geoscience***, featured the paper 'Steeper temporal distribution of rain intensity at higher temperatures within Australian storms', highlighting the research work carried out by WRC's Conrad Wasko and Professor Ashish Sharma.

The article was the first ever in engineering hydrology from Australia and the first ever in hydrology globally authored by a student as first author. In addition the story caught the attention of Channels 7, 9, 10, ABC, as well as Scientific American, CCTV and many more media outlets around the world

Their research found that Australian storms that occur at warmer temperatures have more intense highs and weaker lows in rainfall. If this trend continues with future warming, the risk of flooding due to short-term extreme bursts of rainfall could increase even if the overall amount of precipitation associated with each storm remains the same. Based on their statistical analysis in combination with hydrologic flow routing relationships, the authors estimate that for a 5 °C temperature increase, flood peaks could increase by 5 to 20 % in the Australian climate zones they studied.

The UNSW Hydrology Group undertakes world class research in statistical hydrology, climate change impact assessments, catchment hydrology, remote sensing and ecohydrology. The Group develops innovative methods for solving the problems faced by industry, government and society about flooding and water availability. A particular area of interest is how climate change may affect these issues. They also work to improve understanding of the way that catchments operate.

In 2015 Dr Fiona Johnson and Prof Ashish Sharma were successful in winning a $300,000 ARC Linkage project grant – working with the NSW Department of Primary Industries (DPI) Water to provide a framework for evaluating climate models on their representation of drought drivers and then use this information to develop improved downscaling schemes.



Conrad Wasko



WRC STAFF KENSINGTON CAMPUS

WRC STAFF LIST

Director

Professor Richard Stuetz

Director (WRL)

Professor Ian Turner

Business Managers

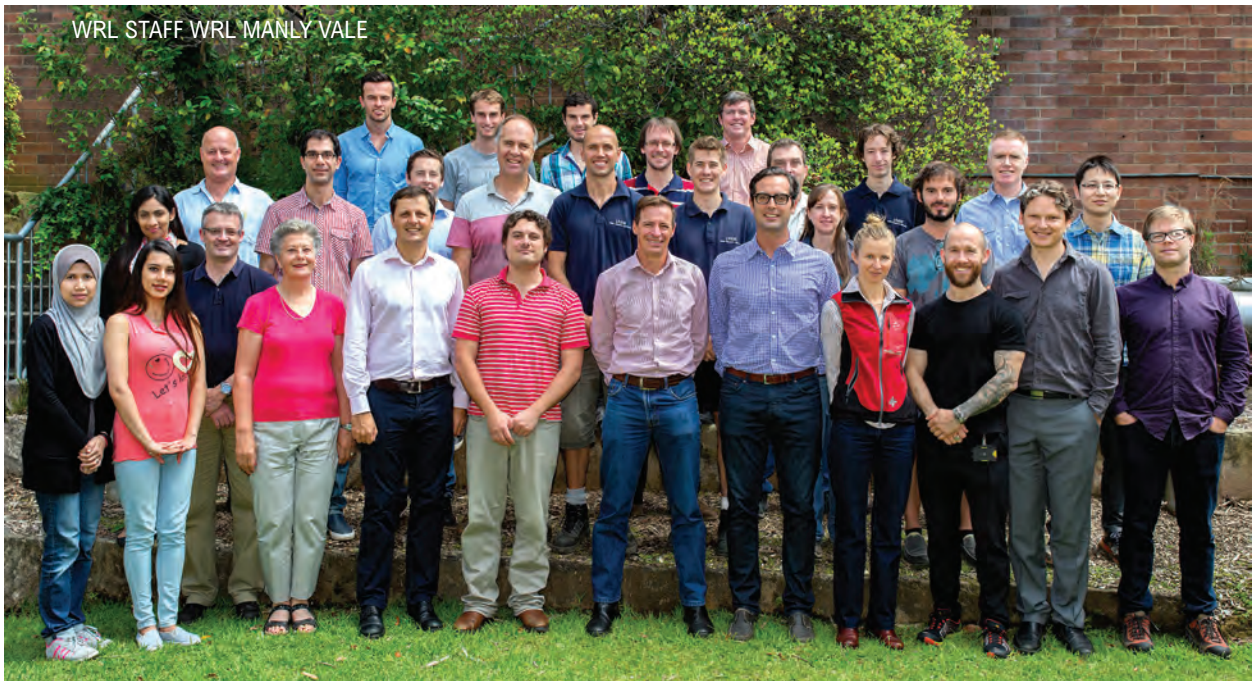
Grantley Smith (WRL)
Robert Steel

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Professor David Waite
Associate Professor Ron Cox
Associate Professor Stuart Khan
Associate Professor Tommy Wiedmann
Dr Stefan Felder
Dr Fiona Johnson
Stephen Moore

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Associate Professor Sven Lundie
Dr Hoori Ajami
Dr AJ Anceno
Dr Radoslaw Barczak
Dr Xavier Barthelemy
Dr Mark Bligh
Dr Richard Collins
Dr Juan Pablo Alvarez Gaitan
Dr Shikha Garg


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Dr Lucy Marshall
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Dr Gavin Parcsi
Dr Robert Parinussa
Dr An Ninh Pham
Dr David Roser
Dr Hazel Rowley
Judith Shinabeck
Dr Eric Sivret
Dr Kristen D Splinter
Dr Xabier Vazquez Campos
Dr Xinguang Wang
Dr Yuan Wang
Dr Fitsum Woldemeskel

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Matt Blacka
James Carley
Dr William Glamore
Brett Miller
Ben Modra
Grantley Smith

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Dr Francois Flocard
Duncan Rayner

Project Engineers

Mathiew Dieber
Chris Drummond
Nathan Guerry
Daniel Howe
Priom Rahman
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Anna Blacka
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Coral Johnson
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Larry Paice
Ross Mathews
Hamish Studholme
Joan Terleckyj
Robert Thompson

Water Reference Library

Caroline Hedges

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Professor Gary Jones, eWater Limited, Australia
Professor Ian King, Member ASCE
Professor Venkat Lakshmi, University of South Carolina, USA
Professor Gregory Peters, Chalmers University, Sweden
Professor Andrew Rose, Southern Cross University, Australia
Associate Professor Ian Cordery, UNSW, Australia
Associate Professor Mark Davidson, Plymouth University
Associate Professor William Peirson, New College, Australia
Dr Radoslaw Barczak, Warsaw University of Technology, Poland
Dr Baichuan Cao, Beijing Jiaotong University, China
Dr Bruce Cathers, UNSW Australia
Dr Heather Coleman, University of Ulster, United Kingdom
Dr Stuart Dever, Kimbriki Resource Recovery Centre, Australia
Dr Manabu Fujii, Tokyo Institute of Technology, Japan
Dr Alexandra Gkemitzi, Democritus University of Thrace, Greece
Dr Weijia Gong, Harbin Institute of Technology, China
Dr Jing Guan, Beijing Origin Water Technology, Beijing
Dr Heng Liang, Harbin Institute of Technology, China
Dr Fen Fang Lin, Nanzan University, Japan
Dr Liang Liu, Changzhou University, China
Dr Tongxu Liu, Guangdong Institute of Eco-Environmental and Soil Sciences, China
Dr David Poulson de Sousa, University of Southern Denmark.
Dr Michael Short, University of South Australia
Dr Gareth Swarbrick, Pells Sullivan & Meynink, Sydney Australia

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