UNSW SYDNEY

Australia's Global University

Civil and Environmental Engineering

Annual Report 2016

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CONTENTS

WELCOME FROM HEAD OF SCHOOL

Dear Friends and Colleagues

As you will see from the contents of this 2016 Annual Report, the School of Civil & Environmental Engineering had yet another stellar year in teaching, in research and in community and industry outreach.

Internationally ranked for the third year in a row as the premier School of its kind in Australia, and one of the world's top twenty, we continue to forge ahead, with innovative research fields, new courses, and an ever expanding network of industry connections.

Engineers have always been people of action – driven to create, to solve problems, to make things happen, and to make a difference. Our current students and staff are no exception.

In the 21st century, the School is moving towards a blended learning approach - utilising creative, efficient and educationally sound digital teaching & learning methods as well as continuing our high quality embodied methods – lectures, laboratories, site visits and workshops. The School actively encourages and rewards good teaching – amazingly, almost one quarter of our academic staff have received UNSW Teaching Excellence awards. In 2016 Dr Ali Amin was the latest staff member to receive a well-deserved V-C Teaching Excellence award.

The School remains committed to advancing a more prosperous, safe and just society. Our Centres and discipline groups provide focal points for our researchers to contribute to global efforts in innovative civil, environmental and geospatial engineering research. Our strengths as engineering research leaders are evidenced by our ERA ranking of 5 out of 5, and grant funding success - with over $13 million awarded in 2016 to our research centres, including more than $3.6 million won in prestigious Australian Research Council grants. With strong internal and external collaborations - and with mentorship provided to our great young researchers – the School's future excellence in research is ensured.

This Report provides only a small insight into our busy year and into the quality and resourcefulness of our staff; academic, research, professional and technical. A strong School does not happen without the efforts and collegiality of its staff; I thank them all for their amazing dedication and hard work.

PROFESSOR STEPHEN FOSTER
HEAD OF SCHOOL

ABOUT US

The UNSW School of Civil & Environmental Engineering is internationally ranked as Number 1 in Australia (QS & AWRU) and in the world's top 20 (QS World University Rankings 2014-7).

We are the largest School in the UNSW Faculty of Engineering, itself the pre-eminent centre for engineering studies and research in Australia.

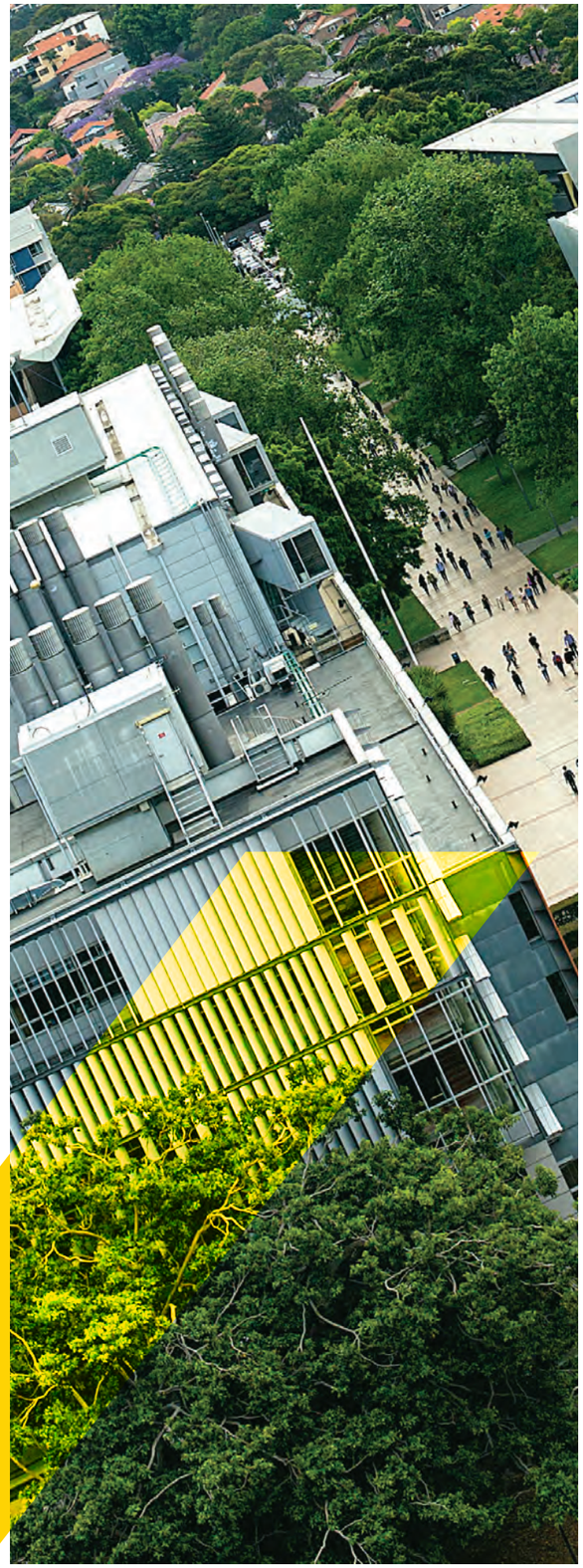
From our foundation in 1949, the School has pursued excellence and innovation in education and research, and our alumni are to be found as leaders and decision makers in industry, government and the community.

With over 2,900 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 80 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.



STATISTICS

UNSW CIVIL & ENVIRONMENTAL ENGINEERING STATISTICS 2006 - 2016

	2006	2008	2010	2012	2014	2016
STUDENT NUMBERS						
BE	730	1,012	1307	1509	1682	2052
PGR Coursework	329	354	398	510	623	660
HDR	90	77	90	124	216	206
Total EFTSU - all students	592	805	1172	1410	1712	1966
RESEARCH STATS						
Research Publications	198	234	267	368	511	521
ARC Grants won	5	9	5	5	10	10
ARC Grants (year announced)	$1.53M	$2.89M	$1.75M	$1.38M	$4.08M	$3.66M
Total Research Income	$7.7M	$10.7M	$15.1M	$15.56M	$11.85M	$13.4M

SCHOOL STATS 2016

Academic Staff	48
Professional & Technical Staff	27
Research Centres Research Staff	80
Research Students	206
Postgraduate Coursework Students	660
Undergraduates	2052
Doctoral Graduates	39
Coursework Graduates	270
BE Graduates	375
Research Publications refereed	521
Generated Teaching & Research Income	$64M
ARC Funding	$3.7M
Total Research Funding	$13.4M
Operating Budget	$20.85M

STILL NUMBER ONE

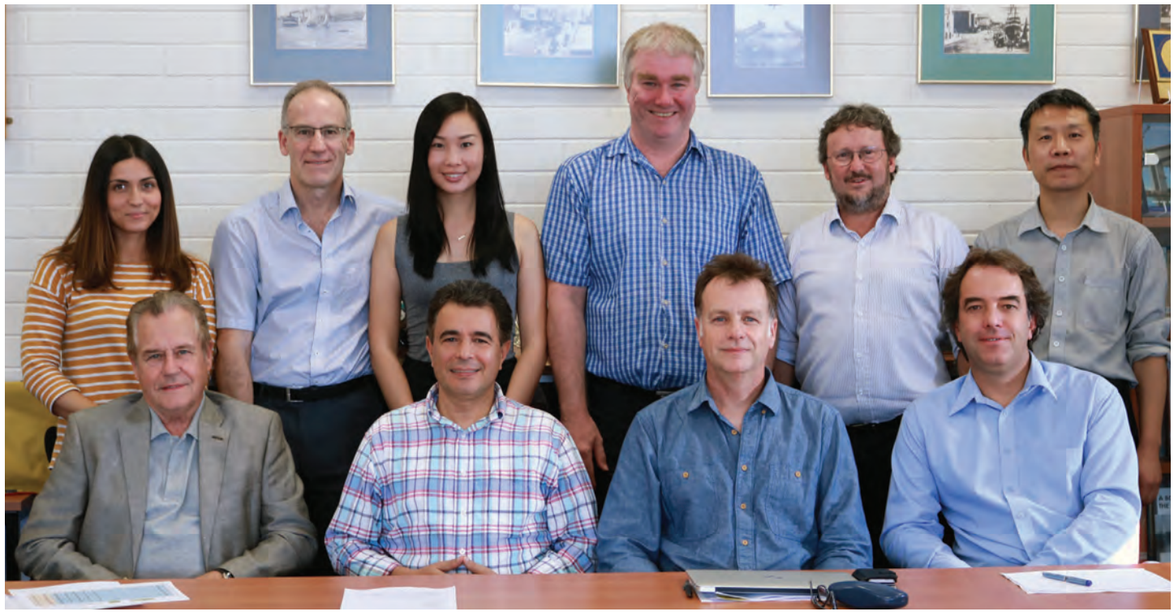
The School is ranked first in Australia - by both the Quacquarelli Symonds (QS) World University Subject rankings (2015 - 2017) and the Shanghai Jiao Tong Global Rankings of Academic Subjects (2016) – also known as Academic Ranking of World Universities (ARWU).

Globally we are placed at 16th in the world by QS, an amazing achievement, and the only Australian Civil Engineering School to be included in the QS top 20 in 2017.

QS Rankings are based on the expert opinion of 76,798 academics and 44,426 employers, alongside the analysis of 28.5 million research papers and over 113 million citations sourced from the Scopus/Elsevier bibliometric database.

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.

SCHOOL MANAGEMENT COMMITTEE



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

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.

Prof Stephen **Foster**	*Chair*
A/Prof Mario **Attard**	*Associate Head*
Prof S Travis **Waller**	*Chair RMC, Director rCITI*
Dr Steven **Davis**	*Co-Chair, TLC*
Dr Kurt **Douglas**	*Chair, ERC*
Prof Chongmin **Song**	*Chair, CIT&ETC*
A/Prof Vinayak **Dixit**	*Chair TSC*
Prof Richard **Stuetz**	*Director WRC (Kens); Co-Chair TLC*
Prof Ian **Turner**	*Director WRL*
Prof Brian **Uy**	*Director CIES*
Dr Martin **Andersen**	*Director CWI*
A/Prof Ron **Cox**	*Director AACARNSI*
Prof Nasser **Khalili**	
Prof David **Carmichael**	
Prof Chris **Rizos**	
Anthony **Dever**	*Business Manager*
Kristy **Guia**	*Student Centre Manager*
Betty **Lai**	*EA to HoS*

The School Executive Group (SEG) 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.

2016 School Executive Group Members

Professor Stephen **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 S 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.

OUR RESEARCH HUBS

The School is at the forefront of innovative, original and applied research across the breadth of civil, environmental and geospatial engineering. With a 5 out of 5 ERA research ranking, we have won 135 highly competitive Australian Research Council grants totalling $44M since 2001 in order to pursue our investigations into issues of national and global importance.

ACCARNSI

Australian Climate Change Adaptation Research Network for Settlements & Infrastructure

Our Vision: To facilitate the coordination of the Australian research community in the field of Climate Change Adaptation for Settlement and Infrastructure – supporting multi-disciplinary research, building research capacity, and promoting open exchange of information and resources.

CIES

Centre for Infrastructure Engineering & Safety

As an internationally recognised centre, focused on high-level research in structural engineering, geotechnical engineering, engineering materials and computational mechanics, CIES provides outcomes that improve the design, construction and maintenance of economic, effective, safe and sustainable civil engineering infrastructure.

CIRI

Construction Innovation and Research Initiative Engineering & Safety

Construction is the world's largest industry and its efficiency and sustainability is of obvious importance. CIRI academics are actively engaged in industrial research on major construction projects in the region. We undertake basic and applied research in two broad areas - the design and management of large scale field processes and improved technology for construction activities.

CWI

Connected Waters Initiative

An integrated understanding of groundwater is essential for the future of the Australian environment, our urban and rural communities, and for agricultural and mining activity. The Connected Waters Initiative Research Centre aims to help fill critical gaps in our knowledge through research, teaching and public education.

rCITI

Research Centre for Integrated Transport Innovation

Our aim is to be a world leading organisation in integrated interdisciplinary transport research and development. Our five core research pillars are Planning, ITS, Communications, Infrastructure, Energy/Fuel and Computational Sustainability.

SAGE

Surveying and Geospatial Engineering Research

The Surveying and Geospatial Engineering (SAGE) Research group conducts world class research in the subdisciplines of geodesy, photogrammetry, positioning measurement and remote sensing. The group includes one of the world's top satellite and wireless positioning research groups, and one of Australia's premier Earth observation research teams.

SEI

Sustainable Engineering Research

The aim of the Sustainable Engineering Research Initiative is to explore, research, define, assess and resolve issues of sustainability in engineering problems, in particular the implications and implementation of sustainability concepts and practices for all areas of civil infrastructure –buildings, roads and transport, water supply, waste disposal – in the areas of planning, design, construction, operation and maintenance.

WRC

Water Research Centre

Australia's water management needs innovative and integrated solutions in terms of environmental, energy and social considerations. WRC conducts pure and applied research in surface and groundwater hydrology, public health and water treatment, and civil and environmental hydraulics. We also undertake commercial activity in collaboration with industry.

OUR PEOPLE

ACADEMIC STAFF

 **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
 **Amin**, Ali Lecturer BE (Civil) Hons 1, PhD, UNSW	My research is centred upon the use of fibres (steel, polypropylene or otherwise) in concrete. By adding fibres to concrete, the primary objective is to bridge cracks once they form and provide some post cracking resistance in tension. My research has led to the development of physical-mechanical models which describe this behaviour in a wide range of applications.
 **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.
 **Bradford,** Mark 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.
 **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 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 Associate Professor Chair, Technical Services 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, 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	I research the behaviour of structural systems (buildings and bridges) constructed 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.
 **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, 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.
 **Kim,** Taehwan Lecturer BSc, MSc KAIST, Seoul, PhD Purdue USA	Research Interests: Advanced and sustainable infrastructure materials: Thermodynamics in cementitious materials and the modelling of their chemical process: Advanced materials characterization techniques: fundamental understanding of chemo-physical reactions in cementitious materials: Microstructure evolution of cementitious materials: Utilizing natural and waste materials to develop low carbon foot-print materials.
 **Khalili,** Nasser Professor 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 Senior 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 Senior Lecturer 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.
 **Rey,** David Lecturer BSc, MSc EE & IT Montpellier; MSc Maths PUC-Rio, Brazil; PhD IFSTTAR Lyon. Grenoble, France	Research Interests: Transportation networks, combinatorial algorithms, mathematical programming and operations research. Travel time prediction models, sustainable travel behaviour in urban networks.
 **Rau,** Gabriel Lecturer Diplom-Ingenieur, Stuttgart, PhD UNSW	I am a water engineer interested in physical and chemical hydrogeology, hydrogeologic processes, subsurface heat transport, hydrogeological responses to different forcing factors, and fundamental transport of heat and solute in natural porous materials. I love to get my hands dirty in the lab and in the field in order to quantify properties and processes from real-world observations
 **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.

ACADEMIC STAFF CONT.

 **Russell,** Adrian Associate Professor 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.
 **Splinter,** Kristen Lecturer BSc (Eng), Queen's University, Kingston, Canada; MSc, Florida, PhD Oregon State, USA	Research Interests: I study how our coastline (namely the beaches) erode and recover from changes in the size of waves, sediment supply, and water levels. I develop simple numerical models based on broad-scale observations that can predict how beaches change due to changes in wave height and wave period.
 **Stuetz,** Richard Professor Director, Water Research Centre Kensington Co- Chair Teaching & Learning 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.
 **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 Associate Professor 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.
 **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 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

 **Li,** Xiaomin ARC DECRA Fellow Water Research Centre (WRC)	Research interests: Extracellular electron transfer: Biogeochemical process: Environmental microbiology : Pollutant transformation

FAREWELL

Professor Ian Acworth retired at the end of 2015, having joined UNSW as senior lecturer in 1993. With over 30 years of experience in groundwater and environmental engineering investigations, Ian was responsible for the initial development of the electrical imaging method in the late 70's and has remained at the forefront of developments in this area.

In 2016 the School said farewell and thank you to structural engineering academic **Dr Sawekchai (Ball) Tangaramavong** – who has now taken up a position as lecturer at Chulalongkorn University in Bangkok. We wish him all the best in his return home.

We also farewelled transport engineering expert **Dr Upali Vandebona** who retired in 2016 after nearly thirty years' service at the School. See p16 for fuller story.

RESEARCH, ADJUNCT AND VISITING ACADEMIC STAFF (SCHOOL) 2016

Emeritus Professors

Black, John Andrew
Fell, Robin
Gilbert, Raymond Ian
Tin Loi, Francis Shay Khiet
Trinder, John
Valliappan, Somasundaram

VC's Post-Doctoral Research Fellows

Chen, Huichao
Ma, Jinxing

ANSTO Post-Doctoral Research Fellow

Kinsela, Andrew Stephen

Professorial Visiting Fellows

Kearsley, Arthur Harry William
Kayvani, Kourosh

Senior Visiting Fellows

Cordery, Ian
Rueger, Jean Marc

Visiting Fellows

Cathers, Bruce
Zhu, Xinhui

Visiting Senior Lecturer

Chen, Jian
Li, Yaojun

Adjunct Professors

McCabe, Matthew

Adjunct Associate Professors

Aldred, James
Peirson, William Leslie
Peters, Gregory
Rosso, Kevin Michael
Seed, Alan William
Voo, Yen Lei

Adjunct Senior Lecturers

Govind, Ramesh Jaga
Mariethoz, Gregoire

Adjunct Lecturers

Blenkinsopp, Christopher Edwin

CONGRATULATIONS

to the following staff for their well-deserved promotions to:

Associate Professor:

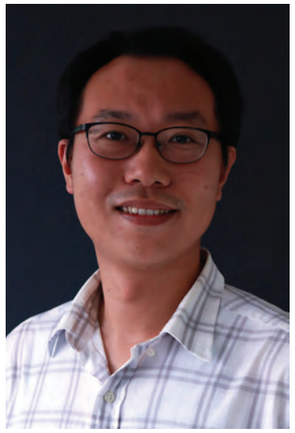
Vinayak Dixit, Will Glamore, and Hamid Valipour

Senior Lecturer:

Arman Khoshghalb

WELCOME NEW STAFF

WELCOMING DR TAEHWAN KIM



CVEN would like to welcome Dr Taehwan Kim to the 7th floor world of structural engineering. Originally studying and working in fast-paced, uber city Seoul, South Korea, he comes to us via the USA: working at Oklahoma State University and completing his PhD at Purdue University in Indiana. Dr Kim brings with him many strengths and much experience, but perhaps his two greatest strengths are his drive toward interdisciplinary research and his ambition to be a world leading researcher in the relatively new area of chemistry of cementitious materials.

Only speaking English for eight years, he learned this difficult second language through email, discussions with his supervisor and by reading and writing technical materials, but he is also quickly becoming accustomed to the colloquial nuances of Australian English. He has felt very welcomed and accommodated by CVEN staff and students who, he says, "are familiar with communicating with international staff". Morning tea breaks with 7th floor colleagues are proving instructive and heart-warming, as the arrival of Dr Kim further enriches the global character of the CVEN community.

His overarching career interest is improving the durability and sustainability of construction materials. Concrete has a long history, perhaps beginning three thousand years ago as the Egyptians built their pyramids. Two thousand years ago Romans created a kind of mortar to build masterful and resilient structures. But modern concrete has only been with us since the late 1800s. And it could be improved. Its quality is often affected by temperature, moisture and stresses such as vibration. Dr Kim is among a very small number of researchers who combine empirical data with chemical science to characterise cementitious properties.

Advanced x-ray technology such as micro CT can help unlock the interior of concrete, creating detailed characterisation profiles. From such research emerges exciting possibilities for innovations: such as the use of by-products from other industries as a component of contemporary concrete, easing its ecological footprint. An important step considering concrete is the single most widely used human-made material in the world.

Since arriving at UNSW Dr Kim has developed a working relationship with the Mark Wainwright Analytical Centre, a centralised laboratory that houses major instrumentation for the analysis of physical materials. This state of the art equipment is beyond the economic reach of an individual faculty and is a major attraction for Dr Kim and other international researchers.

"I hope in the future, by bringing chemical science to empirical data, we can predict the performance more accurately and improve the durability of concrete materials", lowering costs, ensuring safety and contributing to a sustainable future.

DR DAVID REY

CVEN would like to congratulate Dr David Rey on becoming a Lecturer in transport engineering after being a research associate here for 3 years. It has been a smooth transition, as David has been teaching several classes since he arrived. Now, along with a new office come new opportunities. This office is not one of those well-worn rooms with years of collected artefact softening the corners. His is an office waiting to be filled with the stuff of his career.

Already, he has designed a new post graduate course for the Masters of Engineering Science Transport. Transport Logistics Engineering (CVEN9421) explores advanced methods applied to transport systems such as network algorithms, mathematical optimization and integer programming. This new unit fills the current gap in transport logistics within the curriculum.

Surprisingly, David began his undergraduate studies as an electrical engineer. On completion of a BSc and a MSc from Universite Montpellier II, he developed a growing suspicion that he was not particularly enthused about electrical engineering. He was, instead, deeply drawn to mathematics and research. He completed a Masters of Mathematics at Pontificia Universidade Catolica do Rio de Janeiro, but it was 2008 and the GFC had hit hard. No-one was hiring maths graduates. But as he sat on buses for too long, as he waited for late running trains, as he saw multiple empty buses following each other, he pondered how mathematical knowledge could improve this and so he began to seek out academic work in transport engineering. He knew "we could do better."

He was awarded a fellowship grant at IFSTTAR and the Universite de Grenoble, where his PhD studies began at the Traffic Engineering Laboratory. His gaze and interest were taken up to skies, away from crowded buses, as he investigated conflict detection and resolution in air traffic control. He is proud of the advances he and his colleagues made in efficient and scalable solutions to improve global air traffic safety.

Since joining CVEN and the transport innovation hub rCITI, David has come back down to earth, looking at some of the challenges faced in urban networks. He is fascinated by abstract solutions that can be used for any routing problem: from mail delivery to charity food collection. Colloquially known as the travelling salesman problem, vehicle routing is a long-standing engineering aporia, emerging in the 1930s and significantly developed in the 1970s.

But since then few major improvements have been designed. This is a delicious challenge for a young conceptual academic "to touch real world problems and at the same time engage with higher levels of abstraction".

Transport systems engage so many stakeholders and David Rey believes it is vital that transport engineering academics recognise and delineate their role within the matrix of stakeholders. "We have to be innovative, designing new ideas and new solutions: solutions that are real not just on paper, but on the road and in the sky". Industry is a vital link in the implementation of innovative ideas, with their established infrastructures and teams of engineers at their disposal. Working at CVEN was so attractive to David partly because of its close knit ties to industry combined with its intellectual rigour and technological capacities.

Dr Rey's connections to local and international industry are being constantly solidified by his research work. French – Australian joint venture Keolis-Downer is currently working with the NSW government to design innovative transport services. David will be assisting them with innovations such as responsive, on-demand public transportation. This is the transport system of the future, re-thinking traditional methods, attempting to make moving around our cities safer, easier, saner and cleaner. David Rey will be part of this sweeping change.

DR KRISTEN SPLINTER

Dr Kristen Splinter's role at the Water Research Laboratory (WRL) has been evolving since she first arrived in 2011. Moving from a purely research role, she has recently joined the CVEN academic team, accepting a full time lecturing position, teaching undergraduate and post graduate students a broad range of topics including sustainability and coastal engineering.

Dr Splinter is a woman who wants the practical application of her work to make coastal communities safer at a time when coastal living is potentially treacherous. "Recently I have been examining the hydrodynamics over reefs during cyclone conditions. This work is particularly important in the context of rising sea levels and climate change, where Pacific Island Nations become more vulnerable due to reef submergence and degradation. "

Kristen is an international academic, completing her undergraduate engineering degree in Canada at Queen's University. It was here that her love of coastal and estuarine engineering took hold, after interning on a wetlands water quality project. This led to a Masters in Coastal and Oceanographic Engineering at the University of Florida and then to a PhD in Geological Oceanography at Oregon State University.

It was during her PhD that she got her first taste of Australia: studying video imagery data from Palm Beach, NSW to develop models on sandbar migration. A post doc in Queensland followed until she was lured to WRL by the critical mass of talent and expertise. With the guidance of Professor Ian Turner Kristen has used her video imaging and modelling skills to develop practically applicable shoreline forecasting tools. For instance, Kristen and Ian Turner are delivering a beach erosion forecasting system for NSW Environmental Trust over the next two years.

"When I tell people that I study beaches, they think that's really cool, what they don't understand is how much maths is involved." Kristen sits at computers analysing data to get at the 'why' of a problem. Much of her research these days focuses on Narrabeen-Collaroy beaches where "a lidar, permanently mounted on top of the Flight Deck building, is continuously scanning and giving us data about how the beach changes wave by wave. During the big storms in June 2016, we measured the waves as they came into shore and could see how the beach responded and recovered. This is unique data that can help us better understand sediment transport in extreme events. Because we are collecting such high-resolution data, we can also look at how beaches evolve over a tide cycle."

But the technology is getter cooler, more mobile. "I just purchased a new quadcopter to test out the concept of having moveable video imaging systems. Traditionally we mount cameras on the beach and leave them at a single location for years (or decades). The use of drones would let us quickly assess new areas of interest and collect meaningful data about bathymetry, sand bars and perhaps currents."

Kristen Splinter's world is full of movement. "I'm fascinated by rips and beach morphology and how it changes over time." It only makes sense that the technology she relies on moves as well.

FAREWELL TO AN OLD FRIEND: DR UPALI VANDEBONA

Transport engineer Dr Upali Vandebona has worked at the School of Civil and Environmental Engineering for nearly 30 years. In 2016 he transitioned from full time academic to an Honorary Senior Lecturer; a kind of semi retirement from the life he has known for so long. He has worked under six Vice-Chancellors and seven Heads of School. He has survived sweeping redundancies, restructures, technological transformations and exploding student numbers and always with gentlemanly kindness, acceptance and fortitude. His colleagues will remember him as an intelligent, rigorous and patient academic, who developed trustworthy methods to find truth in the detail.

People are always happy to see Dr Vandebona and his relationship with the School has been one of mutual affection. He feels deeply supported by the School over his long career. "This School has always been a very nice place to work with very good support from the academic staff. They have always told me when a cyclone was coming and how to duck for cover. The administrative staff have always been cheerfully helpful and the technical staff have patiently assisted me with ever-changing procedures. There may have been many ripples, but the water has kept flowing and my boat went with it."

Born in Sri Lanka, Dr Vandebona completed his undergraduate studies in civil engineering in his homeland. A Masters degree in town planning took him to Thailand and his PhD in transport engineering was completed at Monash University.

"In 1987 transport engineering was an up and coming field." What attracted this young academic to transport was its modernity, its innovative thinking and its solution based approaches. "Engineers have always built roads, but transport engineering seeks to know how whole systems work. I found this approach much more fun. I liked maths and had a good feel for operations research."

Just as his career was burgeoning so was computational technology. Hand written calculations were replaced with numerical modelling. An exciting time for someone with aptitude: so Dr Vandebona created one of the first simulated models using animation techniques in 1987. "I was really wrapt in it, immersed, time flew without me realising. I wasn't homesick." Looking back on his career it was these innovations in simulation that he regards as one of his finest achievements, along with his contributions to the improved efficiency of urban public transport systems.

"The modern world is much more comfortable materially, and many improvements in living standards have come with that, but it is very tiring. Very contradictory." Upali sees contemporary academics achieving tremendous output, while they are squeezed by their demanding workloads. "We are burning them out. We no longer have the time for those important corridor conferences. It has become very difficult to sit and talk with students: to get to know the whole person."

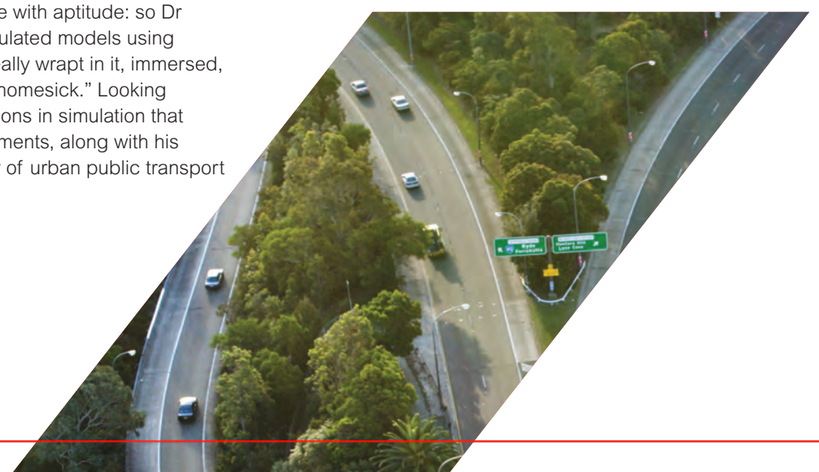
Just as he has witnessed the increasing workloads of academics so has he witnessed the changes in student culture. "Students today are very busy, with many constraints on their time and they cannot be blamed for not having the time to fully reflect on what they learned today. They are not taking notes, but taking pictures. They are not going over things one, two, three times like I did. But our students have always been very good and today so many of our students are successful in industry." He has always had a quiet message of hope for all students: this is a huge field with so many opportunities: "you can find the right match".

Upali Vandebona is a man who likes time to think and reflect. He likes walking through the stacks in the library just to see what can be discovered by wandering. He loves reading in other disciplines to cross fertilise his engineering knowledge and to create the open and free mind that all-too-busy human beings just don't have time for anymore.

As he steps into retirement he knows he can have more time to ponder and witness and learn. Thirty years experience is not to be underestimated. He will continue to write papers, attend conferences and supervise student work. He knows that wisdom from the past is still relevant today: "There are gems from the 1800s that can still tell us something". Projects which seem brand new actually have an intellectual lineage and "even though the language may have changed, historical projects are still relevant."

So with more time he intends to travel with his wife, both in Australia and overseas. They love travel and both have large extended families living in many countries. Perhaps his one serious regret is not spending more time with this family. But as he came to work and succeed in a more affluent country, he helped support his family materially, remaining humble about his contribution to their wellbeing and thankful for their affection and community.

CVEN would like to thank Dr Upali Vandebona for his decades of exemplary teaching and academic research, but perhaps most of all for always being the gentleman and the poet.



SCHOOL ADMINISTRATION

The School's Administration team had a successful year in meeting the high demand for advice and requests from all stakeholders associated with our School. Student numbers continue to grow with high demand for all our courses. The School has continued to deliver students with the best possible experience while studying at the School of Civil and Environmental Engineering.

The Student Centre team ensured that all our students are supported and given the right guidance to assist them from when they accept their offer, right through to graduation. As our student numbers grow, we are increasingly aware how imperative it is to ensure that all of our students are provided with a personalised service each time.

One of the Student Centre's initiatives in 2016 focussed on our postgraduate coursework students. We understand that although they are here for a short period of time, they deserve to feel included in the whole University experience. As such the School office piloted English Conversational Classes for all our international students and Networking Sessions to ensure they were aware of the services that are available to them while studying at UNSW. The Student Centre hopes to continue to provide these types of experiences in 2017.

The School ensured that our undergraduate students feel part of the School community by providing them with plenty of support. The School supported the student societies CEVSOC and SURVSOC through a number of events to ensure students have a well-rounded student experience. In addition to our undergraduate and postgraduate coursework student support, let's not forget our wonderful PhD students who are excelling in research every day. We have a dedicated staff member who is always there to provide guidance and support on a daily basis.

Our IT team provided staff and students with the latest technology to ensure their teaching and research can be performed at the highest level. We also continued to improve our websites across the School and Centres.

Health and Safety was a major focus in 2016 ensuring a safe working environment across the School's facilities and laboratories. The School completed a successful audit by Safework NSW.

The School's Administration team met all UNSW deadlines and requirements in 2016 while continuing to provide a high level of support to staff and students. The team will continue to provide top quality financial, administration, office accommodation and other workplace support to staff and students.

I am proud to lead such a dedicated and highly motivated team in the School of Civil and Environmental Engineering.

Anthony Dever, School Manager

PROFESSIONAL STAFF

STUDENT SERVICES MANAGER

Kristy Guia
Student Services Officer

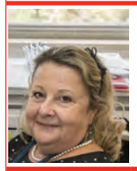
ADMINISTRATIVE STAFF

Les Brown
Administrative Assistant

Lena Comino
Administrative Officer

Flora Fan
Administrative Officer

Olivia Huang
Student Services Officer



Patricia McLaughlin
Administrative Officer

Renata Melis
Administrative Officer

HoS OFFICE

Betty Lai
EA to Head of School

Lucia Wong
Projects Officer

BUSINESS

Anthony Dever
School 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

Xiaobo Ni
Web Developer

Patrick Vuong
Computer Systems Officer

PROFESSIONAL STAFF CONT.

PROFESSIONAL OFFICERS

Dr Gautam Chattopadhyay
Manager, Water Quality Laboratories

Dr Zhen-Tian Chang
Manager, Randwick Heavy Structures Laboratory

Paul Gwynne
Manager, Infrastructure Laboratories, Kensington

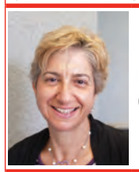
Dr Yincai Zhou
Professional Officer SAGE

FACILITIES / WORKPLACE SAFETY STAFF

Denise Lee
Facility Officer

Emilio Saliba
Workplace Safety Officer

CENTRE MANAGERS

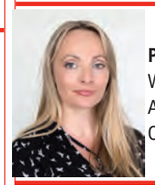


Irene Calaizis
CIES

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

Ben Pauley

Luiz Paulo Pettersen Pinto Coelho

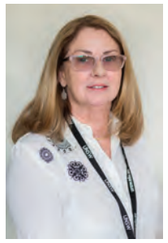
Tim Weston

Greg Worthing

Dr Artur Ziolkowski

CONGRATULATIONS

Congratulations Tricia Tesoriero



Tricia was awarded the 2016 UNSW Engineering Administrative Staff Excellence award for her work on the School's external relations projects - particularly the annual Year 10 work experience week, an important outreach program. Her care for the young students involved, administrative efficiency, problem solving capacities, and above all, her amazing attention to detail, has taken the program from its tentative pilot stage to an inspiring, innovative and highly esteemed experience for high school students interested in engineering as a future career.

FAREWELL LES BROWN

Les Brown has been a fixture at the School of Civil and Environmental Engineering for over two decades. But a fixture more akin to a chandelier than a light bulb.

For over twenty years Les has been helping students at the front desk of the School office. He was the students' first port of call. The one that helped solve their problems and ease their worries. A student can go through a whole degree without talking to their lecturers, but they would, inevitably, talk to Les, and with his wealth of information and unflappable character he has been the friendly face of the School to thousands.

He has a warm friendliness that made him a go-to guy for staff as well as students. Les knows the importance of a friendly chat. While his official title was admin officer, his true and unofficial title is "friend to all". Les retired at the end of 2016. He will be sorely missed.

Fuller story here: https://www.engineering.unsw.edu.au/civil-engineering/news/farewell-to-les-brown

LEVEL 3 WORKPLACE SAFETY COMMITTEE

L-R Dr Gautam Chattopadhyay, Jiayi (Jerry) Fu - HDR Student Rep, Stephen Foster (HoS), Jarita Zeng - Ugrd Student Rep, Maria Lee, Blathnaid Farrell – Faculty Advisory, Zhen-Tian Chang, Linlin Ge, Ali Akbarnezhad, Paul Gwynne (partially obscured), Emilio Sabila.
Absent: Les Brown, Irene Calaizis, Ron Moncay, Larry Paice

CVEN OH&S COMMITTEE 2016

Paul **Gwynne**	*Chair*
Les **Brown**	*Deputy Chair*
Maria **Lee**	*Secretary*
Paul **Gwynne**	*Heavy Structures/Geotech*
Stephen **Foster**	*HoS*
Irene **Calaizis**	
Gautam **Chattopadhyay** / Kelvin **Ong**	*WRC - Kensington*
Larry **Paice**	*WRL*
Patricia **Karwan**	
Ron **Moncay** /John **Gilbert**	*HSL*
Ali Akbar **Nezhad**	
Catriona **Tate**	*Undergrad Rep*
Xabier Vazquez **Campos**	*Postgrad Rep*
Rohan **Singh-Panwar**	*Advisory*

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.)

In 2016 Paul's Gwynne's outstanding contribution to the safety culture at UNSW was recognised with a **UNSW Staff Excellence in Health & Safety Award**. As well as his demanding duties as CVEN Laboratory manager, Paul has worked tirelessly to fine-tune the School safety management system and implemented the innovative safety initiative "CivilSafe" within the School's online safety system.

Paul was a key organiser of the School's participation in the 2016 SafeWork NSW Self-Insurance Licence audit, where UNSW achieved a compliance score of 90.9% for Management Responsibility and 90.9% for Risk Management.

The School of Biotechnology and Biomolecular Sciences (BABS) and School of Civil and Environmental Engineering (CVEN) were the two verification sites for the audit. Each School was visited for a day by four auditors. Several persons across both Schools were interviewed by the auditors and presented vast and detailed evidence to demonstrate implementation of the UNSW Health and Safety Management System. CVEN met all the necessary requirements and our standards received high recommendations.

RESEARCH STAFF - CENTRES

2016 - CIES STAFF

ACTING DIRECTOR

Professor Chongmin **Song**, BE ME Tsinghua, DEng Tokyo

RESEARCH DIRECTOR

Scientia Professor Mark **Bradford**, BSc BE PhD *Syd* DSc *UNSW* FTSE PEng CPEng CEng Dist.MASCE FIEAust FIStructE

DEPUTY DIRECTORS

Emeritus Professor Ian **Gilbert**, BE PhD *UNSW* CPEng FIEAust MACI

Professor Nasser **Khalili**, BSc Teh MSc Birm PhD *UNSW*

A/Professor Arnaud **Castel** BE, MEngSc, PhD *Toulouse*

CENTRE MANAGEMENT

CENTRE MANAGER

Irene **Calaizis**, BCom *UNSW*

ADMINISTRATIVE OFFICER

Patricia **Karwan**

OTHER ACADEMICS

Professor David **Carmichael**, BE MEngSc *USyd*, PhD *Cant*, CPEng, FIEAust, MASCE

Professor Stephen **Foster**, BE *NSWIT*, MEngSc PhD *UNSW*, FIEAust

Professor Yong Lin **Pi**, BE *Tongji* ME *Wuhan* PhD *UNSW* CPEng MIEAust

A/Professor Mario **Attard** BE PhD MHEd *UNSW*, MIEAust, CPEng

A/Professor Wei **Gao** BE HDU, ME PhD *Xidian*, MIIAV, MAAS

A/Professor Linlin **Ge**, PhD *UNSW*, MSc *Inst of Seismology*, BEng *WTUSM*

A/Professor Adrian **Russell** BE, PhD *UNSW*, PGCert *Bristol*

A/Professor Hamid **Vali Pour** Goudarzi BSc MSc T*ehran*, PhD *UNSW*

Dr Ali **Akbarnezhad**, BE *AUT, Tehran*, PhD *NUS*

Dr Ali **Amin**, BE, PhD *UNSW*, MIEAust CPEng RPEQ

Dr Kurt **Douglas** BE Syd. PhD *UNSW*

Dr Ehab **Hamed**, BSc MSc PhD *Technion*

Dr Arman **Khoshghalb**, BE ME *Sharif Uni of Tech*, PhD *UNSW*

Dr Taehwan **Kim**, BSc, MSc KAIST, PhD *Purdue*

Dr Kostas **Senetakis**, BEng, MSc, PhD *AUTh*

Dr Johnson Xuesong **Shen**, BEng, MSc *Nanjing*, PhD *HKPU*

Dr Sawekchai **Tangaramvong** BEng Chulalongkorn, MEngSc PhD *UNSW*, MIEAust

OTHER RESEARCH STAFF
(alphabetical order)

Dr Ankit **Agarwal**, B-Tech IIT *Kanpur* PhD *UNSW*

Dr Abdolreza **Ataei**, BSc, MSc, PhD *UNSW*

Dr Farhad **Aslani**, BSC, MSc, PhD *UTS*

Dr Zhen-Tian **Chang**, BE ME *Hunan* PhD *UNSW*

Dr. Huichao **Chen**, BEng, ME, PhD *Southeast University (Nanjing)*

Dr Yue **Huang**, BE MPhil CityU HK, PhD *UNSW*

Dr Mohammad **Khan** BSc *BUET* MSc *NUS* PhD *UNSW*

Dr David **Kellerman** BE, PhD *UNSW*

Dr Mahbub **Khan**, BE ME UOA(NZ), PhD *UNSW*

Dr Inamullah **Khan**, BE MEngSc PhD *Toulouse*

Dr Nima **Khorsandnia**, BSc MSc *BIHE*, PhD *UTS*

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Dr Yan **Liu**, BE ME *DLUT*, PhD *UQ*

Dr Alex Hay-Man **Ng**, PhD *UNSW*, MEngSc *UNSW*, BE *UNSW*

Dr Vipulkumar **Patel**, BE, ME, PhD *VU*

Dr Ahsan **Parvez**, BSc, PhD *UNSW*

Dr Albert **Saputra**, BE, PhD *UNSW*

Dr Babak **Shahbodaghkhan**, BSc. *IKIU,* MSc. *Tehran,* PhD *Kyoto*

Dr Hossein **Talebi**, BSc, MSc, PhD *BUW*

Dr Tai H. **Thai**, BE ME *HCMUT*, PhD *Sejong*

Dr Mohammad **Vahab**, BSc, MSc, PhD *SUT* (Iran)

Dr Thanh ***Vo***, BE/BCom *Syd*, MEngSc, PhD *UNSW*

Dr Di **Wu** BE PhD *UNSW*

Dr Chengwei **Yang**, BEng UNSW, PhD *UNSW*

Dr Guotao **Yang**, BE PhD *Tongji*

TECHNICAL TEAM

John **Gilbert**
Ron **Moncay**
Ben **Pauley**
Greg **Worthing**

EMERITUS PROFESSORS

Francis **Tin-Loi** BE PhD *Monash*, CPEng MIEAust

Somasundaram **Valliappan** BE *Annam*, MS *Northeastern*, PhD DSc *Wales*, CPEng, FASCE, FIACM

OTHER UNSW MEMBERS

Professor Alan **Crosky**
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

Dr Voo Yen **Lei**, 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 Zhaoqiu **Liu**, School of Civil Engineering, Yancheng Institute of Technology, China

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

A/Professor Jian **Chen**, School of Civil Engineering, Harbin Institute of Technology, China

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

Dr Hauke **Gravenkamp**, University of Duisburg-Essen, Germany

Dr Yi **Wang**, Shenyang Agriculture University (SAU), China

Dr Zihua **Zhang**, Ningbo University, China

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

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

Dr Chen **Wu**, College of Civil Engineering, Fujian University of Technology, China

A/Professor Zhiqiang **Hu**, Dalian University of Technology, China

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

Professor Yoshiko **Ri**, Department of Human Habitat, Faculty of Environmental & Symbiotic Sciences, Prefectural University of Kumamoto, Japan

Dr Junyu **Liu**, Dalian University of Technology, China

Dr You Qin **Huang**, Guangzhou University, China

Dr. Jin-Woo **Lee**, Composite Research Division, Korea Institute of Materials Science, Korea

Dr. Kangeun **Lee**, Composite Research Division, Korea Institute of Materials Science, Korea

2016 - RCITI STAFF

DIRECTOR

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

DEPUTY DIRECTOR

Associate Professor Vinayak **Dixit**, Director - TRACSLab@ UNSW

CENTRE ADMINISTRATOR

Maria **Lee**

ACADEMICS

Dr Lauren **Gardner**, Senior Lecturer

Dr Taha Hossein **Rashidi**, Senior Lecturer

Dr David **Rey**, Lecturer

Dr Upali **Vandebona**, Honorary Senior Lecturer

Dr Ken **Doust**, Adjunct Senior Lecturer

Dr Chen **Cai**, Conjoint Lecturer

Associate Professor Jay **Katupitiya**, Head of Mechatronics, UNSW School of Mechanical and Manufacturing Engineering

Professor 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, UNSW School of Psychology

Professor Fidelis T. **Suorineni**, Chair of Mine Geotechnical Engineering, School of Mining Engineering

Jamye **Harrison**, Adjunct Professor

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 Zhitao **Xiong**, Research Associate

Dr Kasun **Wijayaratna**, Research Associate

PROJECT OFFICER

Sylvia **Brohl**

2016 - WRC STAFF

WRC - KENSINGTON CAMPUS HUB

DIRECTOR

Professor Richard **Stuetz**

BUSINESS MANAGER

Robert **Steel**

ADMINISTRATION

Patricia **Karwan**

ACADEMICS

Professor Ashish **Sharma**
Professor David **Waite**
Associate Professor Tommy **Wiedmann**

Dr Fiona **Johnson**
Dr Stuart **Khan**

RESEARCH STAFF

Associate Professor Sivakumar **Bellie**
Associate Professor Sven **Lundie**
Dr Hoori **Ajami**
Dr AJ **Anceno**
Dr Radoslaw **Barczak**
Dr Mark **Bligh**
Dr Richard **Collins**
Dr Juan Pablo Alvarez **Gaitan**
Dr Shikha **Garg**
Dr Michalis **Hadjikakou**
Dr Di **He**
Dr Adele **Jones**
Dr Andrew **Kinsela**
Dr Peter **Kovalsky**
Dr Hung Viet **Le**
Dr Nhat **Le**
Dr Xiaomin **Li**
Dr Jingwan **Li**
Dr Simin **Maleknia**
Dr Lucy **Marshall**
Dr James **McDonald**
Dr Rajeshwar **Mehrotra**
Dr Christopher **Miller**
Dr Robert **Parinussa**
Dr An Ninh **Pham**
Dr Md Mamunur **Rashid**
Dr David **Roser**
Dr Hazel **Rowley**
Dr Xiu **Yuan**
Dr Xabier **Vazquez Campos**
Dr Xinguang **Wang**
Dr Yuan **Wang**
Dr Conrad **Wasko**
Dr Arash **Zamyadi**
Mohammed **Hasan**
Zaved **Khan**
Gough **Lui**
Daniel **Micevski**
Judith **Schinabeck**
Jeffrey **Yu**

VISITING ACADEMICS

Professor Nicholas **Ashbolt**, University of Alberta, Canada

Professor Paolo **Burlando**, ETH Zurich, Switzerland

Professor Amin A. **Elshorbagy,** University of Saskatchewan, Canada

Professor Gary **Jones**, eWater Limited, Australia

Professor Venkat **Lakshmi**, University of South Carolina, USA

Professor Michele **Prevost**, Polytechnique Montreal, Canada

Professor Jane Meri **Santos**, Federal University of Espirito Santo, Brazil

Associate Professor Ataur **Rahman,** Western Sydney University, Australia

Dr Baichuan **Cao**, Beijing Jiaotong University, China

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 Stephan **Pfister**, ETH Zurich, Switzerland

Dr David **Poulson de Sousa**, University of Southern Denmark, Denmark

Dr Michael **Short,** University of South Australia, Australia

Dr Gareth **Swarbrick**, Pells Sullivan & Meynink, Sydney Australia

Dr Jacqueline **Thomas,** University of Sydney, Australia

WRC - NORTHERN BEACHES CAMPUS HUB
Water Research Laboratory WRL

DIRECTOR

Professor Ian **Turner**

BUSINESS MANAGER

Grantley **Smith**

ACADEMICS

Associate Professor Ron **Cox**
Dr Stefan **Felder**

RESEARCH STAFF

Dr Xavier **Barthelemy**
Dr Mitchell **Harley**
Dr Kristen D **Splinter**

PROFESSIONAL ENGINEERS

PRINCIPAL ENGINEERS

Doug **Anderson**
Matt **Blacka**
James **Carley**
Associate Professor William **Glamore**
Ben **Modra**
Grantley **Smith**

SENIOR ENGINEERS

Ian **Coghlan**
Duncan **Rayner**

PROJECT ENGINEERS

Mathiew **Dieber**
Chris **Drummond**
Alice **Harrison**
Daniel **Howe**
Prion **Rahman**
James **Ruprecht**
Toby **Tucker**

TECHNICAL & ADMINISTRATION

Anna **Blacka**
Grace **Carlino**
Robert **Jenkins**
Coral **Johnson**
Larry **Paice**
Ross M**athews**
Joan **Terleckyi**
Robert **Thompson**

VISITING ACADEMICS

Professor Ian **King**, Member ASCE

Associate Professor Mark **Davidson**, Plymouth University

Associate Professor William **Peirson**, New College, UNSW

Dr Bruce **Cathers**, UNSW

VALE - RAYMOND ERIC (RAY) LAWTHER

VALE RAYMOND ERIC (RAY) LAWTHER

1945 - 2016
BE (Civil) Hons '67, PhD '72
Taught at School 1973 – 2004,
Honorary Visiting Fellow till 2007

Over his thirty career at the School Ray Lawther became a living legend to students and his colleagues. A brilliant undergraduate student, he went on to complete a PhD in structural engineering under the supervision of Professor Stan Shaw; his thesis topic 'Lateral instability of some beams and trusses.''

Ray continued to make significant contributions in the areas of structural stability and finiteelement methods through the '70s and '80s. In the 90's he worked with colleagues Mario Attard and Francis Tin-Loi in the area of structural mechanics, working on the application of analytical and computational techniques to various fundamental problems in the broad area of stability and nonlinear material behaviour. Head of School Professor Stephen Foster recalls, 'There was little that Ray did not know about computational methods – the paper I most remember was where he related the theory of bracing of structures to Einstein's special theory of relativity.'

Ray was also an outstanding classroom teacher – in the School History alumni recalled him as 'knowledgeable and entertaining', 'very laidback', 'dedicated, enthusiastic and always ready to assist' but it was his car they really remembered, the red MG TC, driven in those unimaginable days of the 70s and 80's, through UNSW campus and parked outside the building!

Robert Care was a Teaching Fellow at the School in the 70s, while undertaking his PhD. He recalled the School passion for cards at lunchtimes, especially 'six -handed '500' in the fourth floor Hydrology rooms. Ray Lawther was a key figure. 'The rules were tailored to make the game more challenging and the contracts were always high.'

'My memories of Ray always bring a smile to my face,' says student and colleague Associate Professor Mario Attard, reflecting on how Ray 'would always help anyone, any student who came to his office with a mathematical or structural problem. He was a fantastic teacher. I loved attending his classes when I was an undergraduate. His main area of research was the eigenvalue problem. I still use his "process modification" to solve problems that sometimes can't be solved using conventional methods. He was very particular about his drawings and would do everything by hand as he thought the computer generated drawing did not have the details or precision he wanted. He also had a picture of Einstein in his office. He always wanted students to think and be lateral thinkers.'

"He was a most memorable character, a wonderful teacher, an extraordinary problem solver and someone whose company was so stimulating and enjoyable. He was unique"!

Colleague Bruce Cathers agrees, 'Ray's door at UNSW was always open to help students. Every so often he would challenge the students with unusual and interesting problems. I know of one time he came up with a problem in Engineering Computations related to Richardson's extrapolation method - and promised a slab to the first student to come up with the solution. And he also had high standards to which he firmly adhered in terms of exams and assignments.'

Ray was famously camera shy, and refused to let the School put his picture on the fledgling internet. To tease him a little, Mario Attard put a picture of the Australian polar explorer Douglas Mawson on Ray's door. The image did look quite a bit like Ray, perhaps channelling some of Ray's fierceness when faced with any hint of student plagiarism. Interestingly Ray didn't take the picture off, and eventually the image found its way into a student yearbook as one Dr Ray Lawther.

Both Mario and Bruce had personal stories to tell of Ray's brilliant assistance. Mario remembered 'I once went to his office with a mathematical puzzle which took me several days to solve. Ray looked at the problem, gave me the solution, and then went through the history of the problem - giving the solution a name...' Bruce recalled, 'I once asked Ray about a problem to do with geometry and integration. The algebra was horrendous - it was pages long - and I asked Ray about it. He replied straight away that it was trivial and proceeded to give me a wonderful, physically based explanation in terms of matchsticks! '

For Stephen Foster, 'Ray was not just a colleague but a personal friend and I know this is the sentiment of many in our School who had the opportunity to work and study with him and had the pleasure of enjoying a game of golf or croquet, or five hundred, or sitting down and sipping a fine glass of wine with him. He was a great colleague and friend to many of us over many years.'

All who knew Ray would agree with Bruce Cathers, "He was a most memorable character, a wonderful teacher, an extraordinary problem solver and someone whose company was so stimulating and enjoyable. He was unique"!

Our sincere condolences to Ray's wife Chris and his family.

OUR RESEARCH

RMC REPORT

RESEARCH MANAGEMENT COMMITTEE (RMC)

Prof Travis **Waller**	*Chair, RMC*
A/Prof Arnaud **Castel**	*Deputy Chair, Postgrad Research Student Coordinator*
A/Prof Samsung **Lim**	*Deputy Research Student Coordinator*
Prof Brian **Uy**	*CIES Director*
Prof Mark **Bradford**	*CIES Research Director*
Prof Richard **Stuetz**	*WRC Director*
Dr Martin **Andersen**	*CWI Director*
Dr Vinayak **Dixit**	*RCITI Representative*
A/Prof Denis **O'Carroll**	*WRL representative*
A/Prof Adrian **Russell**	*Practicum Scholarships*
A/Prof Linlin **Ge**	*International Relations Director*
Dr Wei **Gao**	*Taste of Research Coordinator*
Ms Patricia **McLaughlin**	*HDR Student Administrator*
Prof David **Carmichael**	
Prof Nasser **Khalili**	
Prof Ashish **Sharma**	

Prof Travis Waller

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 2016, 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

The most recent Australian Government's Excellence in Research for Australia (ERA) gave 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 2016, the School had 206 higher degree research students enrolled in either ME (20) or PhD (186) programs. 2016 also saw 33 of our PHD students and 6 ME students successfully graduate. Their achievements and those of their leading research supervisors extended 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 2016. Much of the heavy work load in this area is carried by the School's Postgraduate Coordinator Associate Professor Arnaud Castel, his deputy A/Prof Samsung Lim, and the Postgraduate Research Student Administrator Ms Pattie McLaughlin.

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 grants 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 2016 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 2016 also saw the School continue on its ARC success story –with fifteen staff winning ten highly sought after ARC Grants – 6 in Discovery, 1 Discovery Early Career, and 3 in Linkage – to the total value of $3.66M.

RESEARCH STATS CIVIL & ENVIRONMENTAL ENGINEERING 2007 — 2016

Publications	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
Books	2	6	5	5	4	3	2	3	1	0
Chapters in Books	11	12	4	11	9	9	9	10	3	14
Refereed Journal Articles	113	128	125	183	196	241	334	357	333	405
Refereed Conference Publications	100	88	114	68	148	115	168	141	109	102
Total	226	234	248	267	357	368	513	511	446	521
Higher degree research students	76	77	65	90	105	124	195	216	214	206
Research Grants	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
ARC Grants (year announced)	$1.74M	$2.89M	$4.32M	$1.75M	$3.26M	$1.38M	$4.47M	$4.08M	$4.88M	$3.66M
Total Research Income	**$8.0M**	**$10.7M**	**$13.6M**	**$15.1M**	**$17.35M**	**$15.6M**	**$13.71M ***	**$11.85M**	**$12.44M**	**$13.4M**
No. Discovery Project Grants	3	6	8	3	9	3	4	7	6	6
No. Linkage & LIEF	3	3	4	2	0	1	5 + 1 shared	2	8	3
DECRA					1	1	1	1	0	1
NHMRC Grants								1		
Total Grants	**6**	**9**	**12**	**5**	**10**	**5**	**10 .5**	**11**	**14**	**10**

The RMC also administered the **2016 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.

Toby Tucker, WRL Project Engineer, installing the equipment onsite

In 2016 $388,274 was awarded by the RMC to academic staff for a range of new equipment – to support ongoing and new research projects in all our research hubs and centres. Some examples:

As part of their 2016 SMEG grant A/Prof William Glamore's team at the School's Water Research Laboratory were successful in obtaining an ISCO auto-sampler. Over the past 12 months they have used the kit to sample catchment runoff parameters over various runoff events as part of a large research hydrodynamic modelling study in collaboration with the Hunter Water Corporation. The fundamental research project will be critical in estimating pollutant loads in catchments. Additional research is underway to examine the roll of emerging contaminants using the equipment obtained.

Dr Juan Pablo Alvarez- Gaitan, Sustainability Assessment Program Research Associate, WRC

Using state of the art research sustainability software GaBi / ecoinvent purchased with their 2016 School Minor Equipment Grant, researchers in the School's Sustainable Assessment Program (part of the Water Research Centre) are contributing to the development of more environmentally friendly photovoltaics cells using Life Cycle Assessment (LCA), in collaboration with colleagues from the School of Photovoltaics and Renewable Energy Engineering (SPREE). The study included global warming, human toxicity, freshwater eutrophication and ecotoxicity and abiotic depletion as impacts categories. Energy payback time was also included.

2016 ARC GRANTS

L-R Chris Rizos, Richard Collins, Taha Rashidi, Stuart Khan, Ashish Sharma, Chongmin Song, Vinayak Dixit, Lucy Marshall, Ehab Hamed, Stephen Foster, Jinling Wang.
Absent: Hoori Ajami, Arnaud Castel, Brian Uy, David Waite, Travis Waller

In 2016 the School continued its amazing track record in winning ten highly sought after Australian Research Council Grants – 6 in Discovery, 1 Discovery Early Career, and 3 in Linkage – to the total value of $3.66M.

The objectives of the Discovery Projects scheme are to encourage high-quality research environments; to enhance international collaboration in research; to expand Australia's knowledge base and research capability, and to enhance the scale and focus of research in the national Science and Research Priorities. Under the Linkage scheme, industry partners make a significant cash and/or in-kind contribution to research projects. The collaboration is essential to transforming industries, building communities and strengthening the Australian economy.

The School's success contributed to the strong performance of our Faculty and University. In 2016 UNSW received more Discovery Project grants than any other institution in the country – 88 grants worth $32 million. UNSW Engineering won 27 of those 88, to a value of $9.98M. In the ARC Linkage grants, UNSW outperformed every other university in the State and ranked third nationally, winning 25 grants for a total of $7.6M. The Faculty of Engineering won 13 of those 25, to a value of $4.06M.

School staff across the disciplines of water, structures and surveying were involved in the six successful ARC Discovery projects, including Dr Hoori Ajami, Dr Richard Collins, Prof Stephen Foster, Dr Ehab Hamed, A/Prof Stuart Khan, Dr Lucy Marshall, Prof Chris Rizos, Prof Brian Uy, Prof David Waite and A/Prof Jinling Wang. Dr Taha Hossein Rashidi – a Senior Lecturer in Transport Engineering received a Discovery Early Career Research Award (DECRA) of $358K.

Head of School Professor Stephen Foster congratulated all those who were successful and thanked all those staff who submitted. "We all know how competitive these grants are," he said, "with a success rate of just 17.8% across the country in Discovery and 16.7% for DECRAs. So well done to all!"

Staff involved in the three successful CVEN Linkage grants were A/Prof Arnaud Castel, Dr Vinayak Dixit, Prof Stephen Foster, Dr Taha Rashidi, Prof David Waite, and Prof S Travis Waller. Their projects involve research into human factors influencing the success or otherwise of automated vehicles; developing innovative low carbon cement formulations for the Australian construction industry; and a policy appraisal tool that shows the consequences of land use decisions.

School academics Prof Chongmin Song, A/Prof Stuart Khan and Prof Ashish Sharma were involved in three successful Linkage projects with external academic and industry colleagues. Details are listed below.

LIST OF 2016 ARC GRANTS AND PROJECTS

Discovery Projects

Professor Stephen Foster; Professor Frank Vecchio, "*Characterisation of shear and tensile fracture of ultra-high performance fibre reinforced concrete*": ARC DP 170104618 - $379,500

This project aims to investigate the shear-tension interaction performance of ultra-high performance fibre reinforced concrete (UHPFRC). In January 2014, the draft Australian Standard for the design of concrete bridges was released; this is the first standard in Australia, and one of the first in the world, to include comprehensive design procedures for steel fibre reinforced concrete (SFRC). Rules allow conventional, strain softening SFRC, but exclude the use of strain hardening UHPFRC because of insufficient research on core aspects of the materials when conventionally reinforced. The study expects to provide vital data engineers and Standards bodies need to adopt UHPFRC.

Associate Professor Stuart Khan; Associate Professor Frederic Leusch, "*The effect of wastewater treatment on the ecotoxicity of chiral chemicals*." ARC DP 170100357 - $376,000

This project aims to assess the environmental implications of pharmaceuticals discharged in effluents from wastewater treatment plants. Trace levels of human pharmaceuticals occur in sewage and urban waterways, but during sewage treatment, some pharmaceuticals can undergo a chemical transformation known as 'chiral inversion'. In some cases, this may convert relatively benign environmental contaminants to more ecologically toxic species. This project will investigate why and how some pharmaceuticals become susceptible to chiral inversion and assess ecotoxicological differences. This work is expected to determine the significance of considering chiral inversion in environmental risk assessment, with applications to a broader range of chemicals including pesticides and industrial chemicals.

Dr Lucy Marshall; **Dr Hoori Ajami**; Dr David Nott, "*Uncertainty quantification in terrestrial hydrologic systems*": ARC DP 170103959 - $245,000

This project aims to develop a framework to simulate, quantify and analyse the uncertainty in streamflow and vegetation dynamics via approximate Bayesian computation. Water is a fundamental resource, and a difficulty in water resource management is to make predictions in a changing environment. Uncertainties in predictions of natural systems due to observational and model error make this more difficult. It is anticipated that the results from this project will advance uncertainty analysis in hydrology and help understand how different types of data and information can inform model characterisation. This will be useful in providing vital information on the attributes and extent of uncertainty to inform water resources analysis, management and decision making.

Professor Chris Rizos; **Associate Professor Ahmed El-Mowafy**; **Associate Professor Jinling Wang**; **Professor Michael Meurer**, "*Trustworthy positioning for intelligent transport systems*": ARC DP 170103341 - $460,000

This project aims to develop a holistic approach for reliable positioning for Intelligent Transport Systems (ITS). This project will address the challenges of integrity monitoring in ITS when using satellite-based technology, its integration with other sensors, and when supported by the proposed Australia National Positioning Infrastructure. It will consider Australian geography, large area, and sparse population, and emphasise rural transport. Expected primary outputs include algorithms, a detailed analysis of required systems and recommendations that will help prepare Australia for the importation of self-driving vehicles.

Professor Brian Uy; **Dr Ehab Hamed**; Professor Zhong Tao; Dr Won-Hee Kang, "*Coupled service and ultimate behaviour of high strength composite columns*": ARC DP 170100001 - $435,500

This project aims to improve the coupled service and strength load behaviour of high strength composite columns used in building and bridge infrastructure. Taller and longer buildings and bridges need efficient and safe material. Australian Standards for concrete and steel now allow higher strength materials of 100 and 690 MPa. This project will consider coupled service and strength load issues incorporating time-dependent effects and ductility, and extend the range of concrete and steel strengths to 150 and 960 MPa for world-class heavy infrastructure. This project is expected to improve the safety and economy of tall buildings, bridges and large infrastructure.

Professor David Waite; **Dr Richard Collins**; Dr Peter Nico, "*Reactive oxygen species production on oxygenation of subsurface sediments*": ARC DP 170103512 - $335,000

This project aims to examine the nature, extent and effect of redox processes in subsurface environments. Reactive oxygen species, including hydrogen peroxide, superoxide and hydroxyl radicals, transform and affect redox-active substances in the environment such as arsenic, uranium and natural organic matter (which may be oxidised to carbon dioxide). Production of significant quantities of reactive oxygen species on oxygenation of subsurface sediments through actions such as aquifer recharge and high flow events may alter the form and mobility of trace elements and influence the cycling of carbon and eventual efflux of carbon dioxide to the atmosphere. This project will examine the nature, extent and effect of these redox processes in selected subsurface environments. This research could have implications for contaminant transformation and fate and carbon cycling.

DECRA: **Dr Taha Hossein Rashidi**, "*Integrating social media with conventional data sources to model land use*": DE170101346 - $358,000

This project aims to design a framework linking urban pattern development to changing demographics. This multi-level modelling framework for housing, job and school searches is linked to a demographics evolution module providing information about household lifestyle changes. The framework benefits from detailed behavioural models which capture inter-dependencies among household members' decisions. This project examines the capacity of social media data to complement the existing data resources. The expected outcome is a tool for policy appraisal for city planning.

ARC GRANTS

CVEN-led successful ARC Linkage projects

Dr Vinayak Dixit; Professor Travis Waller; Professor Michiel Bliemer; Dr Steven Most; Professor Andry Rakotonirainy; Professor Michael Regan; Mr Benjamin Barnes; Ms Victoria Pyta; Mr Carl Liersch

LP160101021: This project aims to explore three human factor issues critical to the successful deployment of automated vehicles: factors influencing driver choice of automated vehicle control; interactions between automated and manually controlled vehicles; and driver detection, recognition, and reaction to automated vehicle system failures. Automated vehicles are predicted to be transformative, but their ultimate success and expected societal benefits will depend on drivers' trust in them and on how people choose to use and interact with them. Insights from this research should prepare our society for more automated vehicles on the roadways.

Industry partners: ARRB Group Ltd; Transport For Nsw; Robert Bosch (Australia) Proprietary Limited; Road Safety Commission; GoGet Carshare; Suncorp Group Limited; Vicroads Design; Transport Accident Commission; Liberty Mutual Research Institute For Safety.
Award: $458K

Professor David Waite; Professor Stephen Foster; Associate Professor Arnaud Castel; Professor Christoph Arns; Dr Louise Keyte; Dr Redmond Lloyd
LP160101153: This project aims to develop innovative low carbon cement formulations for the Australian construction industry. It will design new binder formulations that include a high level clinker replacement and achieve high early strength by controlling early hydration reactions (< 24 hrs) through combining admixtures. Using geochemistry to improve early hydration, it will use commonly available supplementary cementitious materials to prepare low carbon concrete. This research is expected to transform the Australian construction industry by developing higher performing, more durable structures with dramatically lower embodied carbon dioxide and improved life-cycle costs.

Industry partner: Boral Construction Materials Limited
Award: $450,000.00

Dr Taha Hossein Rashidi; Dr Vinayak Dixit; Dr James Cook

LP160100450: This project aims to develop a policy appraisal tool that shows the consequences of land use decisions. The proposed integrated multi-level modelling framework—linked to models that monitor demographics evolution, travel demand, energy, labour, economy, housing and household dynamics—can assess sustainability, equity and economy. This framework is expected to help people make better decisions about housing, maintain system level properties such as price equilibrium, show the impact of land use in the transport system, and improve policy appraisal for city planning.

Industry partner: Veitch Lister Consulting Pty Ltd
Award: $162,252.00

Other ARC Linkage projects CVEN staff are involved in:

UNSW Chemical Engineering: Professor Gregory Leslie; Dr Rita Henderson; **Professor Ashish Sharma;** Professor Kenneth Grattan; Professor Tong Sun; Dr Peter Jarvis; Dr Heriberto Bustamante; Dr Peter Cox; Dr Bala Vigneswaran

LP160100620: This project aims to make the water industry capable of foreseeing and managing adverse raw water organic matter quality from the catchment to the treatment plant… This catchment to plant approach is expected to make existing treatment assets more productive and defer additional treatment costs.

Industry partners: Sydney Water Corporation; Water NSW
Award: $450,000

Western Sydney University: Associate Professor Arumugam Sathasivan; Professor Brajesh Singh; **Associate Professor Stuart Khan;** Professor Jens Coorssen; Professor Linda Blackall; Professor Bruce Rittmann; Dr Maneesha Ginige; Dr Peter Cox

LP160100909: This project aims to develop an adaptive, real-time control system for managing disinfectant residuals in chloraminated water supply systems… The project will develop and demonstrate a real-time control technology which delivers microbiologically safe, cost-efficient drinking water to people in warmer climates, despite warming climate and increasing population.

Industry partners: Commonwealth Scientific And Industrial Research Organisation; Sydney Water Corporation; Central Seq Distributor-Retailer Authority; South East Queensland Water; Logan City Council; Unitywater

Award: $710,000

University of Newcastle: Professor Robert Melchers; **Professor Chongmin Song**; Mr Damian McGuckin; Dr Stuart Cannon; Professor Martin Renilson

LP160100391: This project will research the deterioration of structural integrity and remaining life of marine assets such as ships and offshore energy facilities, by integrating structural response analysis methods with aged-structure assessment techniques…Anticipated outcomes are superior safety, expected lifetime and economic benefits of maritime assets.

Industry partners: Defence Science And Technology Organisation; Pacific Engineering Systems International P/L

Awarded: $550,000.00

Nationally, ARC Linkage applications had an overall success rate of 31% in 2016.

RESEARCH GRANTS

TOTAL RESEARCH GRANT INCOME 2016 $13.4M

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

ACCARNSI -AUSTRALIAN CLIMATE CHANGE ADAPTATION RESEARCH NETWORK FOR SETTLEMENTS & INFRASTRUCTURE

Our Vision: To facilitate the coordination of the Australian research community in the field of Climate Change Adaptation for Settlement and Infrastructure – supporting multi-disciplinary research, building research capacity, and promoting open exchange of information and resources.

Network Convenor - Associate Professor Ron Cox
Network Coordinator - Tamara Rouse
Research Associate - Dr Kate Panayotou

Researcher	Topic	Granting Organisation	Funds in 2016
A/Prof Ron Cox	Australian Climate Change Adaptation Research Network for Settlements and Infrastructure - ACCARNSI – promote adaptation research and build capacity	NCCARF – Griffith University for Commonwealth Dept of Environment and Energy	$160,625
A/Prof Ron Cox	Review of finance mechanisms for climate change adaptation	Griffith University – Department of the Environment	$4,500
A/Prof Ron Cox	Optimisation of seawalls and beach nourishment for coastal adaptation	Office on Environment and Heritage (OEH) – NSW Adaptation Research Hub: Coastal Processes Response Node	$136,000
TOTAL			**$301,125**

SAGE - SURVEYING AND GEOSPATIAL ENGINEERING RESEARCH

The Surveying and Geospatial Engineering (SAGE) Research group conducts world class research in the subdisciplines of geodesy, photogrammetry, positioning measurement, laser scanning, geospatial information systems and remote sensing. The group includes one of the world's top satellite and wireless positioning research groups, and one of Australia's premier Earth observation research teams.

Group leader: Prof Chris Rizos - Professor of Geodesy and Navigation

Researcher(s)	Research Topic	Granting Organisation	2016 Income
Chris Rizos	Next Generation Australian and New Zealand Datum	Cooperative Research Centre for Spatial Information	5,000
Chris Rizos	Underground Mine Environments	ARC Linkage Project - ARC contribution	115,944
Chris Rizos	Underground Mine Environments	ARC Linkage Project - Industry Partner contribution	30,000
Jinling Wang	Indoor Positioning and Navigation with Beidou Pseudolites	China Hunan Engineering Research Center of Navigation Instrument	16,300
Jinling Wang	High Accuracy Positioning, and Mapping and Navigation for ITS: Analysis of Needs and Technological Challenges	South Navigation Limited	20,000
Linlin Ge	Accuracy and applicability drone-based photogrammetry	NSW Department of Industry	11,000
Linlin Ge	Accuracy and applicability drone-based photogrammetry	Propeller Aerobotics	11,000
Linlin Ge	Research Centre for Transformation of Urban Ports and Harbours (TUPAH)	Australia-China Council, Department of Foreign Affairs and Trade, the Commonwealth of Australia	35,000
Linlin Ge	Monitoring Invasive Species	North West Local Land Service NSW	20,545
Total			**264,789**

RESEARCH GRANTS

CIES

Centre for infrastructure Engineering and Safety

CIES is a leader in national and international research in infrastructure engineering, with an interdisciplinary research team supported by advanced analytical, computational and experimental techniques and facilities.

As Australia's premier high level research group in structural engineering, geotechnical engineering, engineering materials and computational mechanics, CIES provides outcomes that improve the design, construction and maintenance of economic, effective, safe and sustainable civil engineering infrastructure.

At CIES, we apply our skills to engineering and safety assessments of infrastructure. In particular we look at the risk management of buildings, bridges, dams, roads and other infrastructure when subjected to both in-service conditions and overload (or limit) conditions, such as in fire, earthquake, cyclone or blast situations, or when structures are exposed to hostile environments.

The centre aims to promote multi-disciplinary collaboration across the Faculties of Engineering, Science and the Built Environment at UNSW and to foster international and interdisciplinary research collaborations and partnerships with industry.

We undertake advanced and strategic consultancies with industry, utilising our analytical and laboratory testing facilities, many with the support of Australian Research Council (ARC) Linkage Project funding.

CIES consists of 130 staff and researchers, including fifty academic and research staff, 6 professional support staff and more than seventy-five PhD students, making it Australia's largest research centre for infrastructure engineering and safety.

In 2016, 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.

Acting Director: Professor Chongmin Song
Centre Manager: Irene Calaizis
Website: http://www.cies.unsw.edu.au/
Email: i.calaizis@unsw.edu.au

Researcher(s)	Research Topic	Granting Organisation	Value at 2016
I Gilbert, E Hamed	Time-dependent behaviour of precast concrete sandwich panels	ARC Discovery DP160102027	$134,578
W Gao, Y-L Pi, S Tangaramvong	Unified nondeterministic dynamic safety assessment of softening structures	ARC Discovery DP160103919	$124,226
M Bradford, H Vali Pour	Composite steel-timber structural system	ARC Discovery DP160104092	$150,106
Chongmin Song	Scaled boundary framework for adaptive and multiscale structural analysis	ARC Discovery DP160104628	$134,578
A Castel, A Mukherjee (Curtin)	Modelling and testing corroding reinforced concrete structures	ARC Discovery DP160104731	$69,578
C Song, F Tin-Loi, S Tangaramvong	From CAD and digital imaging to fully automatic adaptive 3D analysis	ARC Discovery DP150103747	$129,091
A Russell, D Muir Wood	Internal erosion of soils: microstructural modelling	ARC Discovery DP150104123	$109,215
MA Bradford	Buckling capacity of high-strength steel flexural members	ARC Discovery DP150100446	$139,029
S Foster, H Vali Pour	Rotation Capacity of Joints in SFRC Moment Resisting Beams and Frames	ARC Discovery DP150104107	$89,339
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	$181,305
A Russell, N Khalili	Shallow foundations in unsaturated soils: mechanistic design through numerical modelling, analysis and experimental investigation	ARC Discovery DP140103142	$154,642
W Gao, Y-L Pi, F Tin-Loi	Stochastic geometrically nonlinear elasto-plastic buckling and behaviour of curved grid-like structures	ARC Discovery DP140101887	$143,977
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
A Castel, S Foster, A Akbarnezhad, R Lloyd	A mix design approach to reduce early-age thermal cracking of concrete	ARC Linkage LP150100725	$196,704
S Foster, Hamid Valipour, Graeme McGregor	High Strength Concrete Beam-Columns with High-Strength Steel Reinforcement	ARC Linkage LP150101102	$194,151
M Bradford, B Uy, Yanlin Guo, Li Xian Dai	Composite steel-timber structural system	ARC Linkage LP150101196	$347,810
A Mukherjee, B Uy, V Karaganov, A Stanco	Laser Ultrasonic Health Monitoring for Australia's Infrastructure Assets	ARC Linkage LP150100475	$27,849
N Khalili , A Khoshghalb, J Rubsov	Experimental investigation and constitutive modelling of weak rocks subject to mechanical and moisture degradation	ARC Linkage LP140101078	141,726
C Zhang, B Uy, W-H Kang, W Huang, P Lv	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	$40,153
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)	$187,905
M Bradford	National Drop Weight Impact Testing Facility	Monash University / ARC LIEF Shared Grant - LE160100138	$12,500
A Russell	National Rock, Concrete and Advanced Composite Testing Capability	University of Queensland/ ARC LIEF Shared Grant - LE160100206	$10,000
W Gao	Performance assessment and optimal design for nano and composite structures	UNSW / Faculty Matching Funds - ARC IH150100006 ARC Research Hub for Nanoscience-based Construction Material Manufacturing	$26,500
S Foster	250 kN Universal Testing Machine	UNSW Major Research Equipment and Infrastructure Initiative Scheme (MREII)	$151,700
L Ge	Tech voucher project with Propeller Aerobotics	NSW Department of Industry	$22,000
K Senetakis	Academic Start Up Funds	UNSW Engineering Faculty Award	$30,000
S Foster	Emissions Reduction Fund Cement and Concrete Industrial Processes Study	Department of the Environment	$58,185
I Gilbert, A Castel	Shrinkage and cracking of concrete	Cement Concrete and Aggregates Australia (CCAA)	$50,000
N Khalili	Peer Review Liquefaction Assessment and Seismic Study – Mardi Dam	Wyong Shire Council	$10,850
N Khalili	Review of geotechnical design parameters	PSM Consult Pty Ltd	$14,500
C Song	Erosion of embankment dams and dam spillways	NSW Dams Safety Committee	$6,500
A Akbarnezhad	Design for Adaptability in Modular Construction and Advantages of BIM Integration into the Design Process	Modular Building Systems Pty Ltd	$31,700
Industry funded research projects undertaken by Geotech Group	Various	Geotech Group	$49,697
Industry funded research projects undertaken by Structures Group	Various	Structures Group	$54,172
TOTAL			**$3,274,266**

RESEARCH GRANTS

RCITI

Through strategic partnerships with government and industry, and some ground breaking innovations, the team at rCITI are shaping the way forward for the future of transport.

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.

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.

The Transport Engineering Research Group is recognised nationally and internationally for performing high quality theoretical and applied research in a diverse set of domains of transport engineering, and is the only one of its kind in Australia actively doing research on a comprehensive set of areas related to transport engineering including: network design; optimisation; pricing; safety; planning; risk assessment; demand modelling; public transport analysis; traffic management; land use modelling; simulation; operation research.

With eighteen academic and research staff, the Group has been rapidly expanding, with 26 PhD and 4 Masters students in 2016.

Centre Director: Advisian Professor of Transport Innovation Prof S Travis Waller
Centre Manager: Maria Lee
Website: http://www.rciti.unsw.edu.au/
Email: rciti@unsw.edu.au

rCITI Senior Investigator(s) / Advisor(s) / Researcher(s)	Subject Area / Research Topic	Granting Organization(s) / Industry Sponsor(s)	In Kind value 2016	Value for 2016
A/Prof Vinayak Dixit	Specification Linear Programming for Traffic Signal Performance reporting	Roads & Maritime Service		$95,475
A/Prof Vinayak Dixit	Traffic Networks	Google Maps Outreach Grant	$1M	
Prof S. Travis Waller; A/Prof Vinayak Dixit	Travel network and demand integration: dynamics, stochasticity, adaptivity	Medulla Soft Technologies Pvt Ltd (India) RG162238		$90,000
A/Prof Vinayak Dixit	Mobile Phone Distractions	Victoria Roads		$20,000
Prof S. Travis Waller	M4 Managed Motorway Evaluation	Roads and Maritime Services		$38,398
Prof S. Travis Waller	Adaptive Stochastic Dynamic Traffic Assignment	DP150104687 Australian Research Council (ARC) Discovery Project		$89,200
Prof Michiel Bliemer, Prof S. Travis Waller, Prof David Hensher, A/Prof Vinayak Dixit, Prof Elisabet Rustrom, Prof Stephane Hess, Prof Hans Van Lint.	Investigating Travel Choice Behaviour: A New Approach	DP150103299 University of Sydney / ARC Discovery Project Shared Grant		$93,276
A/Prof Vinayak Dixit, Dr Taha Hossein Rashidi Prof S. Travis Waller Mr Gopi Krishnan	Planning and operational models for food rescue and delivery to the poor	LP150101266 ARC- Linkage Project / OzHarvest - ARC Linkage Project Industry Partner Contribution		$50,812
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 Meead Saberi; Dr Taha Hossein Rashidi	Predictive Modelling of Vehicle Transaction	Royal Automobile Club of Victoria		$20,000
Prof S. Travis Waller	A Collaboration to Develop and Deploy Novel Integrated Network Techniques to Enhance the NSW Transport System.	RG134213 Transport for NSW		$250,000
Prof S. Travis Waller, Prof Michiel Bliemer, A/Prof 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 ARC Linkage Project / TSS-Transport Simulation Systems Australia P/L - ARC Linkage Project Industry Partner Contribution		$113,746
Prof S. Travis Waller, A/Prof 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 - ARC Linkage Project/ GoGet CarShare - ARC Linkage Project Industry Partner Contribution.		$55,996
Total			**$1M in kind**	**$1,002,369**

WRC WATER RESEARCH CENTRE

Australia's water management needs innovative and integrated solutions in terms of environmental, energy and social considerations. *The Water Research Centre (WRC) is an international leading university centre that provides multidisciplinary research in water resources, engineering, management and the development of tools for environmental management and sustainability for improving aquatic and atmospheric environments.* We also undertake commercial activity in collaboration with industry.

With its two research locations; WRC at the Kensington campus and the Water Research Laboratory (WRL) located at Manly Vale, we operate as an externally funded UNSW research centre within the School of Civil and Environmental Engineering.

Our history as a leading Australian water research organisation forms the base on which we have grown –we are now able to apply our experience and critical thinking across more than just water, into diverse (yet related) fields - Civil and environmental hydraulics: Water quality and treatment processes: Lifecycle assessment and sustainability: Waste management: Hydroclimatology: Carbon and water footprinting: Issues concerning atmospheric emissions and odour: Coastal engineering: Risk assessment.

WRC (Kensington) Centre Director: Professor Richard Stuetz
WRC (Kensington) Business Manager: Robert Steel
Website: http://www.wrc.unsw.edu.au/
Email: water@unsw.edu.au

Kensington Campus Hub Investigators	Research Topic	Granting Organisation	Cash received 2016 (ex GST)
D. Waite, J. Fletcher (UNSW), P. Kovalsky (Mincarb), Jianshu Zhao (Pangu)	Optimising CDI water treatment for ion removal and energy recovery	ARC Linkage Project LP150100854	241,184
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	191,170
T. Wiedmann (UNSW), M. Lenzen (Sydney University), S. Kenway (University of Queensland), P. Lant (University of Queensland), A. Halog (University of Queensland), P. Perez (University of Wollongong), R. Crawford (University of Melbourne),M. Diesendorf (UNSW), M. Balatbat (UNSW), G. Monroe (UNSW)	Enhanced modelling capacity for the Industrial Ecology Virtual Laboratory	UNSW / ARC LIEF Central Contribution	180,000
T. Wiedmann (UNSW), M. Lenzen (Sydney University), S. Kenway (University of Queensland), P. Lant (University of Queensland), A. Halog (University of Queensland), P. Perez (University of Wollongong), R. Crawford (University of Melbourne),M. Diesendorf (UNSW), M. Balatbat (UNSW), G. Monroe (UNSW)	Enhanced modelling capacity for the Industrial Ecology Virtual Laboratory	ARC LIEF LE160100066	149,419
F. Johnson, A. Sharma (UNSW), S. Chowdhury, R. Beecham (DPI Water)	Assessing future drought risk for water resources system management	ARC Linkage Project LP150100548	144,151
F. Johnson, A. Sharma (UNSW), S. Chowdhury, R. Beecham (DPI Water)	Assessing future drought risk for water resources system management	DPI-Water Linkage Project LP150100548	130,000
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	72,340
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 pretreatment strategies for remote community groundwater supplies	ARC LP130101107, Beijing Origin Water, Water Research Australia, Water Corporation of WA, Power and Water Corporation	71,990
D. Waite, S. Foster, A Castel, C. Arns (UNSW), L. Keyte (Boral Construction Materials Limited), R. Lloyd (Boral Cement Limited)	Development of innovative cement binders with low carbon footprint	ARC Linkage Project LP160101153	70,850
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	69,221

RESEARCH GRANTS

Kensington Campus Hub Investigators	Research Topic	Granting Organisation	Cash received 2016 (ex GST)
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 sub-daily rainfall intensity	University of Adelaide / ARC Discovery Project shared Grant DP150100411	41,192
L. Nghiem (University of Wollongong), W. Price (University of Wollongong), P. Perez (University of Wollongong), R. Stuetz (UNSW), H. Bustamante (Sydney Water), S. Murthy (District of Columbia Water and Sewer Authority)	Analytics to predict anaerobic codigestion & down-stream process performance	University of Wollongong / ARC Linkage Project Shared Grant LP150100304	32,805
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
A. Jones, R. Collins, D. Waite	Using mediated electrochemistry to correlate the reduction of trichloroethylene to the reduction potential of various Fe(II)-Fe oxide systems	Australian Synchrotron / X-ray Absorption Spectroscopy Beamline Access	1,314
A. Jones, R. Collins, W. Xiao	Transformation kinetics of ferrihydrite induced by the dissimilatory Fe reducing bacterium Shewanella onedensis and comparison with abiotic transformation kinetics	Australian Synchrotron / X-ray Absorption Spectroscopy Beamline Access	1,198
CRC GRANTS			
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	186,224
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	124,256
R. Stuetz	Litter management strategies to reduce odour emissions from poultry litter	UNSW Strategic Support Grant	100,000
T. Wiedmann	Integrated Carbon Metrics (ICM) – a multi-scale life cycle approach to assessing, mapping and tracking carbon outcomes for the Built Environment Scholarship - Soo Huey Teh	CRC For Low Carbon Living Limited	30,000
R. Stuetz	Energy Benchmarking for efficient, low carbon water recycling operations - Scholarship Ben Thwaites	CRC For Low Carbon Living Limited	22,500
R. Stuetz	Energy Benchmarking for efficient, low carbon water recycling operations	CRC For Low Carbon Living Limited	17,500
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	13,250
T. Wiedmann	Integrated Carbon Metrics (ICM) – a multi-scale life cycle approach to assessing, mapping and tracking carbon outcomes for the Built Environment - Scholarship top-up - Guangwu Chen	CRC For Low Carbon Living Limited	6,000
OTHER GRANTS			
D. Waite, P. Kovalsky, A. Kinsela	Development of robust low cost capacitive deionisation technology	Sir Ratan Tata Trust / International Contract	180,891
D. Waite	Overview of options for wastewater treatment and resource recovery	Beijing Origin Water Technology Co Ltd / International Contract	166,500
A. Zamyadi, R. Henderson, R. Stuetz	Capacity of granular/biological activated carbon for algal, taste and odour removal: Development of predictive tool	Melbourne Water Corporation / State Government Contract	95,000
R. Collins	Mbraun Anaerobic Chamber	UNSW MREII	65,409
D. Waite	Determination of factors causing strength increase on high level retardant addition to Portland Cement	Boral Cement Limited	50,686
S. Khan	Critical control point assessment to quantify robustness and reliability of multiple treatment barriers of a DPR Scheme	Hazen and Sawyer	50,263
B. Stanford, G. Johns (Hazen and Sawyer), S. Khan, T. Wiedmann (UNSW), M. Hadjikakou (UNSW)	Methodology for a comprehensive analysis (TBL) of alternative water supply projects compared to direct potable reuse WRRF-14-03	Hazen and Sawyer & Water Research Australia / WateReuse Research Foundation Subcontract	37,083
R. Collins	Faculty Silver Star	UNSW Faculty of Engineering	30,000
D. Waite	Faculty Silver Star	UNSW Faculty of Engineering	30,000
D. Waite (UNSW), B. Rittmann (Arizona State University), G. Rundblad (Kings College London)	Human health implications of intentional and non-intentional nanoparticle ingestion, injection and inhalation	UNSW / PLuS Alliance Collaborative Research Seed Grants	25,000
D. Roser	Wet weather overflows health monitoring	Sydney Water Corporation / State Government Contract	20,680
D. Waite	Development of sustainable zero-discharge wastewater treatment systems	UNSW / Tsinghua University Collaborative Research Fund - Seed Grants	20,000
T. Wiedmann	City carbon footprint networks using the Global Industrial Ecology Virtual Lab	UNSW / Tsinghua University Collaborative Research Fund - Seed Grants	20,000
R. Stuetz (UNSW), R. Barczak (Warsaw University of Technology)	OdourCOB - Odour characterization of odorants from biosolids	European Commission / Marie Curie International Outgoing Fellowships for Career Development (IOF)	18,523
S. Khan	Strategic analysis of water quality in the Parramatta river catchment	Jacobs Group (Australia) Pty Ltd / Parramatta City Council Subcontract	13,500
S. Khan (UNSW), J. Drewes (Technical University of Munich)	Modelling contaminant removal during wastewater treatment	UNSW / Australia-Germany Joint Research Cooperation Scheme	12,500
M. Hadjikakou	Our 'foodprint' matter – Australian diets and their environmental, economical and health impacts	Australian Academy of Science / WH Gladstones Population and Environment Fund	12,000
A. Anceno	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	9,228
S. Khan	Emerging contaminant research prioritisation decision framework	Water Environment and Reuse Foundation (WE&RF) / International Contract	8,602
A. Sharma	Flood inundation data assimilation - Scholarship for Sahani Pathiraja	CSIRO / Postgraduate Studentship	6,044
R. Stuetz	Optimisation of granular sludge for energy efficient wastewater treatment and reuse - Scholarship for Benjamin Thwaites	WQRA Postgraduate Scholarships	5,000
L. Marshall	Paxton catchment improvement program: Peer Review	Hunter Water Corporation / State Government Contract	4,772
A. Sharma	Wathnet model independent expert review	WREMA Pty Ltd / Contract Research	5,000
S. Khan	From collection system to tap: Resiliency of treatment pocesses for direct potable reuse	Sustainable Systems LLC -Consulting	4,114

RESEARCH GRANTS

Kensington Campus Hub Investigators	Research Topic	Granting Organisation	Cash received 2016 (ex GST)
M. Hadjikakou	Gordon Research Conference on Industrial Ecology 2016 & International Society for Ecological Economics Conference 2016	Ian Potter Foundation / Travel and Conference Grants	2,000
APPLIED RESEARCH			
N. Le Minh	Odour analysis	ABIGROUP Contractors & CH2M Hill Aus Pty	72,405
N. Le Minh	Odour analysis	ExcelPlas Pty Ltd	17,725
S. Khan, J. McDonald	Trace Organics analysis	Water NSW	13,500
N. Le Minh	Odour analysis	The Odour Unit	14,330
D. Roser	Consulting	Office of the Environment	11,375
N. Le Minh	Odour analysis	Peter Stephenson & Associates Pty Ltd	8,190
D. Waite	Consulting	Norton Rose Fulbright	8,100
N. Le Minh	Odour analysis	REHAU Pty Ltd	3,420
R. Henderson	LCOCD analysis	University of Queensland	1,320
N. Le Minh	Odour analysis	Sydney Water Corporation	830
R. Henderson	LCOCD analysis	Ecolab Pty Ltd	120
Total			**2,966,080**

water@UNSW water research centre

WRL

We are the Water Research Laboratory (WRL) - a world-leading academic research and consulting laboratory that endeavours to tackle the most challenging and pressing water-engineering problems faced by the world today relating to water and the environment.

As part of UNSW Civil & Environmental Engineering's Water Research Centre, we aim to deliver world leading water engineering research that results in real positive impact on a global scale. WRL is at the frontier of water engineering research. We pride ourselves on paving the way to discover and deliver new ideas, leading conversations and delivering solutions that have a global positive impact, be it new technologies to monitor and quantify changing coastlines, or restoring wetlands to preserve wildlife and ecological communities.

Based on Sydney's Northern Beaches, our globally-esteemed laboratory spans four hectares and is home to state-of-the-art facilities and equipment. Our personnel are comprised of the most experienced and creative problem solvers in their respective areas of research and industry.

Our expertise extends (but is not limited) to:

Estuarine, coastal and ocean hydrodynamics and sediment transport; Coastal zone monitoring, foreshore protection and management; River flow and floodplain management; Groundwater research and management; Civil engineering hydraulics; Catchment hydrology; Environmental studies and climate adaptation; Wetland restoration.

Our prestigious record built over more than 50 years has made us what we are today, a leading global think tank. We're a band of pioneers and experts driven by a passion to finding grand breakthroughs for a better tomorrow.

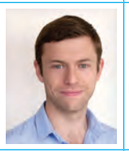
WRL Director: Professor Ian Turner
Centre Manager: Grantley Smith
Website: http://www.wrl.unsw.edu.au/
Email: info@wrl.unsw.edu.au

Northern Beaches WRL Hub Researchers	Research or Project Topic	Granting Organisation(s)	Funds received in 2016
Matt Blacka, James Carley, Ian Coghlan, Kristen Splinter, Ron Cox, Dan Howe, Ian Turner, Ben Modra, Chris Drummond, Alice Harrison, Mat Deiber, Toby Tucker, Mitch Harley, Matt Phillips, Josh Simmons, Will Glamore, Duncan Rayner	Coastal Engineering	Asian Development Bank via Tonkin and Taylor, Aurecon, Beatty Legal Pty Limited, Bega Valley Shire Council, Byron Shire Council, Central Coast Council, City of Gold Coast, Clarence City Council, CMS Surveyors, Coasts and Ports 2015 c/- Tonkin & Taylor Ltd, Department of Environment, Land, Water & Planning (Vic), Eco Logical Australia Pty Ltd, GHD Pty Ltd, Grün Solutions, Horton Consulting, HWL Ebsworth, James de Soyres & Associates Pty Ltd, JK Geotechnics, Manly Hydraulics Laboratory, Moyne Shire Council, Northern Beaches Council, NSW Department of Primary Industries - Fisheries, SIMS, Office of Environment and Heritage, Office of Strategic Lands Department of Planning & Environment, Pitt & Sherry, Shoalhaven City Council, Sydney Water, Tonkin and Taylor, Tweed Shire Council, Umwelt (Australia), Waverley Council	$1,295,152
Brett Miller, Grantley Smith, Chris Drummond, Stefan Felder, Bruce Cathers, Matt Blacka, Toby Tucker, Alice Harrison, Mat Deiber, Dan Howe, Ian Coghlan, James Carley, Priom Rahman	Civil Engineering Hydraulics	Drying Green Alliance, ACO Polycrete Pty Ltd, Golder Associates, NSW Fisheries, SPEL, Sydney Water Corportation, ACO Polycrete Pty Ltd, , Australian Water Partnership, Jindex Pty Ltd, Golder Associates	$587,718
Grantley Smith, Brett Miller, Stefan Felder, Bruce Cathers, Ron Cox, Doug Anderson, Alice Harrison, Ben Modra, Priom Rahman	Hydrology, Flooding and Water Resources	NSW SES , NSW OEH, City of Newcastle, WMAWater	$142,520
Will Glamore, Duncan Rayner, Brett Miller, Jamie Ruprecht, Alice Harrison, Toy Tucker, Doug Anderson, Ian King, Grantley Smith, Doug Anderson, Priom Rahman, Chris Drummond, Martin Andersen, Stefan Felder	Environmental Engineering	ARUP Pty Ltd, Clarence Valley Council, Department Of Commerce (For Clarence Valley Council), Ferrier Hodgson, Griffith University, Hornsby Council, Hunter Water Corp, National Climate Change Adaptation Research Facility (NCCARF), National Parks and Wildlife (OEH), Newcastle City Council, Newcastle Coal Infrastructure Group, North Coast Local Land Services, NSW Department of Primary Industries (Fisheries), NSW Environmental Protection Authority, NSW Office of Environment & Heritage, NSW Office of Water, DPI, Shoalhaven City Council, Sutherland Shire Council, NSW Office Of Environmental And Heritage: Parks And Wildlife Divi, Sydney Water Corporation	$1,620,184

RESEARCH GRANTS

Northern Beaches WRL Hub Researchers	Research or Project Topic	Granting Organisation(s)	Funds received in 2016
Doug Anderson, Martin Andersen, Denis O'Carroll, Priom Rahman, Alice Harrison, Duncan Rayner, Toby Tucker, Gabriel Rau, Helen Rutlidge, Will Glamore, Grantley Smith	Groundwater	Australian Nuclear Science and Technology Organisation (ANSTO), C M Jewell and Associates, C M Jewell and Associates, Eco Logical Australia Pty Ltd, GNS Science, JK Geotechnics, McMahon Earth Science, Newcastle City Council , NSW Department of Planning and Environment, RMS, Southern Highlands Coal Action Group, Mnorthern Beaches Council	$197,885
Prof Ian Turner, Dr Kristen Splinter, Dr Mitchell Harley (in collaboration with UNSW Aviation, Delft Technical University, University of Plymouth, University of Bath)	Beach Erosion and Recovery: Quantifying the Hazard	Australia Research Council – Discovery (DP150101339)	$158,200
Prof Ian Turner (in collaboration with UNSW Aviation, UNSW Faculty of Built Environment, UNSW Mining,	Integration of an airborne hyperspectral imager with an existing airborne LiDAR in a UNSW owned aeroplane	MREII (UNSW Major Research Equipment and Infrastructure Initiative Scheme)	$82,500
Prof Ian Turner, Dr Kristen Splinter, Dr Mitchell Harley (in collaboration with NSW-OEH)	Coastal Erosion – a STEM education initiative to promote school & community engagement	Office on Environment and Heritage (OEH) – NSW Adaptation Research Hub: Coastal Processes Response Node	$33,000
Brett Miller, Alice Harrison, Prof Ian Turner	Publically available datasets: online photogrammetry web portal	Office on Environment and Heritage (OEH) – NSW Adaptation Research Hub: Coastal Processes Response Node	$112,000
A/Prof Denis O'Carroll, Dr Martin Andersen (Prof A Baker, BEES)	Groundwater organic matter: carbon source or sink?	Australia Research Council – Discovery (DP160101379)	$148,000
Dr Martin Andersen (Bond, Eberhard, Froend & Kennard)	Research to inform the assessment of ecohydrological responses to coal seam gas extraction and coal mining.	Shared grant: Research program funded by the Office of Water Science, Department of the Environment and Energy, Commonwealth of Australia - RG150063 ($1.9M total)	$354,000
Dr Martin Andersen	NCRIS Groundwater Infrastructure Project	Department of Education NCRIS scheme	$433,500
A/Prof W Glamore, Dr Martin Andersen	The role of organic carbon for determining water quality in an artificially de-stratified dam, Chichester Dam	Hunter Water Corp	$10,000
Dr Gabriel Rau, Dr Martin Andersen (Prof A Baker, Dr Meredith)	Groundwater infrastructure program NSW	RAAP supporting NCRIS Funding - NSW Department of Industry - RG152978	$50,000
A/Prof Denis O'Carroll	Fate of engineered nanoparticles: Challenges in informing human and ecological health risk assessments	Australia Research Council – Future Fellowship (FT140100837)	$223,000
A/Prof Denis O'Carroll, Dr Martin Andersen, A/Prof Will Glamore, Prof Ian Turner, Prof Richard Stuetz (in collaboration with the Connected Waters Initiative)	Emerging Contaminant and Water Quality Laboratory	Research Infrastructure Scheme	$111,307
Dr Stefan Felder	2016 UNSW Faculty of Engineering Silverstar Award for ARC DP16 application	Faculty of Engineering UNSW	$30,000
A/Prof Ron Cox (ACCARNSI)	Australian Climate Change Adaptation Research Network for Settlements and Infrastructure - ACCARNSI – promote adaptation research and build capacity RG150174	NCCARF – Griffith University for Commonwealth Dept of Environment and Energy	$160,625
A/Prof Ron Cox (ACCARNSI)	Review of finance mechanisms for climate change adaptation RG162235	Griffith University – Department of the Environment	$4,500
A/Prof Ron Cox (ACCARNSI)	Optimisation of seawalls and beach nourishment for coastal adaptation	Office on Environment and Heritage (OEH) – NSW Adaptation Research Hub: Coastal Processes Response Node	$136,000
Total			**$5,890,091_**

PHD GRADUATES

STUDENT / [SUPERVISORS]		TOPIC
Alqurashi, Muwaffaq [Wang, Jinling]		Modelling and quality control for 3D UAV mapping
Ataei, Abdolreza [Bradford, Mark]		A low-carbon deconstructable steel-concrete composite framed system with recyclable beam and slab components.
Bai,Yun [Khalili, Nasser]		Coupled thermo-hydro-mechanical (THM) model for multiphase flow through deformable porous media with double porosity
Bracs,Melissa Anne [Turner, Ian L]		Efficient monitoring of sandy shoreline variability at the regional scale
de Burgh,James Matthew [Foster, Stephen J]		Hygro-thermo-mechanical study of concrete elements subject to elevated temperatures: assessment of spalling risk and moisture interactions
Do, Duy Minh [Gao, Wei]		Stochastic Interval Analysis of Structures in the Presence of Uncertain Fields
Figueroa, Ligaya Leah [Lim, Samsung]		Spatial modelling for understanding the correlation between school facilities and academic performance in the Philippines
Gharib, Mohammadmahdi [Foster, Stephen J]		Time-dependent numerical modelling of corrosion initiation in reinforced concrete structures under projected climate change impacts
Halloran, Landon James Szasz [Andersen, Martin & Rau, Gabriel]		Heat tracing in the variably saturated shallow subsurface
Hasan, Mohammad Mahadi [Johnson, Fiona & Sharma, Ashish]		Radar rainfall estimation: consideration of input and structural uncertainty

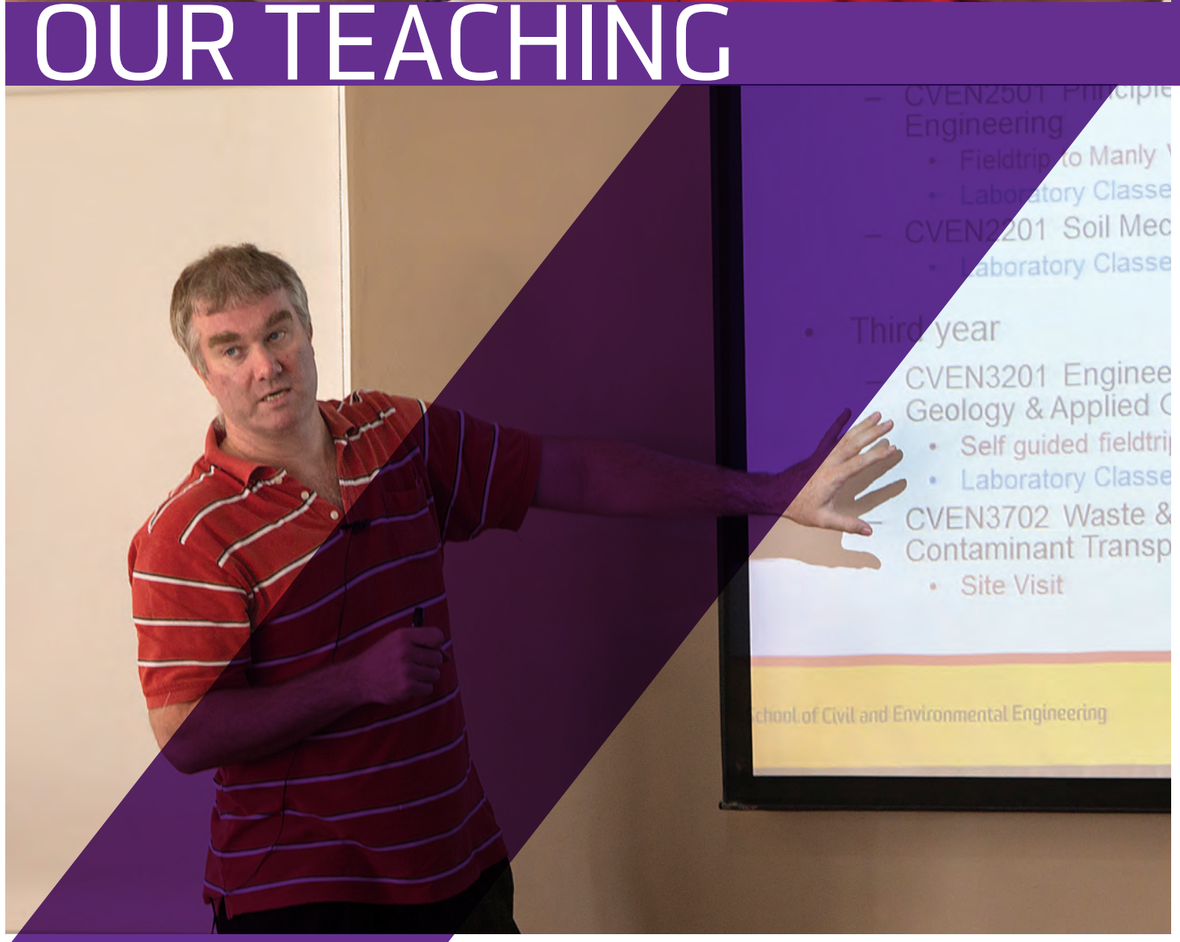
STUDENT / [SUPERVISORS]		TOPIC
Hashemiheidari, Seyed Komeil [Bradford, Mark]		Structural response and mitigating techniques for long-span cable-stayed bridges subjected to blast loading
Henderson, Ian E J [Uy, Brian]		Use of innovative anchors for composite action in rehabilitated steel structures
Howe, Daniel [Blenkinsopp, Christopher E & Turner, Ian L]		Bed shear stress under wave runup on steep slopes
Khan, Mahbub [Uy, Brian]		Behaviour and design of composite columns coupling the benefits of high strength steel and high strength concrete
Khan, Mohammad Zaved Kaiser [Sharma, Ashish]		Modelling seasonal rainfall forecasts forced with improved predictive ocean surface temperature
Kobayashi,Yumi [Khan, Stuart & Peters, Gregory]		Holistic Environmental Health Impact Assessment: Hybridisation of Life Cycle Assessment and Quantitative Risk Assessment using Disability Adjusted Life Years
Le,Hung Viet [Stuetz, Richard]		Fate of volatile sufur compounds in odour bags
Lui,Gough Yumu [Roser, David & Corkish, Richard]		Investigating photovoltaic-powered light-emitting diode based disinfection of water for point-of-use application
Ma,Xiaoming [Waite, David]		Investigations of Reactivity of Nanoscale Iron Particles for Degradation of Chlorinated Organic Contaminants in Seawater
Maheshwari, Pradeep [Waite, David]		Experimental and computational investigation of the formation, transformation and reactivity of iron oxides in wastewater treatment
Pells,Steven Edward [Douglas, Kurt & Peirson, William L]		Erosion of rock in spillways

PHD GRADUATES

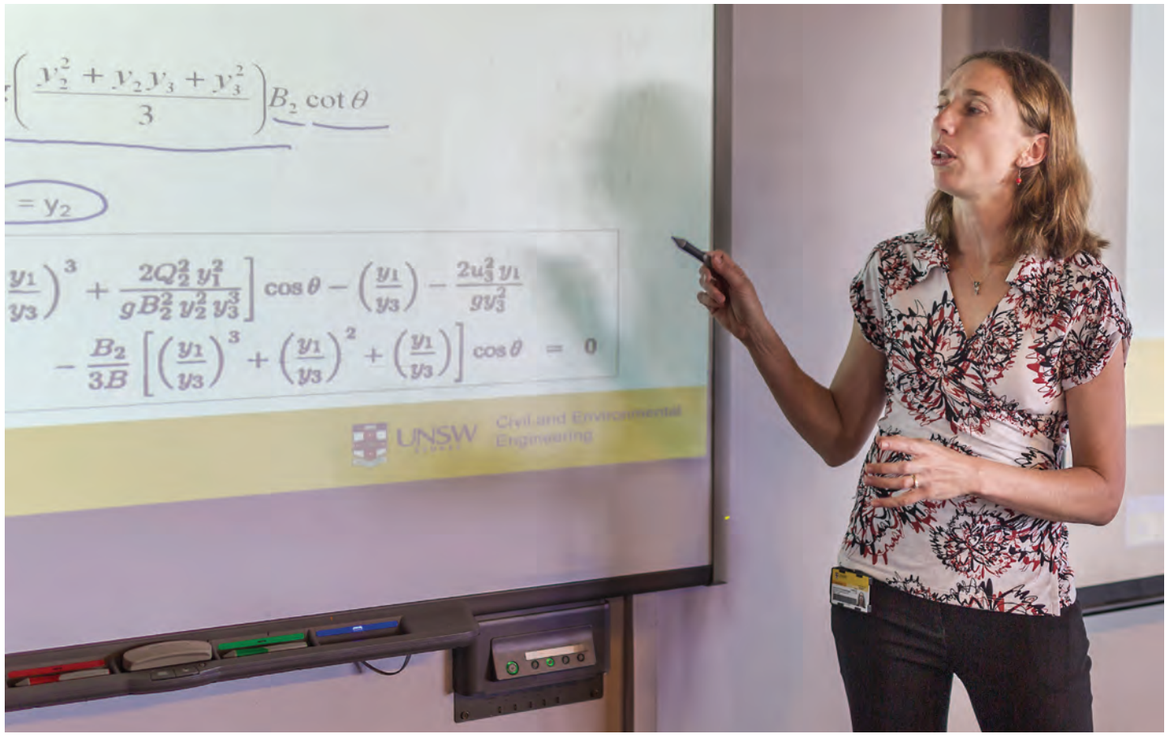
STUDENT / [SUPERVISORS]		TOPIC
Rana, Mohammad Masud [Uy, Brian]		The effects of bond and anchorage on the behaviour and design of composite slabs
Rocheta,Eytan [Sharma, Ashish & Evans, Jason P		On Low-Frequency Rainfall Variability Bias in Climate Model Simulations
Saputra,Albert Artha [Song, Chongmin]		A scaled boundary polyhedral element for three-dimensional analyses
Sepasgozar, Samad [Davis, Steven]		Technology adoption in construction.
Tang,Yi [Russell, Adrian]		Numerical Modelling of Shallow Foundations in Unsaturated Soils
Teo,Tiffany Li Lee [Khan, Stuart J & Coleman, Heather]		Chemical contaminants in swimming pools: Occurrence and health risk assessment
Tsarev,Sergey [Collins, Richard N]		Uranium interactions with reduced iron species: electron transfer between uranium and Fe(0)-Fe(II)-Fe(III) in natural clays and nanoscale zerovalent iron
Wasko,Conrad [Sharma, Ashish]		Continuous rainfall simulation in a warmer climate
Wijayaratna, Kasun [Dixit, Vinayak & Waller, S Travis]		Modelling disrupted transport network behaviour

STUDENT / [SUPERVISORS]		TOPIC
Wijesiri Pathirana, Indika [Uy, Brian]		Use of innovative shear connectors in construction and rehabilitation of steel-concrete composite beams
Yang, Chengwei [Gao, Wei & Tangaramvong, Sawekchai]		Interval elastoplastic analysis of structures
Yousefnia Pasha, Amin [Khalili, Nasser & Khoshghalb, Arman]		Study of water retention curve for deformable porous media
ME or MSc		
Alac Barut, Ruken [Rizos, Chris]		Space observation and Coulomb Stress Change Modelling: application to the Izmit earthquake
Chen,Kai [Wang, Jinling]		Stochastic modelling for vision-based indoor navigation
Liu,Youtian [Ge, Linlin]		InSAR technique for earthquake studies
Lu,Xueqing [Davis, Steven]		The effects of sound and priming on user safety decisions in virtual construction simulators
Norzahari,Nur Fadhillah [Lim, Samsung/ Trinder, John/ & Turner, Russell]		Stem Classification and Modelling from Lidar for a Semi-Automated Forest Inventory
Shakeel,Kiran [Waller, S Travis & Rashidi, Taha]		Modelling mode and route choice behaviour with adaptive data collection

OUR TEACHING



TEACHING AND LEARNING COMMITTEE



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.

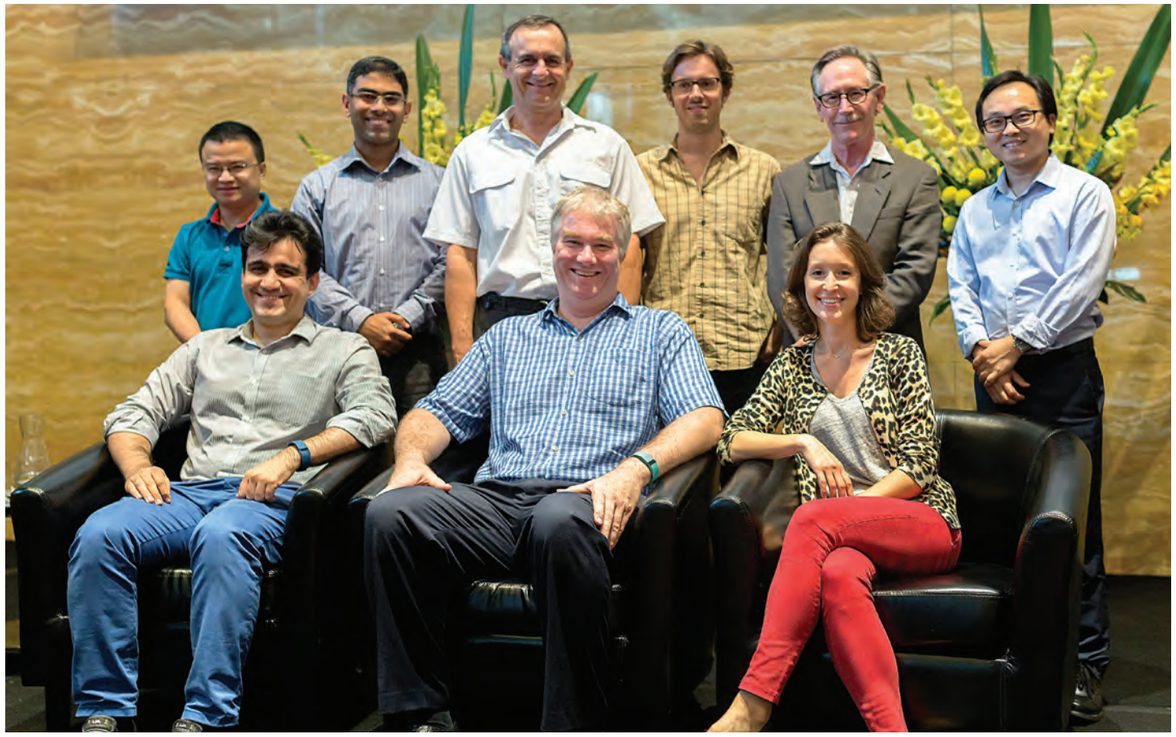
The major drive behind the Committee's agenda is to improve the learning experience of students.

The members of the committee in 2016 were:

CVEN Teaching and Learning Committee 2016

Dr Steven **Davis**	*Co- Chair (Operations & Scholarships)*
Prof Richard **Stuetz**	*Co- Chair (Technology & Innovation)*
A/Prof Mario **Attard**	*Associate Head (Academic)* *Civil Engineering Program Coordinator* *Structures Teaching Representative*
Kristy **Guia**	*Student Services Manager*
Stephen **Moore**	*Environmental Eng Program Coordinator*
Dr Lauren **Gardner**	*Civil with Architecture Program Coordinator* *Transport Teaching Representative*
Dr Bruce **Harvey**	*Surveying Teaching Representative*
A/Prof Stuart **Khan**	*Water and Environmental Teaching Representative*
Dr Arman **Khoshghalb**	*CIT & ET (Computing & Ed Tech Services) Liaison* *Geotechnical Representative*
A/Prof Tommy **Wiedmann**	*Postgraduate Coursework Coordinator*
Dr Hamid **Valipour**	*Year 1 Coordinator*
Dr David **Rey** & Dr Johnson **Shen**	*Year 2 Co - Coordinators*
Dr Ehab **Hamed**	*Year 3 Coordinator*
Dr Taha **Rashidi**	*Year 4 Coordinator*
Dr Kostas **Senetakis**	*Industrial Training Coordinator*
Dr Fiona **Johnson**	*Elite Student Coordinator*
A/Prof Jinling **Wang**	*Faculty IRC Rep*

SCHOOL TEACHING INITIATIVE GRANT SCHEME (STIGS) –INNOVATIVE TEACHERS 2016



L-R: Back: An Ninh Pham, Taha Rashidi, Bruce Harvey, David Rey, Stephen Moore, Johnson Shen Front: Ali Akbarnezhad, Steven Davis, Lauren Gardner.
Absent: Ali Amin, Mario Attard, Richard Stuetz, Travis Waller.

In 2016 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 2016 projects – involving twelve teaching staff – included:

Online teaching innovations and improvements within undergraduate and postgraduate courses, including:

- the creation of Online Assessment Tools for Graphical Modelling Problems in construction courses (Dr Steven Davis)
- the development and integration of visualization and online simulations tools (animations) for enhancing the education experience of second year transport design , planning, and modelling courses (Drs Taha Rashidi and Lauren Gardner); and
- an online, user-oriented design and evaluation framework for ENGG1400 workshops and assessments. ENGG1400 is a first year course in optimization and modelling for engineering students who desire a higher capability in the application of the modelling of engineering systems, and seek to acquire a set of optimization tools that can then be applied to various engineering applications. School teaching Staff involved - Dr David Rey, Dr Lauren Gardner & Prof S Travis Waller - aim to create a tool that can automatically assess, grade, and provide feedback for student computer models.
- Dr Ali Amin and A/Prof Mario Attard will purchase video camera equipment to allow live demonstrations of structural tests conducted in the School's laboratories to be transmitted to the lecture theatre where students will engage in prediction contest for strength and response of reinforced concrete beams.__
- V-C Teaching Excellence Award winner Stephen Moore's *Learning Engineering Business and Consulting Skills by Doing:* which aims to support students in the establishment of an End of Life Computers Re-use and Recycling Social Enterprise as a model for future similar student enterprises.
- Prof Richard Stuetz, Dr Anh Nin Pham, Stephen Moore and Lila Azouz's STIG's project will use Unmanned Aerial Vehicles (UAVs) to obtain video footage of water and wastewater treatment operations – this will be incorporated into the existing online scenario based flowsheet learning activities and used as a 3D teaching tool for Water and Wastewater Treatment infrastructure investigations.

EDUCATIONAL EXCELLENCE – A DISTINCTIVE CVEN MODEL

It was another busy, active and inspired year for the dedicated teachers at the School and the hardworking Committee. It began with the 2016 School Teaching Retreat, held on 18 Feb at Coogee Surf Lifesaving Club. The theme was "Educational excellence – a distinctive CVEN model." The Retreat was oriented towards the UNSW 2025 Strategic Plan's commitment that we will deliver: *"Exemplary education for every student through integrating the most innovative developments in digital and face-to-face learning into novel solutions, to improve educational quality and the student experience."*(UNSW 2025 Strategy, Commitment 3, p7)

School presentations included 'Creation of Online Assessment tools for Graphical Modelling Problems' by Steven Davis : 'Blended Learning Using E-learning Interactive Water and Wastewater Flowsheets Lessons with an in-class Flowsheeting Group Activity'by Richard Stuetz and Stephen Moore: 'Web-based Learning: A Solution for Over-sized Classrooms' by Taha Hossein Rashidi and Lauren Gardner.

Sharing their expertise and experience with us, David Collien from Open Learning spoke on 'Using technology for the development of a personalised learning experience' and Lila Azouz – Education Developer Consultant UNSW Learning Centre, presented on 'Education technology in the delivery of a blended learning experience and the development of on-line modules'. University and Faculty Perspectives were provided by Prof Geoffrey Crisp – PVC (Education) and Prof Maurice Pagnucco – Deputy Dean (Education).

Small Group Discussions were held throughout the day considering, amongst other things - what is the most effective method for improving teaching quality and learning outcomes and where and how should the School be investing in teaching? Staff from each discipline were then asked to select one discipline based course for implementation of a blended leaning (or other) model, and asked to map the learning outcomes, dissect the curriculum and present a preliminary implementation on a week by week basis – mindful of the UNSW 2025 educational strategy. What resourcing would be needed to support course change champions.

ALI AMIN

VC AWARD FOR TEACHING EXCELLENCE

In 2016 Dr Ali Amin won a UNSW Vice-Chancellor's Award for Teaching Excellence (Early Career). The awards recognise excellence in: approaches to teaching and the support of learning that influence, motivate and inspire students to learn; development of curricula, resources or services that reflect a command of the field; evaluation practices that bring about improvements in teaching and learning.

"Excellence in teaching is an essential and fundamental mission of our University and it is very pleasing to be able to formally recognise your contribution this way," President and Vice-Chancellor Professor Ian Jacobs said on congratulating Dr Amin.

Dr Amin has been lecturing subjects in Construction and Structural Analysis and Design within the School since 2013. He has redeveloped courses and introduced a number of blended learning initiatives to the courses he teaches by utilizing videos, animations and construction site visits and field trips - all of which encourage student engagement, motivation and deep learning.

Ali is a firm advocate in empowering our students with the skills and competencies required to meet society's demand for high quality and responsible engineers. He does so by providing demanding, high quality courses with a high level of interaction. Students value the real-world emphasis in the courses he teaches and consistently rate Ali's enthusiastic and innovative teaching extremely highly.

Fifteen of the School's academics have been awarded the prestigious UNSW Vice-Chancellor's Award for Teaching Excellence since its introduction in 1989. With only fifteen Awards presented each year - and with UNSW academic staff members numbering over 2,600 - the School of Civil & Environmental Engineering has been very well represented.

DEVELOPMENT OF NEW FOURTH YEAR COURSES

In 2016 the School made a significant investment in the development of three new fourth year courses –integrating new learning methods and providing us with more flexibility in delivery. The three courses are: CVEN4060 – Student Led Project, CVEN4300 – Structures Practicum, and CVEN4106 – Construction Practicum. These courses will involve more practical subjects, where the students have the opportunity to work in teams, design a project, and implement the idea drawn upon. They have been designed so that students will have hands on learning experience that enables learning by doing. The student groups will be required to make or build something, and then follow up to assess how successful the whole process has been Students will only be allowed to do one of these subjects.

2016 ADMISSION, ENROLMENT, GRADUATE STATISTICS

Undergraduate	Commencing	Enrolled 2016 Sem 1	Graduated 2016
3620 BE Civil Engineering		918	205
3624 BE Civil with Architecture		186	32
3625 & 3707 BE Environmental		74	17
3146 BE Civil/BE Mining		99	21
3621 , 3626, 3703, 3704, 3763, 3766 BE BA *		22	4
3631 & 3773 BE Civil/ BE Enviro		132	20
3715 & 3764 BE/BCom**		418	51
3730, 3735, 3767, 3772, 3941, 3942, 3762 BE BSc		95	14
3742, 3746, 3707,3776 BE Surveying & Geoinfo Systems		89	9
4776/4777/4778 BE/LLB (Engineering/Law)		19	2
Total Undergraduates	**693**	**2052**	**375**
Postgraduate Coursework	**Commencing**	**Enrolled Sem 1**	**Graduated**
5338 & 7338 Grad Dip & Grad Cert		28	5
8538 & 8338 MEngSc		495	226
8539 MEngSc (Extension)		35	32
8621 ME (coursework) new		102	7
Total Coursework	**342**	**660**	**270**
HDR	**Commencing**	**Enrolled Sem 1**	**Graduated**
PhD		186	33
ME		20	6
Total Higher Degree	**38**	**206**	**39**

ADVICE TO GRADUATES

Dr Robert Care, CVEN alumnus and Strategic Geographies Leader of global consulting group Arup gave an inspirational occasional address at the November 2016 graduation ceremony for UNSW civil and environmental engineering students.

In it he urged graduates to understand that an engineering career is not, will not and cannot ever be a narrow focus on technical issues, but rather a facing of the planetary and societal issues - 'resource scarcity and security – ***water, food, energy*** – poverty, growing inequality, urbanisation and climate change. **All** are engineering challenges.'

Dr Care shared honestly from his own personal journey as an engineering leader, and advised graduates to ensure they took care of themselves, sought help when needed, and selected wisely those elements which form a balanced life.

'You have chosen a great calling,' he said, 'designing and building our futures – in consulting or in contracting, in industry, in finance, in management consulting, or even in politics.

You have all the skills to make a huge difference, a major contribution to the **people** on our **tiny, cool, blue planet**. There are wonderful opportunities out there for you. Take those opportunities. Embrace change. Embrace failure. Grow. Learn. Give and receive.

And one final message – **just go for it**.'

STUDENT LIAISON

In 2016 the T&L Committee organised regular student focus groups, with a new position created in CEVSOC for TLC liaison – giving undergraduate students a voice in the structure and delivery of courses.

The Committee also supported the student organisation CEVSOC including:

CEVSOC International Night: The focus was on assisting international students finding jobs for IT and after graduation. There was also a focus on how they can get more involved with University and School life. There were around 40 students in attendance.

Thesis information Night: Ron Cox and Ian Turner attended to discuss the two Thesis options in the new program. Students completing Thesis also spoke of their experiences. 130 students were in attendance.

STUDENT PRIZES

CVEN STUDENT PRIZES 2016

University Medal Winners

Congratulations to our two 2016 University Medallists for their outstanding academic performance - soaring above even the rigorous standards of an Honours Class 1.

	**Camellia Wong**	University Medallist BE Civil Engineering
	**Ahmed Nashwan Abdul Matheen**	University Medallist BE Environmental Engineering

Year 1 prize

Nikolay Kumiashvili	Jacob N Frenkel prize: for the best achievement in Civil Engineering for a first year student

Year 3 prizes

Griffen Mallows	Welding Technology Institute Of Australia Prize: for the best performance in CVEN3303 Steel Structures
Zoe Gillespie	The Full Time Class Of 1962 Civil Engineering And Surveying Alumni Prize: for the female student with the highest WAM at the end of 3rd year.
David Morgan	The JK Geotechnics Prize: for the best performance in CVEN3202 Soil Mechanics
Karin Ching	The Crawford Munro Memorial Prize: for the best performance in CVEN3501 Water Resources Engineering
Darren Pham	The ASI Undergraduate Steel Design Award: for the best performance in CVEN2301 (Mechanics of Solids) & CVEN3303 (Steel Structures)

Final Year prizes

Camellia Wong	Alexander Wargon Prize: for Best performance in the Structures Discipline in the BE Civil Engineering degree
Ebony Catalano	The Engineers Australia Civil and Structural Engineering Prize: for the best performance in Structural design in the final year of the degree

SAGE prizes

Luke Chidzey	EGM Memorial Prize : for outstanding performance in GIS courses
Allen Qi	Assoc Of Public Authority Surveyors: for the best performance in SAGE courses in first year
Belinda Serafin	Consulting Surveyors NSW - Land Development: Awarded to the graduating SAGE student with the bestmark in Cadastral and Land Development courses
Alec Xie	SSSI - For Photo & R S: Awarded to the student with the best total mark in the Photogrammetry and Remote Sensing course
Eloise Harch	R.S. Mather Memorial : Awarded to the student with the best total mark in Geodesy courses: GMAT2700 and GMAT3700.
Belinda Serafin	The Bossi Medal: for the best performance in the final year of the Bachelor of Surveying & Spatial Information Science
Eryan Chen	Maurice Maughan Prize: Awarded to the student with the best total mark in GMAT2500 and GMAT2550
Belinda Serafin	Institution of Surveyors NSW Inc Prize: for the best performance by a graduating student in the BE in Surveying and Spatial Information Systems

Year4 Industry Sponsored prizes

	**Madeline Harty**	The Civil & Environmental Engineering (CVEN) Civil with Architecture Discipline Prize, sponsored by ARUP
	**Cassandra Murphy**	The CVEN Environmental Engineering Discipline Prize, sponsored by Royal HaskoningDHV
	**Katherine Hannigan**	The CVEN Construction Management Discipline Prize, sponsored by Multiplex
	**Julian Ng**	The CVEN Geotechnical Discipline Prize, sponsored by PSM
	**Nurinda Suastha**	The CVEN Structures Discipline Prize, sponsored by Aurecon
	**Belinda Serafin**	The CVEN Surveying Discipline Prize, sponsored by RPS
	**Navreet Virdi**	The CVEN Transport Discipline Prize, sponsored by AECOM
	**Thomas Darley**	The CVEN Water Discipline Prize, sponsored by GHD
	**Carla Frankel**	The CVEN Practice Prize, sponsored by Cardno

Other prizes

Chaitanya Baldeo, Randil Pohorambage, Yuyi Liu, Steve Jun Jie Lu	School of Civil and Environmental Engineering Display Prize: for the best student group to create a business proposal and display that defines and promotes the School

Winners of Dean's Awards 2017 for studies completed in 2016

The Dean's Awards are prestigious awards - given to the highest academic achieving UNSW Engineering students - students who have a minimum High Distinction average!

Name	Program name
Ming En Chin	Bachelor of Engineering/Bachelor of Arts
Josiah Blas Fajardo	Bachelor of Engineering/Bachelor of Laws
Roy Fu	Bachelor of Civil Engineering/ Bachelor of Science
Jefry Halim	Bachelor of Engineering (Honours)
Jianan Jiang	Bachelor of Civil Engineering
Jason Waihay Ko	Bachelor of Engineering/Bachelor of Commerce
Jason Lam	Bachelor of Civil Engineering
Monica Laut	Bachelor of Civil Engineering/ Bachelor of Environmental Engineering
Kevin Luu	Bachelor of Engineering(Hons)/ Bachelor of Science (Computer Science)
David Michael Morgan	Bachelor of Engineering/Bachelor of Commerce
Daniel Christian Setioso	Bachelor of Engineering/Bachelor of Commerce
Dan Su	Bachelor of Engineering (Honours)
Clinton Ngo Tran	Bachelor of Engineering (Hons)/ Bachelor of Commerce
Atheththan Vigneswaran	Bachelor of Engineering (Honours)
CharlieZeng	Bachelor of Engineering (Hons)/ Bachelor of Commerce

ENGINEERING STUDENTS

Staff and Students get ready for the Cardno Cup 2016

CEVSOC SPORTS & CHARITY

CEVSOC Sports & Charity Manager for 2016 CEVSOC Mary Hadjiangeli was busy during the year – coordinating amongst other things, the **World's Greatest Shave** – which fundraises for the Leukaemia Foundation - and the annual **Cardno Cup football match** between staff and students. Old age and cunning won over youth and beauty again in the Cardno cup where CVEN staff and students played a scintillating game. Both sides displayed a high level of football skills, team work, discipline, commitment and style. Staff won 5 -3. Condolences and thanks to the student team, the ref, and to our loyal industry supporters and annual sponsors Cardno.

Mary and hairdressing assistants with brave shavee Jeff Thomas

E-REUSE

Environmental engineering student Charlotte Wang and Rohan Pala (civil engineering/commerce) were at the forefront of a new campus–wide scheme (eReuse Inc) to save UNSW computers from landfill – refurbishing and then recycling them for people who lack access to computers. The School of Civil and Environmental Engineering was the first UNSW group to sign up for e-Reuse. Moreover, valuable funding and support for the development process was provided throughout 2016 by the Head of School Professor Stephen Foster and the School's Teaching and Learning Committee.

GROUNDWATER RESOURCE INVESTIGATION CVEN 4503

The fourth year course in groundwater involves a program of field work and data analysis undertaken at the UNSW Farm in Wellington, NSW.

COASTAL ENGINEERING STUDENTS VISIT BOTANY BAY AND CRONULLA

In May 2016, 60 budding coastal engineers from the CVEN9640 Coastal Engineering class were taken on a tour of Botany Bay and southern Sydney by Water Research Laboratory Director Professor Ian Turner and Senior Research Associate Dr Mitch Harley. Among the places visited were the Banksmeadow Revetment, where they observed the 20 tonne tri-bar and dolos units placed along the reventment to protect Port Botany from wave attack. This was followed by a visit to various groyne structures around Lady Robinsons Beach and Kurnell. To finish the day, the students had a close inspection of the "seabee" seawall in Cronulla and observed different beach processes in action.

SUSTAINABLE INFRASTRUCTURE

The VC, Professor Ian Jacobs, was impressed when he visited the showcase of the fourth year course Planning Sustainable Infrastructure. Reflection on and celebration of the Mer Island culture and the development of learning and engineering outcomes were the themes of this year's showcase. The Mer Project was approached by final-year students in technical and consultative ways that recognised the importance of culturally responsive and integrated solutions.

SAGE TRIGS TRIP

So how does laser radiation propagate through the atmosphere? Students investigated exactly that during a surveying practical exercise with their lecturer Dr Craig Roberts at the North Bondi trigonometric station measuring to colleagues at Clovelly and Maroubra trig stations.

CEVSOC / SURVSOC

CEVSOC Office Bearers for 2016:

George **Chard**	*President*
Alex **Warren**	*Vice-President*
Claudia **Burbidge**	*Treasurer*
Jessica **Vorreiter**	*Secretary*
Guy **Baumber**	*Arc Delegate*
Shabab **Jahan**	*Promotions Manager*
Joe **Zheng**	*ENGSOC Representative*
Mary **Hadjiangeli**	*Sports & Charity Manager*
James **Mallett**	*Major Social Events Manager*
Zoe **McLaughlin**	*Technical Events Manager*
Simon **Chan**	*Weekly Events Manager*
Aurelia **Israel**	*International Student Manager*
Charlotte **Wang**	*Teaching & Learning Representative*

2016 saw CEVSOC continue its transformation into a progressive, diverse and inclusive student community with one of the largest and most active member bases of any society at UNSW. Our member base almost doubled in 2016, increasing to over 1000 people compared to 600 in the previous year. We were able to introduce a number of brand-new events and initiatives to broaden our scope and cater to members with different interests. As a result of this expansion, the CEVSOC committee likewise expanded to almost twice its previous size, allowing us to take on more people than ever!

The events offering got a major boost in 2016 expanding to 30 events in 2016 compared to 15 in 2015. 2016 saw the introduction of case competitions, trivia nights, hikes and many more opportunities for our members to get involved. These new event offerings allowed us to cater to a wide range of tastes and ensure that CEVSOC offered something for everyone. Our event attendance also sky-rocketed in 2016, with every ticketed event selling out and attendances up to doubling across the board.

A suite of changes were made to promote diversity and inclusion within CEVSOC. Most notable was the establishment of the first-ever international student position on the main committee, to give these students a voice in the direction of the society. This led to the introduction of professional information nights dedicated to international students, the modification of our current events to be more sensitive to different cultures and the translation of our marketing material into other languages.

We also introduced a Teaching and Learning Committee position to give our students a voice in the structure and delivery of courses. This position saw huge interest and led to the running of a number of student focus groups to get our members' voices heard.

CEVSOC collaborated with over 10 student societies in 2016, including PsychSoc, WIESOC, CSESOC and EWB. Collaboration with other societies allowed our members to meet new people and discover extra-curricular opportunities outside of their scope of study. Our collaborative events proved to be extremely successful and created a vibrant social atmosphere for those involved.

Networking is tough for undergraduate students. However,

CEVSOC President George Chard

International Student Manager: Aurelia Israel

networking is simultaneously one of the most important skills to develop before entering the engineering industry. To try and remedy this issue, CEVSOC introduced our first-ever Third Year Camp in 2016. This event involved taking 120 students and a group of 10 industry representatives for a weekend away filled with networking, engineering challenges and team building activities. Networking over drinks and canapes can be tough, but networking over a scavenger hunt or an archery competition proved to be much easier! This event saw huge interest from students and even went on to win the coveted Arc Club Activity of the Year award for 2016!

Leading CEVSOC was an amazing experience and I can't be anymore grateful for the opportunity to give back to my student body. I would like to give my thanks to our dedicated member base for their enthusiasm and involvement, this year's committee for their exceptional hard work and dedication, and finally our industry sponsors and School for their unwavering support of our unique student community. 2016 was a great year for CEVSOC and I can't wait to see what the new committee achieves in 2017.

George Chard
CEVSOC President 2016

3rd year camp 2016 group activity

Surveying Camp Berry

SURVSOC- THE SURVEYING SOCIETY

2016 Office-Bearers

Luke **Chidzey**	*President*
Luke **Haavisto**	*Vice President*
Jacky **Chan**	*Treasurer*
Hannah **Pearce**	*Secretary*
Conor **Molloy**	*ARC Delegate*
Tim **Cook**	*AUSIM/Industry Representative*
Mitchell **Bradac**	*4th Year Representative*
Angus **Baxter**	*3rd Year Representative*
Karats **Eisenmenger**	*2nd Year Representative*

Another good year for SurvSoc, which set up a FaceBook page to better connect and communicate.

Aiming High 3rd Year Camp 2016

YEAR 4 DINNER

The School's industry-subsidised annual Year 4 dinner was held at the Shangri-La Hotel at Circular Quay, and a good time was had by all. Industry sponsored prizes were awarded at the dinner to outstanding students in several disciplines (see pp46-47 for full list). Our congratulations to them and to all our wonderful hard working students, and thanks to our generous industry sponsors for their continuing support.

SAGE

INDUSTRY & COMMUNITY

INDUSTRY ADVISORY COMMITTEE

The Industry Advisory Committee is an important means by which links between the School and industry are maintained. Its main function is that of a "sounding board" for the School in regard to undergraduate and graduate programs, research directions and community outreach.

The IAC membership represents a broad cross section of relevant industry sectors at a senior and influential level. This year, 2016, we welcomed many new members – alumnus Christine Atkins, National Manager, Transport Policy at Infrastructure Partnerships Australia (IPA); Ross Jones, Jacob's Vice President | Buildings & Infrastructure | Eastern- Asia Pacific region; Paul Plowman, General Manager, Liveable City Solutions at Sydney Water; alumnus Narelle Underwood, NSW Surveyor-General ; and Harry Young, Regional Director of Multiplex.

We farewelled, and sincerely thanked, outgoing members Paul Harcombe, who retired from his position as NSW Deputy Surveyor-General, and Eric de Rooy who has moved to a new role at Sydney Water.

In Feb 2016 I chaired the School's annual teaching staff retreat – which focussed on educational technologies, the 'blended learning' model, UNSW and Faculty educational strategies, and called for staff input in envisioning ' a CVEN model for excellence in education'.

In keeping with our commitment to raise the community profile and the enrolment levels of surveying and geospatial degrees - in 2016 the ERC / IAC met with NSW Surveying task force in March to discuss current and future strategies. The year showed some improvement in undergraduate surveying fortunes, with student enrolments almost doubling in the three years since the School of Surveying and Geospatial Engineering had re-merged with CVEN.

Members of the IAC also provided support and feedback for the School during its successful EA Accreditation process in May 2016.

In May the Dean, Professor Mark Hoffman, made a presentation at the IAC meeting, and we raised with him our ongoing concerns about the continuing decline in high school students studying extension mathematics. 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.

In August we were delighted when IAC member and CVEN alumnus Kourosh Kayvani was awarded the 2016 John Connell Gold Medal –presented annually by EA to an outstanding structural engineer, and Athena Venios – also IAC member and CVEN alumnus - won the 2016 Judy Raper Award for Leadership in Engineering. In September IAC member and alumnus Narelle Underwood became Australia's first woman Surveyor-General. The IAC is committed to supporting UNSW and CVEN women in engineering programs and encouraging more diversity in the profession.

In August IAC members reviewed and provided feedback to the Head of School on proposals for three new fourth year hands-on courses – which involve the opportunity for students to work in teams, design a practical project, and implement the idea drawn upon. In my own view, every course should reinforce the notion of the creative process, introducing procedures that challenge the students to question more, and continually daring engineers to think outside the box.

The IAC and the School have taken a long term approach to raising the profile and maintaining the excellent reputation of the School with 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 is supported individually and collectively by IAC members, and each continues to receive very favourable feedback from participants.

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

Ian McIntyre
Chairman

Ian **McIntyre**
Principal and Global Service Lead, Contractual Services, Advisian

Ian McIntyre is a Principal of Advisian and is the Global Service Lead, Contractual Services. He graduated in Civil Engineering from UNSW in 1974 with First Class Honours. As a consultant for thirty 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 conversely 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 Agnew 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 ten years at St. Aloysius College at Milsons Point in that role. Deirdre is currently a director of Australian Careers Advice, a professional careers consultancy.

Christine **Atkins**
National Manager,Transport Policy
Infrastructure Partnerships Australia

Christine Atkins is currently National Manager, Transport Policy at Infrastructure Partnerships Australia –the nation's peak infrastructure forum, comprising public and private sector CEO Members, advocating the public policy debate around solutions to Australia's infrastructure challenges. Christine has over fifteen years' experience in analysis and assessment of major transport and infrastructure projects, having worked on complex and high-profile projects both within Australia and overseas. She has experience in strategy and policy analysis and development, financial modelling and government sector procurement, including PPP projects, business case development, procurement design and tender evaluation.

Prior to working in the Commercial Advisory Team at Deloitte, she worked with Booz Allen Hamilton, following a period with MVA, London on the Congestion Charging Project. Previously, she worked for two years in the Infrastructure Advisory and Corporate Finance areas at Andersen. Prior to this, she worked in traffic and transport engineering at Sinclair Knight Merz.

Christine has a BE Civil Hons (1999) from UNSW, and a Grad Dip in Applied Finance and Investment (2003) from the Financial Services Institute.

Laurie **Foy**,
Consultant

Laurie has over 30 years construction industry experience gained both locally and in South East Asia, and is currently providing consultant services in Development Management / Project Management to SHPL.

Prior to this Laurie worked for Brookfield Multiplex from 1991 to 2015, beginning with leading the Sheraton on the Park project. He then provided leadership to teams on some of Brookfield Multiplex's most exciting and 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.

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

James is a director with the Engineering Excellence Group at Laing O'Rourke, an global team of technical specialists and innovators that seek smarter ways to do things, to challenge traditional practice. He sits in between the 'blue sky thinkers' and project teams and brings them together so that the innovations and thoughts can be manifested in real situations.

After studying a combined undergraduate degree in civil engineering and geology, it was the Thredbo Landslide in 1997 which led James to a PhD in geotechnical engineering at UNSW and really focused his career. He looked at slope behaviour prior to a landslide, and 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.

James relishes the conversations he has with clients about how new ideas and technologies could be integrated into projects to provide greater efficiency. He focuses on innovative engineering solutions that can provide smarter, faster, cheaper and safer delivery, increased quality and improved performance.

Laing O'Rourke was recently listed in the top 10 of the BRW Most Innovative Companies, in part due to some of the ground-breaking work happening within their Engineering Excellence Group.

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.

Ross **Jones**
Vice President Buildings & Infrastructure Eastern Region - Jacobs

Ross Jones is Jacobs' Vice President Eastern, responsible for leading the Jacobs business across Australia's Eastern States. He oversees the major business lines of Transport, Water Environment & Spatial, Built Environment, Power Consulting and Project Management/Construction Management.

Ross is a Company Director of Jacobs, having been with the organisation (incl. SKM) for over 18 years. His experience covers a variety of technical disciplines, including environmental impact assessment and management, community consultation, air quality management, traffic noise and ecologically sustainable development. He has project managed integrated concept design and EISs, predominantly for transport projects and has prepared numerous construction environmental management plans. He has also been project manager on several community consultation projects. In recent years, Ross has been involved in collaborative contracting at the ALT level on construction and planning projects.

Previously, Ross held the position of SKM's Global General Manager – Water & Environment prior to the merger with Jacobs. Before that, he held a range of operations, client management and technical leadership roles in SKM.

Dr Kourosh **Kayvani**
Global Director of Excellence & Expertise, Aurecon

Professor Kourosh Kayvani is Global Director of Excellence & Expertise at Aurecon. In his 28 years in the industry, he has played key roles in the engineering of many innovative, complex structures across the globe, including Wembley Stadium in the UK, West Kowloon Terminus in Hong Kong and in Australia: ANSTO OPAL nuclear reactor, the Sydney Hockey Stadium, Brookfield Place, Civic Tower, 5 Martin Place, Liberty Place and Melbourne Star Observation Wheel. He specialises in long-span structures, tall buildings, stadium structures, seismic design and forensic engineering. Kourosh is a Fellow of the Institution of Engineers Australia and a Laureate of the IABSE Prize awarded by the International Association for Bridge and Structural Engineering for his work on long-span structures worldwide. He has also been listed in Engineers Australia's Top 100 most influential engineers in 2009. Kourosh is a Visiting Professorial Fellow at UNSW, a Director of the Australian Steel Institute, and the President of the Lightweight Structures Association of Australasia

David **Kinniburgh**

Australian Market Leader – Transportation

GHD

David Kinniburgh is GHD's Australian Market Leader – Transportation - responsible for overseeing the development and delivery of GHD's regional transportation strategy. David has worked with GHD for more than 22 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, Parramatta, Wollongong, Dubbo and Orange. Other roles within GHD have included Operating Centre Manager for GHD's Tasmanian business and Victorian Manager for Transportation and Municipal Engineering.

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.

In 2016 Paul was 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

Garry Mostyn graduated from UNSW in civil engineering in 1973. He subsequently completed a master's degree in geotechnical engineering at UNSW and a bachelor's degree in geology and statistics at Macquarie University. He worked with the NSW Department of Public Works and with consulting geotechnical engineers from 1970 until 1986. He then joined the Civil Engineering at UNSW where he lectured in civil and environmental engineering practice and geotechnical engineering. He joined PSM in 1997 as a Principal Consultant while retaining a part time appointment at UNSW.

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 80 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 as well as the highest levels of the Australian Geomechanics Society and the International Society for Rock Mechanics

Paul **Plowman**

Sydney Water

Paul Plowman is the General Manager, Liveable City Solutions at Sydney Water. Paul has led strategies to enable the delivery of products and services to Sydney Water customers to ensure that Sydney remains one of the most livable cities in the world.

Paul's team oversee the Sydney Water's long term strategy, planning, and infrastructure delivery. Sydney Water is Australia's largest utility, providing drinking water, recycled water, wastewater and stormwater services to its customers, extending from Sydney to the Blue Mountains and the Illawarra.

Paul is currently the chair for Program Ozwater2017 and is a Wateraid Ambassador.

Paul has held previous senior executive roles in the Northern Territory Power and Water Corporate and Melbourne Water Corporation. Paul is a qualified Civil Engineer and also holds a Masters of Business Administration

Iain **Scoular**,

General Manager, Group Services, CIMIC

Iain has more than 35 years' experience working with major contractors in the Australian construction industry. As a General Manager with Leighton Holdings for ten years, Iain was responsible for leading specialist engineering teams covering the fields of Pre-Contracts, Insurance and Risk Management, Planning and Controls, Carbon and Environmental Management, with the overriding objective of raising the standards of project delivery performance. Iain's 'hands-on' project experience includes road and railway infrastructure construction, dams and water supply, large multi-function public entertainment complexes and the restoration of heritage-listed buildings.

Iain has an Honours degree in Civil Engineering from UNSW, is a Member of the Institution of Engineers Australia and is a Chartered Professional Engineer.

Narelle **Underwood**,

NSW Surveyor-General

Narelle Underwood is the Surveyor-General of NSW and Director of Survey Operations at Spatial Services, a division of the NSW Department of Finance, Services and Innovation.

She graduated from UNSW in 2009 with a BE Hons 1 Surveying & Spatial Information Systems and the University Medal. She became a Registered Land Surveyor in 2010.

Prior to joining Spatial Services, Narelle worked in both private industry and state government. She was at NSW Road's and Maritime Services for over 7 years and held a number of senior roles, including Southern Region Survey Manager and Principal Surveyor.

Throughout her career Narelle has been actively involved in the surveying and spatial professional organisations in NSW.

Narelle has won a total of nine industry awards for her innovation and commitment to quality outputs, including the Asia-Pacific Spatial Excellence Awards Young Professional of the Year in 2011, which she won from amidst a highly capable international field.

As Surveyor General she is the President of the Board of Surveying and Spatial Information (BOSSI), Chair of the Geographical Names Board, NSW Surveying Taskforce and the Surveying and Mapping Industry Council.

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.

Harry **Young**,

Regional Director, Construction + Development, Multiplex

Harry Young graduated from USyd in 1995 with a BE in civil and structural engineering, and went straight to work for international contractors Multiplex. He has acted in a variety of roles for Multiplex and is now Regional Director, Construction & Development, for NSW and ACT.

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)

INDUSTRY SUPPORTERS

The School's External Relations Committee administers the Industry Partner Program and within that portfolio organises an annual Industry Partners Careers Market for third and fourth year students, an Elite Student/Industry Supporters breakfast at Sydney's Botanic Gardens (pictured), a Year 10 work experience week, Year 4 prizes, and the CVEN Maths Primary Prize. Thanks to all our industry supporters – who make these wonderful events possible.

Thanks to our fantastic Industry Partners & Supporters for 2016 - Advisian, AECOM, ANSTO, ARUP, Aurecon, Bouygues Construction, Cardno, CPB Contractors, GHD, JK Geotechnics, Laing O'Rourke, Multiplex, Pells Sullivan Meynink (PSM), Royal HaskoningDHV, RPS, SMEC Australia, Taylor Thomson Whitting (TTW), and WSP/Parsons Brinckerhoff.

EXTERNAL RELATIONS COMMITTEE REPORT

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

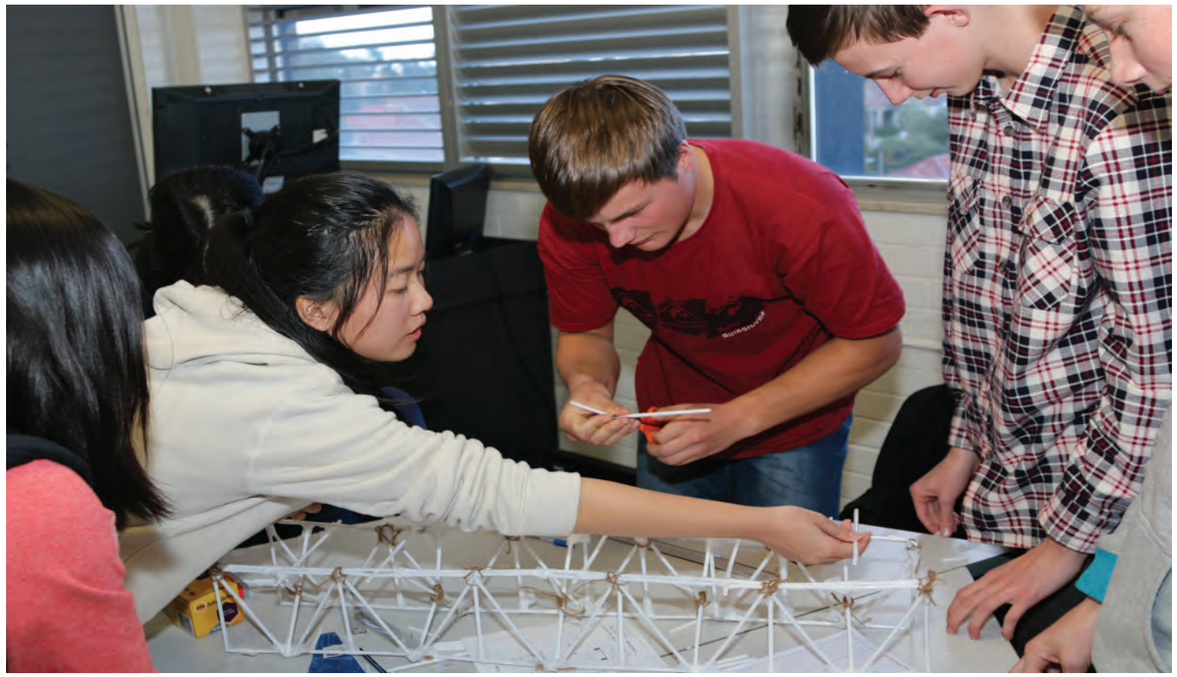
The strategic objectives of the **External Relations Committee (ERC)** of the School of Civil & Environmental Engineering (CVEN) include the development of effective outreach and profile raising programs, as well as building and maintaining strong relationships with industry and our alumni community.

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, UNSW Nura Gili Winter School, and working closely with the Women in Engineering camp – an annual week-long event coordinated by UNSW Engineering. Numbers had been boosted – from 30 young women in 2015, to 90 in 2016. During the week, CVEN alumnus Eva Hanly gave a presentation on the Trans Urban tunnels, while ERC Chair Dr Kurt Douglas gave a mega talk (pictured) on Sydney civil infrastructure, past, present and future.

2016 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. The new dual award program civil engineering/ surveying, which began in 2016, has greatly assisted a rise in undergraduate enrolments. A meeting between the ERC, IAC and the NSW Surveying Taskforce was held in March to acknowledge and to further progress. Since 2013, student enrolments have doubled within the SAGE degrees.

In 2016 the ER Manager Mary O'Connell produced a **Social Engagement @ Civil & Environmental Engineering** booklet - as hard copy and a series of online stories - which showcased just some of the ways in which the School is involved in advancing a prosperous, safer and more just society. From our participation in Engineers without Borders, to a social justice project at home – the inspirational student-led project eReuse – to academics who work with disadvantaged and marginalised communities in Australia and around the world, the School is very socially engaged. Moreover our top scholars positively influence global trends in areas such as safe building structures, GPS systems, international water quality guidelines, transport modelling, real measurement of national footprints, and effective transnational waste management. The booklet was mailed out to NSW careers advisers and secondary schools, as well as to alumni, industry partners and UNSW colleagues.

The annual Year 10 work experience week was held in June. Designed and organised by the School's external relations and industry advisory committees, and approved by the



NSW Department of Education and Communities, this fantastic outreach project has been running since 2010. It is coordinated by Ms Tricia Tesoriero, who won a 2016 Faculty of Engineering Staff Excellence award for her amazing organisational skills – and patience.

In 2016 we accepted 60 students from 57 high schools in Sydney and regional NSW including Armidale, the Blue Mountains, Forbes, Jindabyne, Newcastle, Tamworth, Wagga Wagga, Wollongong and Woolgoolga. The students appreciated visiting a wide variety of civil engineering sites – in progress, accomplished and in creative incubation – including Laing O'Rourke's 'Innovation Space', Lend Lease's development at Darling Harbour, several UNSW Laboratories, Port Botany, Centennial Parklands, Seacliff Bridge, Sydney Harbour Bridge, the Opera House, and the NSW Transport Management Centre. Students also tried their hands at their own structural design – as pictured.

Feedback remains **overwhelmingly positive** – One young participant wrote, 'Everything we did was amazing, not only the places we went but the people I met and the things I learnt too. I really feel like I've found my place in the world which is such a huge relief. I'm almost certain that I will be attending UNSW based on this trip. Thank you so much for this. It really has changed my life.'
Our special thanks to Advisian, ARUP, Barangaroo Delivery Authority, Centennial Parklands Education Precinct, Darling Harbour Live, Laing O'Rourke, LendLease, Multiplex, Sydney City Council, NSW Transport Management Centre, and the UNSW Water Research Centre for making the time to welcome and inspire the interest of these potential engineers.

The ERC also coordinates the annual Elite Student/Industry Breakfast, the CVEN Primary School Maths prize, and IAC

EXTERNAL RELATIONS COMMITTEE REPORT CONT.

Year 10 kids at Seacliff

Narelle Underwood

BE Hons 1 Surveying and Spatial Information Systems, '09
NSW Surveyor-General

"There is a severe shortage of Registered Land Surveyors in Australia so we're working to lift the profile of the profession. With technology changing so rapidly, we really don't know what will be happening in five or ten years, what people will need and how data and information will be used. It's an open book, which makes this profession extremely exciting."

Narelle Underwood is NSW's 25th Surveyor General since Augustus Alt was appointed to the position in 1787 before his arrival with the First Fleet. Narelle is the first female Surveyor General in any Australian state and is the youngest to take the role in NSW in 200 years.

While at UNSW, Narelle won the Dean's Award twice and the University Medal on graduation. She also contributed to the Surveying Student Society, serving as both treasurer and president and is currently a member of the School's Industry Advisory Committee. Since her graduation she has won a total of nine industry awards for her innovation and commitment to quality outputs, including the Asia-Pacific Spatial Excellence Awards Young Professional of the Year in 2011.

As NSW's 25th Surveyor General since 1787, she will serve as President of the Board of Surveying and Spatial Information (BOSSI), chair of the Geographical Names Board of NSW and Electoral Boundaries Commissioner. Narelle will bring her expertise to improve urban planning, community services and infrastructure and help keep surveying standards consistent nationwide.

Narelle Underwood is not daunted by the ever changing technological landscape of the surveying industry; she is excited by it. "Merging new and traditional technologies continues to be one of my greatest joys. Combining data drawn from different sources allows surveyors to be much richer and more useful," she says. Technological innovation can ensure the expansion of public infrastructure in the future.

Narelle is working with the NSW Surveying Task Force to encourage more graduates to consider a career in surveying – without whom the construction industry could very well grind to a halt. She hopes that her appointment will serve as an example for women and young people looking to enter a career in surveying. "There is a severe shortage of Registered Land Surveyors in Australia so we're working to lift the profile of the profession. With technology changing so rapidly, we really don't know what will be happening in five or ten years, what people will need and how data and information will be used. It's an open book, which makes this profession extremely exciting."

meetings. We also continue to develop the School's relationship with our graduates through the Annual Report and the annual CVEN Alumni newsletter - distributed to all engineering alumni at the end of each year through the University's magazine *UNSWorld*. The 8 page 2016 newsletter had some great stories – including Ian McIntyre sharing his thoughts on the HSC maths issue, profiles of Athena Venios, winner of the 2016 Judy Raper Award for Engineering leadership, alumnus Mark Combe, listed in EA 2016 Top 50 most innovative engineers, and history making SAGE alumnus Narelle Underwood who became NSW's 25th Surveyor General –the first woman SG in the country.

The ERC also provides support for Alumni group reunions –in 2016 the School was delighted to be able to support the alumni reunion organised by the CEVSOC president of 1986 Pete Bailey, and his indefatigable aide Greg Stanmore, with prizes, complimentary histories and a few rounds at the thirsty bar. See fuller story and pics on last page.

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

MATHS PRIZE

A total of 85 NSW primary schools participated in the seventh year of 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 alumni presented 300 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.

Avondale School ElijahMorton & KoaHampson with BrianTimms 2016

School	First Name	Family Name
Alexandria Park Community School	Noah	**Lassman**
	Eric	**Lin**
	Theodore	**Sanuri**
	Biao	**Su**
Annandale North Public School	Liam	**Howe**
	Sienna	**Monahan**
	Bede	**Quang**
	Merryn	**Quang**
Arncliffe Public School	Hadi	**Abdul-Hadi**
	Victor	**Yan**
Australian International Academy, Kellyville	Abdulrahman	**Hussein**
	Amna	**Jidah**
	Rayan	**Zubair**
	Shifa	**Zubair**
Avondale School	Koa	**Hampson**
	Elijah	**Morton**
Balgowlah North Public School	Jamie	**Stodart**
	John	**Huh**
	Christine	**Zou**
Bankstown West Public School	Joshua	**Bui**
	Chi	**Hoang**
	Kalea	**Lee**
	Auslee	**Pamintuan**
Beaumont Hills Public School	Jonathan	**Nguyen**
	Akshaj	**Shetty**
	Cairistiona	**Clarke**
	Felix	**Edquist**
	Leonston	**Ho**
	Matthew	**Kelly**
Beecroft Public School	Nathan	**Zhou**
	Rafael	**Deubler**
Bellevue Hill Public School	Rebecca	**Fajwul**
	Zara	**Joseph**
	Anna	**Vincent Hull**
Belrose Public School	Tobias	**Clear**
	Benjamin	**Jewell**
	Charlotte	**Smith**
	Taiyo	**Yasushima**
Berowra Public School	Isabella	**Clayton**
	Daniel	**Cooke**
	Kamden	**Hogarth**
	Alex	**Jones**
Blackheath Public School	Tomas	**Coghill**
	Kenta	**Marsh**
Bondi Beach Public School	Mason	**Bicknell-Catteli**
	Oliver	**Hunt**
Bronte Public School	Louis	**Fletcher**
Cammeray Public School	Aneira	**Astbury**
	Noah	**Eley**
	Liam	**Hopper**
	Aditya	**Shrivastava**
	Sebastien	**Walker**
Carlingford Public School	Zion	**He**
	Kelly	**Fadjar**
Carlton Public School	Ellis	**Kha**
	Kaylee	**Liu**
	Dylan	**Yang**
Casula Public School	Arjun	**Mahadik**
	Andrea	**Tran**
	Yenuka	**Welihinda Badalge**
	Elaine	**Zhang**
Chifley Public School	Harmani	**Taylor**
Claremont College, Randwick	Jasmine	**Buchanan**
	Benjamin	**Hickman**
	Jack	**Murray**
	Annette	**Ong**
Clovelly Public School	Debbie	**Winter**
Condoblin Public School	Shanaya	**Buick**
	Ashley	**Folkers**
	Amali	**Haworth**
	Catherine	**McDonald**
Coolah Central School	Thomas	**Burgess**
	Ashton-Rose	**Cameron**
	Charlie	**Gilder**
	Maggie	**Walker**
Cowra Public School	Towen	**Schick**
	Ruixi	**Zhang**
Crescent Head Public School	Sienna	**Moore**
	Kullen	**Van Der Jagt**
Crown Street Public School	Allen	**Chanthara-sonthi**
	Nicholas	**Chen**
	Stella	**Trevaskis**
	Haoran	**Zhang**
Croydon Public School	Helena	**Chiu**
	Samuel	**Kim**
	Rebecca	**Ren**
	Gloria	**Xi**
Daceyville Public School	Julia	**Chen**
	Cameron	**Gray**
	Natalia	**Rimac**
	Gabriella	**Wahib**
Double Bay Public School	Oscar	**Kirk**
Earlwood Public School	Minh	**Nguyen**
	Maya	**Taib**
Eastlakes Public School	Muhaimin	**Abdullah**
	Mahi	**Islam**
	Subham	**Mustafa**
	Adrian	**Posiadala**
Epping Heights Public School	Michael	**Adams**
	David	**Ahn**
	Eric	**Kwak**
	Claire	**Wang**
	Eric	**Qin**
Ermington Public School	Sizhe	**Pan**
	Daniel	**Archer**
	Ayden	**Bottos**
	Elliott	**Cripps**
	Hannah	**Sistrom**
	Benjamin	**Visagie**
Ferncourt Public School, Marrickville	Dexter	**Harding**
	Ewan	**McGregor**
	Xuran	**Qin**
	Samuel	**Turnbull**
Glenhaven Public School	Mia	**Craig**
	Jack	**Macauley**
Harbord Public School	Mia	**Christiansson**
	Greta	**Cook**
	Hannah	**Ealey**
	George	**Lawson**
Jasper Rd Public School	Linus	**Guo**
	Annabel	**Hall**
	Joseph	**Lim**
	Samuel	**Luo**
Kambora Public School	Ziggy	**Barry**
	Joshua	**Cooper**
	Penelope	**Law**
Kensington Public School	Tengjun	**Liu**
	Ethan	**Saputra**
	Ethan	**Tan**
	Adem	**Yerlikaya**
Loquat Valley Anglican School	Maeve	**McNulty**
	Ella	**Robinson**
Manly West Public School	Rose	**Dowdle**
	Tyler	**Gaunt**
	Austin	**Holley**
	Joshua	**Wilkinson**
Maroubra Junction Public School	Olivia	**Chu**
	Justin	**He**
	James	**Perkin**
	Alexander	**Xylas**
Masada College, St Ives	Rhys	**Hain**
Matraville Public School	Tamzid	**Hossain**
	Justin	**Shao**
Middle Harbour Public School	Sam	**Carroll**
	Oliver	**Franz**
	Kanan	**Toyoda**
	Sam	**Walton**
Mosman Public School	Oscar	**Brown**
Mount Colah Public School	Liv	**Dryza**
	Lewis	**Pendrick**
Mount Druitt Public School	Samantha	**Cantorna**
	Aayarsh	**Kumar**
	Ontik	**Reza**
	Girish	**Sikder**
Narrabeen North Public School	Taj	**Gleeson**
	Rio	**Wong**
Niagara Park Public School	Eve	**Dawson**
	Nathan	**Rodgers**
North Haven Public School	Aironn	**Cabonilas**
	Ryan	**Ferguson**
Northmead Public School	William	**Grieve**
	Matej	**Groombridge**
	Cassidy	**Jephtha**
	Lindsey	**Kim**
Oatley Public School	Anthony	**Kousparis**
	Jessica	**Lau**
Our Lady of the Rosary, Kensington	Cynthia	**Liong**
	Isaac	**Tait**
	Adrian	**Wang**
	Genita	**Wongpaibool**
Pagewood Public School	Pavith	**Gunasekara**
	Oliver	**Martin**
	Ayaan	**Rahman**
	Alex	**Stamoulis**
Pennant Hills Public School	Patrick	**Forrest**
Picnic Point Public School	Andrew	**Ding**
	Felix	**Lam**
	Mohammad	**Medlej**
	Daniel	**Nguyen**
Rainbow Street Public School	Arki	**Valdy**
Randwick Public School	Johathan	**Wright**
Roselea Public School	EJ	**Sandico**
	Emma	**Huang**
	Edwin	**Yuan**
South Coogee Public School	Lara	**Brennan**
	Daniel	**Di Francesco**
	Justin	**Poon**
	Caitlin	**Terry**
St Declan's, Penshurst	Matteo	**Budanovic**
	Ava	**Smith**
	Lachlan	**Stevens**
	Angeleena	**Thomas**
St Francis of Assisi, Paddington	Alexandra	**Bulman**
	Eugene	**Jap**
	Giacomo	**Mazzola**
	Jude	**Timbs**
	Zacary	**Kennerson**
	Anthony	**Le**
	Rhys	**Nguyen**
	Alexander	**Nikolovski**
St Joseph's, Como	Julia	**Caraffa**
	Jaden	**Gasking**
	Ronan	**O'Meara**
	Luke	**Thorne**
St Philip's Christian College, Gosford	Eden	**Hallett**
St Spyridon College Junior School, Kingsford	Paul	**Giavis**
Sylvania Heights Public School	Pamela	**Konstant**
	Sophie	**Pham**
	Caleb	**Strahl**
	Luke	**Zeng**
Tacking Point Public School	Cameron	**Aird**
Tagai State College Mer Campus	Brodie	**Ferrett**
	Shorna	**Cowley**
	Frinzo	**Kabere**
	Gariam	**Noah**
	Udiwad	**Tapim**
	Malina	**Waigana**
	Maxine	**Wailu**
	Kobe	**White**
Toongabbie Public School	Rachael	**Mathew**
	Raine	**Park**
	Amit	**Simkhada**
	Drew	**Whiting**
Turramurra Public School	Daniel	**Bradford**
	Toby	**Falzon**
	Patrick	**Hill**
	Matt	**Pain**
Warrawee Public School	Brendon	**Chien**
	Anthony	**Lamberti**
	Amelie	**Muir**
	Juny	**Park**
West Pennant Hills Public School	Connor	**Goodsell**
	Rebecca	**Stephen**
	Seth	**Sweeney**
Wheeler Heights Public School	Ethan	**Baillie**
	Zoe	**Davey**
	Ashton	**Duryea**
	Alexander	**Wu**
Wollondilly Anglican College, Tahmoor	Taylah	**Apps**
	Jackson	**Loscuito**
Woollahra Public School	Wensen	**Dong**
	Alexander	**Fan**
	Hannah	**Shoebridge**

ALUMNI CONGRATULATIONS

SAGE ALUMNI – DOING VERY WELL, THANKS!

Legendary surveying academic Dr Bruce Harvey caught up with quite a few of his ex-students at an RMS in-house surveying seminar in May 2016. The award winning lecturer who has taught students at UNSW for nearly thirty years said, 'it was nice to see them all doing so well.'

LtoR, Back Row: Armen Dervisevic (BE '07), Steve Robinson (BSurv '91), David Burke (BSurv '88)

Middle: Jason Phipps (BE '08), Kit Panya (BE '07), Michael Waud (BE '04), James Wards (BE '11), Ryan Fifield 2009, Pat Shaw (BE '95)

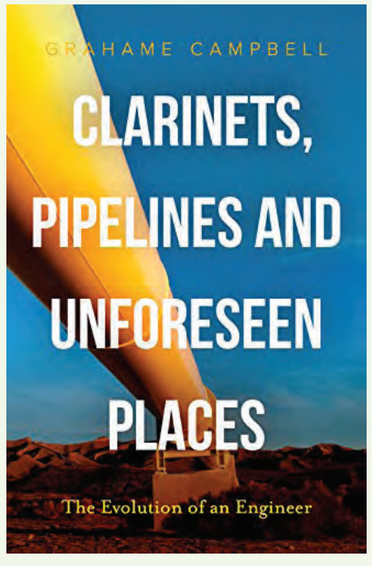
Front: Mick Dunn (BE '95), Dr Bruce Harvey , Narelle Underwood (BE '09), Helen Pollock (BE '97), David Jenkins (BSurv '87)

Also present but not in the photo: Peter Nedelkovski (BSurv '94), and Alastair Linke (BE'06).

ALUMNUS GRAHAME CAMPBELL MEMOIR

"one is - you've got to listen, two is - you've got to be on time, three is - you have to work in groups"

As a successful engineer and a talented jazz musician, Grahame says, "People always ask me, "What's the thing about music?" and I say, "It's three things: one is you've got to listen, two is you've got to be on time, three is you have to work in groups". These are exactly the same things you need to be a success in business."



In his memoir Clarinets, Pipelines and Unforeseen Places, alumnus Grahame Campbell (BE (Civil) 1965, MEngSc '72) tells his extraordinary life story. From selling ice creams at the beach to planning a pipeline in a war zone, and from playing the clarinet in the Trinidad Symphony Orchestra to running a multibillion-dollar business, Grahame's stories tell not just the evolution of an engineer, but the evolution of an industry from 1965 to 1996.

"There is this undercurrent within the industry" says Grahame, "that "nobody talks to engineers and nobody is interested in engineering" and I think it's largely because engineers are not great communicators. I feel strongly that as an industry we can do this better so I decided to tell my story."

WINS IN 2016

Congratulations to our high achieving alumni including:

Mark Combe (BE Civil '87 UNSW, MIE, MIPENZ, RPEQ,)

In 2016 Mark Combe was acclaimed by Engineers Australia as one of Australia's Top 50 most innovative engineers. In 2015 his company Fibercon won a prestigious Shell and Australian Department of Industry, Innovation & Science Innovation Challenge Award for their development of a recycled macro-plastic fibre reinforcing made entirely from industrial plastic wastes. Fibercon was the industry sponsor of a three-year PhD program at James Cook University to develop Emesh - whose fibres can reinforce concrete in footpaths, cycleways, shotcrete and small precast elements. The company also tested its Macro Poly and Steel fibres with researchers at UNSW.

"The construction industry is not nearly as innovative as it could be," Mark says, "despite the fact that our future depends upon it. It tends to stick with what it knows, and what has worked in the past. Understandable, perhaps, but no longer defensible. We all need to play a role in reducing the carbon footprint of construction.

In 2016 CVEN alumnus and Professorial Visiting Fellow **Dr Kourosh Kayvani**, (MEngSc '92, PhD '97) won the John Connell Gold Medal Award from Engineers Australia - Structural College.

The steep eligibility criteria included that the recipient must have "made a significant contribution nationally and internationally to the standing and prestige of the structural engineering profession". With a career spanning over 25 years, Kourosh, Global Director of Excellence and Expertise at Aurecon, has played key roles in the design and delivery of many innovative, complex and award winning projects across the globe, including Wembley Stadium in London UK, West Kowloon Terminus in Hong Kong, and in Australia; ANSTO OPAL nuclear reactor, the Sydney Hockey Stadium, Brookfield Place, 5 Martin Place, Liberty Place and Melbourne Star Observation Wheel. He specialises in long-span structures, tall buildings, stadium structures, seismic design and forensic engineering.

In 2016 UNSW surveying alumnus **Narelle Underwood** (BE (Surveying & Spatial Information Systems) Hons 1, 09)was appointed NSW Surveyor General. She has the distinction of being the first female Surveyor General in Australia. Throughout her career Narelle has been actively involved in the surveying and spatial professional organisations in NSW.

Narelle has won a total of nine industry awards for her innovation and commitment to quality outputs, including the Asia-Pacific Spatial Excellence Awards Young Professional of the Year in 2011, which she won from amidst a highly capable international field.

As Surveyor General she is the President of the Board of Surveying and Spatial Information (BOSSI), Chair of the Geographical Names Board, NSW Surveying Taskforce and the Surveying and Mapping Industry Council.

Athena Venios (BE Civil Hons '97) Technical Director - Transport Group, AECOM was the winner of the 2016 Judy Raper Award for Leadership in Engineering, in recognition of her sustained and significant contribution through demonstrated leadership within the profession in Australia. The breadth of Athena's experience is impressive, spanning projects in road, bridge construction and maintenance, rail, water, aviation and transport planning and community support facilities. Her work has taken her to south east Asia and Greece and she has integrated her international experiences to bring focus and creativity to all of her work and to support her people. Athena is currently leading a diverse team to identify and preserve a new corridor for the future Outer Sydney Orbital, as part of NSW's long term transport master plan. Despite her heavy workload she reamins a dedicated member of AECOM's Diversity and Inclusion Committee.

In 2016 **Dr Voo Yen Lei** (BE Hons 1 '01; PhD '04) and his innovative Malaysian company Dura Technology won a prestigious design award in 2016 from the American Pre-stressed-Precast Concrete Institute for Best International Transportation Structure. Dura had designed and constructed a single-span, 100 metre long, concrete box-girder bridge over the Perak River, giving the city of Gerik road access across the river for the first time ever. "Using a precast-prestressed-segmental solution certainly helped to overcome the obstacles on this project," Voo says. "It is a better quality bridge than conventional concrete designs that requires negligible maintenance, delivers better functionality and a better look at the lowest cost."

Dr Voo completed his PhD at the School in 2004, under the supervision of Professor Stephen Foster. His research into the behaviour of prestressed reactive powder concrete girders has laid the groundwork for his subsequent career.

ALUMNI REUNION

REUNION OF THE CLAN

Once a community leader, always a leader – so it proved when the CEVSOC president of 1986 Pete Bailey, and his indefatigable aide Greg Stanmore set out to reunite the brotherhood and sisterhood of the graduate class of '86 (and '87.. and '88 …yes, those were less frantic times!) to celebrate their thirtieth anniversary with a gathering down at Harts Hotel on the Rocks.

Sixty staunch alumni of the School of Civil & Environmental Engineering turned up to mix and mingle – network and share. Hard to believe it was thirty years since graduation – the crowd looked so young and handsome!

Out of a possible 89 graduates, Pete Bailey was very happy with the night's turnout. As he said, the result was better than a PASS Conceded, indeed well over CREDIT Level.

Another 80's hero, Dr Alex Heaney turned up to hand out the lucky door prizes and to receive belated but very sincere thanks for his teaching. Timber engineering is on its way back! Also representing the School was retired staff member Dr David Robinson and external relations manager Dr Mary O'Connell.

The School was delighted to be able to support the gathering with prizes, complimentary histories and a few rounds at the thirsty bar.

Above: The School in 1986 photo by Adrian Bull

Below: Alex Heaney calls out the lucky door prize – event organiser Peter Bailey behind photo by Adrian Bull