BIG DATA – BE AWARE OF UNAWARENESS
Welcome to this Edition of Ingenuity.

With the developing narrative coming from government about the importance of science and technology to the future economy, and the discussion about innovation and entrepreneurship and the role it must play in Australia as we look ahead, we have centred this edition around the theme of innovation and, in particular explored how current advances in technology are shaping the world we live in. These technological advances also have real impact on the future career options our students will pursue.

Importantly we remain well placed as one of the world’s leading universities for engineering and technology, with our global ranking having been recently confirmed in the QS subject rankings. This is an affirmation of both our research strength and the quality of education we provide. But, we can’t afford to rest on our laurels if we are to maintain this standing amongst our peers.

I was fortunate to take a short trip to Germany in January to explore aspects of advanced manufacturing, what the Germans are calling Industry 4.0. In essence, it is how the Internet of Things, robotics and automation come together to greatly enhance production techniques. For me, it was eye opening to see how far and how fast things are progressing in this space. What is clear is that digitisation across all areas of engineering is becoming a dominant theme and we must respond to this in both our education and research. The requirement for all our staff and students to have digital literacy is not open for debate.

We are currently discussing a number of strategic investments into areas that relate to these external developments such as data engineering, cyber security and advanced manufacturing. We are also looking at how we can develop new student courses with relevance in these areas. Consequently, I am excited with the content of this year’s magazine, covering as it does the impact of technology on areas such as sustainable cities and next generation healthcare as well as ‘Big Data’.

In previous columns for various alumni newsletters and magazines, I have mentioned the importance of equipping our graduates better for the transition into the world of work and especially providing them with critical insights and transferable skills which will help them to become the leaders of tomorrow. Two aspects of this are highlighted in this edition through articles on ‘The Business of Engineering’ and the ‘IdeaHub’; two initiatives designed to provide such transferable skills to our students.

Over the last year, I have continued to meet with a great many of our outstanding alumni, partners and friends. As always, it goes without saying that we will not realise our ambition to maintain the world leading position for The University of Queensland without the continued support and interest from these groups.

I hope you will enjoy reading our magazine. If you have any thoughts or comments about anything to do with this or other aspects of the Faculty, please do not hesitate to get in contact.

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EXECUTIVE DEAN
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Page 18
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Engineering

THE GREATS

Dr Russ Morrison AM (BE 1962; DREng 2014), co-founder and current director of engineering consultancy BMT WBM, was awarded the Alumnus of the Year Award as chosen by the Alumni Friends of The University of Queensland Inc. Meanwhile both Yassmin Abdel-Magied (BE 2011), a widely known writer and social commentator, and Jeromy Moore (BE 2000), a Performance Engineer at Porsche, received Distinguished Young Alumni Awards. These awards recognise young alumni whose early accomplishments inspire and provide leadership to students and alumni alike.

Wrapping up the awards for the EAIT Faculty, three students who are yet to make their mark on their professional fields have been recognised for their commitment to their studies. The Graduate of the Year award is given to students achieving the highest GPA in their undergraduate degree, with all three students awarded being engineering graduates. Nicholas Doyle, Kianoosh Soltani Naveh and Julian Torino received this accolade in 2015.

Dr Jeffrey Dawes (PhD 1987) was also recognised with a Vice-Chancellor’s Alumni Excellence Award for his commitment to improving the lives of those in communities where his company, Komatsu, operates, and his innovative approach to corporate philanthropy as a leading example of corporate social responsibility.
IN HONOUR OF THE WORLD’S FIRST COMPUTER PROGRAMMER, ADA LOVELACE, A LIST OF THE WORLD’S UP AND COMING FEMALE ROBOTIC EXPERTS HAS BEEN COMPILED.

Featuring UQ’s Dr Hanna Kurniawati, “25 Women in Robotics you need to know about” showcases women in a wide range of roles and career stages who are trailblazing a path for both themselves and females that follow. Hanna also acts as a mentor for the next generation of technological experts, sharing her passion for robotics with her students.

“It is a great honour to be featured alongside many of my own role models. I hope I too can inspire and support the next generation of roboticists as well as UQ has supported me,” Hanna said.

The list was compiled by non-profit organisation, Robohub, whose mission is to connect robotics research, start-ups, business, and education across the globe.

CONTINUING THE TRADITION OF ‘PAYING IT FORWARD’ FOR THE STUDENTS WHO ARE TO FOLLOW IN THEIR FOOTSTEPS, THE GRADUATING CLASS HAVE ONCE AGAIN LED THE ANNUAL ENGINEERING CLASS GIFT APPEAL.

Since the initiative was launched in 2011, graduating students have collectively raised more than $18,000 to enhance the engineering student experience for future cohorts of students at UQ.

Hitting previous fundraised amounts out of the ball park, the 2015 Class Gift Committee raised a staggering $5,042 from 110 students, staff and alumni alike. Their goal was to provide their peers with the facilities for networking with potential employers in a more relaxed atmosphere. Thanks to their efforts, future students will benefit from a barbeque and landscaped area which will be available for industry engagement.

Class Gift Committee member, Ngaire Howard said the Engineering Class Gift initiative provides the graduating class with a way to leave a legacy for future students – a positive impact on University life.

“As graduating donors, we hope to foster the professional development of future engineers through the creation of a space dedicated to industry events,” said Ngaire.

“The installation of a permanent BBQ area dedicated solely for engineering student groups and alumni will provide an enhanced experience for those holding industry seminars to foster professional development.”

Alumnus and donor to this year’s Class Gift, Claude Reghenzani (BE 1960) said that it had been 60 years, almost to the day, since the Faculty had welcomed him as an undergraduate student.

“From the sombre red brick engineering buildings in George Street, to the present state of the art Engineering complex at St Lucia, I am delighted to see the progress that has been made. I trust that my donation to this year’s Engineering Class Gift will inspire future students to never forget what The University of Queensland gave to them.”
Washing the way to change

CREATING CHANGE FOR PEOPLE EXPERIENCING HOMELESSNESS HAS LED UQ ENGINEERING AND COMMERCE STUDENT, LUCAS PATCHETT AND HIS BUSINESS PARTNER, NIC MARCHESI TO BE NAMED 2016 YOUNG AUSTRALIANS OF THE YEAR.

Lucas and Nic established Orange Sky Laundry, a free mobile clothes washing service for the homeless, in 2014 when the two best mates converted an old van into a mobile laundromat which they drove around Brisbane. Services have expanded rapidly, with four vans now running in 36 locations across Brisbane, the Gold Coast, Melbourne, Sydney, and Perth set to launch soon.

With one in 200 people in Australia being homeless on any given night, it is a much needed service.

“One of the first guys we helped actually studied engineering like me. But after some bad luck in life he ended up on the street, and that really opened our eyes to the massive issue of how easily homelessness can happen,” said Lucas.

“We're now washing more than 200 loads each week. We also have to say thank you to our 300 plus volunteers, who are fantastic. The cool thing is we have partnerships with a chemical company and laundry servicing company, both of which are Australia wide, and LG, which is an international company. So it’s a very scalable model; we can get a van on the road in two days.”

Lucas and Nic have a vision to develop the model into a global concept, to help the many millions of people sleeping on streets throughout the world.

“As well as Australia, there’s actually no one in the whole world doing what we’re doing, so it’s exciting knowing that we could provide this service internationally and have a significant impact.”

Social entrepreneur, Lucas explained that while it seems his UQ engineering degree might not necessarily be directly related to his charity, he feels that he draws on his skills every day.

“At the core of engineering is creative solutions and solving problems that have been looked at the same way for a long time. The fact that we have no background in social work means we're looking at things through different eyes with a different perspective on an industry that’s been looked at the same way for a long time. We’ve shaken things up,” said Lucas.

The two washers and dryers fitted on each van allow Orange Sky Laundry to provide 20kg of clean clothes every hour and as clothes are being washed, homeless people connect with volunteers.

“We're giving people back the basic human right of having a good chat,” said Lucas.

“We can restore respect, raise health standards and be a catalyst for conversation. We have found a way to treat others how they want to be treated,” said Nic.

To donate and find out more about Orange Sky Laundry visit orangeskylaundry.com.au.
ENCOURAGING ENTREPRENEURIALLY MINDED STUDENTS TO DEVELOP THEIR BUSINESS IDEAS, UQ LAUNCHED ITS NEW INITIATIVE, THE ‘UQ IDEA HUB’.

Hosted in a co-working space, the UQ Idea Hub entails a 7-week intensive program covering topics such as ideation and research, pitching and storytelling, prototyping methodologies, market validation and developing business models.

Professor Simon Biggs, Executive Dean of the UQ Faculty of Engineering, Architecture and Information Technology said the program is important to UQ as it exists to build students entrepreneurship skills alongside the traditional curriculum.

“The program, led by Nimrod Klayman with support from a number of UQ alumni, has had a very positive reception from the students. This year the first session of the program has attracted over 70 students from across the campus who are now working in small teams learning the key skills associated with developing an innovative idea into an early-stage ‘investable’ proposition. Our primary aim for UQ Idea Hub is to increase awareness amongst students of what innovation and entrepreneurship really is, learning the language of new ideas and helping them develop the sorts of skills they will need to be leaders and change makers in the years ahead,” said Professor Biggs.

UQ alumni, business founders or corporations with a passion for creating change are invited and encouraged to be involved with the program to impart their wisdom to students. Previous UQ Idea Hub mentor, Elliot Smith (BE 2012), Founder and Chief Software Engineer at HSK Instruments said UQ Idea Hub is vital to UQ’s future in the changing job market.

“We’re equipping people with the technical skills they need to make real change in the world and now, having a place to go and build ideas into budding business we are providing them with the entrepreneurial side as well.

As someone who has spent time running a start-up and, quite frankly, learned a lot of things by messing them up I think it’s a great opportunity to give back to the UQ start-up community and hopefully provide current students with the lessons I’ve learned and help them take another step in the right direction,” said Elliot.

UQ Idea Hub provides a space for student’s ideas to turn into something big. Each year, innovative students apply to the program hoping to expand their business idea to form a profitable start-up. Antony, UQ engineering student is one such student who has exciting goals for his business, Brisbane Mirror Re-silvering.

“Silvering glass was a skill I obtained during an engineering thesis on Energy Systems. As part of my thesis, I was silvering optical quality, high reflectivity, solar mirrors when I realised how easy it was to silver household mirrors. I only started considering the business potential of mirror re-silvering after a friend offered me 50 dollars to re-silver his grandmothers mirror. After refusing the cash, and finishing the easy job, I wondered how many other people required the same service.

In a business search I conducted in 2015, I found there were no commercial glass silvering firms anywhere in Brisbane, Queensland or within a 1,000 km radius. I soon realised that I had the skills and experience to start a small business, with a niche market, and that it had the potential to become industrial if I started silvering commercial mirrors.

After realising my customer potential, I posted an advertisement on google and I immediately received calls asking if I could re-silver old mirrors which had sentimental value to people. Currently my work-space is my garage and I am still studying full-time so I’ve had to decline many jobs because of time or space constraints.

I’ve realised that even someone who has little to no business experience or knowledge and virtually no capital, like myself, can start a business with the whole of south Queensland as a customer base. Like most things, it just takes the effort, incentive, will power and confidence to start.”

UQ Idea Hub is enabling students such as Antony, to get their business idea off the ground and create commercial opportunity. For more information about the program or to get involved visit ideahub.uq.edu.au.
LONG RECOGNISED FOR OUR PROBLEM SOLVING SKILLS, ENGINEERS ARE INCREASINGLY BEING CALLED UPON TO ADDRESS FAR MORE COMPLEX PROBLEMS, THE CONSEQUENCES OF WHICH ARE OF GREATER POTENTIAL SOCIETAL IMPACT THAN EVER BEFORE.

The past century has seen tremendous growth and prosperity in the Western Hemisphere. We have witnessed dramatic change across many spectra – social, technological, economic, environmental and political. But this historical context has not prepared us for what might happen in the remainder of the 21st century.

The planet has not seen such rapid expansion of the middle class, as we have witnessed in China, in history. Arguably this expansion has much further to run and is likely to be replicated in India, Southeast Asia, Latin America and Africa. We are witnessing pervasive megatrends as several billion humans emerge from poverty, urbanise, build wealth and live longer. The pressures that these megatrends will place on equity, infrastructure, aging, food, energy, the environment and the climate are likely to be far greater than those experienced during the industrialisation of the western world. As the global population grows from 7 billion to more than 9 billion, it is likely that the implications will transcend multiple generations.

This scale and pace of change brings both opportunities and challenges for engineers. The influences and consequences of the changes are seldom just technical, and so it will be vital that engineering pedagogy in this twenty-first century transcends the traditional deep scientific and engineering disciplines that defined the engineering curriculum of the last century.

One way that UQ is responding to this new era is through the proposed Business of Engineering stream. Built around four pillars – Global Change, Professional Practice, Leadership, and Innovation, these streams will be introduced across the traditional undergraduate offering before being tackled more deeply at a masters level. Without compromising the deep engineering disciplinary skills upon which the profession is built, the Business of Engineering aims to provide engineers with improved decision-making capacity. A deeper, more mature and pervasive treatment of ethics and sustainability are at the core of a transformation of engineering pedagogy.
The Business of Engineering: Built around Four Pillars

Global Change
The Global Change series helps to provide our engineers with a better framework for thinking about the future societal impact of megatrends and global change. These megatrends will create special challenges and opportunities for the engineer of the future. The world will require tremendous investment in infrastructure and productive capacity. It will also require new skills and thinking from the engineers and leaders of the future. Our response must deliver increased, long-term resilience and will demand collaboration between practitioners and researchers across disciplines including natural sciences, engineering, agriculture, environmental science, ecology, public health, social sciences, economics, management, business and entrepreneurial innovation, and policy and regulation.

Professional Practice
The Professional Practice series is designed to prepare engineers to manage change and implement engineering solutions in the real world. Students learn to identify (non-engineering) barriers to successful project delivery and technology deployment and work towards overcoming these through practical knowledge of strategic management, organisational design, financial analysis, law and regulation, stakeholder engagement and ethics, as they relate to engineering related businesses and projects. They undertake and interpret financial analysis of projects and develop the skills required to assess risk and uncertainty and understand economic, social, environmental and ethical drivers and the inevitable trade-offs necessary to make better quality decisions relevant to engineering projects and businesses.

Leadership
The Leadership series is designed to prepare engineers to lead in organisations as well as in society so that they can influence and effect change. Built on a foundation of core principals such as ethics, communication and trust, the series explores the practice of leadership and systems that support learning organisations. Ethical decision making by leaders and all members of an organisation is paramount to building trust. Effective communication is also critical for leaders in this increasingly complex world – whether it be around enabling a shared organisational vision or articulating the risks and uncertainties associated with important new projects and technological interventions, the challenges for leaders in an increasingly complex but connected world demand exceptional communication skills and methods if organisations are to stay true to their purpose and build trust with stakeholders.

Innovation
Finally, this scale and pace of change in society means huge opportunities and challenges for engineers. Traditional business models are being challenged, markets are disappearing while new ones emerge and globalisation means new markets with increased competition. Issues such as climate change may threaten natural and built environments and require wholesale changes to the energy infrastructure that underpins our modern livelihoods. As we meet the challenges of the 21st century, innovation will be crucial and technology will provide a vital thread. Irrespective of the industrial sector we choose, we will need to constantly innovate in order to remain competitive and relevant.

The Innovation series will provide UQ engineers with the skills to drive innovation by mobilising the human capital within and external to an organisation.
What role will technology play in creating sustainable cities of the future?

AUSTRALIA’S GROWING POPULATION IS PROJECTED TO DOUBLE TO 46 MILLION PEOPLE BY 2075, WITH BRISBANE BEING ONE OF THE FASTEST-GROWING CAPITAL CITIES. HOW DO WE ACCOMMODATE THIS GROWTH, WHAT ROLE WILL TECHNOLOGY PLAY AND WHAT CAN WE LEARN FROM OTHER FAST GROWING CITIES AROUND THE WORLD?

Big data and green technology in transport

WITH PROFESSOR CARLO GIACOMO PRATO Professor of Transport, UQ School of Civil Engineering

About 70 per cent of the world’s population will live in cities by 2050 and will generate approximately 90 per cent of the anthropogenic greenhouse gas emissions. As a fast growing city, Brisbane faces an uphill challenge that requires innovative ideas for achieving environmental, economic and social sustainability. The answer to that challenge? To become smarter.

How do cities become smarter? When observing world rankings of smart and sustainable cities, the answer certainly requires big data and green technology. Examples of successful applications of green technology are the energy efficient buildings in Melbourne, the renewable energy use in Munich, and the zero waste program in San Francisco. Examples of brilliant applications of big data are the intelligent infrastructures in Singapore, the state-of-the-art public transport systems in Bogota, and the disaster response plan in New York.

Does big data and green technology make cities smarter on their own? When thinking broadly, the short answer is no. Electric vehicles are green, but until battery technology will improve and eliminate the range anxiety from the mind of potential customers, market penetration will stay close to zero. Autonomous vehicles are smart, but until the infrastructure technology advances and detaches the feeling of “cool but unattainable” from public perception, only a few enthusiasts will purchase them. E-commerce is smart, but until big data will solve the last mile problem and intercept the customer when and where s/he needs, traffic congestion will increase because of the growing number of vans on our roads.

The key is to make big data and technology serve planners and citizens rather than dictate general solutions that will not cater to their context-related needs. Planners moving towards open-source mapping and powerful data visualization will understand traffic flows first and design human-focused policies later. Transit agencies using social media to receive feedback will provide citizens with the opportunity to help shape anthropocentric public transport systems. Cities will become sustainable when big data and technology make people the centre of their solutions, allowing people to do more with less because they feel that technology supports them towards change.
Water technology is at the core of any city, whether in ancient times, at present or in the future. But a sustainable and ‘liveable’ city in the future will need to focus even more on the diverse role water can, and should play in the fabric of a city. A key element in this context is the role of water in making cities greener with more tree cover and attractive public places. This in turn also makes cities ‘cooler’, which is of growing importance, even to human health, due to the combined effects of the global and the (self-generated) urban climate warming.

The use of technology in the water systems of modern cities is already ubiquitous. Beside the (now) traditional elements such as dams, pumps, pipe networks and water/wastewater treatment systems, we are increasingly relying on new water sources including desalination and water recycling. For example, nearly 50 per cent of Perth’s total drinking water supply already comes from desalination and a large water recycling plant is also under construction. Similarly, the collection and treatment processes for used water (aka wastewater) have substantially increased in complexity in the last few decades and will continue to do so as they are providing much more than a public health role by significantly contributing to environmental protection and increasingly even to the resource efficiency and recovery objectives of our societies.

The latter aspects will gain further importance with the drive to recover most of the valuable resources in used water, namely the water itself, the organic compounds for energy generation and the nutrients as fertilizer. All of these developments will yet again expand the technology needs in the urban water systems.

In future, this trend towards more complex and technology dependent systems in cities is set to continue, both in the water field and more generally in urban developments. The key word in this context is ‘integration’ of different systems and functions. While most of the current systems are serving one specific purpose, in future we expect to see the close interaction and even integration of technology solutions to achieve multiple outcomes simultaneously. For example, a sewer pipe or a rainwater collection system may also be the source for recycled water that can be used in different applications such as irrigation of green spaces, non-potable domestic (e.g. for toilet flushing or washing machines) and industrial use.

While there is a clear need and substantial benefit of further enhancing the integration of technology in the urban water context, these developments need to be strongly supported by, and incorporated into, a novel concept of how cities and urban areas are planned and developed.

In such a new ‘water-sensitive city’, the provision of all water related services needs to be an integral element in the overall planning, design and implementation of the ongoing growth, densification and renewal of our cities. Hence, for any of our technology solutions to provide the maximal benefits in future urban developments, they need to be embedded in the overall social, economic and environmental objectives we have for our sustainable cities of the future.
The internet of green things

WITH DR PAOLA LEARDINI Senior Lecturer, UQ School of Architecture

Population projections for growth in major Australian capital cities are aligned with the global urban trend that will lead more than two-thirds of the world’s population to live within urban environments by 2050. A vision of feasible routes to sustainable and liveable high-density cities still, however, appears blurred and likely distorted through the lens of a Neoliberal approach to economic development.

Australia’s easy access to natural resources has indeed justified delays in the uptake of sustainable development strategies, gaining the country 150th place in the climate and energy category of the 2016 Environmental Performance Index. This is a warning about the need to contextualise the national growth within the global threat of land and resource scarcity.

According to the United Nations Environment Program, buildings use about 40 per cent of global energy, 25 per cent of global water, 40 per cent of global resources, and emit approximately 1/3 of greenhouse gases. Thus, any future infrastructure investment in support of urban growth must promote the efficiency and resilience of cities to unpredictable and extreme events.

Given their current building stock and their projected growth, Australian cities have the potential to drive the shift towards low-carbon development - once the country’s commitment to the Paris climate agreement eventually translates into tangible planning actions. The outcomes of the 2050 Deep Decarbonisation Pathways Project, coordinated by the United Nations Sustainable Development Solutions Network, show that Australia could successfully transition towards a carbon-neutral economy using technologies that are already available or in development, while maintaining similar rates of growth to the last five years.

An even greater leap forward is achievable through smart technology, which has become a major player in the implementation of decarbonised urbanism initiatives, together with high performance buildings and renewables. The smart data grid offers real-time monitoring and feedback mechanisms that allow the optimization of urban systems, and increase their resilience. Efficiency – of energy, resources, space and infrastructures – seems to be the key word of the smart city approach.

Precedents set by cities that are at the forefront of building ‘smarter’, such as the 2015 Copenhagen Climate Plan, the Aspern Smart City Research in Vienna, the Yokohama Smart City Project, or Barcelona’s Urban Platform, just to mention a few, prove that environmental, social and economic opportunities yielded by sustainable urban growth are substantial, while upfront costs, which are often a barrier to adoption, are only a fraction of those associated to current inaction. The growth of Australian cities provides the chance to promote national development while improving living standards. This requires a shift from individual to public interest through policies that raise the bar in terms of building performance, clean energy and the low carbon economy. Ultimately, greening smart cities is not a choice, but the way forward.
WITH AN AGING POPULATION, OUR RELIANCE ON THE HEALTH CARE SYSTEM IS INCREASING MORE AND MORE EACH YEAR. AS THE DOCTORS AND HEALTH CARE PROFESSIONALS OF THE BABY-BOOMER GENERATION BEGIN TO RETIRE, WE ARE WITNESSING A PARADIGM-SHIFT IN HOW WE THINK ABOUT AND ADDRESS HEALTH ISSUES. AS THE WORLD AROUND US BEGINS TO LOOK TO ENGINEERING AND TECHNOLOGY FOR SOLUTIONS, SO TOO DOES OUR HEALTHCARE SECTOR. AND AS OUR ALUMNI AND RESEARCHERS WILL TELL YOU, IT’S NOT A MOMENT TOO SOON.
The gift of sight is one which most take for granted. As we navigate new roads, memorise new faces, and make selections in supermarket aisles, it’s our eyes that take in the details, in turn allowing our brains to make calculated decisions. For vision impaired people, these daily tasks can be strenuous and at times, simply not plausible. Until now. Utilising the latest advancements in biomedical engineering, a multidisciplinary team of engineers, technologists, scientists and ophthalmologists, are quite literally giving visually-impaired people the gift of sight. The retinal prosthesis or ‘bionic eye’ is most suitable for the degenerative eye condition known as retinitis pigmentosa. Patients with this condition are born with eyesight, but their light-receiving photoreceptor cells degenerate over time. At the end-stage of retinitis pigmentosa, patients have only ‘bare-light’ or ‘no-light’ perception, meaning their visual function is limited to localising a bright light.

A bionic eye can offer improved visual function, allowing a patient to orient themselves in an unfamiliar environment, such as walking down the street or avoiding obstacles in crowded places. We also expect improvements in activities of daily living, allowing recipients more confidence and independence in their own home. Our clinical trial of the first 24-electrode prototype, was successfully trialled on three volunteers – all of whom are profoundly blind. However, once the volunteers were fitted with the device, they were able to perform vision tasks such as navigating obstacle courses and differentiating objects on a screen. Based on this successful trial, we’ve since further developed an improved ‘take home’ version of our retinal prosthesis which is due to commence clinical trials in Melbourne in the coming months. This study will confirm the safety and efficacy of our device as we progress down a commercial pathway. Our continued collaboration with vision processing experts at Data61 (formerly NICTA), and neuroscientists at our own institute as well as the Centre for Eye Research Australia (CERA) means we will be able to continually introduce enhancements to the bionic eye through improved vision processing and stimulation strategies.

The new device will have a light-weight portable vision processor worn on the hip or hanging from a lanyard. Camera images from a small video camera on glasses are captured by the vision processor and converted into signals suitable for electrical stimulation. A magnetically-coupled coil at the side of the patient’s head transmits these signals to an implanted stimulator, much the same as a cochlear implant for hearing. Finally, the stimulation signals reach an electrode array that is implanted at the back of the eye and the patient perceives the signals as flashes of light that form the shape or outline of objects. There is some surgery required to implant the device but we’re proud of how minimally invasive this is. Our electrode array sits in a natural pocket between two outer layers of the eye and will remain there safely without any need for mechanical fixing.

The results from our bionic eye clinical trials to-date give us encouragement that we will be able to provide meaningful prosthetic vision to patients with degenerative eye diseases. The more we innovate, the more we learn of how these innovations can make a substantial difference to patient outcomes. We’re helping to restore a level of vision to people who previously would have not been able to see again, and that’s incredibly exciting.
UQ’s Dr Amin Abbosh is leading the development of a compact and portable system which he is confident will assist in the efficient diagnosis of brain injuries in a matter of seconds.

In the news, we are frequently confronted with the tragic details of vehicle crashes and the victims of these unfortunate events. What news stations fail to mention however, are the high proportions of brain injuries which are acquired as a result of these accidents. The International Brain Injury Association (IBIA) noted that of all types of injury, those to the brain are among the most likely to result in death or permanent disability. On a global scale the impact of brain injuries is far-reaching as the IBIA estimates that in the United States of America, approximately 5.3 million people are living with a traumatic brain injury related disability, and in the European Union brain injury accounts for one million hospital admissions per year. Brain Injury Australia referenced that nationally over 1.9 million people are affected by a traumatic brain injury.

When an injury to the brain occurs, since the patient’s condition deteriorates so drastically, the creation of a rapid diagnostic and monitoring system is vital for their survival.

From the onset of a brain injury, including strokes, millions of brain cells die every second. This then damages the control links with different body parts, which can result in loss of memory, movement or speech, often leading to a disability or even death. On-the-spot and rapid diagnosis will ensure that the patient can receive the appropriate treatment in a timely manner, which I believe will result in a complete recovery. Although highly sensitive technologies such as CT scans and MRIs already exist for the diagnosis of brain injuries, these machines are bulky, and are not designed to be carried by first response paramedic teams for the on-site diagnosis of patients. Moreover, around three-quarters of the world’s population does not have access to reliable and affordable medical imaging systems according to the World Health Organisation. This is why our work is so vital. Existing technologies are not an affordable method for a large amount of patients, nor are they readily accessible in rural or developing communities. A compact and mobile technology that can be applied to monitor the patient continuously, and in real time, either at the bedside or in the emergency room, is a significant advantage in comparison to existing techniques.

Our portable, non-invasive, non-ionizing, cost-effective and safe microwave imaging system can meet all of those requirements – it’s low-cost and can be used frequently for long-term monitoring.

Utilising electromagnetic fields at the microwave band, the machine is placed over the head of the patient, allowing the medical practitioner to gain a clear image of the brain and any injuries that may be present. Microwave imaging refers to the image reconstruction process of an object using microwave frequencies, so in a microwave-based head imaging system, a safe low-level of electromagnetic energy is emitted towards the head using an antenna array and the scattered signals are collected and processed to image the interior of the human head. The image reconstruction and the principle of detection mostly depend on the contrast of scattering or electrical properties between normal and abnormal tissues of the brain. A brain injury causes a significant change in the electrical properties of the brain affected tissue. The machine itself will be free-standing, light-weight, portable and user-friendly, allowing paramedics to stock it as part of their ambulance itinerary and carry it to accidents as required.

This system provides significant rapid data acquisition, processing and image creation capabilities for the fast detection and three-dimensional localisation of brain injuries. The system can detect, localize and classify traumatic and non-traumatic brain injuries which are the major cause of disability and mortality worldwide. Through use of this machine, I believe we can save many lives and prevent the lifelong disability of many others every year.
Since 1980, worldwide obesity has more than doubled, with two in three Australian adults considered either overweight or obese due to consumer diets high in sugar, salt and saturated fat, leading to an increase in related heart disease, diabetes and cancer (Australian Institute of Health and Welfare). Despite recent improvements, high consumption of sugar-sweetened beverages and foods high in salt and saturated fats remains an issue across all ages, particularly with the younger demographic within Australia. The food industry is very adept at making foods and beverages with improved health credentials, along with sophisticated marketing strategies, but products continually fail in the market due to unacceptable flavour or texture characteristics.

Traditionally, food companies rely on trial and error methods when reconstructing the composition of snack foods, beverages and dairy foods. In addition, stealthy reduction techniques are allowing incremental reductions to be achieved in salt, fat and sugar. Whilst this approach has been reasonably successful, it is failing to make the step change required to obtain universally healthier formulations since they are being pushed well-outside where current design rules apply. The ineffectiveness of this strategy arises from a lack of knowledge on the interplay between ingredients and sensory perception, which is partially controlled by the complex physics and physiology of oral processing.

And with previous change behaviour and marketing strategies aimed at making people eat healthier being largely unsuccessful, our research into the texture and mouthfeel of foods and beverages during and after consumption presents an alternative engineering approach to improving health around the world.

Working in partnership with some of the world’s biggest food companies, we are creating new ways for industry to manufacture their products. A key area of our approach is capturing the interaction of foods and beverages with oral mucosal substrates, which play a key role in perceptual processes that drive unacceptable mouthfeel sensations.

In addition, we are world leaders in developing techniques from the fields of tribology (study of friction and lubrication) and rheology (study of flow and deformation) to quantify relevant physical properties that drive oral sensations. Together with an engineering approach to the design of model foods to explore variables, in conjunction with translation of insights to real products, we are uncovering unique tools to assist companies develop rational design approaches. This approach is thus enhancing the development of healthy foods with lower fat, sugar and salt, whilst retaining the gratifying characteristics of these ingredients.

As the third largest contributor to the Australian economy, the food industry is now a priority area for the Australian Government. We know that that snack foods and sugar-based beverages are bad for us, but that doesn’t prevent us from buying and consuming them. Therefore, significant reductions in the levels of fat, sugar and salt in these foods would make a significant improvement to the health and well-being of our nation, and people globally.

Professor Stokes’ research has been supported by grants from the Australia Research Council (ARC) Discovery and Linkage grants, the ARC Industrial Transformation Training Centre for ‘Agents of Change: transforming the food industry for Australia, Asia and beyond’, the ARC Centre of Excellence on Plant Cell Walls, and numerous companies based internationally (USA, NZ and UK) and locally. Jason is currently a consultant for several international and national food companies, and is on the experts’ advisory panel for a New Zealand Primary Growth Partnership with Fonterra NZ in Food Structure Design. He was awarded a UQ Partners in Research Excellence Award in 2014 for his successful collaborations with PepsiCo USA and the British Society of Rheology Annual Award 2013.
COUGHING UP THE DATA FOR DIAGNOSIS

WITH ASSOCIATE PROFESSOR UDANTHA ABEYRATNE

UQ’S ASSOCIATE PROFESSOR UDANTHA ABEYRATNE HAS DISCOVERED, A COUGH IS NOT JUST ONE OF THE FUNDAMENTAL SYMPTOMS OF RESPIRATORY DISEASES, IT IS ALSO ONE OF THE MOST UNDERUTILISED OPPORTUNITIES FOR DIAGNOSIS.

The sound of a cough is something which most automatically associate with an illness. As children we’re taught to cover our mouths when we cough for fear of spreading germs and any illness we may have. However, it is also one of the most underutilised opportunities for diagnosis in current clinical practices.

Experienced physicians are capable of drawing some qualitative information from coughs, but find it difficult to verbalise their insights and pass their experience on to other humans. During a cough, the lower airways including the lungs are directly connected to the atmosphere through a column of air that can support a high bandwidth channel, which we call the information superhighway to the lungs. We developed a technology to diagnose respiratory diseases based on the mathematical analysis of a cough and respiratory sounds acquired through this information superhighway.

The technology that we are talking about recently resulted in a spinoff company known as ResApp Health Ltd. Our technology can be made available in multiple formats. In the simplest form, it can be implemented on a smart phone such as an iPhone; no extra attachments, network access or body-contact with the patient are required. The phone will acquire sounds, analyse them using our mathematical algorithms and arrive at a decision in real-time.

It is these features that make the technology such a viable option for diagnosing illnesses in rural and developing communities. The technology can also be delivered on cloud computing platforms for telehealth applications or be used in developing hospital grade medical instruments.

Our immediate focus is to develop diagnostic technologies for respiratory illnesses such as asthma, wheeze, pneumonia, croup, bronchiolitis and chronic obstructive pulmonary disease (COPD). What many fail to realise is just how serious respiratory illness is within societies throughout the world, from the poorest to the most affluent. Respiratory diseases cause millions of deaths and cost billions of dollars every year. For example, Pneumonia is the leading killer of children under the age of 5, with one child dying every 30 seconds from this disease. Meanwhile bronchiolitis is the leading cause for hospitalisation for infants under six months old, and COPD is the third leading cause of death in adults after cardiovascular disease and cancer.

The ResApp technology provides an easy to use decision device and increases the diagnostic specificity of pneumonia by 200-400 per cent over that of the World Health Organisation’s standard for resource-poor regions. The current diagnosis method of chest auscultation is not specific or sensitive enough as a diagnostic tool. Meanwhile chest x-ray, which is often used for the diagnosis of pneumonia is not available in disease endemic remote areas of the world.

There is a dire need for technology of this calibre throughout the world from Australia and America, to sub-Saharan Africa and remote Asia. Our technology provides unprecedented opportunities for Australian Indigenous health too. Respiratory diseases are rampant among the Indigenous people, reporting one of the highest rates of pneumonia prevalence in the world.

This research program started in 2009 through a Grand Challenges in Global Health Explorations grant from the Bill and Melinda Gates Foundation, USA which had publicly called for proposals on paradigm shifting new solutions to the tough problem of diagnosing pneumonia in resource poor regions. One of the key reasons for the heavy mortality is unavailability of accurate, easy to use diagnostic technologies for such regions. This is why our technology is so vitally important. If we can diagnose people earlier and better, then we can and will save lives. In the absence of early treatment, childhood pneumonia can advance to states that may be difficult to manage even in a hospital setting.

Large clinical studies to further develop and validate the technology are ongoing in the Princess Margaret Hospital and Joondalup Health Campus, Western Australia as well as The Princess Alexandra Hospital, Brisbane. Results we obtained so far clearly indicate the vast but hitherto untapped potential of cough analysis in diagnosing respiratory diseases. We are also excited by some recent results that suggest our technology can separate viral pneumonias from bacterial ones. Though we need further validation of this idea, if proven scalable to larger data sets, it has the potential to revolutionize the way pneumonia is diagnosed and treated in the world, while addressing the currently intractable problem of the development of antibiotic resistance in communities.

To find out more about research at the Faculty of Engineering, Architecture and IT visit eait.uq.edu.au/research.
Big Data provides us with a new way of perceiving the world, where everything is an object, every object is associated or in interaction with other objects, and every object can be ranked by criteria such as importance, interestingness, influence, risk, or a combination of these.

The main goal of Big Data research is to ‘become aware of unawareness’. This has two levels of meaning: objectively, there are known facts and unknown facts; subjectively, there are things we know and things we don’t know. Big Data solves the problem of not knowing what we don’t know. This is done via two methods: ‘from small-to-big’ and ‘from-big-to-small’.

At UQ, we create change by understanding this fundamental problem in Big Data using Big Data Analytics.

We develop methods of data fusion to ‘connect-the-dots’ and derive a global picture (from ‘small’ to big) of situations such as market feedback on products and services, overviews of patient medical conditions in a hospital, overall performance of a business, and trending social opinions in social communities on social networks.

We develop analytical approaches to find relevant individual objects by detecting outliers in a huge collection of objects (from ‘big’ to ‘small’) such as security threats, emerging events on social networks, personalised medical recommendations for patients, and performance predictions for a given organisation.
Big Data Analytics requires automating the scalable computational resources. Corporate data can be stored and outsourced managed in an on-demand and privacy-preserved fashion by third parties. Large computing centres and open cloud computing platforms are becoming a popular choice for organisations to develop their Big Data applications with minimum effort.

Most Big Data applications consist of three basic aspects: Big Data Fusion, Big Data Analytics, and Big Data Visualisation. At UQ, the DKE (Data and Knowledge Engineering) research division in School of Information Technology and Electrical Engineering, led by Prof Xiaofang Zhou, has been working at a world-first level on all three of these aspects in ARC (Australian Research Council) funded projects.

In dealing with the well-known three big-‘v’ (volume, variety, and velocity) properties of Big Data, we are facing new challenges. Firstly, traditional sampling and modelling theories are challenged: how much data ought to be enough for analysis? Should a solution be computed on the fly or simply searched over a large data space? Secondly, as in a high-dimensional data space, every object would be an outlier, can we design algorithms and indexes to work with a large volume of high-dimensional yet sparse data efficiently? Thirdly, how can we design and implement algorithms that optimise the usage of Tera-byte scale memories in current cloud computing platforms?

Social media is now a part of human life. It has been seen that performance of organisations can be influenced by social opinions. For example, government elections, local housing prices, and stock market share prices are all influenced by people’s attitudes, feelings, and moods. Therefore, if we are able to accurately capture people’s sentiment and opinions expressed on social media toward certain objects, we can then predict changes of performance with respect to the changes of people’s opinions.
AS COMPUTERS BECOME INCREASINGLY UBQUITOUS IN THE WORLD AROUND US, THE INTERFACES WE USE TO CONTROL AND INTERACT WITH THEM ALSO SHIFT AWAY FROM THE NOW FAMILIAR KEYBOARD, SCREEN AND MOUSE, TO BECOME EMBEDDED INTO THE ENVIRONMENT IN A VARIETY OF WAYS.

From this perspective, interaction designers are at the forefront of exploring and determining how we interact with a digitally augmented physical world, and how interactive technologies can be designed to enhance our experience of using them.

In UQ’s School of IT and Electrical Engineering (ITEE) Bachelor of Multimedia Design and Master of Interaction Design programs, students prepare for careers in the broad field of User Experience (UX) Design. UQ’s ICT design programs have played a leading role in adopting studio methods from Architecture for the teaching of technology as a design discipline. Technology and design streams of study come together in studio, where students work in teams to understand problem situations, explore human values, and build prototype solutions. Sulcus Loci gave a small team of ITEE students the opportunity to combine their experience design skills with a group of designers who were focused on creating an innovative structure, along with creative input from artist in residence Svenja Kratz. The interactive pavilion, inspired by images from QBI microscopy, demonstrates the potential for future collaborative projects that explore how we can design new ways of interacting with digital data that has been incorporated into the built environment.

In Sulcus Loci, the fabric skin of the structure became an interactive surface, using Microsoft Kinect to sense where people touched, pushed and poked at the material, then using data projectors mounted on the skeleton to paint the skin with images inspired by brain cells.

The interactivity was coded using the Unity 3D platform, which coordinated lighting and the audio layers composed by Eve Klein from UQ School of Music. The soundscape was also driven by infrared and ultrasound proximity sensors mounted inside the structure, so that as more people moved through it, the intensity and layers of sound increased. The final interactive component was the physical animation of the structure itself. Servo motors mounted on the outside of Sulcus Loci were attached to the spurs that the fabric skin was wrapped around. With sensor data also providing input, the motors moved the skin to create a sense of the whole structure ‘breathing’, and giving a glimpse of the future for interactive buildings, and where Architects and Interaction Designers will increasingly collaborate and learn from each other.

Sulcus Loci is an immersive interactive installation built by UQ students from Interaction Design and Master of Architecture courses in collaboration with artist Svenja Kratz. Previously exhibited at the State Library of Queensland, the installation featured a soundscape by Eve Klein from UQ’s School of Music and showcased an impressive image library generated by researchers of Queensland Brain Institute’s Microscopy Unit. This cross-disciplinary project was initiated by UQ Art Museum as a part of broader program to engage students and academics in a creative nexus of the arts, science and environment.
IT IS NOT ALL DOOM AND GLOOM IN MINING, WITH INNOVATION AND SUSTAINABILITY OPENING UP NEW HOPE FOR THE INDUSTRY WRITES PROFESSOR CHRIS MORAN, DIRECTOR SUSTAINABLE MINERALS INSTITUTE.

Leading practices in mining occur all over the world. It is not possible to list the implementation in any sensible fashion. However, I am cautiously optimistic that we are seeing increasing implementation of leading practices. I say “cautiously” because we also continue to see unacceptable events occurring that should not. Fatalities associated within mining are too high, negative environmental impacts are still far too often in evidence, and the number of conflicts between communities and mining are increasing.

The mining industry has highlighted the importance of one area above all others: the safety of the workforce. There has been a very significant decrease in fatalities and injuries across the industry. There is no case for complacency on this, but it is a very good outcome and has been driven by intense research, development of pragmatic approaches and workforce education, and gradual embedding into the culture of mining.

Technically, we are now able to conceive significantly better ways to undertake mining and metals refining. We are by no means able to implement all that we can conceive. One major constraint is that mining is very capital intensive to get started. That is, a mining company must generally make a very large upfront investment in manufactured capital (plant and equipment) before any cash flows from the mine. This becomes a constraint in terms of innovation because it is not likely that future financial capital investment will occur after the initial investment. This technology lock-in can last for decades for very large mines. Consequently, it can look, at any one point in time, that operating mines are not using the latest technologies and leading sustainability practices.

It is also critical that we reuse the products of mining once we have gone to the significant efforts required to win them from the earth. This is more than just recycling what we can. It is important that society begins to take a very close look at the design of manufactured capital with a view to the reusability of the metals, in particular, that we embed. Currently, we are becoming far more aware of the recovery of metals, but the problems associated with releasing these metals from things such as building or electronic wastes, are expensive and require far too much energy. We need to have a massive increase in collaboration between designers, engineers, scientists and those with governing responsibilities to create a step change improvement in metals recovery and reuse.

Another constraint might be termed the “mining company social contract with communities”. A very important part of securing the formal and social license to operate for many mines is the employment opportunities for local people. If technology becomes available that could conceivably change the sustainability of the operation from an efficiency perspective, the employment opportunities might decrease. In such cases, the mining company will need to reframe its social contact with the community.

Many opportunities exist in building human capital in the communities, such as education and business skills building, but they will be different from the traditional direct employment. One might speculate that the best environmental stewards over the long term for a mining project would be the local community. So perhaps building the skills and supporting technologies for the community to be the environmental managers during operations and the stewards after mining would provide a long term social contract attractive to the communities?

THE SUSTAINABLE MINERALS INSTITUTE (SMI) PROVIDES THE KNOWLEDGE AND IMPLEMENTATION PATHWAYS TO ENABLE MINING COMPANIES TO SOLVE THEIR SUSTAINABILITY CHALLENGES. OUR MAIN LINES OF WORK ARE CATEGORISED IN THOSE PRACTICES THAT AFFECT PRODUCTION, PEOPLE AND ENVIRONMENT. ULTIMATELY, WE WOULD LIKE TO SEE THE FINGERPRINTS OF THE SMI RESEARCH AND EDUCATION ON A DISCERNIBLE REDUCTION IN THE FOOTPRINT OF MINING.
A thirst to follow a road less travelled, led Dr Jurij Karlovšek to geotechnical engineering, and more specifically to tunnels. For Jurij, tunnels provided a unique path he wasn’t able to find in any other stream of engineering.

Once Jurij made the purposeful decision to establish his career in geotechnical tunnel engineering while conducting his internship in Japan, he and his wife moved to the country that is at the moment seeing the largest amount of tunnelling activity in the southern-hemisphere – Australia. It was here in Australia, that Jurij embarked on an academic career and began his PhD in 2009.

Throughout his PhD studies, Jurij’s passion for geotechnical engineering and his advanced knowledge of the sector did not go unnoticed by his peers, leading to an offer for a lectureship position at UQ in 2016.

“My philosophy is grounded in the belief that industry and academia should work together in the pursuit of excellence and innovation. Through my lectureship I want to lead the creation and delivery of top tunnelling classes and conduct state-of-the-art research at a national and international level.”

“One of my key goals is to get students excited about the underground space and working on projects around Australia. It is rewarding to see young engineers discover their interest in tunnelling and take advantage of the opportunities that come with the sector, such as travel. Through my industry connections I was able to secure an undergraduate internship at Nishimatsu Construction Company – Tokyo, which then led to me being offered a job in Ljubljana, Elea iC!”

A career as a tunnelling engineer is one that is truly global. “Through tunnelling I have been able to travel around the world, and have met some exceptional people who I am still in contact with. As Australia’s underground space continues to develop exponentially as the population increases, the sector holds exciting job prospects for graduates. Whilst tunnelling is relatively new in Australia compared to other countries in Europe and Northern America, the sector continues to steadily grow with projects such as ‘Sydney Metro’ in the planning stages,” Jurij said.

Jurij is undoubtedly breaking new ground in higher education and in industry; encouraging his students to get involved in professional associations from a young age as it unites like-minded people working towards a common goal.
“I knew that as soon as I came to Australia I had to find a technical society to meet colleagues that shared similar interests – interest in tunnelling and underground space in particular. I joined the Australasian Tunnelling Society (ATS) in Queensland and I saw the opportunity to develop a position for a Young Member Representative for the purpose of recruiting more young members and students to diversify the group. Once the Young Member Representative position was created, more undergraduate and postgraduate ‘tunnellers’ attended the technical meetings and so this model was adopted in other Australian states,” Jurij said. Jurij currently holds the position at the National Executive Committee as a Young Professional Representative.

Jurij’s strong connections in Australasia provided him with international links where he also discovered the need for more Young Members activities. “Along with Peter Sala, former chair of the British Tunnelling Society Young Members, we spurred the change for 27 member nations to have Young Member Representatives,” Jurij said. Jurij’s ambition in creating a non-intimidating platform for young tunnelling professionals allowed him to become the International Tunnelling Association Young Members Group Chair for the period of 2014-2016. This year Jurij will hand over his chair and looks forward to seeing how new generations of enthusiastic tunnellers will lead the group. His advocacy for positive change in the tunnelling sector and his passion to impart knowledge to the next generation, led him to being named the ‘International Young Tunneller of the Year’ in 2015.

In November last year, tunnelling experts from around the world gathered for the International Tunnelling Awards in Switzerland. “It was an honour to be named the International Young Tunneller of the Year in the captivating underground city of Hagerbach,” Jurij said.

As Jurij continues to make breakthroughs underground and above, he champions the field of tunnelling, as he pursues his passion to make a positive impact to the sector through advocating for and mentoring young people.

“As my mentors greatly impacted my career path, I learnt how important mentorship is for young people. Now, through my position at UQ I can mentor and guide students to reach their potential.”

“WHEN YOU FIRST ENTER A TUNNEL UNDER CONSTRUCTION IT IS DARK, HUMID AND VERY NOISY. FOR SOME PEOPLE, BEING UNDERGROUND CAN BE INTIMIDATING, ESPECIALLY IF YOU’RE CLAUSTROPHOBIC. FOR DR JURI J KARLOVŠEK (PHD 2014), INTERNATIONAL YOUNG TUNNELLER OF THE YEAR, HE SEES THE POTENTIAL FOR TRANSFORMATION, FOR A VISION TO BE REALISED. MANY PROJECTS OF THE WORLD’S MAJOR CITIES ARE LOOKING UNDERGROUND AS THE NEXT FRONTIER FOR URBAN GROWTH.”
Engage with our students

THERE ARE A NUMBER OF WAYS ALUMNI CAN ENGAGE WITH UQ STUDENTS AND MAKE A DIFFERENCE BY INFLUENCING THE NEXT GENERATION OF ENGINEERS AND INFORMATION TECHNOLOGY SPECIALISTS. WHETHER IT BE THROUGH MENTORING, TUTORING, GUEST SPEAKING, INTERNSHIPS OR PHILANTHROPY, THROUGH PROGRAMS LIKE OUR ANNUAL PHONE APPEAL, YOUR SUPPORT HAS A TRANSFORMATIVE IMPACT ON OUR STUDENTS....

UQ Telephone Campaign
Through the art of conversation, generations of alumni were united with current students – sharing stories of what is happening at UQ, and hearing about times past. More than 800 gifts were received from the 14,153 calls made, providing support for research, teaching and learning initiatives and student mobility. For more information on supporting students through philanthropy, please visit eait.uq.edu.au/philanthropy.

“I really enjoyed participating in the UQ Telephone Campaign. I was able to engage with UQ alumni by sharing campus news, updating alumni information and listening to how UQ had influenced their career paths. We were also able to ask alumni to support several worthwhile funds which support current UQ students through scholarships, new educational programs, research funding and student welfare.

The calls were made to alumni, who ranged from recent graduates, to alumni who were celebrating 50-year milestone anniversaries. Every call we made was a trip down memory lane as they shared their UQ journey with us. We were able to relate to some of their great experiences and learn about how UQ had influenced their lives upon graduation.

Being a part of the UQ Telephone Campaign was an enriching experience, especially knowing that as students, we were able to act as a channel of communication between UQ and alumni. The positive response from UQ’s dedicated alumni was overwhelming. I believe the student callers, and the alumni who participated in the program, felt proud to be a part of UQ and realised the strong legacy behind being a UQ student.”

Utkarsha Somalwar, UQ Engineering Student (pictured left)
"After 18 years working in industry as a chemical engineer, I found myself with some spare time following the closure of the BP Bulwer Island Oil Refinery where I worked. I knew that I wanted to change my career path and as I enjoy talking with people from a variety of backgrounds and helping people understand complex engineering concepts, I found tutoring to be a great option. As I tutor chemical engineering undergraduate and masters students, I have found that my industry experience and perspective greatly benefits the students I teach. It is rewarding to see that my work experience and learnings can help others. I am enjoying being back at UQ again after all these years as I have been able to reconnect with old classmates and lecturers and even former work colleagues."

Greg Siemon, UQ Engineering Tutor (pictured right)

"We have been associated with the Bachelor of Engineering (Honours)/Master of Engineering (BE(Hons)/ME) Placement Program since its inception and have actively used the program as our primary means of recruiting graduate process engineers into the business. Without exception, the students who have been placed at Queensland Alumina Limited (QAL) have been very talented and from day one have been able to contribute value to the projects they are assigned. They provide a resource that is out of the daily firefighting world of operations, allowing longer term projects to be worked on that have consistently delivered value far and above the resource commitment required to manage the students. The students come armed with a wealth of knowledge that they enthusiastically apply to the real world situations that are faced within the workplace. The students are a real spark of energy on-site that is a pleasure to be around. QAL continues to be very proud to be associated with this program and the ongoing collaboration opportunities that derives with UQ as a result."

Tom Connor, Production Analyst, Queensland Alumina Limited

“It’s a privilege and quite a responsibility to mentor a UQ student, particularly during a time when life-changing decisions can be made. I have found the experience is rewarding on multiple levels and an opportunity to give something back to the University and help the next generation of engineers.”

Grant Worner
Oil, Industry Executive

“The wisdom and experience of alumni can help lead our future graduates on their path to success. Through the MEET a Mentor program, students are connected with established alumni to motivate, encourage, empower and transform the next generation of professionals entering the industry. For more information about the program visit eait.uq.edu.au/meet-mentor.

Internships and Employability Programs
Industry placements are an outstanding opportunity for alumni, companies and industry partners to engage with UQ’s best and brightest students. Our Industry Placements Coordinator manages several placement and employability schemes that call for industry partners and leaders in the field to get involved.

For more information, visit eait.uq.edu.au/industry-partnerships.

Tutoring & Guest Speaking
Students greatly value the industry relevant knowledge and experience alumni possess. Through tutoring or guest speaking, alumni have the opportunity to share their unique insights into the worlds of engineering or information technology with students.

If you are interested in applying to tutor current students in aerospace, chemical, materials, metallurgical, mechanical, mechatronic, and/or mining engineering, please visit eait.uq.edu.au/alumni-tutoring-vacancies.

“After 18 years working in industry as a chemical engineer, I found myself with some spare time following the closure of the BP Bulwer Island Oil Refinery where I worked. I knew that I wanted to change my career path and as I enjoy talking with people from a variety of backgrounds and helping people understand complex engineering concepts, I found tutoring to be a great option. As I tutor chemical engineering undergraduate and masters students, I have found that my industry experience and perspective greatly benefits the students I teach. It is rewarding to see that my work experience and learnings can help others. I am enjoying being back at UQ again after all these years as I have been able to reconnect with old classmates and lecturers and even former work colleagues.”

Greg Siemon, UQ Engineering Tutor (pictured right)
Looking back over these years, I realise that I have been privileged to be part of the extraordinary and exciting development of our tertiary education system and engineering education in particular.

Australia’s tertiary (engineering) education is now big business: enrolments are greater and more international than ever. In 2014, more than 100,000 students were enrolled in Australian engineering degrees. There are around 5,000 at UQ.

Advances in technology have seen slide rules replaced with laptops and everyday use of mobile devices that can access global information and communication networks. When coupled with increasing globalisation, changing work places and practice, and community expectations, engineering education now looks very different.

As a final year student in 1975, I was in a class of 20 students. We had a “home room” to which lecturers came for classes, many of which were primarily about transfer of information. Hand held HP calculators had just replaced slide rules and were the very latest in readily available technology. Meanwhile assessment was mostly written examination.

Thanks to rapid advances in computers and information technology, what students could do in class rooms in the late 80’s when I returned to teach at UQ was very different. Classes were no longer primarily about providing information – they were increasingly about students using information acquired outside of the class room. Chemical engineering staff will remember this as the era of Resource Based Education and a shift to student rather than teacher centred education.

By the late 90’s the Department of Chemical Engineering took this further by implementing a completely new Project Centred Curriculum.

Approximately one quarter of the program was devoted to team-based project work designed to develop technical and professional skills, and simulate professional workplace experiences and practices. Assessment now included performance in professional skills such as team work and communication.

This was far-reaching change that was enthusiastically embraced by the students and employers, acclaimed internationally (most recently in 2012 by a joint Royal Academy of Engineering and Massachusetts Institute of Technology study) and recognised with several national teaching awards including a 2005 Award for Programs that Enhance Learning. Walking across the stage at Parliament House in Canberra to accept this award was certainly a memorable moment. Equally memorable is having worked with a wonderfully collegial team of UQ chemical engineering educators including Jim Litster, Ian Cameron, Paul Lant and Tony Howes.

After moving into the Associate Dean role encompassing all engineering, architecture and information technology programs and courses, the successes of the chemical engineering approaches were translated into other areas. First year students worked on the Engineers without Borders (EWB) Design Challenge and other community or industry based projects as part of the first year engineering curriculum. UQ has partnered with EWB from its very beginning to offer service and community based student learning experiences across all year levels.

This is something I have been especially pleased to support. We also acknowledge our engineering students as “Student Engineers” – tasking them to take charge of their own future.

With industry engagement, professional practice, and research pathways now available to our undergraduate students across all engineering disciplines, we really are placing the world at the feet of our students. It’s really rewarding to know that much of this evolved from Chemical Engineering’s Project Centred Curriculum.

Other significant improvements are the new kinds of “teaching spaces” both physical spaces (learning centres, studios and workshops) that support hands-on campus based activities, and virtual and online learning environments. New technologies are driving continual improvement and innovation in blended learning.

Design and delivery of the UQ Student Engineer’s education is a team effort relying on academic and professional staff and interactions with industry and community. Overall, UQ engineering has effectively moved educationally with the times over the last 40 years. It also values diversity and recognises the contribution this makes to strengthening overall outcomes. The challenge for the university is to maintain this in the face of continuing change. It is disappointing that the proportion of women in engineering remains persistently low despite university and industry attempts to recruit more women; however, through our UQ Women in Engineering program, we are helping to address this issue.

I believe the future of both the engineering education sector and the overall engineering industry, is incredibly exciting – there has never been more of a need for qualified engineers to lead our communities forward. If I had my time over again, I can’t imagine doing anything else – having contributed to the education of many thousands of engineering graduates is a very satisfying legacy.
ALUMNI TALK SERIES

THE FACULTY’S ‘LEADERS OF INFLUENCE’ SERIES HAS PROVIDED ALUMNI AND FRIENDS WITH AN OPPORTUNITY TO HEAR FROM HIGH CALIBRE INDUSTRY LEADERS ON CURRENT AND CRITICAL ISSUES THAT IMPACT AUSTRALIAN AND GLOBAL ENGINEERING, ARCHITECTURE AND IT COMPANIES. THE SUCCESS OF THE SERIES HAS LED TO THE FACULTY HOSTING SEVERAL KEYNOTE PRESENTATIONS IN 2016.

Seminars are delivered in Brisbane, Sydney and Melbourne. Attendees can expect lively discussions, access to VIP speakers, and networking with fellow UQ alumni over light refreshments.

UQ alumnus, Matthew Coulter (BE 1984) said that he has found the ‘Leaders of Influence’ Series to be “of great value and a refreshing change from the usual corporate presentations. The Series presents excellent speakers who are leaders in industry, and as an alumni function, a sense of being ‘amongst friends’ which, brings out the best in the presenters, encouraging lively and candid opinions. This atmosphere is conducive to a rich discussion around the lunch table as well as in the open forum.”

PREVIOUS SPEAKERS:
- Mike Kane, CEO and Managing Director of Boral presented ‘Productivity in Australia: Why Boral’s stand against the CFMEU matters to us all’
- Rod Duke, Chief Executive Officer of Santos GLNG presented ‘Leadership challenges: Building Queensland’s new LNG industry’
- Elizabeth Bryan, Chairman of Caltex and Virgin Australia presented ‘Business transformation in a changing landscape’
- Ken Boal, Vice President of Cisco Australia and New Zealand presented ‘Delivering on the Ideas Boom: Opportunities for Australia’
- Lance Hockridge, CEO and Managing Director of Aurizon presented ‘Creating value and building resilience in a commodity downturn’
- Kathryn Fagg, Board Member of the Reserve Bank of Australia presented ‘Leading for a more productive Australia: Towards greater inclusion and collaboration’

UPCOMING SPEAKERS:
- Wednesday, 22 June: David Rohrsheim, General Manager of UBER Australia and New Zealand (Sydney) presenting ‘Changing Lanes: Uber and the Future of Cities’
- Friday, 19 August: Lara Poloni, Chief Executive of AECOM Australia and New Zealand (Brisbane)

Alumni and friends are warmly invited to attend our upcoming ‘Leaders of Influence’ Series events. For more information and to register visit eait.uq.edu.au/alumni-events.

Receive a complimentary ticket to an upcoming ‘Leaders of Influence’ event by emailing alumni@eait.uq.edu.au with your full name, contact details and code ‘LOI16Ingenuity’ (offer expires 31.12.2016)
We bring together workshops, experienced mentors and a network of local and global innovators to help you grow your idea into a solution that matters. Throughout the program, you will have the opportunity to form and test your early stage ideas for potential commercial opportunity. You will also build networks with fellow alumni, idea makers and seasoned entrepreneurs for a strong, well-connected start to your entrepreneurial journey.

To find out more visit ideahub.uq.edu.au.

UQ Idea Hub is a startup pre-incubator for the aspiring, the inspiring and the ambitious

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do you have the next big idea?