

2015

DISCOVERY AT UQ



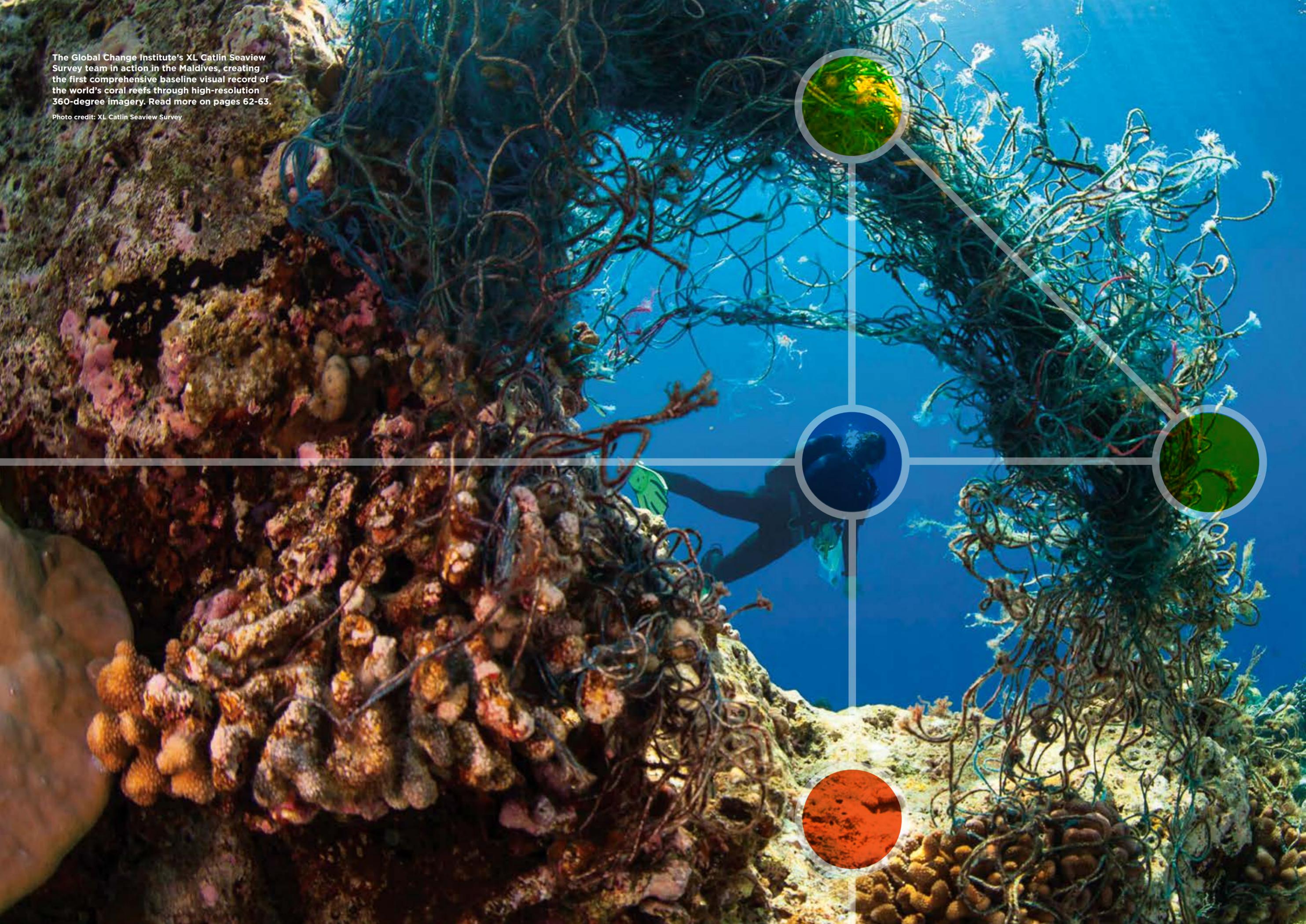
THE UNIVERSITY
OF QUEENSLAND
AUSTRALIA



Create change

The Global Change Institute's XL Catlin Seaview Survey team in action in the Maldives, creating the first comprehensive baseline visual record of the world's coral reefs through high-resolution 360-degree imagery. Read more on pages 62-63.

Photo credit: XL Catlin Seaview Survey



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Message from the Vice-Chancellor and President, and Deputy Vice-Chancellor (Research)

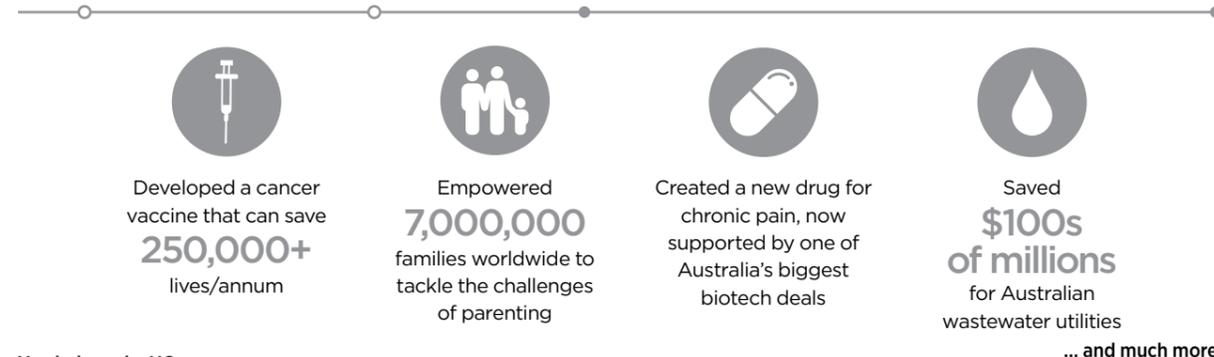


Professor Robyn Ward, Deputy Vice-Chancellor (Research) with Professor Peter Høj, Vice-Chancellor and President

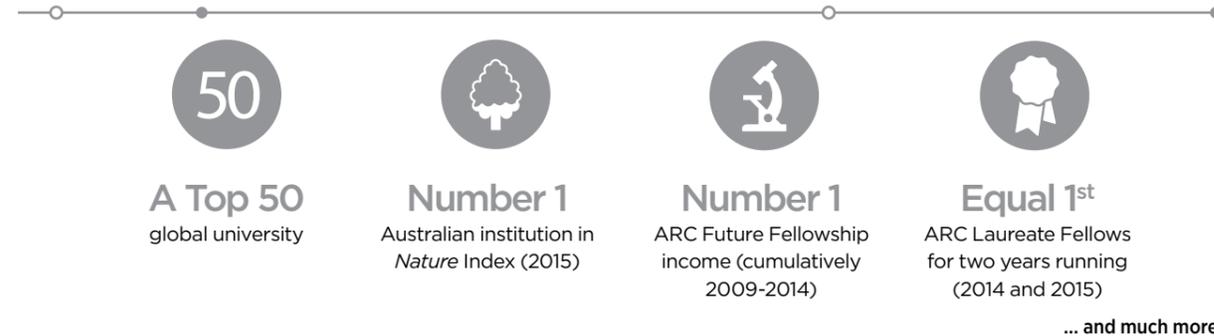
As we marvel at the positive impact of UQ research, it is clear that exceptional partners and allies are instrumental in taking the benefits of UQ innovation to people all over the world.

To all our collaborators and friends in industry, government, philanthropy and the not-for-profit sector: thank you!

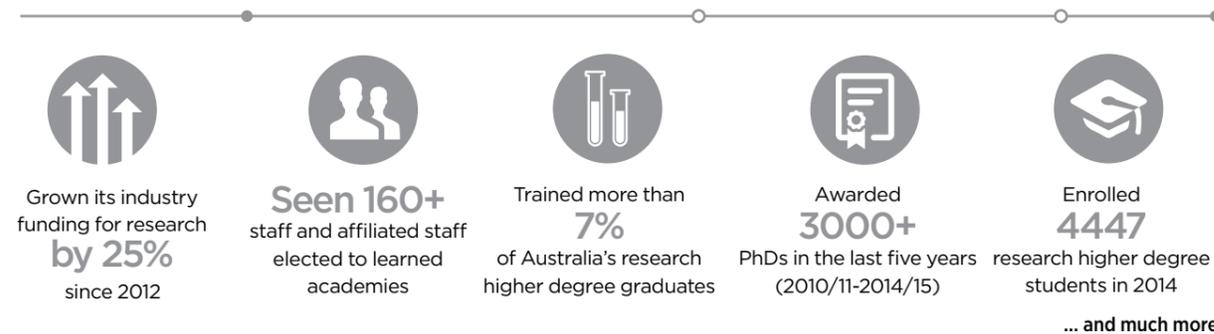
With your support, UQ teams have:



You help make UQ:



With your support UQ has:



Students and young researchers in the talent pipeline take guidance and inspiration from seasoned innovators in their UQ community. It is a UQ Research Week tradition to award both rapidly ascending researchers and excellent supervisors. You can read about winners of the 2015

Foundation Research Excellence Awards and the Awards for Excellence in RHD Supervision in *Discovery at UQ*. Please join us in celebrating the achievements of outstanding researchers and emerging stars. Together, let's follow and support their careers as they seek to create change.

RESEARCH AT UQ

The University of Queensland is one of Australia's premier research institutions, receiving \$377.3 million in research grants in 2014.

A world-class research institution

UQ ranks in the top 50 as measured by the *US News* Best Global Universities Rankings and the *QS World University Rankings*. The University also ranks 56 in the Performance Ranking of Scientific Papers for World Universities; 65 in the *Times Higher Education* World University Rankings and 77 in the Academic Ranking of World Universities.

Research quality

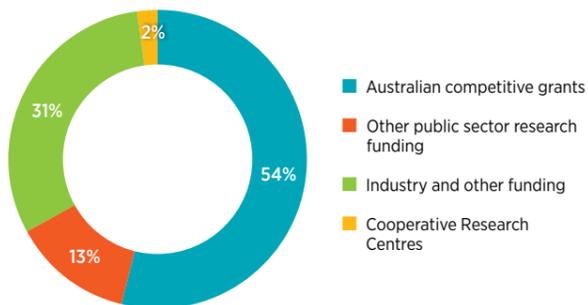
The Australian Government's ERA 2012 National Report confirmed that research at UQ is above world standard in more specialised fields of research than any other Australian university.

- 100 per cent of UQ research is at world standard or above
- 35 specialised fields of research at UQ received the highest possible score of five
- UQ was the only Australian university to achieve the maximum rating of five in education, statistics, numerical and computation mathematics, environmental engineering, environmental biotechnology, industrial biotechnology, and specialist studies in education.

Research funding 2014

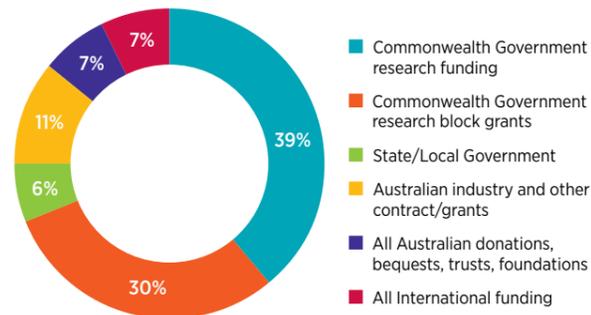
\$377.3 million total sponsored grants and contracts including:

	\$million
Australian competitive grants	204.6
Other public sector research funding	46.3
Industry and other funding	117.1
Cooperative Research Centres	9.3



Sources of UQ research support 2014

	\$million
Commonwealth Government research funding	212.3
Commonwealth Government research block grants	163.3
State/Local Government	32.9
Australian industry and other contract/grants	59.5
All Australian donations, bequests, trusts, foundations	36.0
All international funding	36.6

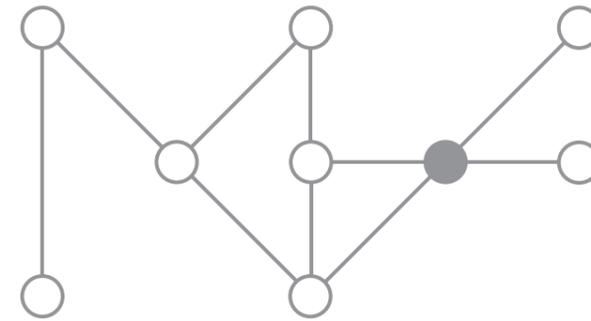


Commonwealth research block grants 2014

	\$million
Joint Research Engagement	29.7
JRE Engineering Cadetships (28 new places)	0.4
Research Infrastructure Block Grant	26.3
Sustainable Research Excellence	20.2
Research Training Scheme	61.0
Australian Postgraduate Awards (304 new places)	23.8
International Postgraduate Research Scholarships (29 new places)	1.9

UQ revenue 2014

Total Operating Revenue	\$1.69 billion
Total Research Support	\$540.6 million



UQ fellowship honours 2014

Australian Research Council (ARC) Laureate Fellows	11
National Health and Medical Research Council (NHMRC) Australia Fellows	2
NHMRC John Cade Fellowship	1
Queensland Government Smart Futures/State Premier's Fellows	3
Fellows of the Academy of Social Sciences in Australia	43
Fellows of the Australian Academy of Science	30
Fellows of the Australian Academy of Technological Sciences and Engineering	31
Fellows of the Australian Academy of the Humanities	34
Fellows of the Australian Institute of Aboriginal and Torres Strait Islander Studies	22
Fellows of the Australian Academy of Health and Medical Sciences	2

Research strengths

- Agriculture and Food Sciences
- Applied and Theoretical Economics
- Biological Sciences
- Business, Management and Finance
- Cancer Studies
- Chemical Engineering
- Chemical Sciences and Materials Engineering
- Clinical Sciences and Experimental Medicine
- Communication, Media and Cultural Studies
- Ecology and Environmental Science
- Education
- Environmental Engineering and Water Management
- Genetics and Genomics
- Human Movement and Sports Science
- Immunology and Infectious Diseases
- Information Systems and Data Management
- Law
- Literary Studies
- Mathematics and Statistics
- Mechanical Engineering
- Medicinal Chemistry and Pharmaceutical Sciences
- Mining and Minerals Processing
- Molecular and Cellular Biosciences
- Nanotechnology and Bioengineering
- Neurosciences
- Performing Arts and Creative Writing
- Physics
- Psychology and Cognitive Science
- Public Health and Health Services
- Social and Political Science

Education impact and training 2014

Research Higher Degree students enrolled	4447
PhDs awarded	736
Domestic	412
International	324
MPhils awarded	93
Domestic	68
International	25

Faculties, research institutes and centres

In partnership with government, industry and donors, UQ has developed globally recognised research institutes to complement the teaching and research activity in its faculties. The University also has more than 100 research centres and major university-wide research initiatives that support the critical mass that enables UQ to tackle significant global challenges. Centres and institutes work in a range of disciplines from the biosciences and nanotechnology to sustainable development and social science.

Faculties

- Business, Economics and Law (BEL)
- Engineering, Architecture and Information Technology (EAIT)
- Health and Behavioural Sciences (HABS)
- Humanities and Social Sciences (HASS)
- Medicine and Biomedical Sciences (M+BS)
- Science

Institutes

- Australian Institute for Bioengineering and Nanotechnology (AIBN)
- Global Change Institute (GCI)
- Institute for Molecular Bioscience (IMB)
- Institute for Social Science Research (ISSR)
- Mater Research Institute-UQ (MRI-UQ)
- Queensland Alliance for Agriculture and Food Innovation (QAAFI)
- Queensland Brain Institute (QBI)
- Sustainable Minerals Institute (SMI)
- UQ Diamantina Institute (UQDI)

Please note all funding represented in AU\$. Data/figures current as at 30 June 2015.

Promising future

With a promise of personalised medicine, a promise of genuine food security, and a promise of sustainable biofuels, Genomics is making a lot of promises, and it's delivering – just as quickly as researchers can keep up.

Genomics is the study of “genomes”, the DNA contained in each cell. It is the study of both DNA sequence and of gene expression, the process by which the information contained in DNA becomes a useful product. Of particular interest are the differences between individuals, and for gene expression the mechanisms that underpin those differences, which can be specific to cell types and contexts, such as ageing, environments or disease. UQ researchers work in many different areas of genomics: here are just three.

Professor Naomi Wray (Queensland Brain Institute)

My research is around statistical genomics: the analysis of common complex genetics traits, diseases and disorders that impact society the most, focusing particularly on psychiatric and neurological disorders.

We develop new methodologies to analyse genomic data and disseminate these through software used by the international research community. We analyse datasets of up to hundreds of thousands of people measured for millions of DNA markers. We are starting to build systems genomics datasets that are rich in multiple layers of genomic data for each individual.

Mechanisms underpinning common diseases are poorly understood, but genomic tools have allowed unprecedented in-roads. The hope is that this new understanding will fast track delivery of new and repurposed drugs, and contribute to a more personalised approach to prevention and management of common disease.

Position: Co-director, Centre for Neurogenetics and Statistical Genomics (CNSG), Queensland Brain Institute

Funding: National Health and Medical Research Council, Motor Neurone Disease Research Institute Australia (MNDRIA) Ice Bucket Challenge, Australian Research Council, National Institutes of Health

Collaborators: QIMR Berghofer Medical Research Institute; Royal Brisbane and Women's Hospital; Macquarie University; the Universities of Western Australia, Sydney, North Carolina, Edinburgh and Aarhus; Karolinska Institutet

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🌐 cnsgenomics.com

researchers.uq.edu.au/researcher/2006
qbi.uq.edu.au/group-leader-wray

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Revolocity

Dr. Peter Visscher
presenting on Genomics,
Big Data, Medicine and
Complex Traits



Complete Genomics Revolocity Sequencer

Professor Deon Venter (Mater Health Services)

I work in the area of clinical diagnostics of single gene disorders and cancers. Many people carry genetic diseases or may be at risk of developing certain conditions because of their genetic make-up. It is becoming increasingly apparent that knowing the sequence of a person's DNA can help manage existing diseases or minimise the impact of diseases they are at risk of developing. With many types of cancer, knowing the cancer genome sequence can help oncologists choose the best chemotherapy agents.

We will be getting a Whole-Genome DNA Sequencer in early 2016 – this apparatus fills three large rooms, performs billions of sequencing reactions simultaneously, and can produce up to 10,000 sequences per year. It generates massive amounts of data, which then require handling by sophisticated computer algorithms so that we can arrive at an early diagnosis for the patient.

Earlier diagnosis of disease risk can provide the information to implement preventive strategies; earlier, more focused and cheaper diagnosis of existing disease; and more in-depth knowledge of what makes a patient's cancer behave the way it does, thus allowing us to target cancer-driving gene mutations. This work is also very valuable as it could enable the management of the health of entire populations by optimising diet, exercise and other factors.

Position: Director of Pathology, Mater Health Services

Funding: Mater Health Services

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Collecting data in the field

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2015 DOE JGI Genomics of Energy and Environment Meeting Talk

Single Cells and Metagenomes

Carl Woese's grand view of life

Professor Philip Hugenholtz (Australian Centre for Ecogenomics)

Genomics is reshaping the face of microbiology because we are, for the first time, able to readily access the genetic blueprints of uncultured organisms which comprise the bulk of microbial diversity.

Directly sequencing DNA and RNA from the environment allows us to determine their genomes without the need to grow them in the lab. This is giving us a whole new view of microbial ecology and evolution. We look at a wide range of microbial ecosystems, applying culture-independent, high-throughput, sequencing-based techniques: we look at human, animal, insect and plant tissue, marine surface waters, deep-sea sediments, and engineered systems, among others.

My goal for the past 20 years has been to systematically organise microbial genomic data into an evolutionary framework, but only in the last year have the tools been available to make this a reality. The sheer volume of sequence data being generated is a major challenge for analysis and interpretation, but this is a problem common to the genomics field in general.

Position: Professor of Microbiology and Director of the Australian Centre for Ecogenomics (ACE), School of Chemistry & Molecular Biosciences; researcher in the Institute for Molecular Bioscience

Funding: Australian Research Council Laureate, Discovery and Linkage grants; National Health and Medical Research Council Program and Project grants; Moore Foundation; UQ

Collaborators: Translational Research Institute, University of Copenhagen, University of Western Sydney, University of Technology Sydney, Prince Charles Hospital

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🌐 ecogenomic.org

Monitoring Mongolia's mining boom



As Mongolia's mining boom encroaches on the livelihood of its nomadic people, researchers from The University of Queensland are working to help protect the country's heritage.

Mongolia's mining industry now accounts for almost a quarter of the nation's gross domestic product but the financial benefits have also led to social changes and environmental degradation, impacting the nation's iconic herder populations.

Work by UQ's Sustainable Minerals Institute, in conjunction with the Mongolian Gender Center for Sustainable Development, has led to a publication called *Responsible mining in Mongolia: enhancing positive engagement*.

SMI Research Manager of the Centre for Social Responsibility in Mining Dr Isabel Cane says the document aims to offer practical solutions to some of the problems being faced by the Central Asian country, as well as providing information on how mining affects traditional herding practices.

"A key challenge for Mongolia is finding ways to manage these impacts and create a solid foundation for social development that respects and supports the livelihoods, health and social wellbeing of all its people," says Dr Cane.

"The document offers several recommendations for how local government, national government, mining companies and developers operating in Mongolia can translate these findings into actions that will support responsible minerals development in the future."

The two-year research was funded by the Australian Government Overseas Aid program through the Department of Foreign Affairs and Trade, and was conducted in the Northern forest regions and Southern Gobi Desert of Mongolia.

Through interviews and geographic information system mapping, the research team documented the social changes and the effect on the local environment since the arrival of mining.

One of the challenges identified was the lack of available pasture and losses of income and livelihood options for nomadic farmers, based on 30 years of documented changes in mine-affected areas.

"Contemporary Mongolia was strongly influenced by its long and rich nomadic heritage, with around one-third of the population identifying as herders, which brings deep-rooted connections with land and water through their livelihood and spiritual beliefs," says Dr Cane.

"This research has highlighted that a committed and coordinated approach across agencies is essential if these outcomes are to be achieved."

Responsible mining in Mongolia

UQ researchers: Dr Isabel Cane
(Centre for Social Responsibility in Mining, Sustainable Minerals Institute)

Funding source: Department of Foreign Affairs and Trade, Australian Aid Program

Collaborators: Gender Center for Sustainable Development, Mongolia; Australian National University Crawford School of Public Policy

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Silent life support

“Chronic kidney disease is an increasingly common condition in Australia,” says international leader in kidney disease, diabetes and cardiovascular disease research Professor Wendy Hoy, from the School of Medicine.

“It heightens patients’ cardiovascular risk and is the precursor to almost all end-stage kidney failure, which leads to premature death or the need for gruelling renal replacement therapy. Renal replacement therapy poses an immense burden on Australia’s health care system and, according to current trends, will soon be unsustainable.”

Thanks to a recent National Health and Medical Research Council (NHMRC) grant, Professor Hoy is pioneering a new Centre of Research Excellence (CRE) that will help improve our understanding and management of this disease.

Known as the Chronic Kidney Disease Centre of Research Excellence (CKD.CRE), the Centre will be dedicated to investigating, understanding and improving treatment for patients diagnosed with chronic kidney disease.

“At present, little is known about the disease, with significant investigation still required to determine the best types of care needed, predictors of disease progression, and the effects on cardiovascular function, so as to improve patient outcomes,” says Professor Hoy.

The CKD.CRE aims to facilitate a national surveillance network for chronic kidney disease, and to support practice improvement in primary care and renal supportive care. To do this, the CKD.CRE researchers will develop profiles of patients in various primary care and renal practice settings, in

several states, and in Indigenous and non-Indigenous health care settings. They will track their outpatient trajectories, management, hospitalisations, costs and outcomes, and conduct biomarker research. The CKD.CRE aims to establish Australia’s first chronic kidney disease Bio.Bank.

Professor Hoy and her colleagues hope they can inform on improved detection and understanding of chronic kidney disease and its progression, with the goal to decelerate the rates of patients developing end stage kidney disease and thereby rates of renal replacement therapy.

The CKD.CRE is affiliated with the recently established Global Network of CKD Cohorts (GNCKDC), under the umbrella of the International Society of Nephrology.

Chronic Kidney Disease Centre of Research Excellence

UQ researchers: Professor Wendy Hoy
(School of Medicine)

Funding source: National Health and
Medical Research Council

Collaborators: Queensland University of
Technology, Queensland Health, James
Cook University and the University of
New South Wales

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🌐 [researchers.uq.edu.au/research-
project/23172](https://researchers.uq.edu.au/research-project/23172)



“At present, little is known about the disease, with significant investigation still required to determine the best types of care needed, predictors of disease progression, and the effects on cardiovascular function, so as to improve patient outcomes”

▶ Watch

Translational
Photosynthesis: Feeding
a sustainable future



A future without food?

A dystopian future where food rations are a way of life may not be too distant a possibility, given that global population growth continues to explode faster than crop yields can meet demand.

Motivated by the need to revolutionise crop productivity, a major research project being conducted by the Australian Research Council Centre of Excellence for Translational Photosynthesis is seeking to transform the way fundamental resources such as light, water and nitrogen are converted to grain.

Professors Graeme Hammer and David Jordan from the Queensland Alliance for Agriculture and Food Innovation (QAAFI) Institute are championing two programs of the Centre's research.

"The Centre aims to deliver breakthrough technology that will increase yields of major crops by improving, at a molecular level, the way plants harness the sun's energy through photosynthesis," says Professor Hammer.

Photosynthesis is the process plants use to convert light energy from the sun into chemical energy to fuel the plant's activities and growth.

"Improving photosynthesis is widely recognised as the new frontier for increasing crop yields to help ensure food security but, despite its importance for all life on earth, we have only recently developed the technology to manipulate photosynthesis at a molecular level."

The ARC Centre incorporates four major research themes: improving the ability of leaves to capture carbon dioxide (CO₂), increasing the spectral range of light captured for photosynthesis, identifying improved photosynthetic traits in plants through advanced genomics and field phenomics, and mathematical modelling to link changes in leaf function to the field performance of crops.

"Advances have the potential to transform plants' efficiency to capture sunlight and use it for CO₂ fixation and biomass production," says Professor Jordan.

Professors Hammer and Jordan have made significant developments in furthering this goal. Their first development is a prototype simulation model that links daily crop growth with a biochemical model of photosynthesis, which they now aim to link with existing crop models for sorghum and wheat.

They have also identified natural genetic variations in the photosynthetic abilities of different sorghum varieties – research that could deliver tangible applications for selecting for improved plant productivity.

Centre of Research Excellence: Translational Photosynthesis

UQ researchers: Professor Graeme Hammer, Professor David Jordan (Queensland Alliance for Agriculture and Food Innovation)

Funding source: Australian Research Council Centre of Excellence Program

Collaborators: Australian National University (lead), The University of Sydney, The University of Queensland, Western Sydney University, CSIRO Agriculture, International Rice Research Institute

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Eradicating disease and helping build a healthier community are key motivators for UQ's scientific research: UQ's reputation for excellence and innovation is reflected in every facet of Australian health, medical, behavioural and biomedical sciences research



Immune attack	18
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Biting back against pain	28
Natural fit	30
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Virtual treatment: actual success	34

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HEALTHY PEOPLE

Immune attack

What happens when a skin cancer treatment works well for a third of patients, but poorly for the other two-thirds? And what if that drug is the best – and sometimes only – one available?

For The University of Queensland Diamantina Institute (UQDI) researcher Dr Fiona Simpson, the answer is easy: find a better drug, or, find a way to support that drug to make it more effective.

“One of my frustrations as a scientist was having my mother pass away from cancer and, at the time, being unable to do anything about it,” says Dr Simpson.

“With that experience, and with Professor Ian Frazer’s advice to ‘do something translational’ with my research, I decided to study how patients respond or don’t respond to targeted cancer therapy antibodies, to find out why some patients respond well and others get no improvement.”

Dr Simpson and her team hope to find out how to turn treatment non-responders into responders, and ultimately to prevent cancer from recurring.

So far, they have discovered a connection between how tumour cells present signalling molecules on their surfaces and then how therapeutic antibodies bind to them, which in turn changes the level of immune cell activation, leading to tumour cell killing.

“We have found a way to use small molecule inhibitors to create ‘good patterns’ that force tumours to leave more receptors on cell surfaces.

“This provides more targets on which antibodies can act, bringing the immune cells in to attack the tumour and hopefully reducing the recurrence of cancer in future,” Dr Simpson says.

Clinical trials at the Princess Alexandra Hospital are currently under way.

Enhancing the efficacy of existing cancer drugs

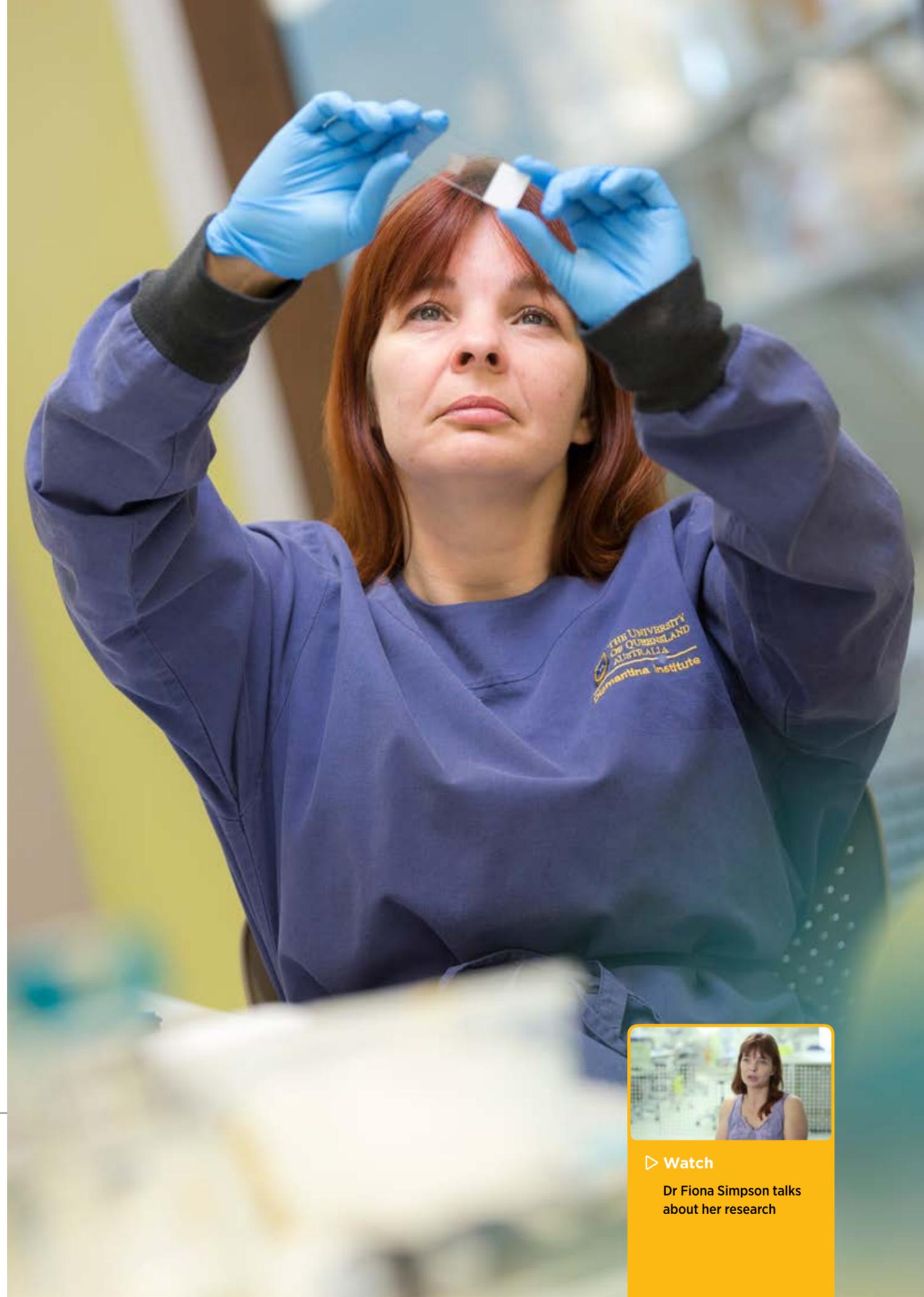
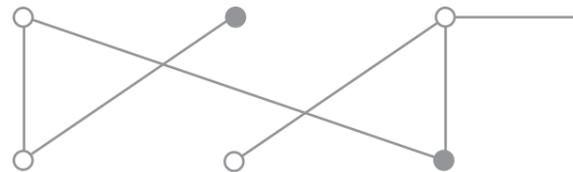
UQ researchers: Dr Fiona Simpson, Dr James Wells, Associate Professor Nicholas Saunders (The University of Queensland Diamantina Institute)

Funding source: National Health and Medical Research Council Career Development Award, Cancer Council Queensland, International Rotary Club (Nundah), UniQuest Trailblazer and Pathfinder competitions, Princess Alexandra Hospital Research Foundation/Diamantina Health Partners Award for Innovation, National Breast Cancer Foundation, Queensland Head and Neck Cancer Centre

Collaborators: Princess Alexandra Hospital, University of Newcastle, University of Sydney

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🌐 di.uq.edu.au/dr-fiona-simpson



▶ Watch

Dr Fiona Simpson talks about her research

Binge factor



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Binge drinking at the time of conception has deleterious effects, presenting a similar risk to developing type 2 diabetes in early middle age as indulging in a high-fat diet for a major part of life.

“We think this is astounding,” says Associate Professor Karen Moritz from the School of Biomedical Sciences, who has overseen the study led by PhD Candidate Emelie Gårdebjer in her research group.

“This is the first study to look at the impact of high alcohol use at conception.”

Rats, which have a “very similar” first five days of development to humans, were exposed to a milk-based Sustagen formula that simulated an “ad lib” drinking model up to the time of implantation. Separate control groups were exposed to a high-fat diet, and both the high-fat diet and the formula.

“The results have drawn quite a close relationship to what would be happening in a human,” says Professor Moritz.

“The model mimics a woman having a binge drink. When we have tested for susceptibility to type 2 diabetes, signs have been similar to a human in a pre-diabetic state becoming insulin resistant and glucose intolerant. The alcohol has not directly affected the baby’s organs as it develops. It has affected the embryo before it is even implanted.”

“This is the first study to look at the impact of high alcohol use at conception”

Associate Professor Moritz says considerable evidence suggests people underestimate how much they drink, with older, well-educated women who delay having children most inclined to drink during pregnancy, although consumption “crosses all social boundaries”.

“If you pour a 100ml glass of wine, which is a standard drink in Australia, we would look at it and say, ‘but it is not even half full!’” she says.

“The blood alcohol tested in the study is like a woman who has shared a bottle of wine with her partner, or had four or five spirit drinks.”

She stresses greater awareness is needed about the perils of women drinking “as soon as they know they are pregnant, or if planning a pregnancy”.

Further research will assess if nutrient therapy can negate the risk for chronic disease development, and potential transgenerational impacts of high alcohol use by women during conception.



Associate Professor Karen Moritz in the lab

Laboratory for developmental programming in disease

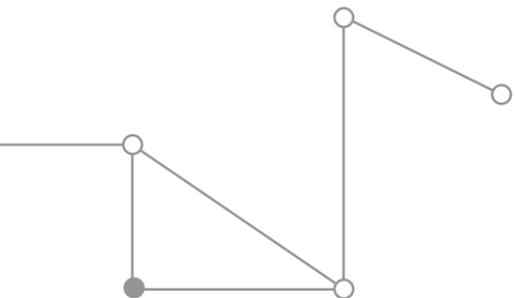
UQ researchers: Emelie Gårdebjer, Associate Professor Karen Moritz (School of Biomedical Sciences)

Funding source: National Health and Medical Research Council

Collaborators: The University of Melbourne

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🌐 uq.edu.au/sbms/laboratory-for-developmental-programming-disease





Blue skies no more

Days of bright blue skies fading into starry nights are a distant memory for the School of Public Health's Dr Yuming Guo, who has led a study showing young people experience greater "years of life lost" from air pollution in Beijing.

"When I was 15 years old, the sky was blue," says Dr Guo, recalling his childhood in Shandong Province, China.

"We could see stars at night."

Dr Guo estimates air pollution became an issue in his hometown around 2000.

"When we drove home from the city," he recalls, "there were so many factories, and you could see the car windows covered by yellow particles. It was so heavy that you could write something on the window."

Dr Shanshan Li, one of Dr Guo's collaborators from the School of Public Health - along with Professor Gail Williams - grew up in Beijing, and has her own memories.

"Air pollution was initially caused by sandstorms from the outside of Beijing," she says, recalling how the clouds and smog led to the "daily environment being all yellow or orange" on some days as early as the mid-1990s.

Dr Guo, Dr Li and Professor Williams have developed an international collaborative group with Chinese scientists to assess the health impacts of air pollution.

In a population-based study using daily time series data from 2004 to 2008, and involving more than 80,000 deaths across eight urban districts in Beijing, the burden of air pollution on young people (up to 65 years) and older people (over 65 years) was assessed using years of life lost (YLL),

which considers mortality and standard life expectancy. Air pollutants were shown to affect younger people more, raising awareness of potential economic costs as, according to Dr Guo, "the young population is more economically productive".

Subsequent findings have associated air pollution with specific deleterious health effects, highlighting the need for further action.

"Air pollution has significant impacts on physiological function, including lung function, heart function, renal function, hematopoietic function, metabolic endocrine function, liver function and inflammatory response function," says Dr Guo.

Air pollution and health in China

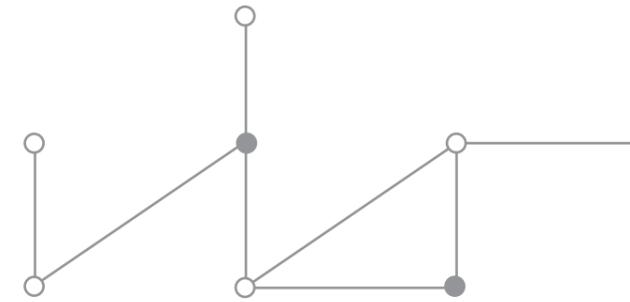
UQ researchers: Dr Yuming Guo, Dr Shanshan Li, Professor Gail Williams (School of Public Health)

Funding source: Centre for Air Quality & Health Research and Evaluation, M+BS Emerging Leaders Medical Research Grant

Collaborators: Peking University, Chinese Research Academy of Environmental Sciences, China National Cancer Centre, Kailuan Hospital, Tiantan Hospital

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Superbug turning point?

UQ scientists are launching a global search to discover new compounds to combat antibiotic resistant bacteria (superbugs).

The Community for Open Antimicrobial Drug Discovery (CO-ADD) is a not-for-profit initiative inviting chemists from around the world to submit compounds to be screened for antimicrobial activity, free of charge.

Led by researchers from UQ's Institute for Molecular Bioscience, CO-ADD aims to reinvigorate and unblock the antibiotic pipeline.

"Currently there is very little antibiotic discovery being undertaken, and pharmaceutical companies have already screened their own compound libraries," says CO-ADD Director Professor Matt Cooper.

"We see this as potentially catastrophic, as more than 170 Australians die from bacterial infections every week and, before antibiotics, one in three people died before the age of 30.

"We are now dangerously close to the pre-antibiotic era where cancer patients receiving chemotherapy or patients receiving simple hip-replacement or knee operations will die from bacterial infections."

CO-ADD will screen thousands of compounds currently sitting on the shelves in laboratories around the world that were not designed as antibiotics and would not otherwise be screened for antimicrobial activity.

"We are now dangerously close to the pre-antibiotic era where cancer patients receiving chemotherapy or patients receiving simple hip-replacement operations will die from bacterial infections"

"Across the world synthetic chemists make 15,000 new compounds every day, providing an untapped resource with antimicrobial potential," says Professor Cooper.

"Our CO-ADD scientists aim to screen as many of these as possible in the next 18 months."

The team hopes to find a new antibiotic and will also build an open access database of all compounds found with antimicrobial potential, essentially creating a world bank of molecules for the scientific community.

Professor Cooper and his team recognise the power of a community approach in combating superbugs, because, "individually we are drop in the ocean - together we are an ocean".

He envisions that the CO-ADD model could be applied to other diseases in future, such as malaria, dengue and tuberculosis, where there is always a need for more drug discovery activity and quality compounds that could be developed into life-saving drugs.

"A collaborative approach like the CO-ADD model could revolutionise the way we find drugs to treat and prevent these and other parasitic diseases that affect billions of people around the world."

Community for Open Antimicrobial Drug Discovery (CO-ADD)

UQ researcher: Professor Matt Cooper (Institute for Molecular Bioscience)

Funding source: The Wellcome Trust, The University of Queensland

Collaborators: Already engaging with chemists from 11 countries including those in the Asia-Pacific, North and South America, and Europe

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🌐 co-add.org

🐦 @COADD_news

🐦 @IMBatUQ

📘 [InstituteForMolecularBioscience](https://www.instituteforMolecularBioscience.com)

📺 [IMBatUQ](https://www.youtube.com/IMBatUQ)



▶ Watch

The latest weapon in the fight against superbugs

🔊 Listen

Global search for the next antibiotic

Eat better, get better



“Designer drugs” aren’t often associated with the natural world, but two UQ researchers are harnessing the healing properties of plants to provide effective and inexpensive treatments for serious illnesses affecting thousands of patients every year.

Inspired by the need to develop safe, effective and inexpensive drugs for life threatening diseases, the Institute for Molecular Bioscience’s Professor David Craik and his colleagues are harnessing a family of plant proteins called cyclotides to develop the next generation of drugs, diagnostic agents and neuroscience tools. They hope these “growable” bio-pills will improve the lives of patients who cannot afford current medications, provide new treatment options for patients who cannot tolerate the side-effects of current drugs, and treat disease targets that are resistant to artificial drug treatments.

The new drugs will be extracted, purified, and delivered as conventional medicines, or incorporated into novel plant products such as bio-pills (seeds), medicinal teas, or even foods.

“Many third-world countries can’t afford high-tech protein-based drugs, but if they could be growing these plants in their backyard and producing designer protein-based drugs themselves, it could be done very, very cheaply,” Professor Craik says.

Cyclotides for bio-pills

UQ researchers: Professor David J Craik, Dr Mark Jackson, Dr Edward Gilding (Institute for Molecular Bioscience)

Funding source: National Health and Medical Research Council Senior Principal Research Fellowship, Ramaciotti Medical Research Award, GSK Award for Research Excellence

Collaborators: La Trobe University

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Dr Tim O’Hare from the Queensland Alliance for Agriculture and Food Innovation (QAAFI) has also developed effective plant-based medicine that is already being deployed to the market, in the form of modified sweet corn that contains pigments to minimise macular degeneration, the leading cause of blindness in the developed world.

“The science increasingly shows that the yellow pigments in the macula – zeaxanthin and lutein – help protect the eye from the progress of macular degeneration, so people with low levels of these pigments are more likely to suffer,” Dr O’Hare says.

The human body needs to ingest these pigments through diet or supplements; however, while lutein is readily available in green leafy vegetables, zeaxanthin is much rarer. Sweet corn is one of the best sources, but consuming between four to eleven cobs per day is necessary to achieve the same zeaxanthin-intake as supplements.

With access to a wide range of germplasm and the Department of Agriculture and Fisheries sweet corn breeding program, Dr O’Hare and his colleagues have succeeded in creating the first sweet corn in the world that supplies 1000 per cent more zeaxanthin in one cob, successfully delivering as much pigment as a supplement. The cobs are also easy to differentiate from other varieties, with a deep golden-orange colour (pictured above).

Eating never felt so good...

Sweet corn zeaxanthin

UQ researcher: Dr Tim O’Hare (Queensland Alliance for Agriculture and Food Innovation)

Funding source: Horticulture Innovation Australia Ltd, Queensland Government

Collaborators: Queensland Department of Agriculture and Fisheries

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Biting back against pain

Despite their terrifying appearance, spiders and snakes could deliver a new generation of therapeutic advancements.

Professor Glenn King leads a research team at UQ's Institute for Molecular Bioscience (IMB) investigating the chemistry of venoms from various species of predators to develop innovative drugs to treat stroke, chronic pain and epilepsy.

Professor King and his team have found seven peptides in spider venom that block the molecular pathway responsible for sending pain signals from nerves to the brain.

"As humans we have nine sodium channels in our bodies, one of which when blocked can switch off and prevent us from experiencing pain," says Professor King.

"The challenge is finding peptides that specifically target Nav1.7 (a sodium ion channel at the endings of pain-sensing nerves), which is something current medications can't do but spider venom peptides most likely can.

"The possibility of using spider venoms to successfully manage pain would not only reduce the financial burden to our healthcare system, but would improve the quality of life for thousands living with chronic pain," says Professor King.

Associate Professor Bryan Fry leads the Venom Evolution Laboratory at UQ's School of Biological Sciences and has published extensively on the evolution of venom systems and how they can be harnessed for therapeutic use.

"The use of venoms as therapeutics is an enchanting goal, but I view this as a pleasant side-effect of the real quest: to learn more about the animals I hold so dear," he says.

His research shows that several protein groups have been convergently recruited for use as venom toxins in multiple animal lineages.

"Some of the proteins recruited as venom toxins were shown to be recruited by hematophagous insects in their feeding secretions with a range of convergent activities upon neurological and haematological systems," says Associate Professor Fry.

"The parallels between conventional venoms and salivary secretions adapted to blood-feeding highlights their similarities in terms of protein composition, bioactivity and predatory function."

Associate Professor Fry says venom is thus defined as a secretion, produced in a specialised gland in one animal and

delivered to a target animal through the infliction of a wound, which contains molecules that disrupt normal physiological or biochemical processes.

"Based on biological function as opposed to an anthropocentric view of toxicity, there is a vast range of effects of envenomation, from the hardly noticeable subversion of hemostatic defences produced by a mosquito to the lethal effects of venomous snakes."

Spider venom pain treatment

UQ researchers: Professor Glenn King, Dr Julia Kaae Klint (Institute for Molecular Bioscience)

Funding source: Australian Research Council, National Health and Medical Research Council, National Institute of Neurological Disorders and Stroke - National Institutes of Health

Collaborators: Johns Hopkins University, UCSF, Florey Institute of Neuroscience and Mental Health, Monash University

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Venom evolution laboratory

UQ researcher: Associate Professor Bryan Fry (School of Biological Sciences)

Funding source: Australian Antarctic Division, Australian Research Council, Australia & Pacific Science Foundation, Herman Slade Foundation, National Geographic Society

Collaborators: Monash University, Liverpool School of Tropical Medicine, French Museum of Natural History

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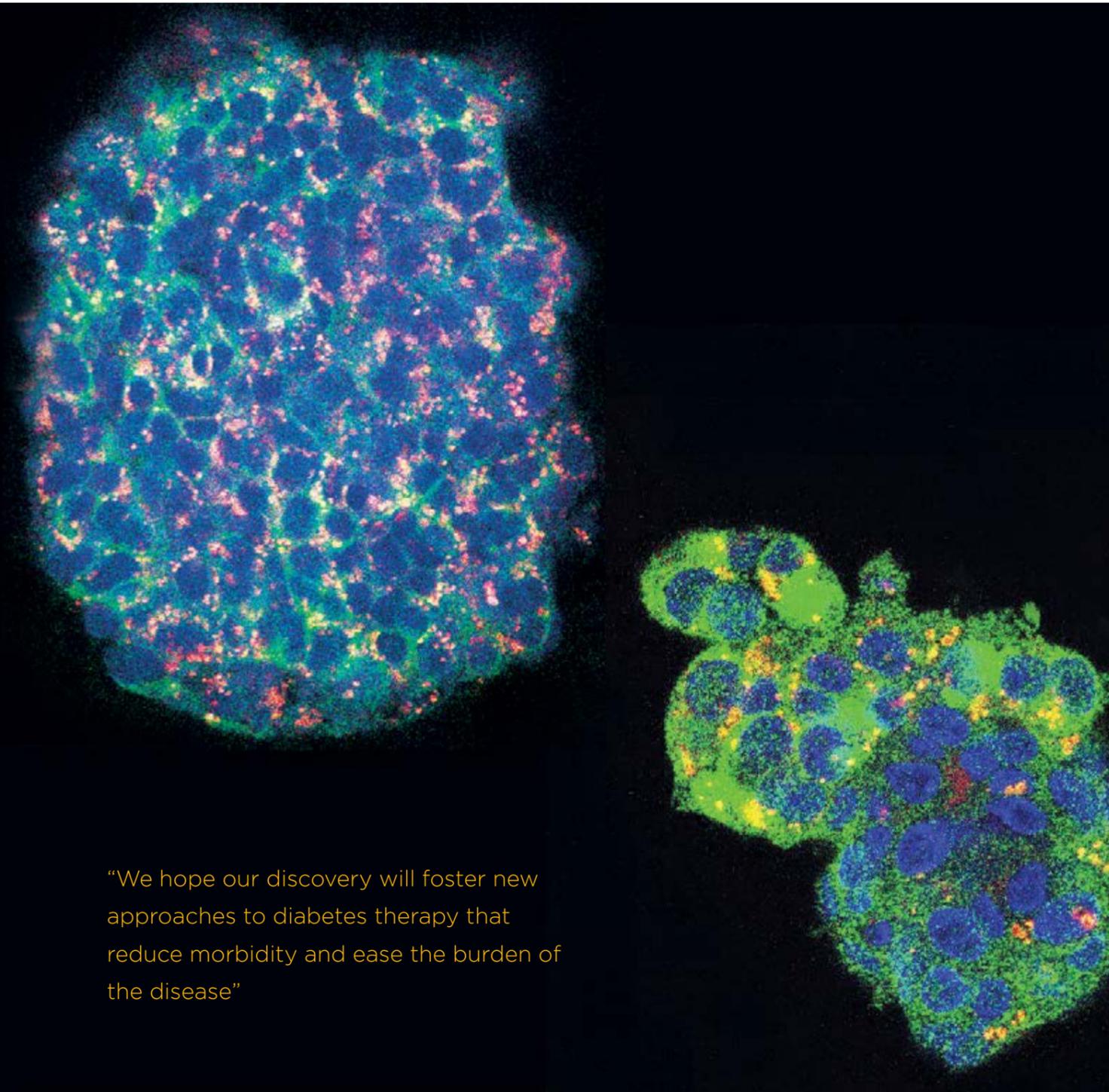
🌐 venomdoc.com

🐦 @BryanGFry



▶ Watch

Spider venom may have legs as future painkiller



“We hope our discovery will foster new approaches to diabetes therapy that reduce morbidity and ease the burden of the disease”

Natural fit

Around 1.7 million Australians diagnosed with type 2 diabetes could soon benefit from a less invasive, natural approach to treatment, thanks to research developed by Professor Michael McGuckin and his team at Mater Research Institute-UQ (MRI-UQ).

Type 2 diabetes is an ever-increasing concern, placing an immense burden on Australia’s health system as the obesity epidemic continues to surge.

The disease occurs when beta cells within the pancreas become stressed and cannot produce enough of the hormone, insulin, to control blood sugar, known as glucose. The major form of this stress is called oxidative stress, which interferes with cellular metabolism, activates the immune system, and interferes with the correct assembly of proteins including insulin.

Current treatments rarely address these underlying issues, instead either pushing beta cells harder to make more insulin, reducing glucose production in the liver, or increasing glucose excretion in urine. Around 40 per cent of type 2 diabetics who use these treatments eventually become dependent on injecting themselves with insulin to overcome post-meal surges in blood glucose.

Although previous research showed that proteins from immune cells called cytokines contribute to beta-cell stress, Professor McGuckin’s team has proven that a specific cytokine, known as IL-22, actually protects beta cells from stress and completely restores control of blood sugar.

Through animal trials, the team has shown that administering IL-22 allows their system to naturally control glucose and restore normal insulin sensitivity, preserving beta cells and limiting the disease’s progression.

In collaboration with colleagues from Melbourne, Professor McGuckin has proven the applicability of his findings to human patients, showing that IL-22 also protects human beta cells from stress during investigations using human pancreatic islets from organ donors.

“We still have to do much work before we can translate IL-22 into an effective and safe therapy in humans,” Professor McGuckin says.

“We hope our discovery will foster new approaches to diabetes therapy that reduce morbidity and ease the burden of the disease.”

Another notable by-product of IL-22 treatment in obese mice was significant weight loss. The team will investigate whether this finding also applies to overweight human patients when the project moves into clinical trials.

New treatment a natural fit for type 2 diabetics

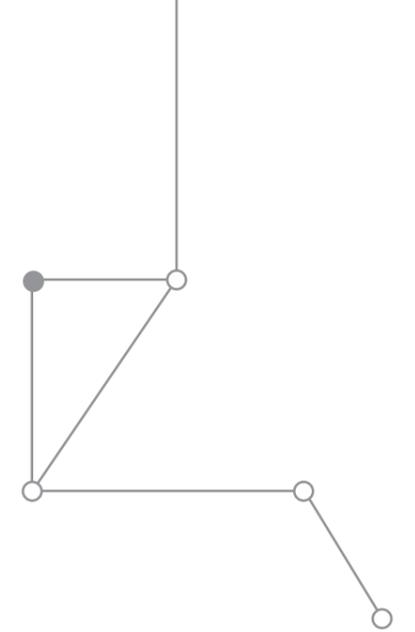
UQ researchers: Professor Michael McGuckin (Mater Research Institute-UQ)

Funding source: National Health and Medical Research Council Project Grants, UQ Collaborative and Industry Engagement Fund Grant

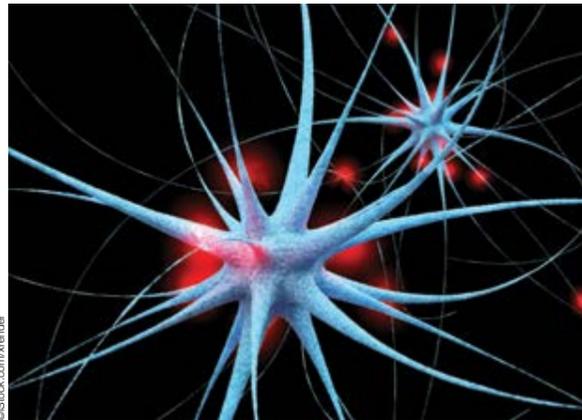
Collaborators: St Vincent’s Institute of Medical Research, Melbourne

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Shaking it up



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Identifying novel drugs that inhibit brain inflammation in Parkinson's Disease

UQ researchers: Associate Professor Trent Woodruff, Dr Richard Gordon (School of Biomedical Sciences)

Funding source: Michael J Fox Foundation for Parkinson's Research, Shake It Up Australia Foundation, National Health and Medical Research Council of Australia

Collaborators: Institute for Molecular Bioscience,  State University

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Shaking on the dance floor may be fun, but not if you have no control over it when you come off to rest.

Sadly, this is the plight for the 10 million people worldwide with Parkinson's disease, the second most common neurological impairment after dementia. Causing tremors, slowing of movement, balance problems, and other mood and sleeping disorders, Parkinson's disease is associated with a chronic inflammation of the brain's neural pathways.

Aiming to remedy this inflammation with targeted, novel drug therapies are Associate Professor Trent Woodruff and Dr Richard Gordon from the School of Biomedical Sciences.

"We have discovered that key components of our innate immune system – termed complement and inflammasome – are activated in response to the protein aggregates (or Lewy bodies) that accumulate and are a hallmark of Parkinsonian brains," says Associate Professor Woodruff.

"We have identified several major downstream targets of these inflammatory systems, and we are now testing novel anti-inflammatory drugs that will penetrate the brain.

"We hold great hope for the future as we have recently confirmed that these drugs can alleviate disease in several rodent models of Parkinson's disease."

With no current cure for Parkinson's disease, such early success augurs well for the formal preclinical and human clinical testing that is the next step in developing new drugs that could slow or halt its progress.

"The future is very promising," says Associate Professor Woodruff.

Perhaps "shaking it up" will one day become "shaking it off"?

"We hold great hope for the future as we have recently confirmed that these drugs can alleviate disease in several rodent models of Parkinson's disease"



Associate Professor Trent Woodruff and team

Virtual treatment: actual success

What happens when you live in the bush and have a stutter or sports injury you want to get rid of? Visiting the local specialist is not an option because there isn't one... or is there?

Co-founders of the Centre for Research in Telerehabilitation and chief investigators in the National Health and Medical Research Council funded Centre for Research Excellence in Telehealth, Professor Deb Theodoros and Associate Professor Trevor Russell, had long noticed the disparity between allied health services provided for city-dwellers and rural residents.

So they decided to do something about it.

"When I was working 'out west' as a clinical physiotherapist, it became clear to me that face-to-face services were neither time-effective nor cost-effective in rural areas," says Associate Professor Russell.

Meanwhile, speech pathologist Professor Theodoros wanted to make evidence-based intensive treatments and long-term maintenance therapy accessible in the home for people with chronic communication disorders and who were disadvantaged by distance or physical disability.

"We both thought there had to be a better way: if people couldn't visit a specialist, perhaps a specialist could visit them - if not actually, then virtually," she says.

And so the Centre for Research in Telerehabilitation was born. Its research spans all age groups in the rehabilitation disciplines: physiotherapy, speech pathology, occupational therapy and audiology, and investigates how care can be delivered online.

"After many years of dedicated research, we have developed a multimedia system that enables real-time videoconferencing and unique measurement of movement and speech," says Associate Professor Russell.

"Our research demonstrates that telerehabilitation technology can not only be used to provide clinically accurate patient assessment at a distance, but can also provide interventions which are as effective as conventional in-person services."

UQ recently launched Australia's first Telerehabilitation Clinic, heralding the latest step in the digital health revolution, and will work with people suffering physical disability; musculoskeletal pain; and speech, language and hearing disorders.

"With more than a third of Australians living outside metropolitan areas, often with poor access to timely and adequate healthcare, possible beneficiaries are limited only by our imagination," says Professor Theodoros.

"We both thought there had to be a better way: if people couldn't visit a specialist, perhaps a specialist could visit them - if not actually, then virtually"



Centre for Research in Telerehabilitation and UQ Telerehabilitation Clinic

UQ researchers: Professor Deb Theodoros, Associate Professor Trevor Russell (School of Health and Rehabilitation Sciences)

Funding source: Wilbow Group Investment Company

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ARTS AND SOCIETY

UQ researchers criss-cross the horizons of time, geography and culture to understand what it means to be a global citizen in the 21st century, learning how and why people interact with each other and the universe



Science meets secularisation

Australian Laureate Fellow and Director of UQ's new Institute for Advanced Studies in the Humanities (IASH) Professor Peter Harrison is focusing his research on the relationship between the two most important cultural products of the West – science and religion.

For many, science and religion have long endured an uneasy balance, with the rise of one seeming to influence the decline of the other in societies around the globe. New research from IASH, led by Professor Harrison, aims to unite historical and sociological approaches to study this relationship throughout history and today.

Last century, it was widely believed that all cultures would eventually evolve into something roughly approximating a secular, Western, liberal democracy. The past few decades, however, have seen the persistence and growth of religion, including varieties of Christian and Muslim fundamentalism. This “return of religion” suggests that this earlier assumption was deeply flawed.

Is religion's resurgence a temporary phenomenon? Or might it be that the West's historical trajectory towards secularism is reversible, or represents an exceptional case, unlikely to be paralleled elsewhere?

Since January 2015, Professor Harrison has been working closely with local and international collaborators to answer these questions as part of the Science and Secularization project. Inspired by questions that arose from his work studying the histories of Western religion and science, Professor Harrison initiated the project after developing a fascination with the complicated connections between the two.

A distinctive feature of this project is its cross-disciplinary and longitudinal approach, applying both historical and sociological studies to determine the place of religion in global politics and liberal societies, the role of science in soft diplomacy, and the growth of religiously motivated rejection of science.

The team will also identify contemporary patterns of religious belief in different cultural settings and seeks to examine their relationship to scientific and technological advance.

“Our hope is that questions asked by historians about historical causation can be illuminated by the empirical methods of sociology, and that, in turn, sociological questions might be sharpened with input from the discipline of history,” he says.

The project has raised significant interest in research circles in the United States, with leading sociologists of religion from University of California San Diego and Rice University already in discussions with the UQ research team.

Professor Harrison brings a distinguished leadership to this ambitious project. Prior to his current role, which is an evolution of his Directorship of the Centre for the History of European Discourses, Professor Harrison was based at the University of Oxford as the Idreos Professor of Science and Religion and Director of the Ian Ramsey Centre. He has published a number of influential books on the historical relations between science and religion and has held visiting fellowships at Yale and Princeton. Professor Harrison is also a founding member of the International Society for Science and Religion, and a Fellow of the Australian Academy of the Humanities.

Science and Secularization

UQ researchers: Professor Peter Harrison (Institute for Advanced Studies in the Humanities)

Funding source: Australian Research Council Laureate Fellowship

Collaborators: UC San Diego, Rice University

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bit.ly/1HXrqsB

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[@IASH_UQ](https://twitter.com/IASH_UQ)

Making music collaboratively

A program of research at the School of Music is showing how leadership in creativity and collaboration is critical for future research in creative disciplines and beyond.

Founded in 2010, the Creative Collaboratorium is a research initiative that explores the productive intersection of creativity and collaboration. Led by Professor Margaret Barrett, Head of School at UQ's School of Music, it explores the ways in which collaborative interactions support innovation and creativity in composition, musicology, music education, music health and wellbeing, and performance. As a prime site for investigating the role of collaboration in creativity, creative practice research in music has the potential to generate new methodologies and theoretical frameworks for the humanities, arts, and social sciences, while promoting dialogue, transformation, and the generation of new knowledge.

Creative Collaboratorium

UQ researcher: Professor Margaret Barrett (Head of School, School of Music)

Funding source: UQ Strategic Initiative Funding, Australian Research Council Discovery Grant, Australia Council for the Arts, Australian Youth Orchestra, Australian Chamber Orchestra, Tasmanian Symphony Orchestra, UQ Collaboration and Industry Engagement Fund, The Australian Children's Music Foundation, Queensland Music Festival

Collaborators: New York University, The University of Edinburgh, The University of Cambridge, Sibelius Academy, University College London, University of Washington

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🌐 uq.edu.au/music/creative-collaboratorium

"The Collaboratorium provides a virtual meeting place for researchers working across the creative disciplines," says Professor Barrett.

"Our aim is to explore the relationships between creativity and collaboration, and develop models of collaboration and creativity that not only generate new knowledge for the creative disciplines but also may be translated to other disciplines, environments, and communities."

The program has generated dozens of projects and publications within and across each of its sub-disciplines. In addition to traditional methods of research engagement, the Collaboratorium features two Ensembles-in-Residence which provide performance "laboratories" for the study of creative collaborations. The Viney-Grinberg Piano Duo (pictured with Dr Mary Broughton and Professor Barrett) and the recently launched White Halo Ensemble disseminate creative practice research nationally and internationally while also advancing knowledge about the nature of collaboration and creativity. Cross-disciplinary collaborations between music performance and psychology, for example, focus on understanding: relationships between commissioner, composer, ensemble, and audience; how collaborations develop over time; and the distinctive features of collaborative creativity.

Other recent projects have explored the role of music learning and engagement in Positive Youth Development for young people living in Juvenile Detention, the life and learning outcomes of early joint engagement in music for infants and young children, and the processes by which canonical works in music are interpreted in and through performance.

UQ will host an International Colloquium in November 2015 to continue the Collaboratorium's research.

Looking to the future, Professor Barrett says, "We will analyse the methodologies and outcomes we have generated so far, compare and contrast these with other approaches, and identify translation possibilities as we promote the benefits that creative collaboration can offer."

"The Collaboratorium provides a virtual meeting place for researchers working across the creative disciplines"



Professor Margaret Barrett (grey jacket), Dr Mary Broughton (floral skirt), Dr Anna Grinberg (seated) and Dr Liam Viney (seated), all members of the UQ School of Music Collaborative Creatorium

Speak up

Since 9/11, Western liberal democratic governments have moved to protect citizens by ushering in anti-terrorism laws. Has the pendulum swung too far away from civil liberties such as free speech?

In a moment immortalised in history, the collapse of the twin towers in New York heralded the dawn of a new era. With the exposed fragility of the nation state came a concurrent backlash: personal safety was now paramount in the hearts and minds of the public.

In the years since, policy makers in the United States, United Kingdom and Australia have realigned values enforced in law. A hard line has been etched against not only offenders, but also people not connected to the risk of terrorism at all.

“Since the terrorist attacks, Western governments have made a calculated move towards prevention, as opposed to purely prosecution of terrorist crimes,” shares Professor Katharine Gelber from the School of Political Science and International Studies.

Professor Gelber is researching the alignment between counter terrorism policies and freedom of speech in liberal democratic countries. In her opinion, policies introduced in the US, UK and Australia since 9/11 have instantiated a “newly reconstructed, and significantly delimited” form of freedom of expression that has been legislated and upheld despite populist rhetoric.

This is the case despite the fact that “leaders in recent years have adopted stances more in favour of human rights protection, and against restrictions on civil liberties,” she says.

“In the United States, President Obama promised he would henceforth ‘reject as false the choice between our safety and our ideals’. In the United Kingdom, Gordon Brown argued for the protection of liberty and security, and in Australia, Julia Gillard stated the ‘9/11 decade’ was over. Their governments, nevertheless, maintained and extended speech-limiting counter-terrorism laws, with their rhetoric not correlating with a return to appropriate parameters for freedom of speech, as agreed before 9/11.”

Instead, Professor Gelber argues there is a “new normal” of simultaneously combating terrorism and advocating for civil liberties protection, while deploying “rights-abrogating measures, such as material support laws, the criminalisation of the broadly defined ‘advocacy’ of terrorism, and the banning of publications” that infringe individual freedoms.

“Today, there is a notion that only law-abiding citizens deserve to have their rights protected, with the government bestowed with the responsibility of ensuring public safety,” she says.

“Much speech has been criminalised in ways previously considered anachronistic or inappropriate, just as there has been increased secrecy and surveillance, including metadata collection, and a subtle silencing of detainees.”



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“Today, there is a notion that only law-abiding citizens deserve to have their rights protected, with the government bestowed with the responsibility of ensuring public safety”

Freedom of speech post 9/11

UQ researcher: Professor Katharine Gelber (School of Political Science and International Studies)

Funding source: Australian Research Council Future Fellowship

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Through a child's eyes

When adults explore the streets of their neighbourhood from the perspective of a child, new understandings can be grasped.

To date, Dr Phillips and her collaborators have studied child-hosted walks in Fortitude Valley, Brisbane, and Chiang Mai, Thailand, created through Lenine Bourke's relational arts project *The Walking Neighbourhood hosted by children*. In both locations, the child hosts and their parents have spoken of the confidence gained by the children – who competently negotiated public spaces – and many of the child participants now walk home from school and shop independently.

Adult participants have been inspired to minimise their caregiver behaviours, such as managing conversations, since their children adeptly led the walks, negotiating road crossings and conversations for groups of adults.

By means of the award-winning* Walking Neighbourhood, researchers hope that urban planners will consider the needs of child pedestrians, that parents and schools will support children's independent mobility and active participation, that retail and service industries welcome children, and that all citizens welcome and include children in negotiations of public spaces.

The study and walks will expand to further destinations in the near future.

*Vienna Walk21 Walking Visionaries Jury Prize, June 2015

The Walking Neighbourhood hosted by children

UQ researcher: Dr Louise Phillips
(School of Education)

Funding source: Canadian Social Sciences and Humanities Research Council grant (administered by University of Toronto)

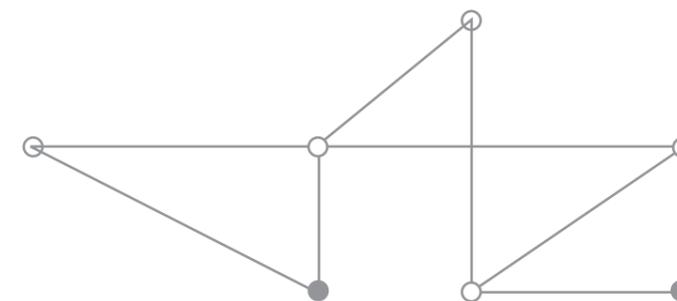
Collaborators: Lenine Bourke, Artistic Director of The Walking Neighbourhood and Dr Andrew Hickey, University of Southern Queensland

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🌐 thewalkingneighbourhood.com.au
walkinglab.org

walk21vienna.com/visionaries/awards-winners

🐦 @Louptales



Butt out or chill out

As some US states experiment with legalising recreational cannabis use, UQ is analysing the relevance of these experiments for Australia.

Cannabis is the most widely used illicit drug in the world, and Australia and the US have some of the highest user rates.

Because its use appears to cause less harm than heroin and cocaine, or even legal drugs like alcohol, there has been growing debate over whether Australia should continue to impose criminal penalties for cannabis use.

Proposed changes include reducing the penalties for use to fines, as in some Australian states; “de facto” legalise its use and sale, as in the Netherlands; or follow the example of US states that have legalised the sale of cannabis to adults for recreational use.

Over the next three years, Director of the Centre for Youth Substance Abuse Research Professor Wayne Hall will analyse the effects of legalising cannabis for medical and recreational use in Colorado, Washington and Oregon, and consider the implications for Australia.

Professor Hall says the legalisation of cannabis in the US is an unprecedented policy experiment with significance for international drug-control treaties, under which cannabis use has been globally prohibited for 63 years.

“It is of major relevance to Australia, given the fact that, historically, drug use trends and policy responses here have been strongly influenced by what has happened in the US,” he says.

Professor Hall’s reviews of the adverse health effects of cannabis are internationally recognised and he has sat on

the International Narcotics Control Board as a nominated member of the World Health Organisation (WHO).

Part of Professor Hall’s research will involve collaborative critical reviews of the evidence on the effects of cannabis legalisation in the US, such as adolescent use and cannabis-related harm.

He will monitor and analyse debates in the US on the effects of cannabis legalisation and prepare reports on the possible implications for Australian policy.

“This evaluation will capitalise on my extensive contacts with drug-policy researchers and analysts in the US,” Professor Hall says.

Legalising cannabis: the pros and cons

UQ researcher: Professor Wayne Hall (Centre for Youth Substance Abuse Research)

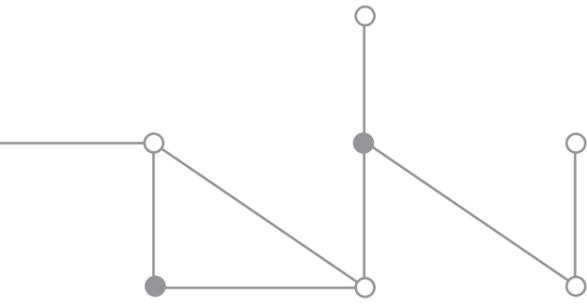
Funding source: Centre for Youth Substance Abuse Research Philanthropy; Graeme Wood Foundation

Collaborators: Centre for Youth Substance Abuse Research; National Drug and Alcohol Research Centre; University of NSW; National Addiction Centre, London

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“It is of major relevance to Australia, given the fact that, historically, drug use trends and policy responses here have been strongly influenced by what has happened in the US”





Enabling equality

UQ researcher Dr Paul Harpur says the way society regulates disability is both inefficient and denying of human rights, and he is using his first-hand experience to combat the causes of inability equities.

Dr Harpur lost his eyesight in a train accident when he was 14 years old but he has remained a high achiever, becoming an internationally recognised disability rights scholar, lawyer and advocate through the TC Beirne School of Law, as well as a dual Paralympian and Commonwealth Games representative.

The experiences gained through his professional and athletics careers have given Dr Harpur a critical understanding of anti-discrimination laws and he is now researching how those laws and regulations impact the rights of people with disabilities.

His research involves analysing the operation of anti-discrimination laws, critiquing the theoretical and practical implications of new forms of promoting equality, and understanding the extent to which existing laws respond to new forms of disablement.

"The anti-discrimination jurisdiction is no longer the only vehicle through which persons with disabilities can protect their human rights," says Dr Harpur.

"Other laws, such as domestic violence, industrial

relations, intellectual property, privacy and so on all adopt a construction of ability and disability.

"How these laws construct difference has a major impact on the capacity of persons with disabilities to exercise their economic rights."

In 2014, Dr Harpur published five articles in top-tier journals that analysed and explained how technological advances improve and alter how people with impairments are disabled.

He has also analysed how such assumptions operate with the intersection between anti-discrimination and occupational health and safety laws.

"Legal institutions can create a hierarchy of rights based upon flawed understandings," says Dr Harpur.

"Disability should be understood by considering how an individual interacts with wider environmental factors.

"The inclusion of individual factors in the analysis of disablement opens new avenues for research.

"For example, when a person experiences injury how do they respond? Most of our legal regimes assume a person with a disability who experiences discrimination will take certain action.

"Analysing how people respond to discrimination provides critical understandings of the capacity of the law to promote equality."



Dr Paul Harpur with guide-dog, Chester

"The anti-discrimination jurisdiction is no longer the only vehicle through which persons with disabilities can protect their human rights"

Understanding and combating the causes of ability inequities

UQ researcher: Dr Paul Harpur (TC Beirne School of Law)

Funding source: Australian Institute for Business and Economics, International Labour Organization (UN Agency), Northern Kentucky University Symposium travel grant, University of Illinois group expense grant

Collaborators: Australian Institute for Business and Economics (UQ, BEL), Center for Public, International and Comparative Law (UQ TC Beirne School of Law), International Labour Organization

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Conversations in context

How can we make sense of social media noise? ISSR's Dr Andrew Smith and his collaborators are doing just this with narratif, a text analytics application that tracks topics in real-time discussions on social media applications.



narratif was born out of research focused on making sense of large quantities of data as they are created, to determine the emerging patterns as they happen.

Dr Smith explains, "It is often only in the aftermath of a disaster that we spend the time and effort to piece together what went wrong."

He recounted his experience with large computer servers, surmising that he and his colleagues were blissfully unaware of most of the problems unfolding within these complex communities of data, users, networks and hackers. They only realised a problem had occurred once multiple systems failed, or the call centre became overwhelmed with complaints.

By quickly sorting relevant hashtags, mentions and keywords, the program helps find the exact conversations users are looking for as they unfold, presenting conversations software platform that is easy to follow.

"narratif is based on a flexible and dynamic model of human recollection, called Schema Memory," Dr Smith says.

"In the same way that memories adapt to help humans choose the appropriate behaviour in a given situation the next time it occurs, narratif groups conversations into contexts so that users can quickly determine which one is the most relevant for their needs."

The program is anticipated to offer particular value for former insight and operational intelligence.

narratif is currently being commercialised through UniQuest, and has launched its first products. Discover is a Twitter monitoring platform, while narratif

Place suggests the optimal content to post to reach the largest possible market based on current social conversations.

Dr Smith and his colleagues have also successfully proven the narratif engine's ability to understand a stream of multiple sensor data, adding, "I am very excited to demonstrate it in action on large-scale social and industrial data feeds."

Dr Smith hopes narratif will broaden awareness around Big Data, and be recognised as the vital resource it can be for understanding our complex society.

narratif

UQ researchers: Dr Andrew Smith, Professor Michele Haynes (Institute for Social Science Research), Professor Janet Wiles (School of Information Technology and Electrical Engineering), Emeritus Professor Mike Humphreys (School of Psychology)

Funding source: Asian Office of Aerospace Research and Development, ISSR Life Course Centre, Australian Research Council Thinking Systems

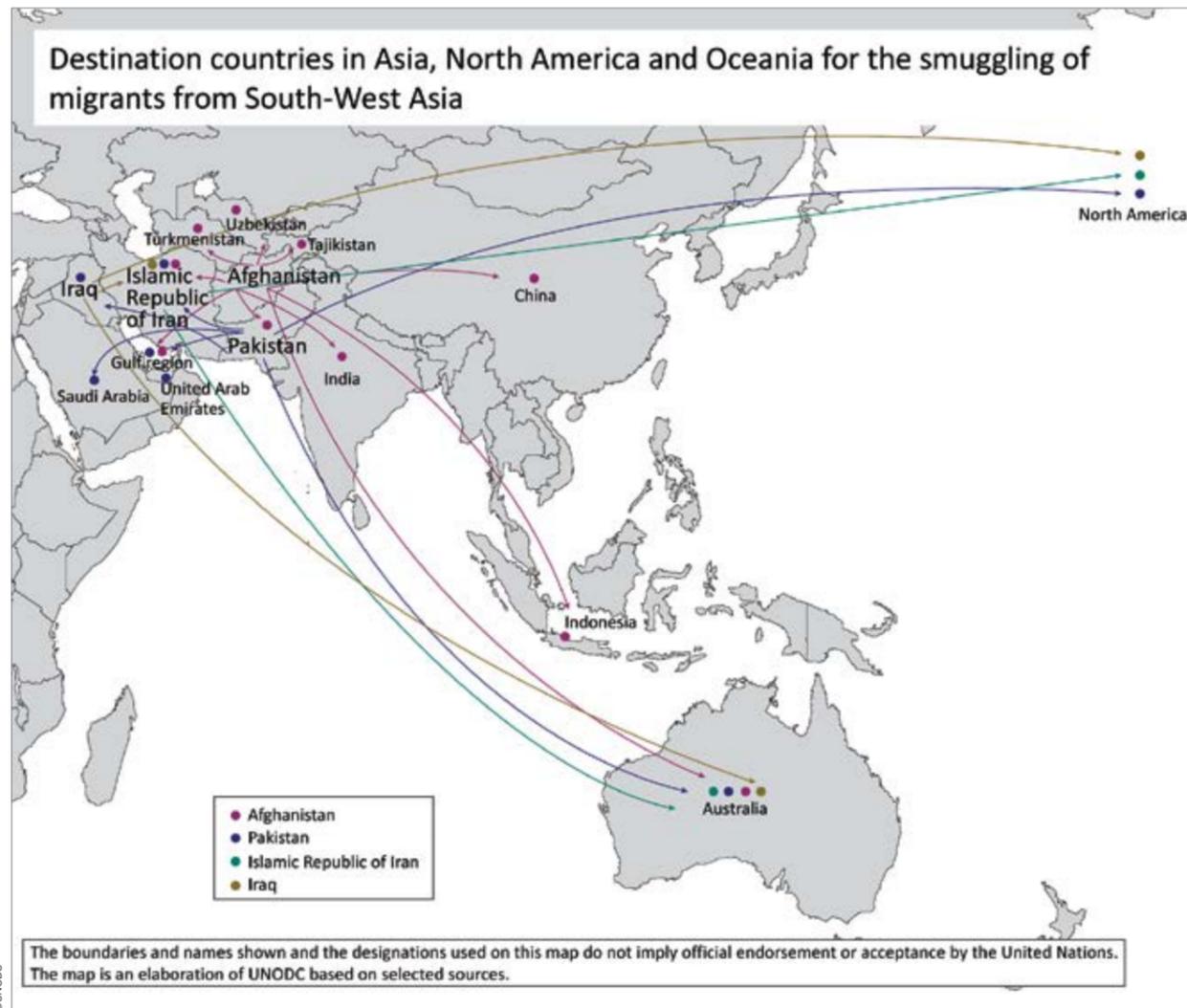
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"In the same way that memories adapt to help humans choose the appropriate behaviour in a given situation the next time it occurs, narratif groups conversations into contexts so that users can quickly determine which one is the most relevant for their needs"



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“I hope our work will end the myths, stereotypes and prejudice towards asylum-seekers and spark some informed debate which is currently lacking in Australian politics and the media”

Smugglers or Samaritans?

In recent years, few topics have dominated news headlines and public debate worldwide as much as the quest of smuggled migrants – many of them asylum seekers – to reach Western Europe, Australia or North America in search of a safer life and better future.

According to research conducted by UQ’s Migrant Smuggling Working Group in conjunction with the UN Office on Drugs and Crime, persecution and poverty are the key drivers for migrant smuggling in Asia.

Suggestions to “stop the boats” fail to take into account the many complex causes and circumstances of this phenomenon: legal avenues of migration are needed to prevent the smuggling of migrants in the medium- and long-term.

Working Group Coordinator Professor Andreas Schloenhardt from the School of Law says that smuggling creates real dangers to the safety of migrants, often placing their lives in jeopardy. Smuggled migrants also find it difficult to assert their rights and are vulnerable to abuse and exploitation.

“The physical dangers associated with migrant smuggling – travelling on unseaworthy vessels, being concealed in locked containers or crossing mountainous areas in icy conditions – rarely deter desperate migrants,” he says, “nor do the high costs and uncertainties about finding work or settling in at the destination countries.”

When analysing 28 states from the Middle East to the Pacific, the Working Group found that criminal networks are creatively exploiting gaps between demand and regular migration, with people being charged as much as US\$50,000 to escape their homeland.

“Many common perceptions about migrant smuggling are not supported by evidence,” Professor Schloenhardt says.

“I hope our work will end the myths, stereotypes and prejudice towards asylum-seekers and spark some informed debate which is currently lacking in Australian politics and the media.”

For example, contrary to public opinion, many migrant smugglers were once smuggled migrants themselves, using their knowledge and experience to “help” others. Their ability to bribe corrupt officials, provide fraudulent documents, and change routes as contacts dictate allows them greater flexibility than would large “Mafia-style” cartels.

“By identifying the profiles, smuggling routes and methods of smugglers, our work exposes the complexity and growing challenge of migrant smuggling in Asia,” notes Professor Schloenhardt.

“Our ultimate aim is to develop strategies that will combat the smuggling of migrants, protect the rights of those smuggled, and create accessible and sustainable avenues for legal migration and asylum-seeking.”

Migrant smuggling in Asia: current trends and related challenges

UQ researcher: Professor Andreas Schloenhardt, Xavier R Goffinet et al (TC Beirne School of Law)

Partner organisations: The University of Vienna; UNODC Regional Office for Southeast Asia and the Pacific, Bangkok, Thailand

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SUSTAINABILITY

The University of Queensland is committed to embedding sustainability across all aspects of learning, discovery, engagement and operations: UQ researchers help develop clean energy and discover ways to protect and conserve our environment

Electric moves

The world at large is powered by electricity, and it now appears that the world “at small” is too.

Headed by Dr Jens Krömer, researchers at the Centre for Microbial Electrochemical Systems (CEMES) are investigating microbes, the tiny, single-cell organisms that enable us to live comfortably on Earth. Specifically, they are studying the interaction of microbes with electrodes.

“We have discovered that, as well as sugars, microbes can eat or create electricity in a bioelectrochemical reactor,” says Dr Krömer, “and so we are exploring ways to exploit this trait to produce renewable chemicals from renewable electricity, carbon dioxide, plant and other organic matter (biomass), and sugar.

“We are also examining how ‘electrified’ microbes can help recover nutrients and/or treat wastewater and urine.”

Their work has enormous potential for producing cheap biofuels in the future, as well as improving feedstock production, developing new “natural” therapeutic drugs, creating eco-friendly fertilisers, replacing petrochemicals with green chemicals, and enhancing metal recovery from mine drainage – all of which are extremely good for the environment.

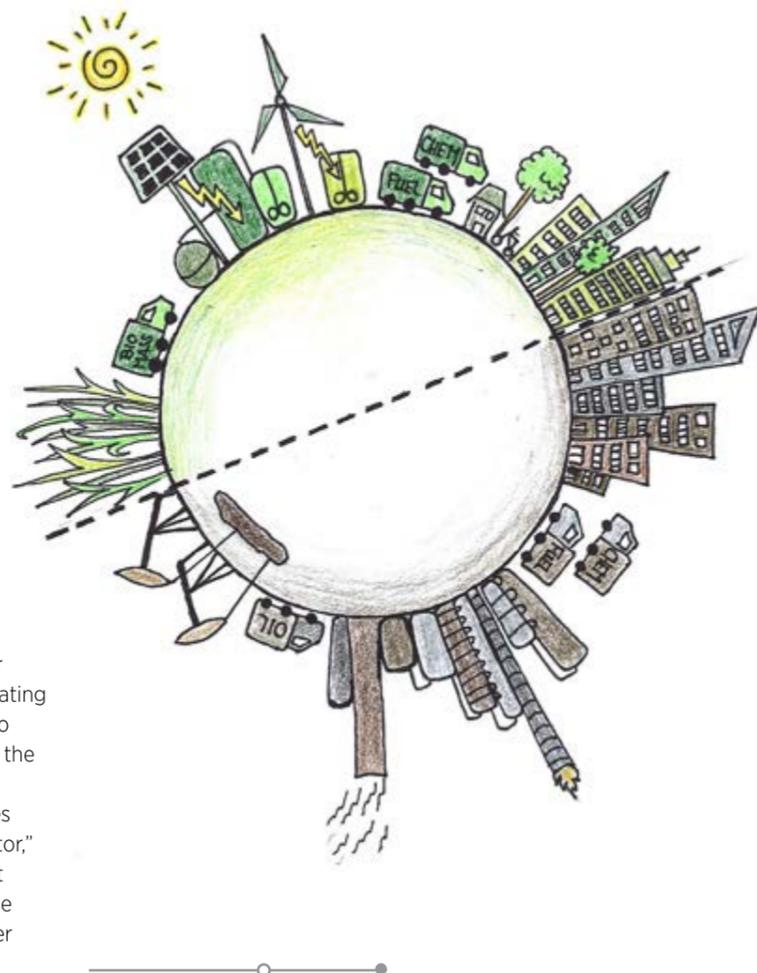
“Microbial fuel cells have emerged in the past few decades as a way of creating electricity through a bioprocess,” continues Dr Krömer.

“Learning how these fuel cells work meant we could interfere with their redox metabolism – the electron-transfer process affecting the oxidation state – in a new way. The current limitation seems to be the actual point (interface) at which the electrons transfer, but we have identified new materials that can improve this.

“Using synthetic biology tools, we have also been able to engineer what the cells can do in the reactors.”

The goal now is to solve the interfacial electron transfer limitation and then scale-up the technology to industry level, thus laying the foundations for a technology revolution in the biotech sector that will support the transition to a long-term sustainable society.

Electric moves indeed!



Applied microbial electrochemistry and biotechnology for treatment of waste, nutrient recovery and industrial production of sustainable fuels and chemicals

UQ researchers: Dr Jens Krömer, Dr Bernardino Viridis, Dr Stefano Freguia (Centre for Microbial Electrochemical Systems)

Funding source: Australian Research Council (ARC) Discovery Early Career Researcher Awards, ARC Discovery Projects, UQ Strategic Fund

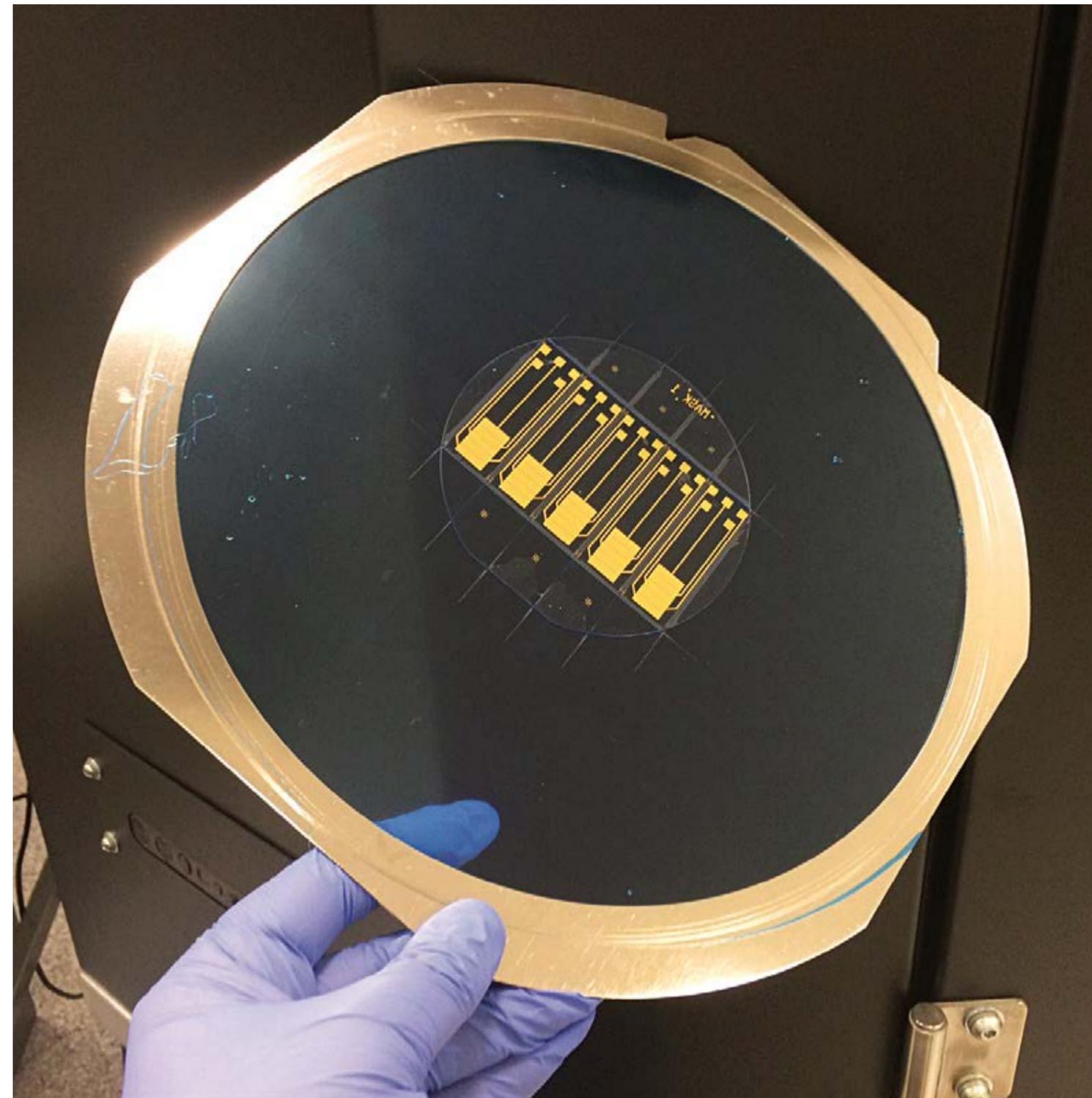
Partner organisations: DECHEMA, Free University Amsterdam, Helmholtz Centre for Environmental Research - UFZ, Queensland University of Technology, Technical University Munich, University of Ghent, University of Girona, University of Wollongong

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Left: Hand-drawn image by PhD student Frauke Kracke, that featured on the cover of *ChemSusChem* journal, summarising the idea that microbial electrochemical systems will one day contribute to a sustainable way of life

Below: Gold micro electrodes generated by the Australian National Fabrication Facility (ANFF), used to study electroactive microbes



Picking on bollworm



The cotton industry is under threat from the cotton bollworm – a major pest capable of devastating the crop’s production – and UQ is joining the fight in the fields.

Professor Glenn King from the Institute for Molecular Bioscience is leading a project to develop an eco-friendly alternative to conventional chemical insecticides to control pests that damage cotton – an important fibre crop to both India and Australia.

India and Australia are the second and seventh largest producers of cotton; however, bollworms are attacking crops and have become resistant to most chemical insecticides.

The pests are also developing a resistance to transgenic cotton, which is a genetically modified cotton variety that produces a natural insecticide.

This is a scenario that threatens to devastate cotton production in both countries.

Professor King and his team are developing plant proteinase inhibitors – an enzyme found in plants that fights off crop pests – as an eco-friendly alternative to conventional chemical insecticides for control of cotton bollworms.

“There is an urgent need for new insecticides due to insects becoming resistant to existing products and others being deregistered due to perceived ecological and human health risks,” says Professor King.

“In contrast with many conventional chemical insecticides, bioinsecticides make an attractive, eco-friendly alternative as they break down safely, posing no risks to the environment.

“This project will provide significant economic, environmental, and societal benefits to both India and Australia by helping to secure the future of the cotton industry, and developing new methods to control cotton bollworms and other insect pests.”

“There is an urgent need for new insecticides due to insects becoming resistant to existing products and others being deregistered due to perceived ecological and human health risks”

Eco-friendly alternative to target insect pests in crops

UQ researcher: Professor Glenn King (Institute for Molecular Bioscience)

Funding source: 2015 India-Australia Science and Technology Fund

Collaborators: Tata Institute of Fundamental Research, Council of Scientific and Industrial Research – National Chemical Laboratory

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Place in the sun

As the spotlight shines on the debate over renewable energy, UQ is lighting the way for clean energy research.

With construction completed earlier this year on the Gatton Solar Research Facility, Director of UQ Solar, Professor Paul Meredith, and a team of UQ researchers are working to address the challenges of integrating large-scale solar photovoltaic (PV) into Australia's electricity distribution network.

The 3.275-megawatt Gatton Solar Research Facility is Queensland's largest solar array and the largest solar PV systems research facility in the southern hemisphere.

It comprises more than 37,000 thin-film PV panels, mounted on the Gatton campus's 10ha former airstrip.

The facility is a key part of AGL Energy Limited's Solar Project and funded through a \$40.7m Education Investment Fund (EIF) grant from the Federal Government. The EIF project has also deployed major infrastructure for power systems and energy economics research at UQ's St Lucia campus and the University of New South Wales's Kensington campus, and is part of the UQ Solar portfolio in the Global Change Institute.

"The research focuses on optimising the value and yield of solar PV systems using advanced monitoring and operational processes," says Professor Meredith.

"It measures the impact of tracking technology to increase the yield of solar generation, as well as the impact of large amounts of intermittent generation sources on the national electricity markets.

"It also examines the benefits and value of integrating battery storage with large-scale PV and studies advanced control strategies for making PV plants more efficient and beneficial to the network, especially in fringe-of-grid or fragile situations."

Professor Meredith says the research was inspired by UQ's own solar projects (for example the 1.22MW array at St Lucia) and the challenges facing solar PV integration into the local distribution network.

"We hope to develop expertise on building and operating solar plants for UQ, while acting as an exemplar for how to provide positive network benefits with large-scale solar PV and forge a new attitude to connecting these plants to the distribution network," he says.

"By providing a platform for in-field scale testing of new technology and ideas we hope to prove the business case for the deployment of large-scale solar power in Australia."

Gatton solar research facility

UQ researchers: Professor Paul Meredith (School of Mathematics and Physics), Professor Tapan Saha (School of Information Technology and Electrical Engineering), Professor John Foster (Global Change Institute and School of Economics)

Funding source: Education Investment Fund, AGL Energy Limited Solar Project

Collaborators: UNSW Power Engineering Group, AGL, FirstSolar, MPower, SMA

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"It measures the impact of tracking technology to increase the yield of solar generation, as well as the impact of large amounts of intermittent generation sources on the national electricity markets"



▶ Watch

Professor Paul Meredith in conversation

Work begins on UQ Solar Farm

Australia's largest solar photovoltaic research facility: Professor Paul Meredith

See view and Seaview

XL Catlin Seaview Survey

UQ researchers: Professor Ove Hoegh-Guldberg, Dr Pim Bongaerts, Dr Ben Neal, and Dr Manuel Gonzalez-Rivero (Global Change Institute)

Funding source: XL Catlin

Partner organisations: XL Catlin, Underwater Earth, Google

Collaborators: National Oceanic and Atmospheric Administration (NOAA), SCRIPPS Institution at UC San Diego, University of California, and the University of Sydney

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The Global Change Institute's XL Catlin Seaview Survey team is advancing our knowledge of the world's coral reefs by creating the first comprehensive baseline visual record through high-resolution 360-degree imagery.

Through diving more than 800 kilometres of reefscape in 23 countries, team members have captured more than 600,000 images of the world's coral reefs. And 2015 has been another busy year.

In February, the team seized a remarkable opportunity to study the Chagos Archipelago, an area in the Western Indian Ocean almost untouched by human activity.

"The archipelago is located in the cleanest seawater anywhere in the world and its ecosystems have experienced far fewer impacts than seen elsewhere, which meant we could conduct baseline research for comparison with degraded reefs worldwide," says Global Change Institute Director Professor Ove Hoegh-Guldberg.

Next on the agenda was the Maldives in April and May, with the XL Catlin Seaview Survey effectively reporting "from the frontline". At one of the most climate-endangered nations on earth, the Survey investigated how human activities may be driving coral reef decline there and around the world by itemising percentage of coral cover, fish abundance and diversity, and the relationships between deep and shallow reefs.

"The survey data will help local communities and authorities in the Maldives to complete assessments of reef damage and measure disturbances after major bleaching or crown-of-thorns outbreaks," says Professor Hoegh-Guldberg.

In August, the team headed to Hawaii in collaboration with US federal agency National Oceanic and Atmospheric Administration to study Hawaii's unique tropical coral reefs linked to large forests and volcanic islands.

"Despite the increasing global threat to coral reefs from climate change, Hawaiian reefs have remained relatively intact, although future conditions pose a very real threat," continues Professor Hoegh-Guldberg.

"Surveying this region is likely to reveal important information on the resilience of coral reefs under the rapid and unprecedented changes in ocean temperature and acidity that are projected."



Photo credit: XL Catlin Seaview Survey

Photo credit: XL Catlin Seaview Survey

Photo credit: XL Catlin Seaview Survey

“Our work is aimed at making a real difference for koala conservation and recovery”

Conserving our national icon

For the past fifteen years, UQ researchers have striven to save an Australian icon, the koala, from further decline.

Driven by a challenge to conserve this rapidly declining Australian species, UQ researchers have been working to safeguard the long-term survival of the koala. An understanding of the causes behind the koala's decline, which can vary substantially between regions, is central to achieving its recovery.

The research team, led by Professor Clive McAlpine and Associate Professor Jonathan Rhodes from the School of Geography, Planning and Environmental Management, has made significant contributions to the conservation of the species by transforming our understanding of the factors behind the decline.

“Our work is aimed at making a real difference for koala conservation and recovery,” says Professor McAlpine.

The team endeavours to inform the conservation and recovery of koala populations across the species' range, using an interdisciplinary approach that draws on landscape ecology, conservation science and economics.

“A major innovation in our research has been the ability to quantify the drivers of koala declines, such as landscape change, urbanisation, and climate change, across whole landscapes,” says Associate Professor Rhodes.

Koala conservation and recovery in the 21st century

UQ researchers: Professor Clive McAlpine, Associate Professor Jonathan Rhodes, Dr Leonie Seabrook (School of Geography, Planning and Environmental Management), Professor Hugh Possingham (School of Biological Sciences)

Funding source: Australian Research Council, National Environmental Research Program, Queensland Government, New South Wales Government, Australian Koala Foundation, South West Natural Resource Management, Australian Centre for Ecological Analysis and Synthesis

Collaborators: Dr Daniel Lunney (Office of Environment and Heritage NSW, University of Sydney)

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This innovation has allowed researchers, for the first time, to build models of regional changes in koala populations and inform regional and national koala conservation policy.

While the team has established that koalas are highly sensitive to habitat loss and fragmentation, they have also identified that in many coastal populations koalas are declining because of urban development-related factors, including domestic dog attacks and vehicle collisions.

Research in south-west and central Queensland has demonstrated that there have been substantial declines in koalas due to land-use pressures, but also that drought and heat waves are key causes.

In New South Wales, a combination of these drivers has caused significant population declines across much of the state.

“One of the key challenges for koala conservation in the 21st century is overcoming the economic and human social factors that constrain conservation activities.

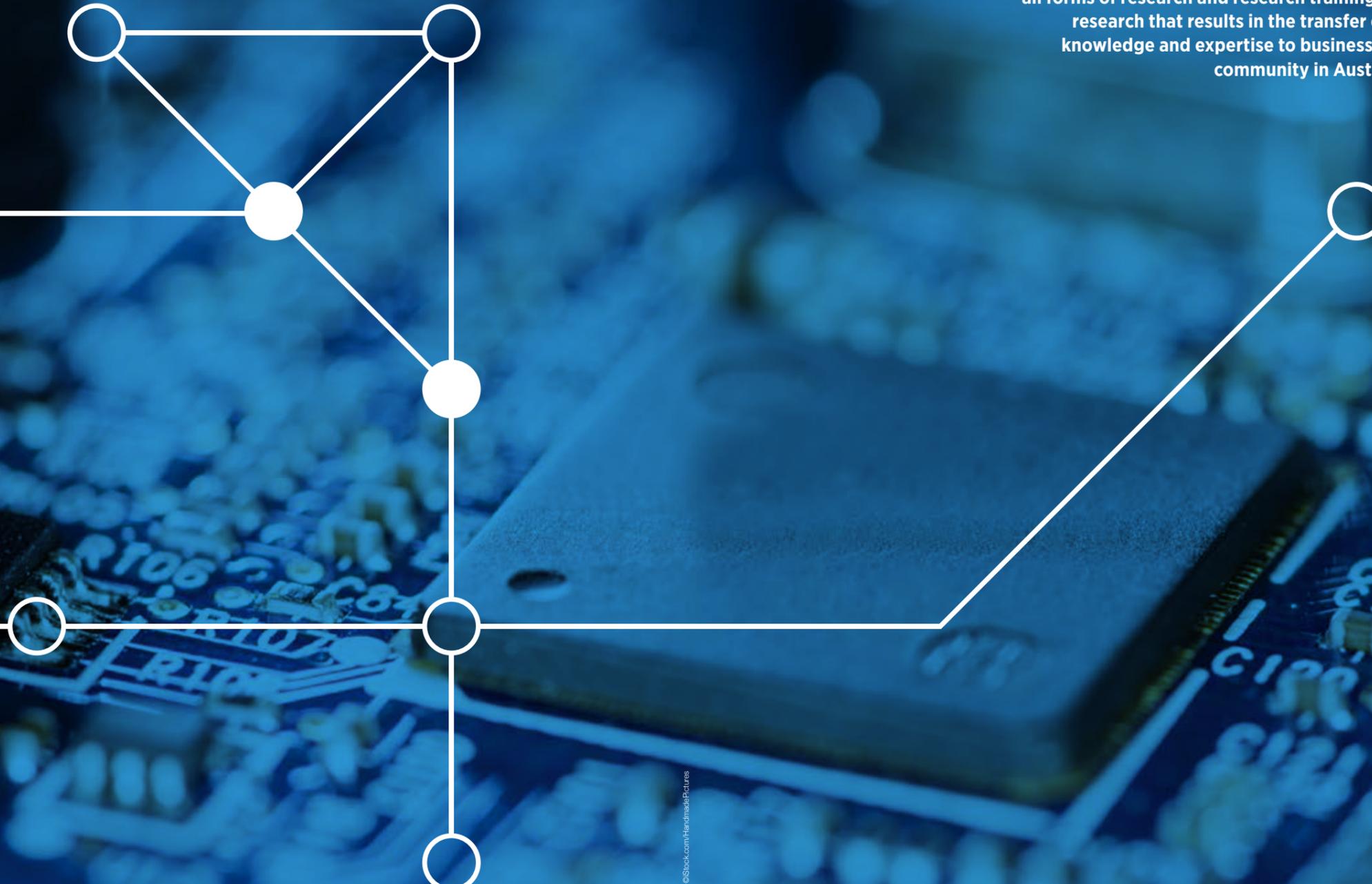
“Our future aims are to integrate our ecological understanding with an understanding of social and economic factors to inform restoration activities for koala recovery.

“This work will make a key contribution to the successful planning and implementation of recovery activities,” says Associate Professor Rhodes.

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TECHNOLOGY AND TRANSLATION

UQ aims to achieve internationally acknowledged excellence in all forms of research and research training, particularly to applied research that results in the transfer of University-generated knowledge and expertise to business, industry and the wider community in Australia and internationally





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Cracking solution

Shattered mobile phone screens will soon be an annoyance of the past thanks to Professor Darren Martin, co-inventor and Chief Scientific Officer for start-up TenasiTech, who is transforming a newly developed scratch-resistant and environmentally sustainable acrylic glass from research into commercial success.

Solid-TT is the company's flagship product, and is poised to revolutionise the six-billion dollar global acrylic glass market. A polymer nanocomposite that uses "nanoclay" additives to strengthen plastics, Solid-TT is significantly more durable than current acrylic glass products and costs a fraction of the price to manufacture and produce.

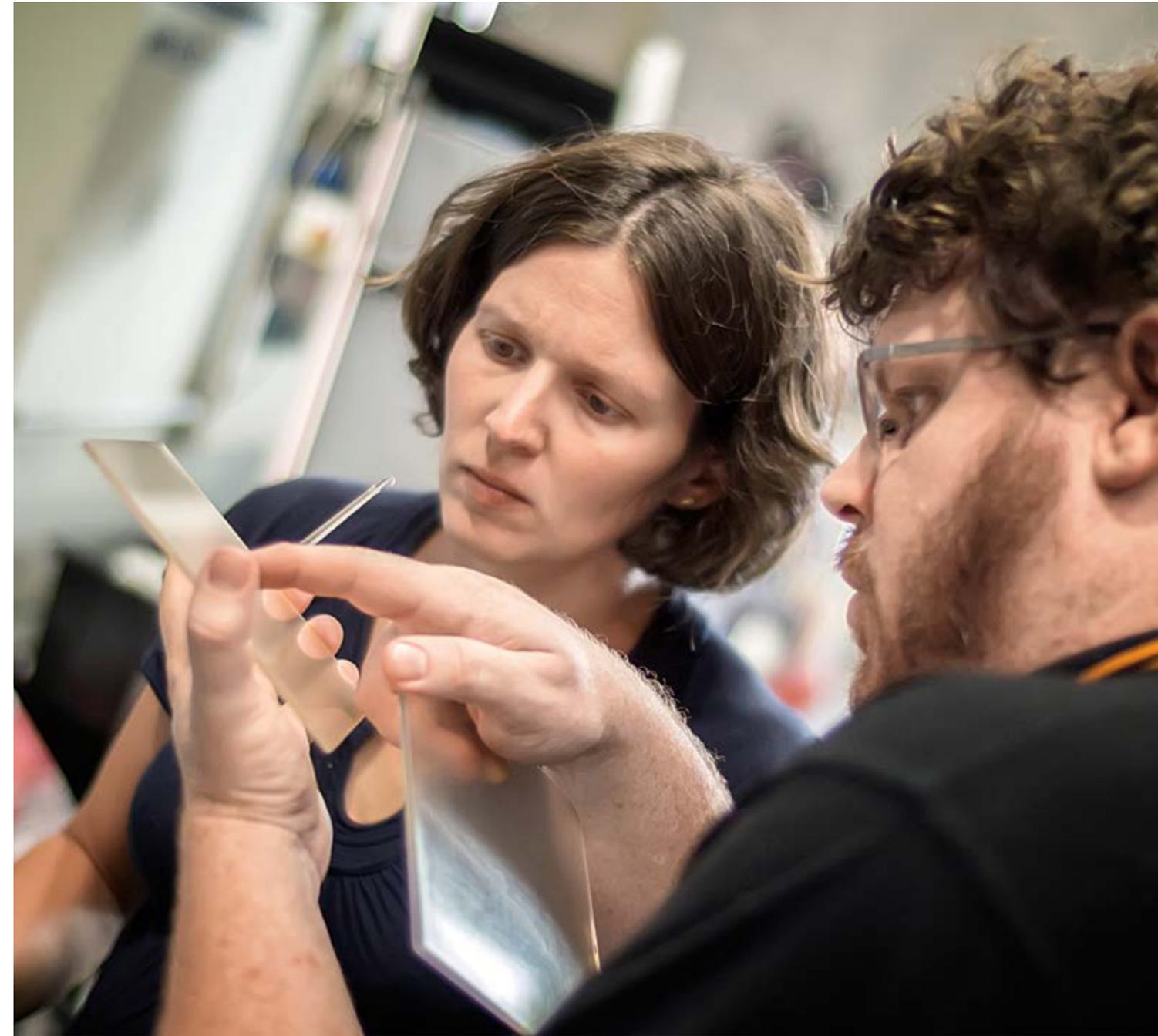
Professor Martin, who is also a Research Group Leader at the Australian Institute for Bioengineering and Nanotechnology, says the current standard for scratch-resistant acrylic involves using strong solvents and chemicals to apply a hard coat. The process is expensive and requires strict environmental monitoring due to the strong solvents and chemicals involved – both factors that Solid-TT overcomes with ease.

"What we offer is a mechanical pigment, a bit like a paint colour pigment, but instead of colour we add scratch-resistance and better mechanical properties and durability. You can add it to the mould, so you don't need to apply the nasty hard coat, which is better for the environment in terms of reduced chemical and solvent use," Professor Martin says.

"You get a more durable and scratch-resistant product for your shiny black electronics, mobile phone screens, an interior part for a car console and doors, or a kitchen cupboard, signage or a shop front."

TenasiTech has gained patents on the technology in Australia, the United States, and Canada, and has a strong customer base in the United States, United Kingdom, and Germany.

The company was listed as a finalist in the 2015 Telstra Business Awards and has also won UQ's iLab Prize as part of the Enterprize Competition, the 2012 Brisbane Lord Mayor's Innovation Award, and the 2010 UQ EAIT Commercialisation Award.



A cracking solution for acrylic glass products

UQ researcher: Professor Darren Martin (Australian Institute for Bioengineering and Nanotechnology)

Funding source: Australian Research Council, National Health and Medical Research Council, UniSeed, Melbourne Angels, Brisbane Angels, State Government Smart Futures, Federal Government Comet, Commercialisation Australia, Accelerate Commercialisation

Collaborators: UQ School of Chemical Engineering, global companies

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▶ Watch

Boost for UQ Plastics Technology

Leaders of Influence - Professor Darren Martin

Ready for take-off

As agriculture continues to evolve to meet market demand, UQ is leveraging all the high-tech the 21st century has to offer, with fast, automated, miniaturised drones custom-built for monitoring farms.

Researchers at UQ Gatton are working with vegetable growers and industry to create robotics technology that is affordable, robust and will meet the needs of the agricultural industry into the future.

Associate Professor Kim Bryceson from the School of Agriculture and Food Sciences is leading the research. Her team has been flying small quad and hexacopters both manually and on pre-programmed missions across crops in paddocks.

“Our students have been working with a strongly supportive group of industry collaborators to develop several specialised small drones for different purposes, and for carrying different ‘payloads’ of data-collecting equipment,” says Associate Professor Bryceson.

“These include the *Weed-drone* that monitors woody weed dieback in rangeland environments that have been controlled using a UQ-developed fungal agent, and the *Pollinator*, used to distribute organic bee attractant to

individual high-value fruit trees, encouraging pollination.”

A *Bug Drone* has also been developed to achieve a more even and efficient distribution of beneficial insects over crops. The drone was designed to reduce pesticide use on farms by dropping beneficial bugs in a precise way.

Another, the *Net Drone*, was designed to develop a geographical information system-based data library of images from above and below netting. It flies under the netting to inspect seedling trays for spatially variable germination.

“We hope that this technology can be used as an early detection tool for seedlings with issues such as diseases, nutritional problems or water stress,” says Associate Professor Bryceson.

“We think these projects have been a great example of interesting research, engaging student education and supportive local businesses working together for a useful industry outcome. Our hope is that the development and operational use of these easily accessible and technologically interesting tools will encourage more young people to enter into the sector with their eyes wide open to innovative ways of doing business.”

A great example of integrated research: student education and local business working together.

Photo credit: Solaris Hamou

“Researchers at UQ Gatton are working with vegetable growers and industry to create robotics technology that is affordable, robust and will meet the needs of the agricultural industry into the future”

Net Drone



Photo credit: AusVeg and Vegetables Australia

Bug Drone

Drone technology for crop research

UQ researcher: Associate Professor Kim Bryceson (School of Agriculture and Food Sciences)

Collaborators: BioHerbicides Australia (*Weed-drone*), Withcott Seedlings (*Net Drone*), Rugby Farms (*Bug Drone*), Organic Crop Protectant Pty Ltd (*The Pollinator*)

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Plastic fantastic

Plastic Bertrand's classic hit *Ça plane pour moi* (translation: "that works for me") could well sum up the efforts of two UQ researchers who are – literally – using plastic to enable therapeutic drugs to work.

According to Professor Rod Minchin from the School of Biomedical Sciences and Professor Darren Martin from the Australian Institute for Bioengineering and Nanotechnology (AIBN), many very useful drugs never make it to the clinic because they are difficult to deliver properly in patients.

"This is especially true for peptides (building blocks that create protein, allowing rapid muscle healing) that are poorly absorbed, are hard to send to target tissues, or are rapidly degraded in the body," says Professor Minchin.

"Our work has discovered that if peptides are encapsulated in a polymer (plastic) commonly used in biomedical implants, their life inside the human body can be extended from less than half an hour to several weeks or more.

"Blended polyurethane films are excellent scaffolds for allowing the controlled, slow release of peptides."

This precisely engineered drug delivery is excellent news for patients with a diverse range of debilitating symptoms.

And for the future?

Says Professor Martin, "We will be investigating whether incorporating nanomaterials into the blended polyurethanes can provide even more control over drug release and therapeutic outcomes."

Ça plane pour moi!

"Blended polyurethane films are excellent scaffolds for allowing the controlled, slow release of peptides"

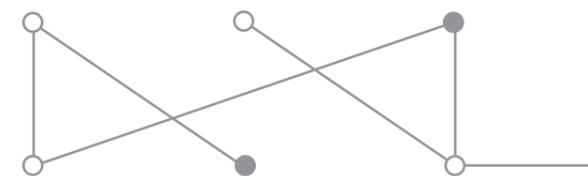
Novel approaches to peptide drug delivery using biostable medical polyurethanes

UQ researchers: Professor Rod Minchin (School of Biomedical Sciences), Professor Darren Martin (Australian Institute for Bioengineering and Nanotechnology)

Funding source: National Health and Medical Research Council, Cochlear Ltd

Collaborators: Dr Yosephine Andriani, Ms Jing Zhang

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The right image

Establishing a general community requires infrastructure such as roads, schools and hospitals. Establishing a research community is no different – but its infrastructure includes highly specialised equipment with expert staff support.



Fortunately, The University of Queensland is well served with its research infrastructure and, in the area of imaging technology, is a national leader.

Home to the Centre for Advanced Imaging and the Queensland Brain Institute's Microscopy Facility, UQ has a range of super-resolution imaging instruments and machines available to researchers in fields as diverse as brain biochemistry, agricultural advancements, and concrete reinforcement construction.

At the Queensland Brain Institute (QBI) the focus is – naturally enough – on images of the brain.

Says QBI Microscopy Facility Manager Mr Luke Hammond, "Recent advancements mean we can now see beyond the resolution of light in living cells. This breakthrough allows us to better understand how neurons (nerve cells within the brain) function, from the movement of individual neurotransmitter receptors, to changes in subcellular structures. By visualising these processes we gain insight into what goes wrong in disease states such as Motor Neurone Disease, Alzheimer's Disease and Schizophrenia.

"These same techniques allow us to monitor axon regeneration in living organisms, and film networks of living neurons firing in real time."

By observing these networks – particularly impressively in fluorescent-stained 3-D imaging of living organisms – QBI researchers have enormous potential to work out how to "rewire the brain" and may even be able to quash phobias and fix brain injuries one day.

Using technology in quite a different way is the high-tech equipment available at the purpose-built Centre for Advanced Imaging (CAI).

"We can image anything from molecules to humans," says CAI Deputy Director, Operations, Mrs Rebecca Osborne.

"For example, we conduct Magnetic Resonance Imaging (MRI) on soft tissue, Positron Emission Tomography (PET) scans of molecular probes, and Computed Tomography (CT) of solid materials; what equipment we use depends on what a particular researcher is investigating."

With such a diverse range available, CAI's work is also varied: scanning differently stimulated brains for psychologists one day, investigating concrete cancer for

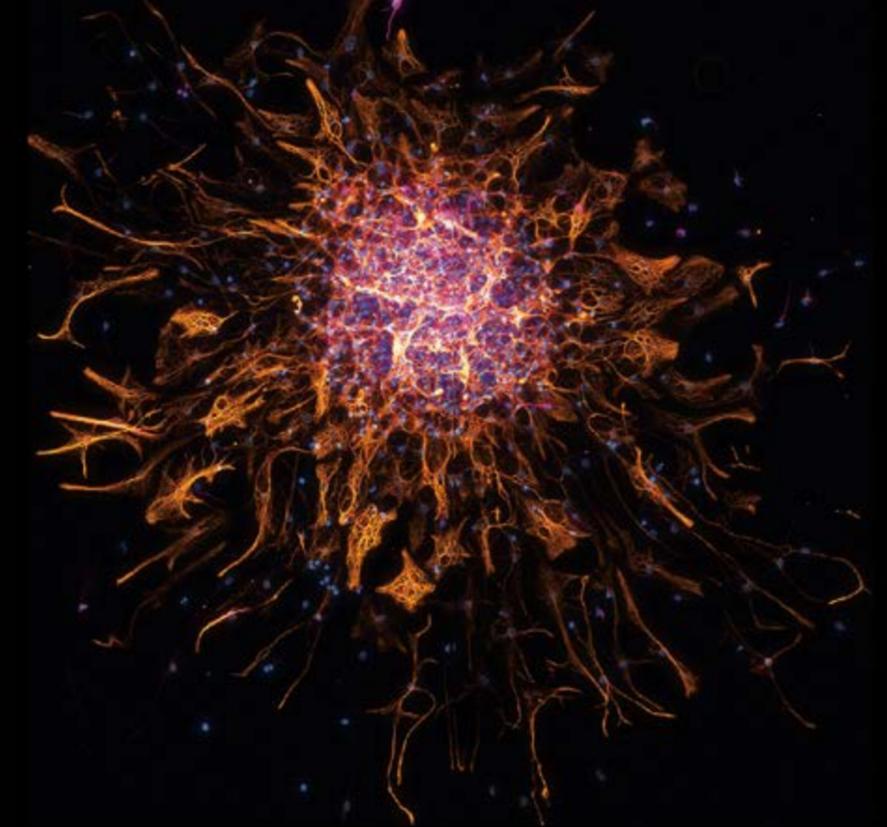
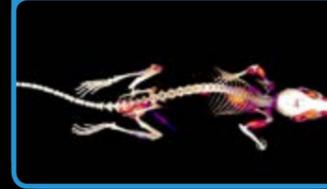
▶ Watch

Human Imaging

Microimaging Facility

Molecular Imaging

Animal Imaging



Above: A neurosphere, a collection of cells derived from a single stem cell isolated from the brain of a mouse (photo: Chanel Taylor, QBI)

Left and far left: Researchers at work in the Centre for Advanced Imaging

building analysts the next. Even crocodiles come under scrutiny!

Having skilled instrument operators on-site also has the advantage that they can pass on expertise to researchers themselves.

"We worked very closely with UQ researchers such as Professor Stuart Crozier from the School of Information Technology and Electrical Engineering in his early research," says Mrs Osborne, "and the technology developed is now used in around 80 per cent of the world's MRI machines."

While investing in the future is necessarily a high-cost venture, both facilities operate on a fee-for-service basis, and limit the use of machines to research only, not clinical diagnostics. And, although UQ researchers take priority, both provide services to UQ affiliates, other academic research organisations, and commercial companies wanting to use the facilities for their research.

"It's all about getting the right image to light the way ahead," says Mr Hammond.

Centre for Advanced Imaging

Contact: Mrs Rebecca Osborne
(Deputy Director, Operations)

Funding source: National Research Infrastructure for Australia; Australian Nuclear Science and Technology Organisation (ANSTO); Australian Government Departments of Education, and Innovation, Science, Research and Tertiary Education; Queensland Government

Partner organisations: National Imaging Facility, Queensland NMR Network (QNN)

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📘 [centreforadvancedimaging](https://www.facebook.com/centreforadvancedimaging)

Queensland Brain Institute Microscopy Facility

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(Microscopy Facility Manager)

Funding source: Australian Research Council Linkage Infrastructure, Equipment and Facilities (LIEF) Project; National Health and Medical Research Council Equipment Grant

Partner organisation: UQ Faculty of Medicine and Biomedical Sciences

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RESEARCH LEADERS

UQ researchers are recognised for their achievements at international, national and institutional levels – and it all starts at the undergraduate level where research students satisfy their intellectual curiosity and contribute to the world’s fund of knowledge

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Preparation pays off

The UQ Advantage Office (UQAO) supports UQ's culture of discovery and innovation through a range of research placement opportunities that encourage students to actively contribute to research discoveries, build global networks and explore careers in research.

UQAO Director Dr Annabelle Willox explains that UQ is committed to providing access to experiences outside of the lecture theatre – such as vacation research programs, conferences and summer schools – that will extend students' academic studies and enhance their employability.

"These programs are very popular with students. In 2014 we had 636 UQ undergraduate summer and winter research scholars, 80 undergraduate research conference presenters, and 73 UQ Advantage Grants awarded to research-based activities," Dr Willox says.

Recent Bachelor of Science (Honours) graduate James Cleland attributes landing a postgraduate research job in Germany to the research experience he gained as a UQ undergraduate.

"I participated in the 2012 UQ Winter Research Program and got a taste for how exciting and rewarding research could be," Mr Cleland says.

While on a year-long **UQ Abroad** exchange at the University of California, Berkeley, Mr Cleland undertook a research internship at the University of California, San Francisco's Cardiovascular Research Institute, with the support of a **UQ Advantage Grant**.

"Under the mentorship of Professor Takashi Mikawa, I studied the processes by which the blood vessels of the heart form in the developing chick embryo.

"This wonderful opportunity for learning how to think about and do good science was an unforgettable experience. Our research was later published in the *Journal of Development Biology*", Mr Cleland says.

"Upon returning to Australia, I presented my research at the multidisciplinary 2013 UQ Undergraduate Research Conference and participated in the 2013 UQ Summer Research Program before starting my Honours degree in neuroscience in 2014."

Realising the importance of being able to communicate his findings to a non-specialist audience, Mr Cleland presented again at the 2014 UQ Undergraduate Research Conference where he won one of the best oral presentation prizes.

"I used to find presenting to an audience really scary, but since participating in these conferences and honing my communication skills, I now actively look for opportunities to present my work," he says.

After completing his Honours thesis at the **Queensland Brain Institute**, Mr Cleland accepted a position at the Max Planck Institute of Molecular Cell Biology and Genetics in Dresden, Germany, where he hopes to start his PhD in the very near future.

"I have no doubt that all the amazing opportunities I had as a UQ undergraduate have given me the best possible preparation for postgraduate studies and a career in research."



"I have no doubt that all the amazing opportunities I had as a UQ undergraduate have given me the best possible preparation for postgraduate studies and a career in research"

UQ Advantage Office

✉ advantage@uq.edu.au
 🌐 uq.edu.au/uqadvantage

Recognising opportunity

The specialist knowledge that comes with doing a PhD can significantly expand career possibilities. Dr Helen Nugent AO has enjoyed a tremendously successful career in both academia and business, thanks to the systematic way of thinking she learned during her doctorate at UQ.

Although already employed at UQ as a senior tutor in history when she graduated in 1978 with a PhD in Indian history, Dr Nugent decided to pursue a career in business.

"Logically, I should have sought a lectureship in Indian history – and I did," she says.

"However, I rethought my career path when I missed out on one of the few such roles that became available."

Dr Nugent enrolled in Harvard Business School's MBA program and, upon graduation, landed a job with McKinsey & Company, a multinational management consulting firm.

Dr Nugent says that her time at UQ gave her transferable skills that prepared her for a prosperous career.

"UQ made an enormous contribution to my life in many ways," she says.

"My doctorate provided me with research skills that have served me in great stead.

"It also gave me the confidence to compete with the best of the best at Harvard Business School. It was a real source of competitive advantage.

"I learned how to think and write, skills that I continued to develop at McKinsey.

"Doing a PhD gave me time to think more broadly too. That is a rare opportunity and one that should be treasured.

"I also gained a broader perspective on life that now helps me see how various threads interconnect, whether in the economy or society.

"This has allowed me at times to see things from a different perspective."

After her time with McKinsey & Company, where she made partner, Dr Nugent became a professor in management and director of the MBA program at the University of New South Wales.

She went on to become Director of Strategy at Westpac Banking Corporation, a non-executive director for several leading Australian companies – including Macquarie Group, Origin Energy and Freehills – as well as chair of a number of not-for-profit organisations.

At present, she is the Chancellor at Bond University and Chairman of both Veda Group and Funds SA, a \$26 billion investment fund of the South Australian Government.

She is also President of Cranbrook School in Sydney and Chairman of the National Portrait Gallery.

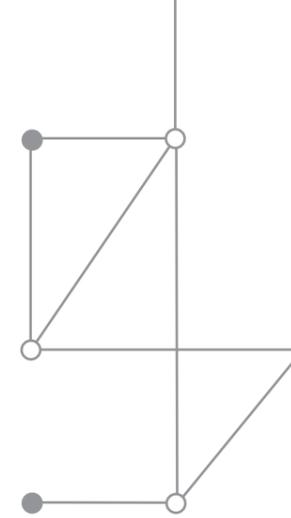
In 2004, Dr Nugent was awarded an Officer in the Order of Australia (AO) for services to business, particularly banking, in the areas of corporate governance, the arts and the community.

Dr Nugent did not abandon the passion that started her research journey, but recognised that other appealing opportunities lay beyond the scope of her PhD topic.

"I only do things where I consider I can add value and which I enjoy," she says.

"The key piece of advice I would offer research students is to recognise that your skills extend far beyond your primary area of expertise.

"I still go to India and love doing so. But it is the systematic way of thinking my doctorate gave me that has changed my life."



"The key piece of advice I would offer research students is to recognise that your skills extend far beyond your primary area of expertise"



UQ Graduate School

✉ uqadvantage@gradschool.uq.edu.au
 🌐 uq.edu.au/grad-school

Eye of the storm

UQ PhD candidate Joshua Soderholm loves a good thunderstorm, because it means he can head into the field and collect data that may enable more accurate warnings of unpredictable and destructive spring and summer storms.

The Geographical Sciences PhD student explores collisions between thunderstorms and sea breezes that lead to rapid, unpredictable and dangerous storms over the heavily populated South-East Queensland region.

"We use the Bureau of Meteorology's highly sensitive mobile research weather radar: CP2, weather balloons and quadcopters," Mr Soderholm says.

"This lets us get in close to storms and collect data of the highest possible resolution that will lead to more accurate methods of forecasting."

The radars use a type of technology new to Australia called "dual-polarisation", which allows the measurement of precipitation types such as snow, hail, or rain, and very accurate rain rates.

The new equipment is allowing researchers to study Australian thunderstorms in unprecedented detail with the ultimate goal of understanding why thunderstorms are more intense in some regions than others.

"Thunderstorm-sea breeze collisions have resulted in some of the most dangerous and damaging storms, including the 1973 Brisbane tornado, a 1985 Brisbane hail storm, a 1989 Redcliffe supercell, and The Gap supercell in November 2008.

"This equipment allows us to collect data on a greater number of thunderstorm-sea breeze interactions which can then be used to improve thunderstorm forecasting in coastal communities."

Sea breezes are a daily part of life in coastal regions such as South-East Queensland and bring much-needed relief on hot spring and summer days.

But when these breezes collide with thunderstorms they provide extra moisture and winds which can turn an ordinary storm into an unpredictable and dangerous tempest.

"We have seen a broad spectrum of thunderstorm systems interacting with the sea breeze, including severe supercells, gusting squall lines and multicell storms," says Mr Soderholm.

"We can identify thunderstorms which collide with the sea breeze and monitor how they change throughout the interaction.

"When these collisions occur under the right conditions, the potential for severe weather – such as larger hail, stronger wind gusts, flash flooding, tornadoes, and more frequent lightning – increases dramatically.

"More accurate forecasting will help people to prepare for and avoid these dangerous storms."

UQ Graduate School

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 🌐 uq.edu.au/grad-school

▶ Watch

Storm chasing

7.30 Report: Join the storm chasers finding the secrets of wild weather



"This equipment allows us to collect data on a greater number of thunderstorm-sea breeze interactions which can then be used to improve thunderstorm forecasting in coastal communities"



A “gut” feeling

Three minutes may not seem like much time to explain an 80,000 word PhD thesis that has taken years to research and develop, but that’s exactly what’s required of PhD candidates competing in the Three Minute Thesis (3MT®) competition.

For researchers applying for funding from government and industry, the ability to present a concise argument justifying the cost and demonstrating the impact that the research will have, to an audience without specialist knowledge, is invaluable.

Developed by UQ, 3MT® is a research communication competition that challenges PhD students to communicate the significance of their projects – without the use of props or industry jargon – in just three minutes.

Dr Megan Rossi (pictured) from the School of Medicine recently completed her PhD and was the winner of the 2014 UQ 3MT® competition. Her research focuses on how gut health affects chronic diseases, with a particular focus on kidney disease.

“As a dietitian, I find it completely frustrating that, despite the incredible research being done, it’s typically the unfounded and potentially dangerous nutrition messages that reach the public.

“I believe a communication barrier between scientists and the public is the root cause.

“My mission is to help bridge that gap by translating scientific evidence into simple concepts that everyone can understand.

“Participating in the Three Minute Thesis competition was a fantastic learning experience that has helped me develop better communication skills,” Dr Rossi says.

“It was very challenging, but also very fulfilling.”

Dr Rossi says that in a competitive environment it is important to showcase yourself and your research in order to secure funding, as well as to broaden collaboration networks.

“Participating in 3MT® publicises your work as a researcher.

“At the end of the day we need to gain employment, so promoting and putting ourselves out there is critical.”

Dr Rossi says that many opportunities have stemmed from her participation in 3MT®, including media interviews and writing media articles, which she has really enjoyed.

“New collaborators also heard about our research through 3MT® and have expressed interest in working with us in the future.”

Dr Rossi says that her career prospects have improved significantly since winning the competition.

“Having 3MT® on my CV is priceless: I could never have imagined the opportunities that have arisen.

“Boeing Australia approached me to do some consultancy work, and competition funders also discussed opportunities to help out financially with the second phase study of our research.

“I even fulfilled my teenage dream of being in *Cosmopolitan* magazine!”

Three Minute Thesis

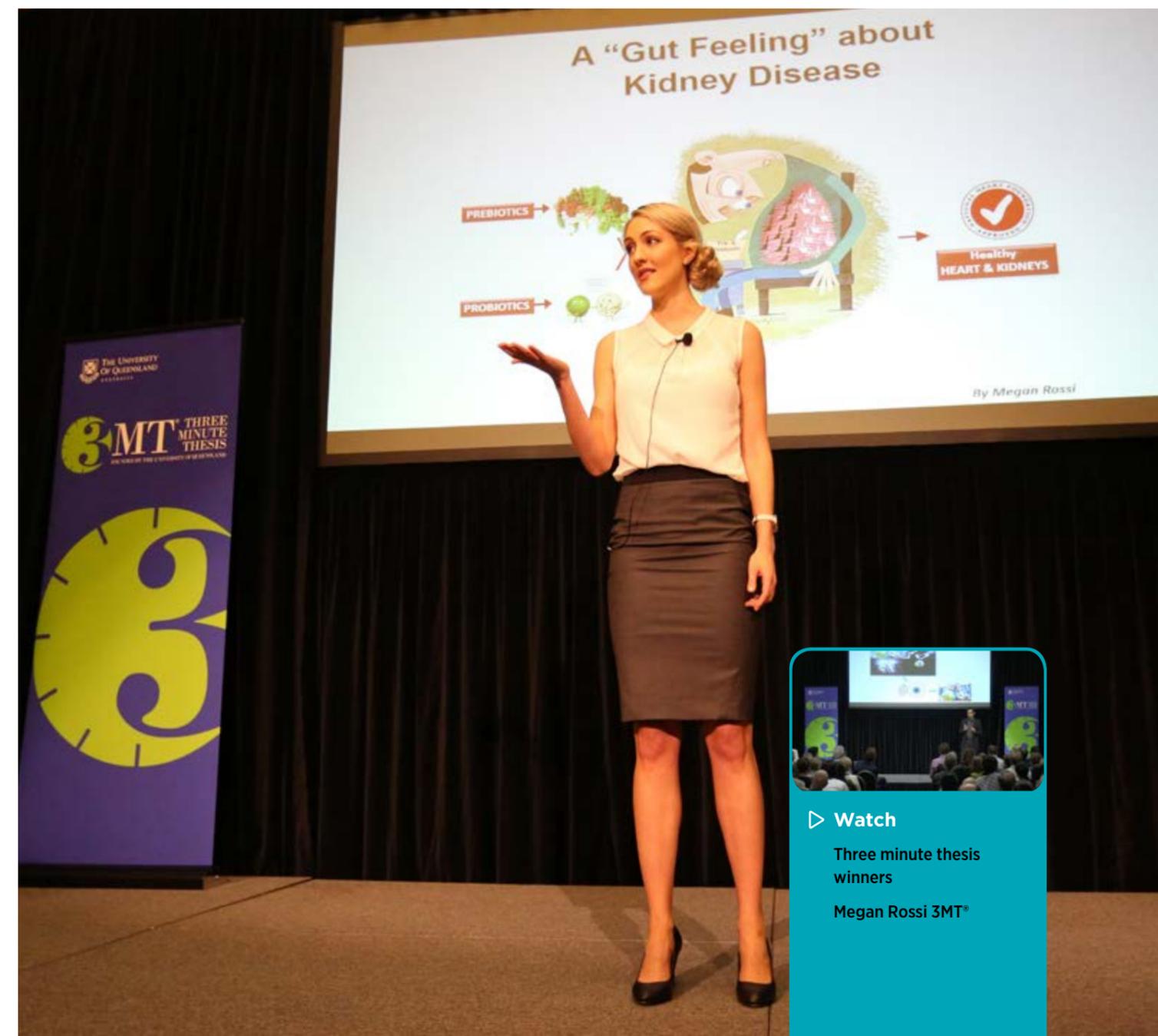
✉ 3MT@uq.edu.au

🌐 threeminutethesis.org

“At the end of the day we need to gain employment, so promoting and putting ourselves out there is critical”



The 2015 3MT® is already under way, with the UQ final taking place on 16 September. The winner will go on to represent UQ at the Trans-Tasman 3MT® competition on 2 October, bringing together competitors from more than 40 institutions in Australia and New Zealand, as well as international guest presenters.



▶ Watch

Three minute thesis winners

Megan Rossi 3MT®



Wanida Phetsang

“The placement really improved my career prospects because I developed connections with people in the industry and now have a better idea of how industry works”

UQ Graduate School

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🌐 uq.edu.au/grad-school

Well placed

Industry experience can play a key role in preparing research students as future knowledge leaders, and the fresh perspectives these bright minds can bring to industry has caught the attention of some leading organisations.

UQ is partnering with several organisations including 3M, Boeing and the Queensland Government to provide its research students with placements and professional development opportunities.

These experiences provide directed, experiential learning that help connect students with industry and ensure UQ produces well-rounded graduates with the necessary skills to enhance their employability.

In 2014, Wanida Phetsang, PhD student with the Institute for Molecular Bioscience, received a 12-month 3M scholarship that included a three-month internship program at 3M Thailand.

“The placement really improved my career prospects because I developed connections with people in the industry and now have a better idea of how industry works.

“It also showed me that I can work as a researcher either in industry or academia.”

Ms Phetsang says that she also saw how research students could be of benefit to industry with their new ideas.

In April 2014, UQ partnered with the Queensland Government to provide a PhD work experience pilot program.

One of the participants, Zoran Boskovic, was placed in a team tasked with finding innovative solutions to challenges faced by a group of Queensland businesses.

“This experience helped me to broaden my communication skills in an industry setting,” he says.

“Being exposed to different audiences has helped me develop my ability to communicate ideas and solutions in different formats. This is crucial to a research professional.”

Mr Boskovic says that it is not only the specialist knowledge gained as part of a PhD that is important, but the process of learning that reinforces that knowledge as well.

“I think one of the main benefits of the program was the chance to apply the skills I acquired through my research study – analytical, research and problem-solving – outside my area of expertise.”

Dean of UQ Graduate School Professor Alastair McEwan says research students have a range of highly developed

skills, particularly analytical capabilities, that can be valuable to employers.

“They bring different and creative insights to business, perspectives that businesses wouldn’t normally have access to,” says Professor McEwan.

“By engaging with UQ research students, organisations are connecting with world-leading experts and gaining exposure to the latest research.

“In addition to placements and work experience we offer multi-disciplinary teamwork workshops, training in business acumen, commercialisation and other topics outside their disciplinary expertise.”

Whether UQ’s PhD students end up in academic jobs or move into industry, the public sector or a non-government organisation, Professor McEwan believes the high level research skills they have developed can make a difference.

Zoran Boskovic



Fellowships, awards and memberships

FELLOWSHIPS

AUSTRALIAN RESEARCH COUNCIL AUSTRALIAN LAUREATE FELLOWS

Professor Bernard Degnan
(School of Biological Sciences)

Professor Peter Harrison
(Institute for Advanced Studies in the Humanities)

Professor Alex Haslam
(School of Psychology)

Professor Ove Hoegh-Guldberg
(School of Biological Sciences)

Professor Justin Marshall
(Queensland Brain Institute)

Professor Jennifer Martin
(Institute for Molecular Bioscience)

Professor Jason Mattingley
(Queensland Brain Institute)

Professor Lorraine Mazerolle
(Institute for Social Science Research)

Professor Peter Mumby
(School of Biological Sciences)

Professor Hugh Possingham
(School of Biological Sciences)

Professor John Quiggin
(School of Economics)

NATIONAL HEALTH AND MEDICAL RESEARCH COUNCIL AUSTRALIA FELLOWS

Professor Matthew Cooper
(Institute for Molecular Bioscience)

Professor Wayne Hall
(UQ Centre for Clinical Research)

NATIONAL HEALTH AND MEDICAL RESEARCH COUNCIL JOHN CADE FELLOWSHIP IN MENTAL HEALTH RESEARCH

Professor John McGrath
(Queensland Brain Institute)

QUEENSLAND GOVERNMENT SMART FUTURES/STATE PREMIER'S FELLOWS

Professor Matthew Brown
(UQ Diamantina Institute)

Professor Anton Middelberg
(Australian Institute for Bioengineering and Nanotechnology)

AWARDS AND HONOURS

ATSE CLUNIES ROSS AWARD 2015, ACADEMY OF TECHNOLOGICAL SCIENCES AND ENGINEERING

Professor Zhiguo Yuan
(Advanced Water Management Centre)

Associate Professor Leigh Ward
(School of Chemistry and Molecular Biosciences)

AUSTRALIA-CHINA COUNCIL ACHIEVEMENT AWARDS 2014

Education

Professor Max Lu
(University of Queensland Provost and Vice-President)

AUSTRALIAN ACADEMY OF SCIENCE 2015 AWARDS

Le Fèvre Memorial Prize for research in basic chemistry

Professor Chengzhong Yu
(Australian Institute for Bioengineering and Nanotechnology)

Nancy Millard Medal for Women in Science

Associate Professor Tamara Davis
(School of Mathematics and Physics)

Ruth Stephens Gani Medal for Distinguished Research in Human Genetics

Dr Jian Yang
(Queensland Brain Institute)

AUSTRALIAN ACHIEVEMENT IN ARCHITECTURE AWARDS 2015, AUSTRALIAN INSTITUTE OF ARCHITECTS

Neville Quarry Architectural Education Prize

Professor Paul Memmott
(School of Architecture)

BUSINESS-HIGHER EDUCATION ROUND TABLE AWARD 2014

Professor Zhiguo Yuan and team
(Advanced Water Management Centre)

CLIMATE CHANGE AWARD 2014, PRINCE ALBERT II OF MONACO FOUNDATION

Professor Ove Hoegh-Guldberg
(Global Change Institute)

CORE CHEMICAL ENGINEERING AWARD 2014, INSTITUTION OF CHEMICAL ENGINEERS, UK

Synergen Met Pty Ltd and The University of Queensland

DISTINGUISHED ACHIEVEMENT AWARD 2014, AUSTRALIAN NEUROSCIENCE SOCIETY

Professor Perry Bartlett
(Queensland Brain Institute)

GLAXOSMITHKLINE AWARD FOR RESEARCH EXCELLENCE 2014

Professor David Craik
(Institute for Molecular Bioscience)

HAROLD SPENCER-JONES GOLD MEDAL 2014, ROYAL INSTITUTE OF NAVIGATION

Professor Mandyam Srinivasan
(Queensland Brain Institute)

HG ANDREWARTHA MEDAL 2014, ROYAL SOCIETY OF SOUTH AUSTRALIA

Associate Professor Kerrie Wilson
(School of Biological Sciences)

INTERNATIONAL WATER ASSOCIATION PROJECT INNOVATION AWARDS 2014

Professor Zhiguo Yuan and team
(Advanced Water Management Centre)

Fellowships, awards and memberships (cont.)

List is a selection of active honours held during period 1 June 2014 to 31 May 2015.

METCALF PRIZE FOR STEM CELL RESEARCH 2015, NATIONAL STEM CELL FOUNDATION OF AUSTRALIA

Associate Professor Christine Wells
(*Australian Institute for Bioengineering and Nanotechnology*)

NHMRC RESEARCH EXCELLENCE AWARDS 2014

Development grant: Highest-ranked

Professor Mark Walker
(*School of Chemistry and Molecular Biosciences and Australian Infectious Disease Research Centre*)

QUEENSLAND YOUNG TALL POPPY SCIENCE AWARD 2014

Dr Claudia Vickers
(*Australian Institute for Bioengineering and Nanotechnology*)

RAMACIOTTI MEDAL FOR EXCELLENCE IN BIOMEDICAL RESEARCH 2014

Professor David Craik
(*Institute for Molecular Bioscience*)

RESEARCH AUSTRALIA DISCOVERY AWARD 2014

Dr Genevieve Healy
(*School of Public Health*)

ROBIN TAVISTOCK AWARD FOR SIGNIFICANT CONTRIBUTION IN THE FIELD OF APHASIA 2014

Professor Linda Worrall
(*School of Health and Rehabilitation Sciences*)

ROLEX AWARDS FOR ENTERPRISE 2014

Young Laureate, Science and Health

Mr Hosam Zowawi
(*Doctoral Candidate, UQ Centre for Clinical Research*)

SCIENCE AND INNOVATION CHAMPIONS 2014, QUEENSLAND GOVERNMENT

Science Champion

Mr Hosam Zowawi
(*Doctoral Candidate, UQ Centre for Clinical Research*)

Science Communicator

Dr Andrew Stephenson
(*School of Mathematics and Physics*)

SCIENCE AND INNOVATION AWARDS FOR YOUNG PEOPLE IN AGRICULTURE 2015, HORTICULTURE INNOVATION AUSTRALIA LIMITED

Dr Alice Hayward
(*Queensland Alliance for Agriculture and Food Innovation*)

SCOPUS YOUNG RESEARCHER AWARDS 2014

Life and Biological Sciences

Associate Professor Kerrie Wilson
(*School of Biological Sciences*)

Physical Sciences

Professor Ajayan Vinu
(*Australian Institute for Bioengineering and Nanotechnology*)

VINCENT DU VIGNEAUD AWARD 2015, AMERICAN PEPTIDE SOCIETY

Professor David Craik
(*Institute for Molecular Bioscience*)

WOMEN IN TECHNOLOGY AWARDS 2014

Rising Star Award

Dr Irina Vetter
(*Institute for Molecular Bioscience*)

Infotech Research Award

Dr Helen Huang
(*School of Information Technology and Electrical Engineering*)

YOUNG INVESTIGATOR AWARD 2015, EUROPEAN SOCIETY OF CLINICAL MICROBIOLOGY AND INFECTIOUS DISEASES

Professor Jason Roberts
(*School of Medicine*)

MEMBERSHIPS (new in 2014/15)

FELLOWS, ACADEMY OF THE SOCIAL SCIENCES IN AUSTRALIA

Professor Lorraine Mazerolle
(*Institute for Social Science Research*)

Professor Paul Memmott
(*School of Architecture*)

Professor Nancy Pachana
(*School of Psychology*)

FELLOWS, AUSTRALIAN ACADEMY OF SCIENCE

Professor Christine Beveridge
(*School of Biological Sciences*)

Professor Wendy Hoy
(*School of Medicine*)

Professor Geoffrey McLachlan
(*School of Mathematics and Physics*)

Professor Linda Richards
(*Queensland Brain Institute*)

Professor Michael Waters
(*Institute for Molecular Bioscience*)

FELLOWS, ACADEMY OF TECHNOLOGICAL SCIENCES AND ENGINEERING

Professor Jose Luis Torero Cullen
(*School of Civil Engineering*)

AUSTRALIAN INSTITUTE OF ABORIGINAL AND TORRES STRAIT ISLANDER STUDIES

Dr Felicity Meakins
(*School of Languages and Cultures*)

AUSTRALIAN ACADEMY OF HEALTH AND MEDICAL SCIENCES

Professor Matthew Brown
(*UQ Diamantina Institute*)

Professor Annette Dobson
(*School of Public Health*)

Professor Nicholas Fisk
(*Faculty of Medicine and Biomedical Sciences*)

Professor Ian Frazer
(*School of Medicine*)

Professor Wayne Hall
(*Centre for Youth Substance Abuse*)

Professor John McGrath
(*School of Medicine*)

Professor David Paterson
(*UQ Centre for Clinical Research*)

Professor Michael Roberts
(*School of Medicine*)

Professor Peter Sly
(*Child Health Research Centre*)

Professor Ranjeny Thomas
(*UQ Diamantina Institute*)

Professor Robyn Ward
(*Office of the Deputy Vice-Chancellor (Research)*)

MEMBERS, AUSTRALIAN RESEARCH COUNCIL COLLEGE OF EXPERTS

Professor Paul Strooper
(*School of Information Technology and Electrical Engineering*)

Professor David Trigger
(*School of Social Science*)

Professor Peter Visscher
(*Queensland Brain Institute*)

MEMBER, COUNCIL OF THE AUSTRALIAN ACADEMY OF SCIENCE

Professor Mandyam Srinivasan
(*Queensland Brain Institute*)



2015 UQ Foundation Research Excellence Awards



DR ALICE HAYWARD

Queensland Alliance for
Agriculture and Food Innovation
(QAAFI)

\$95,733: MICROpropagator – a small RNA application for plant propagation

Propagating genetically identical plantlets (clones) is an intrinsic part of the process for producing elite genotypes of horticultural and woody plants. However, crop industries can lose millions of dollars each year through plant cuttings rooting poorly.

QAAFI's Dr Alice Hayward hopes to improve the propagation of these difficult-to-root tree species through a GMO-free approach termed MICROpropagator.

"We have discovered that small molecules regulating gene expression, known as microRNAs, affect rooting ability in model plant species," she says.

"By applying these microRNAs to cuttings, we hope to enhance their rooting ability, and so give the Australian horticultural industry a global competitive advantage."

Her team will also be investigating the possibility of storing and delivering these microRNAs using a UQ-invented nanoparticle carrier system.

[▶ Watch Video](#)



DR IAN HESKETH

Institute for Advanced Studies
in the Humanities (IASH)

\$52,660: Writing history in the age of the anthropocene: the past and future of Big History

"Big History" is a new approach to history that attempts to transcend the division between the humanities and sciences.

Uniting human and historical sciences within a grand evolutionary story, it promises to provide a universal, scientific framework for addressing some of the major problems of our time, such as human-induced climate change.

IASH's Dr Ian Hesketh will be exploring the origins of Big History and evaluating its prospects for success, the first major research project to analyse critically the promises and possibilities of this new forward-looking form of history.

"I aim to show that Big History is the most recent version of a form of history that has been mobilised at moments of social, political and environmental crisis in the past 200 years," he says.

[▶ Watch Video](#)

2015 UQ Foundation Research Excellence Awards

**DR ZHONGFAN JIA**

Australian Institute for
Bioengineering and Nanotechnology
(AIBN)

\$79,283: Development of a totally plastic rechargeable battery

Bendable, rollable and wearable electronic devices are currently being developed, but flexible rechargeable batteries are needed to fit and power them.

AIBN's Dr Zhongfan Jia aims to develop a totally plastic, rechargeable battery that is flexible and can be fabricated into various shapes.

"I plan to design and synthesise a new type of polymer material that can facilitate both excellent electron storage and transportation," he says.

"Using this polymer as an electrode material will allow batteries to be produced with superior processing capability, long life cycle, and high power output."

And all without using heavy metal compounds, which will overcome current environmental concerns.

▶ Watch Video

**DR EVE MCDONALD-MADDEN**

School of Geography, Planning
and Environmental Management
(GPEM)

\$99,796: Searching for black swans among the shrinking ice: detecting unknown unknowns of climate predictions

As a society, our challenge is to move from debating the evidence for climate change and its impacts to formulating responses that help achieve our ultimate objectives – even in the face of uncertainty.

"The aim is to develop methods to detect when climate predictions are failing to capture how the climate is actually changing," says GPEM's Dr Eve McDonald-Madden.

"If we can detect such failures early, we can trigger the scientific process of diagnosis and the creative process of generating new climate predictions."

This project forges an exciting collaboration between UQ, the United States Geological Survey and US National Snow and Ice Data Center, that through a decision-analytic focus on climate change should help improve policy interventions.

▶ Watch Video

**DR BING-JIE NI**

Advanced Water
Management Centre (AWMC)

\$90,500: Microbial syngas conversion by mixed culture biofilm: transforming wastes into biofuels

"My project will develop a highly innovative platform for storing and transporting liquid bioproducts, so that ultimately we can replace non-renewable petroleum as a fuel source," says AWMC's Dr Bing-Jie Ni.

Of course, he is referring to biofuels, the consumption of which is projected to grow considerably in future.

Organic waste is increasingly recognised as a substantial but largely untapped renewable fuel and chemical resource. Dr Ni's project will enable a high-rate and high-yield conversion of syn(thesis)gas that can be generated through gasifying organic waste to improve its quality and energy density.

The technology Dr Ni plans to deliver will potentially lead to the development of a whole new biotechnology sector uniquely positioned for transitioning to a non-oil based economy.

▶ Watch Video

**DR JOSEPH POWELL**

Institute for
Molecular Bioscience (IMB)

\$97,210: Investigating genetic control of disease susceptibility through trans-eQTL regulation

Genes play a major role in determining a person's susceptibility to common diseases, and genome-wide association studies have identified tens to hundreds of independent genetic polymorphisms (changes) for most diseases.

IMB's Dr Joseph Powell plans to develop a method of critically examining the role that genetic polymorphisms play in the regulation of genes.

"The general perception is that the majority of these polymorphisms act through altering gene regulation," he says.

"I propose to offer a novel method that can be used to evaluate the genetic burden of disease that acts through a form of genome regulation known as trans expression quantitative trait loci (trans-eQTL)."

The methods will be implemented through software that will be made publicly available.

▶ Watch Video

2015 UQ Awards for Excellence in RHD Supervision

The University of Queensland prides itself on its culture of research excellence developed through the efforts of world-class academics and the provision of first-class facilities.

More than 4000 students are currently enrolled in research higher degrees at UQ, and their success is underpinned by advisors who guide them through their candidature. Since 2000, UQ has acknowledged and rewarded outstanding advisors through the Awards for Excellence in RHD Supervision.



ASSOCIATE PROFESSOR RICHARD FULLER

School of Biological Sciences

Highly Commended

As a passionate investigator of biodiversity, Associate Professor Fuller aims to understand how people have affected the natural world around them, and how to reverse their destructive effects. When supervising students, he is guided by the philosophy to provide them with “the freedom to flourish, the resources to succeed, and the space to fail”.

He encourages all his students to share knowledge and learn from their successes and failures as a group. He also encourages students to source their own independent funding.

Of his seven completed students, all have published extensively, and have since taken up postdoctoral research positions and/or are working for academic or environmental organisations.



PROFESSOR PENELOPE SANDERSON

Schools of Information Technology and Electrical Engineering, Psychology, and Medicine

Winner

As leader of UQ's Cognitive Engineering Research Group (CERG), Professor Sanderson has received several awards and honours, most notably the 2012 Human Factors and Ergonomics Society's Paul M Fitts Education Award for which her PhD students nominated her.

Since 2002, she has graduated 13 PhD students as Principal Advisor, and currently advises five doctoral students.

She aims to make the PhD years as rich, productive, and satisfying as possible, meeting with her students both one-on-one and in research groups weekly, and organising professional development activities such as statistical boot camps, winter writing workshops, and educational trips to the US and Canada to meet researchers working in similar fields.

Professor Sanderson is a strong advocate of the oral thesis examination, and actively encourages her students to publish while working on their theses.

▶ Watch Video



PROFESSOR LINDA WORRALL

School of Health and Rehabilitation Sciences

Winner

Over 25 years, Professor Worrall has shared her passion for research into aphasia (loss of speech) with more than 200 research higher degree (RHD) graduates as mentor and 21 as Principal Advisor.

As *Web of Science's* top-ranked researcher in aphasia rehabilitation and current head of the Centre for Clinical Research Excellence in Aphasia Rehabilitation, she leads by example with a patient-centred approach to research and a relationship-centred approach to supervision.

She meets regularly with her RHD students to discuss their current research and/or other topics, such as social media or supervising Honours students. She also provides opportunities for them to gain teaching experience and encourages them to publish in esteemed journals.

Along with annual planning and pre-conference writing retreats, Professor Worrall applies methods from other disciplines to ensure the best outcomes possible.

🐦 @aphasiologist1

▶ Watch Video

2015 Partners in Research Excellence Awards



Category
ENGINEERING, MATERIALS AND ICT

Awarded to
PROFESSOR VICTOR RUDOLPH
School of Chemical Engineering

MR CHRISTOPHER DUNKS
Synergen Met Pty Ltd

Synergen Met Pty Ltd has been collaborating with UQ's Department of Chemical Engineering since 2007 on the development of a skid-mounted on-site, on-demand cyanide production facility for gold and other metal mining. An occupational health and safety boon, the production facility will eliminate the risks associated with transporting and storing highly toxic bulk cyanide, reduce operator exposure during dilution, and use nitrogen (extracted from the air) instead of ammonia as a source material.

Synergen Met is a privately owned start-up company and this is its first major project, already winning several national and international awards for research, development and commercialisation. UQ research staff were embedded with Synergen Met during the demonstration development plant design and commissioning, and have continued this close involvement with prototype testing at an Australian gold mine.

UniQuest, UQ's commercialisation company, assisted with the establishment and management of the administrative, contractual and financial aspects of the project.



Category
HEALTH

Awarded to
PROFESSOR DAVID CRAIK
PROFESSOR DAVID FAIRLIE
Institute for Molecular Bioscience

DR DANIEL GRANT
Pfizer

Peptide drugs can be very good at targeting specific receptors implicated in disease and with few side effects, but have the disadvantages of rapid metabolism and the necessity to be injected. Multinational pharmaceutical company Pfizer saw a need to deliver peptide drugs orally for the treatment of type 2 diabetes and so in 2011, Dr Daniel Grant approached Professors David Craik (pictured left) and David Fairlie (pictured right) from the Institute for Molecular Bioscience (IMB) to work collaboratively on the development of oral medications for treating diabetes and other cardiovascular conditions.

The UQ team complemented Pfizer in bringing new strategies and knowledge in the design of new peptide drug candidates by improving the pharmaceutical properties of peptides, while Pfizer provides UQ with insights into industry decision-making processes for drug development projects.

The collaboration is further facilitated by the support of UniQuest.



Category
SCIENCE

Awarded to
DR ESTEBAN MARCELLIN
Australian Institute for Bioengineering and Nanotechnology

DR CHRIS STOWERS
The Dow Chemical Company

The Systems Biology group at the Australian Institute for Bioengineering and Nanotechnology has established a productive partnership between UQ and the Dow Chemical Company, the third largest chemical company in the world, for many years. This partnership has resulted in substantial improvement in knowledge to enable product development for natural insecticides and platform chemicals of interest to Dow. Dow and UQ have established many ARC Linkage projects plus the establishment of the UQ Dow Centre for Sustainable Engineering for UQ.

Since 2009, UQ's Dr Marcellin (pictured) and Dow's Dr Stowers have collaborated to develop a systems biology platform – sophisticated computer modelling and analysis to understand microbial cells at the molecular level – within Dow. Current projects involve the sustainable production of propionic acid through fermentation processes, rather than fossil fuel byproducts, as Dow is seeking green alternatives for manufacturing chemicals.

UniQuest has played a vital role in IP management and negotiation of contracts.



Category
SOCIAL ENTERPRISE

Awarded to
ASSOCIATE PROFESSOR
MARTIE-LOUISE VERREYNNE
UQ Business School

MR STEVE MOORHOUSE
Queensland Government

Innovation is about the intentional introduction and application of new ideas, processes, products or procedures into businesses and is a key component for helping them improve. To date, governments have found it difficult to obtain reliable data on these business practices.

Associate Professor Martie-Louise Verreyne (pictured right) from the UQ Business School has been working with Steve Moorhouse (pictured right) from the Queensland Government for the past six years to develop a top-quality database of Australian firms that assesses their innovation and other business practices. Her work has had significant impact on state government policy and has attracted international collaboration (Cambridge, Doshisha and Auckland Universities), media interest, and much funding.

UniQuest has assisted with documentation and budget processes for the project.

UQ SUPPORTERS

Thank you to all organisations and individuals who provide support for research at UQ. Special thanks to those listed here who contributed more than \$100,000 in 2014.

ABIGO Medical AB

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Cerebral Palsy Alliance

Children's Health Foundation Queensland

Children's Health Queensland Hospital and Health Service

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Commonwealth Scientific and Industrial Research Organisation (CSIRO)

Cotton Research and Development Corporation

CRC Care

CRC for Advanced Composite Structures

CRC for Greenhouse Gas Technologies

CRC for High Integrity Australian Pork (Pork CRC)

CRC for Living with Autism Spectrum Disorders (Autism CRC)

CRC for Optimising Resource Extraction

CRC for Polymers

CRC for Water Sensitive Cities

Cure Brain Cancer Foundation

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Siemens	The University of Queensland Endowment Fund	Wound Management Innovation CRC
SMEC International	The University of Texas MD Anderson Cancer Center	Xstrata
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Research Support

UQ Library

UQ Library is one of Australia's leading academic libraries and provides support to researchers through all stages of the research lifecycle – from finding and applying for funding, establishing and managing a project, to demonstrating output and impact.

Raising the visibility and accessibility of UQ research

The Library provides advice and support for academics, researchers and research higher degree (RHD) students in a range of areas, including advanced research services, research evaluation for grant and promotion applications, data management, and scholarly publishing.

The Library develops services and policies to support research publications reporting and evaluation; scholarly publishing, including open access, research data collection and management plans; digitisation; UQ eSpace management; and copyright.

UQ eSpace is the single authoritative source for UQ staff and student research output, and the archival home of UQ Research Higher Degree Theses in digital-only form. Since October 2014, RHD students have had the option of making their theses "open access", of whom approximately 50 per cent have done so.

UQ eSpace makes UQ's research visible and accessible through a global network of services such as OAIster, Trove and Google Scholar. It provides data for mandatory Government reporting requirements such as the **Higher Education Research Data Collection (HERDC)** and **Excellence in Research for Australia (ERA)**.

It also operates as an institutional repository for open access publications, research datasets and other digitised materials created by UQ staff, ensuring their inclusion in Research Data Australia and the Thomson Reuters Data Citation Index. Both these tools facilitate access to quality research data and enhance the visibility of UQ researchers and their work.

The Library is home to literary and historical collections of national importance. As the Library digitises more of its special collections, UQ eSpace plays a vital role in making these discoverable and accessible to the research and wider community.

UQ Library

 library.uq.edu.au/research-support



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UQ Researchers

Find an expert

Whether you are from industry or business, the academic or general community, or are a current or prospective research student, your search for an expert solution starts with UQ Researchers.

Commercial quest

UniQuest is continuing its proud tradition of pioneering industry-university collaborations to sustainably commercialise UQ researchers' discoveries and innovations.

As The University of Queensland's main commercialisation company, UniQuest plays a vital role in translating UQ researchers' discoveries and research advances in Health, Engineering and ICT, Science, and Social Enterprise into business outcomes through industry partnerships that have gone on to improve the lives of millions of people around the world.

Successful past projects UniQuest has initiated include the celebrated Gardasil™ cervical cancer vaccine, innovations in MRI technology, a smartphone diagnostic tool for respiratory diseases, virus-resistant crop-development technology, a questionnaire to diagnose anxiety in older people, and parenting strategies that effect change at the population level.

UniQuest has demonstrated time and again its value in intellectual property management and commercialisation through partnering researchers with the right industry contacts to progress their findings down a commercialisation

pathway towards successful products, services and impact. The latest example of this has resulted in a major win for chronic pain sufferers who are now one step closer to an accessible treatment for their debilitating condition.

Spinifex is a biopharmaceutical company founded by UniQuest to further develop and commercialise a chronic pain treatment discovered by Professor Maree Smith. In 2005, UniQuest filed patent applications on the discovery and successfully pitched for venture capital which formed the company. In June 2015, the company was acquired by international pharmaceutical giant Novartis International AG for an upfront cash payment of US\$200 million, as well as undisclosed clinical development and regulatory milestone payments.

"This innovative pain treatment has the potential to improve the lives of millions of people around the world and is a great example of translating UQ's world-class expertise into a commercially viable outcome," says Dr Dean Moss, UniQuest CEO.

UQ technologies licensed by UniQuest have generated more than US\$12 billion in gross product sales, and the 70+ start-up companies founded by UniQuest have gone on to raise more than US\$515 million. UniQuest manages more than 400 contracts per year and has more than 40 start-up companies under management.



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Success stories



Cervical cancer vaccine

With more than 120 million doses distributed worldwide, enhancing the wellbeing of more than 250,000 people per year, cervical cancer vaccine Gardasil™ and its inventors Professor Ian Frazer AC (pictured left) and the late Dr Jian Zhou have demonstrated the impact of UQ innovations. The technology, patented by UniQuest in 1991, licensed to CSL in 1994 – subsequently licensed to Merck and launched on the market as Gardasil™ in 2006 – is now available in more than 120 countries.



MRI innovation

For more than two decades, UQ has been at the forefront of magnetic resonance imaging (MRI) innovation – including the image correction technology that has been incorporated in two-thirds of all clinical MRI systems installed worldwide after 1997. The technology was licensed by UniQuest to both Siemens and GE Healthcare, resulting in more than eight billion patient scans worldwide to date.



Successful parenting strategies

The Triple P – Positive Parenting Program has been ranked by the United Nations as the number one parenting program in the world for its ability to reduce children's behavioural problems, increase parenting skills and improve overall family wellbeing. The Program was developed by Professor Matt Sanders (pictured) and licensed by UniQuest to Triple P International to globally deliver the suite of parenting strategies. It is now available in 18 languages across 25 countries and an estimated seven million children have benefited from the Program.

For more commercialisation stories visit www.uniquet.com.au/30-stories

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To know that I can impact on people's lives is such a motivating and inspiring feeling

Hosam, UQ PhD student

Under the mentorship of renowned infectious diseases expert Professor David Paterson, Hosam is creating a diagnostic tool to rapidly identify antibiotic-resistant superbugs, to help save lives. The tool has the potential to allow patients to be treated quickly and minimise opportunities for the deadly superbugs to spread. By learning to see the world differently, Hosam is creating change. See Hosam's story at uq.edu.au/createchange



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