

REVIEW OF ACTIVITIES

DISCOVERY

The University of Queensland is a truly global research powerhouse. UQ is a leading source of expertise in local, national and international communities in many strategically important areas of research. UQ is also a pacesetter in research translated into commercial uses across a broad spectrum of disciplines, ranging from bioscience, nanotechnology and engineering, to social science and humanities.

Discovery: Key indicators of performance ¹						
Discovery		2012	2013	2014	2015	2016 ³
Proportion of UQ research publications with an international co-author ²	(Percentage)	46.9	47.1	49.1	52.1	na
Number of Research Higher Degree completions	(Count)	621	757	835	749	824
Discovery						2016 projected ³
Total research income (excluding Commonwealth Research Block Grants) ⁴	(\$ million)	368.0	381.8	377.3	385.0	381.6
ARC income (Cat. 1) received ⁴	(\$ million)	89.2	96.3	99.4	80.3	79.6
NHMRC income (Cat. 1) received ⁴	(\$ million)	61.6	76.6	72.6	72.2	69.0
Industry income ^{4,5}	(\$ million)	103.4	122.1	129.0	150.1	149.7
International funding ⁴	(\$ million)	30.4	29.1	36.6	49.9	55.9

¹ In 2015, statistics on Higher Education Research Data Collections points for publications were included. As this is no longer measured, it has not been included this year.
² This data is sourced from Incites, a commercial product. This product underwent considerable development in 2014/2015. As such, historical data may differ from those previously published.
³ Data not finalised until 31 October 2017.
⁴ There may be slight changes in historical data due to improvements made in UQ's reporting systems.
⁵ Industry income includes Australian Research Council Linkage Project Partner Cash, Australian contracts, Australian grants, Australian donations, international funding, and non-Commonwealth Cooperative Research Centres funding.

Research performance

International recognition

International university rankings highlight the excellence of the University's research performance. In 2016, UQ leaped 22 places to rank 55th globally in the prestigious Academic Rankings of World Universities (ARWU). UQ is one of only two Australian universities to be included in the global top 60.

UQ was also ranked as one of the top 50 universities in the world in the University Ranking by Academic Performance, CWTS Leiden Ranking and Performance Ranking of Scientific Papers for World Universities, and well within the top 100 in the *Times Higher Education* World University Rankings, *U.S. News* Best Global Universities Rankings, and QS World University Rankings. UQ again topped the nation in the prestigious *Nature* Index, with the *Nature* Index Rising Stars placing UQ second in the Asia-Pacific region.

Research funding

Research income remained strong, with UQ receiving \$385 million in total research funding income in 2015, the most recent year for which final figures are available (although the projected figure for 2016 is \$382 million). This included Australian competitive grants, industry and other funding, Cooperative Research Centres and other public sector research funding—a strong indication of the commitment and quality of UQ researchers.

Since 2011, the University has increased research income by 13.7 per cent. Governments, industry and private benefactors are acknowledged for sharing in the University's vision for research excellence and its success in attracting research funding.

For the last three years running—2013, 2014 and 2015—UQ has ranked first or second for research income in Australia.

Australian Research Council (ARC) funding

The University continued to perform well in attracting ARC funding commencing in 2016.

Discovery Projects

The University received \$30 million in new funding, ranking second nationally. The total number of new projects awarded was 78 (second nationally), with a success rate of 23.6 per cent (compared to the national average of 17.7 per cent).

Linkage Projects

The University received new ARC funding of \$9.9 million to commence in 2016, ranking second in the country. In addition, UQ will receive partner contributions of almost \$20.7 million over the life of these projects. Twenty-nine new projects were awarded (ranked third nationally), with a success rate of 42 per cent.

Linkage Infrastructure, Equipment and Facilities (LIEF)

The University received ARC funds of \$2.3 million, ranking fifth nationally. Three proposals were approved for 2016 (seventh nationally), with a success rate of 18.8 per cent.

Australian Laureate Fellowships

UQ was awarded two of the 16 Australian Laureate Fellowships commencing in 2016, with a total value of \$5.8 million (second nationally on total funds awarded). UQ's new Australian Laureate Fellows are **Professor Alan Rowan**, Australian Institute for Bioengineering and Nanotechnology, and **Professor Paul Burn**, School of Chemistry and Molecular Biosciences. These prestigious fellowships support excellence in research by attracting world-class researchers and research leaders to key positions in Australia.

Discovery Early Career Researcher Awards (DECRA)

UQ received 27 awards through the DECRA scheme, with a total value of \$9.7 million (ranking first nationally for both the number of awards, and funding dollars awarded).

National Health and Medical Research Council funding

The University's health and medical research benefited from significant funding from the National Health and Medical Research Council (NHMRC).

Project Grants

UQ ranked third nationally with a total of \$31.7 million awarded to support 45 new projects.

Equipment Grant

UQ received \$464,673 in 2016 to help purchase equipment to support medical research. The funding is awarded on a

pro-rata basis, based on the proportion of competitive NHMRC funding awarded each year.

Centres of Research Excellence

UQ was awarded two Centres of Research Excellence, totalling \$5 million, for the Australasian Cerebral Palsy Clinical Trials Network and the Centre for Research Excellence in Stillbirth.

Program Grants

UQ was awarded one Program Grant valued at \$6.9 million.

Development Grants

UQ received four Development Grants to commence in 2016. These grants provide funding for early proof-of-principle- or preseed-stage research.

Early Career Fellowships

UQ received 13 new Early Career Fellowships to commence in 2016. These fellowships allow developing health and medical researchers of outstanding ability to undertake postdoctoral training. Of the 13 fellowships, 11 are based in Australia and two overseas. The latter enable Fellows to spend two years at an overseas institution before returning to UQ for the final two years.

Career Development Fellowships

UQ received seven new Career Development Fellowships (ranking third nationally) to enable outstanding early- to mid-career researchers to develop their capacity for independent research.

Research Fellowships

11 Research Fellowships were awarded to commence in 2016. These fellowships provide support for outstanding health and medical researchers to undertake research of major importance in its field and of significant benefit to Australian health and medical research.

Practitioner Fellowships

UQ received two new Practitioner Fellowships for funding in 2016.

Translating Research into Practice (TRIP) Fellowships

One TRIP Fellowship was awarded to UQ to commence in 2016.

Other research funding

The University also continued to perform strongly in attracting funding from a variety of sources. In 2015 (the most recent year for which data is available), in addition to the \$185.8 million funded from Australian Competitive Grants (Category 1), the University received \$43.1 million in Other Public Sector Research Income (Category 2), \$149.5 million in Industry and Other Research Income (Category 3), and \$6.6 million in Cooperative Research Centre Research Income (Category 4).



Australian Laureate Fellow Professor Paul Burn.



Australian Laureate Fellow Professor Alan Rowan.

Research Block Grants

In 2016, UQ received \$176.6 million through the Australian Government's Research Block Grants, awarded on the basis of research performance. This placed UQ third nationally, behind the University of Melbourne and the University of Sydney.

The funding comprised:

- Joint Research Engagement (\$29.5 million)
- Joint Research Engagement Engineering Cadetships (\$0.5 million)
- Research Infrastructure Block Grant (\$29 million)
- Sustainable Research Excellence (\$25.8 million)
- Research Training Scheme (\$64.4 million)
- Australian Postgraduate Awards (\$25.4 million)
- International Postgraduate Research Scholarships (\$2 million).

UQ Internal Research Support schemes

The University continued to invest heavily in human and physical research capacity through several internal research support schemes. These foster early career researchers, seed research initiatives, promote linkages and partnerships, and support collaborative infrastructure.

Internal research support schemes with funding commencing in 2016 included:

- **UQ Development Fellowships**, aimed at fostering promising early career researchers and retaining mid-career and senior academic staff of exceptional calibre
- **UQ Collaboration and Industry Engagement Fund**, supporting the development of highly competitive ARC Linkage Projects, ARC Industrial Transformation Research Hubs, ARC Industrial Transformation Training Centres, NHMRC Development Grants or NHMRC Partnerships for Better Health Grants by funding pilot research that will

facilitate establishing new or emerging linkages with partner organisations

- **UQ Early Career Researcher Grants Scheme**, to encourage research by new members of staff, provide limited seed funding as a means of generating external research support, and support high-quality projects of modest financial cost from early career researchers
- **UQ Foundation Research Excellence Awards**, recognising demonstrated excellence and promise of future success in research and the leadership potential of individual young researchers
- **UQ-Ochsner Seed Fund for Collaborative Research**, fostering transdisciplinary research between eligible investigators based in UQ's Ochsner Clinical School (New Orleans, US) and those in other UQ schools, institutes and centres
- **UQ Major Equipment and Infrastructure Grants**, supporting the acquisition of major research infrastructure and equipment items, particularly where access to similar equipment is limited and there is demonstrable collaborative gain through its use
- **UQ Major Research Facility Fund**, supporting existing major research facilities within UQ, promoting sound planning strategies for the replacement and upgrade of infrastructure and maintaining competitive advantage in research capability through greater utilisation of existing major research infrastructure within the University
- The UQ Advantage Office's **Summer and Winter Research Programs** supported more than 650 undergraduate students to gain valuable research experience alongside UQ academics.

UQ also participated in schemes administered by Universities Australia, including the Universities Australia - DAAD: Australia-Germany Joint Research Cooperation Scheme that fosters research collaboration of the highest quality between Australian and German researchers.

Prestigious fellowships and awards

The University's global research positioning was highlighted with the election of several new Fellows to Australia's learned academies in 2016. Five new Fellows of the Australian Academy of Health and Medical Sciences (AAHMS) are UQ academics, bringing the number of UQ Fellows of this new academy to 21. Five UQ staff were elected as Fellows of the Academy of the Social Sciences in Australia (ASSA), two were made Fellows of the Australian Academy of Science (AAS), two were elected to the Australian Academy of Technological Sciences and Engineering (ATSE), and two were elected to the Australian Academy of the Humanities (AAH).

More than 164 UQ staff (including honorary and adjunct appointments) and professors emeriti are Fellows of Australia's learned academies, which include AAS, AAHMS, ASSA, ATSE, and AAH. UQ excellence was further recognised with many staff securing a number of prestigious awards, including:

- **Professor Kirill Alexandrov**: Top-ranked Development Grant, 2016 NHMRC Research Excellence Awards
- **Dr Nasim Amarilian**: 2016 Women in Technology Awards (Life Sciences/ICT Rising Star)
- **Associate Professor Helen Cooper and Professor David Craik**: NHMRC 10 of the Best Research Projects 2015 (awarded 2016)
- **Professor Justin Cooper-White**: Marshall and Warren Award, 2016 NHMRC Research Excellence Awards
- **Mathilde Desselle**: 2016 Women in Technology Awards (ICT Professional)
- **Dr Barnaby Dixon**: 2016 Queensland Young Tall Poppy of the Year
- **Associate Professor Geoffrey Faulkner**: Australian Academy of Science 2016 Ruth Stephens Gani Medal
- **Laura Fenlon**: 2016 Women in Technology Awards (PhD Career Start)
- **Dr Alize Ferrari, Associate Professor Margaret Mayfield and Dr Eugenia Sampayo**: Women in Research Citation Awards
- **Dr Anna Hatton, Dr Luke Knibbs and Dr Shyuan Ngo**: 2016 Queensland Young Tall Poppy Awards
- **Professor Ove Hoegh-Guldberg**: 2016 Banksia International Award
- **Professor Mark Kendall**: 2016 CSL Young Florey Medal
- **Professor Hugh Possingham**: Elected as Foreign Associate of the US National Academy of Sciences (NAS)
- **Dr Joseph Powell**: Top-ranked RD Wright Career Development Fellowship - Level 1, 2016 NHMRC Research Excellence Awards, and Commonwealth Health Minister's Award for Excellence in Health and Medical Research for 2016
- **Professor Maree Smith**: Australian Academy of Technological Sciences and Engineering Clunies Ross Award
- **Associate Professor Kerrie Wilson**: 2016 Prime Minister's Prizes for Science - Frank Fenner Prize for Life Scientist of the Year.

Other performance measures

Following on from the December 2015 Excellence in Research for Australia (ERA) assessment affirming the exceptional quality of research at UQ, the University began preparing for the ARC Research Engagement and Impact Assessment that will be piloted in 2017. The first full assessment and reporting will run in 2018 alongside the next ERA assessment.

Research ethics and integrity

The University ensures its researchers are conducting studies to the highest ethical and regulatory standards through continuous improvement of processes and procedures. Significant operational advances in ethics and integrity were achieved in 2016.

In human ethics, two new multidisciplinary Human Research Ethics Committees (HRECs) were established and registered with the National Health and Medical Research Council (NHMRC). In order to facilitate the timely review of applications, the committees met on an alternating fortnightly basis. In conjunction with the establishment of the new HRECs, the University participated in the beta-testing and subsequent implementation of the NHMRC's Human Research Ethics Application (HREA) to replace the National Ethics Application Form (NEAF). The application assists researchers in considering and addressing the principles of the *National Statement on Ethical Conduct in Human Research* and provides the information that HRECs require to review research proposals.

In recognition of the diverse locations UQ researchers conduct their work, both the Animal Ethics and Human Ethics Units implemented electronic submission procedures for applications, and established electronic review, modification and reporting processes for UQ's five Animal Ethics Committees and two Human Research Ethics Committees.

A new policy and procedure, *Research Misconduct - Research Higher Degree candidates* (PPL 4.20.10), was completed and implemented. Resources to help the University's researchers understand how to conduct research responsibly were also developed, including the review and revision of the Research Integrity website, which now provides detailed information—including extensive links to useful external resources as well as clear instructions on



Associate Professor Kerrie Wilson won the Prime Minister's Prizes for Science - Frank Fenner Prize for Life Scientist of the Year.

Dr Alize Ferrari, Queensland Centre for Mental Health; Associate Professor Margaret Mayfield, School of Biological Sciences and Director of the Ecology Centre; and Dr Eugenia Sampayo, School of Biological Sciences and ARC Centre of Excellence for Coral Reef Studies, won Women in Research Citation Awards for their influential work in public health and plant and marine ecology.



The Ochsner Clinical School in New Orleans, US, one of UQ's partners in fostering transdisciplinary research between investigators.



how to report a concern. To promote an understanding of the responsible conduct of research across UQ campuses, a number of seminars and workshops were also delivered.

In collaboration with the University's Integrity and Investigations Unit, the Research Integrity Office identified the current risks around conflicts of interest at the University, particularly in relation to research and its commercialisation, and commenced leading a review of current management practice of conflicts of interest at the University. This review is due for completion in 2017.

The University was also a key participant in the Strengthened Exports Controls Pilot program, a national compliance framework for export controls, which came into effect in April 2016. UQ was one of eight organisations participating in the pilot program conducted by the Defence Export Control Office and the Australian Government Department of Industry. UQ's contribution to the drafting of the *Defence Trade Controls Amendment Bill 2015* was critical for the higher education sector to enable further development of international collaborations in key areas of research that are subject to security-related sensitivities.

Research collaboration

The University continues to focus on building and maintaining strong relationships with national and international industry and research organisations. These partnerships are strongly valued, bringing UQ researchers together with leading researchers and organisations across the globe to achieve demonstrable impact in research fields of national and international significance.

UQ's 2016 Research Week awards recognised 15 researchers and supervisors across three categories—UQ Foundation Research Excellence Awards (UQFREA), Partner in Research Excellence Awards (PIREA), and Awards for Excellence in Research Higher Degree (RHD) Supervision.



UQ has proactively worked beyond traditional government sources of funding to continue growing its research enterprise. To this end, a target was set to double industry-sourced research income by 2020, from a baseline of \$103 million in 2012. The total reported to the Australian Government for 2015 was \$150 million, representing a cumulative 45 per cent increase from 2012. This was maintained for 2016, despite a strong downturn in research support from the resources sector. Industry-sourced income includes partner organisation cash support for ARC Linkage Projects, industry funding of Cooperative Research Centres, industry research contracts (national and international), and philanthropic support.

Research partnerships

A number of selected partnerships were developed or renewed in 2016.

The collaborative research relationship with Boeing that has extended over 14 years was taken to a new level with the September announcement by the Chairman, President and CEO of The Boeing Company, Mr Dennis Muilenberg, that the Brisbane Technology Centre of Boeing Research and Technology Australia will relocate to UQ's St Lucia campus in early 2017. The facility, to be known as Boeing@UQ, will be housed in refurbished space in the Hawken Building with an initial 30 Boeing research staff. While the major focus of the relationship with Boeing involves collaborative research, Boeing also provides a wide range of support for undergraduate programs.

In March, the Vice-Chancellor and President signed an agreement with Shanghai-based Baosteel Group for an extension to the highly successful Baosteel-Australia Joint Research and Development Centre (BAJDC). With its headquarters at UQ, BAJDC has been funded by Baosteel for five years; and the further five years funding of up to \$10 million is a strong vote of confidence in UQ's R&D being able to deliver tangible benefits for Baosteel's operations in China.

UQ's world-class expertise in plant breeding was recognised with the Bill and Melinda Gates Foundation awarding a \$3.8 million grant to evaluate and improve breeding programs in developing countries. The project, to be undertaken by the School of Agriculture and Food Sciences and QAAFI, brings the total Gates Foundation funding for UQ research over the past five years to more than \$23 million.

In 2016, the University was proud to have established the Queensland Genomics Health Alliance, a \$25 million patient-centred and clinically led entity to develop and empower a community of genomics professionals who will drive interest, learning and dialogue in genomics and its clinical application.

Advance Queensland Innovation Partnerships

The Queensland Government Advance Queensland Innovation Partnerships (AQIP) program offers grants of up to \$1.5 million in support of collaborative research projects with industry or SMEs to a total of \$15 million annually. In 2016 UQ attracted \$4.87 million of this pool, almost a third of total funding.

- UQ with Children's Health Queensland and the Merchant Charitable Foundation received \$1.5 million—the largest amount of funding received in the state—to advance early detection of cerebral palsy in babies.
- UQ with Boeing Research and Technology and QMI Solutions received \$1.22 million to develop opportunities arising from incremental sheet forming within manufacturing.
- An additional \$2.15 million was received by UQ and collaborators for other collaborative projects such as zero-energy sewage treatment systems, a koala genome bank, early detection of super-bugs, improving tick-resistance in beef cattle, and a cost effective solution to reliably plug abandoned coal seam gas wells.

UQ Partners in Research Excellence Awards

Four outstanding UQ–industry collaborative partnerships received UQ Partners in Research Excellence Awards (co-sponsored by UniQuest) for their significant impact to industry:

- **Professor Bernie Degnan**, Faculty of Science, with partner Mr Patrick Moase from Autore Pearling (Science category)
- **Professor Darren Martin**, Australian Institute for Bioengineering and Nanotechnology, with partner Mr Colin Saltmere from the Dugalunji Aboriginal Corporation (Engineering, Materials and Information and Communications Technology category)
- **Professor Kenneth Pakenham**, Faculty of Health and Behavioural Sciences, with partner Ms Karen Quaille from Multiple Sclerosis Queensland (Social Enterprise category)
- **Associate Professor Ingrid Winkler**, Mater Research Institute-UQ, with partner Dr John Magnani from GlycoMimetics (Health category).

Cooperative Research Centres

Cooperative Research Centres (CRC) Programme is a grant scheme designed to promote scientific research and collaboration between the private sector and public research bodies. UQ is an essential or supporting participant in 15 of the 32 CRCs currently active Australia-wide, receiving \$6.6 million in funding in 2015. This places UQ in the top four in the country.

In 2015, the Miles Review of the CRC Programme led to the implementation of the new CRC Projects scheme (CRC-P). Under this scheme, industry leads bids for projects up to \$1 million per year for three years to solve industry problems and improve competitiveness, productivity and sustainability of Australian industries. As lead research provider in three of the 11 projects awarded in the first round, UQ accounted for \$6 million of the total \$22.6 million awarded for commencement in 2016.

ICTE-UQ

In 2016, ICTE-UQ delivered a number of customised training programs to support UQ's international research partnerships, including:

- five academic writing support courses, delivered in collaboration with the UQ Graduate School, for 178 Research Higher Degree (RHD) students
- an *English for Academic Communication: Science* course for 35 RHD students (course first offered in 2015)
- a 12-hour *Writing Research Reports* course for 155 students as part of the *English for Academic Communication* workshops designed to develop the English language skills required to write research reports
- a 20-hour course for seven CSIRO researchers over a five-week period, designed to improve participants' written English skills to support their scientific writing
- a *Research Skills Program for International Researchers* for 25 participants from several Indonesian universities.

Research Week

Research Week was held in September to celebrate research excellence by showcasing research collaborations with government and industry, honouring preeminent early- and mid-career researchers, and recognising UQ's most outstanding Research Higher Degree supervisors who are mentoring the next generation of researchers.

Highlights in 2016 included:

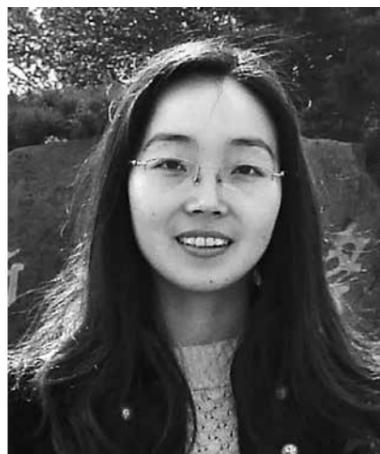
- an engagement event attended by 200 of the University's research stakeholders
- the announcement and presentation of Partners in Research Excellence Awards, the UQ Foundation Research Excellence Awards, Awards for Excellence in Research Higher Degree supervision, and the UQ Three Minute Thesis (3MT*) final
- the hosting of the 7th Annual UQ Undergraduate Research Conference, providing 60 UQ students with an opportunity to share their research and undertake poster presentations.



The CRC for Polymers is one of the 13 Cooperative Research Centres in which UQ is an essential or supporting partner.



UQ Foundation Research Excellence Award winner Dr Cameron Parsell from the Institute for Social Science Research.



UQ Foundation Research Excellence Award winner Dr Chun-Xia Zhao from the Australian Institute for Bioengineering and Nanotechnology.



UQ Award for Excellence in Research Higher Degree Supervision winner Professor Amin Abbosh from the School of Information Technology and Electrical Engineering.

Fostering research leaders

Professional development

The University delivered a broad range of training and development opportunities to researchers in 2016.

Professional development programs targeted at early career researchers (ECRs) were again delivered in 2016, such as the *Research Communication Development* series, a suite of workshops to foster effective and engaging research communication skills, and the ECR Development Program, based on the Go8 Future Research Leaders program and designed to give ECRs the skills to establish and support excellent research management and leadership practice. A second iteration of *Masterclasses in Scientific Writing and Publishing*, presented and coordinated by Nature Publishing, were held at the University, offering targeted workshops to ECRs identified as future research leaders.

Further training and development opportunities to establish best practice in research management and support researcher engagement in industry and commercialisation activities were delivered by UniQuest, Staff Development, the Library, the UQ Graduate School, and external providers such as *The Conversation*, Wiley, ABC, and Australian Science Media Centre.

Other professional development activities and leadership events were held at faculties and institutes, including grant-writing and publication workshops, Q&A panels and leadership awards.

UQ Foundation Research Excellence Awards

The UQ Foundation Research Excellence Awards provide funds to advance and facilitate the research agendas of early- and mid-career researchers, and in 2016 were worth \$550,187.

Recipients were:

- **Dr Arkady Fedorov**, School of Mathematics and Physics: *Non-reciprocal quantum devices on a chip* (\$81,519)
- **Dr Marta Garrido**, Queensland Brain Institute: *Modelling a continuum of psychosis with brain imaging* (\$95,272)
- **Dr Sumaira Hasnain**, Mater Research Institute-UQ: *Targeting cellular stress in autoimmune diabetes* (\$95,921)
- **Dr Cameron Parsell**, Institute for Social Science Research: *Addressing deep and multiple exclusion: Human agency driving social welfare* (\$78,640)
- **Dr Simon Smart**, School of Chemical Engineering: *Production of CO₂-free iron and petrochemicals* (\$98,850)

- **Dr Chun-Xia Zhao**, Australian Institute for Bioengineering and Nanotechnology: *Tumour-on-a-chip: Next generation in vitro model for accelerating the translation of nanomedicines* (\$99,985).

UQ Awards for Excellence in Research Higher Degree Supervision

The UQ Awards for Excellence in Research Higher Degree (RHD) Supervision recognise outstanding performance in supervision, mentoring and training of RHD candidates. In 2016, excellence awards were presented to:

- **Professor Amin Abbosh**, School of Information Technology and Electrical Engineering: recognising that his students come from diverse research backgrounds with different skills sets prompted Professor Abbosh to establish the *Research Methods for RHD* course. Associate Professor Abbosh has been an advisor for 11 years and currently supervises 12 doctoral candidates.
- **Professor Margaret Barrett**, School of Music: embarking on a PhD is a long-term commitment and Professor Barrett ensures that from the outset, her students research a topic that they feel passionate about. Research methodology is also an area of great interest to Professor Barrett—designing a study is a creative, aesthetic and ethical act and she strives to help students understand that designing their study is more than a means to an end.
- **Associate Professor Winnifred Louis**, School of Psychology: students beyond UQ are benefiting from Associate Professor Louis's teaching, with her suite of online and offline tools to help students overcome scholarly challenges and develop as researchers, and her online resources being shared by thousands across the world.
- **Professor Gregory Monteith**, School of Pharmacy: a PhD in pharmacy research offers a range of career opportunities and Professor Monteith encourages his students to take on extra activities to improve their employability. This includes a student retreat where past PhD graduates talk about their own careers. As a supervisor, Professor Monteith has helped 22 students complete their candidature.

In addition, **Associate Professor Jason Tangen**, School of Psychology, was presented with the 2016 Early Career Advisor Award, recognising the special achievement of an early career staff member in supervising and mentoring RHD candidates.

Research and Aboriginal and Torres Strait Islander peoples

In 2016, UQ was successful in securing two ARC Indigenous Discovery Grants in the areas of photographic theory, anthropology and Native Title, and language and cultural knowledge in the Torres Strait. Dr Gary Osmond also received an ARC Future Fellowship and will lead a project in the area of Indigenous sport history.

The Poche Centre for Indigenous Health and the Institute for Urban Indigenous Health partnered in several research projects in 2016 in relation to building capacity in Indigenous communities, and health service delivery. The UQ Poche Centre—established in 2015 with the philanthropic support of Mr Greg Poche AO and Mrs Kay van Norton Poche—also introduced student scholarships for Indigenous research higher degree (RHD) students, with three applicants being awarded generous scholarships for the duration of their candidature.

Dr Katelyn Barney from the Aboriginal and Torres Strait Islander Studies Unit continued work on her National Teaching Fellowship *Pathways to postgraduate study for Indigenous Australian students: enhancing the transition to Research Higher Degrees*, holding several workshops and symposiums for Aboriginal and Torres Strait Islander students interested in RHD pathways.

During Research Week, Pro-Vice-Chancellor (Indigenous Education) **Professor Cindy Shannon** and **Associate Professor Jon Willis** led a workshop on *Research Ethics: important requirements, principles and practices in research involving Aboriginal and Torres Strait Islander peoples*.



Poche RHD scholarship recipient Lee Sheppard, who is researching the topic of 'Sports development in the extractive industries: an Australian case study'.

UQ Graduate School

Research training

The UQ Graduate School has overall responsibility for the strategic direction, quality assurance and policy development supporting research training at the University. In addition, it provides centralised operational management for research higher degree (RHD) admissions, scholarships, candidature and thesis examinations.

The Graduate School also coordinates a number of initiatives aimed at developing the skills and career prospects of RHD candidates through mobility, transferable skills development and industry experiences.

In 2016, more than 1000 RHD candidates successfully completed UQ's online research integrity training module. All RHD candidates are required to complete this training before their confirmation milestones. Online training is complemented by face-to-face workshops throughout the year.

Recruitment and commencements

RHD candidate commencements remained stable overall in 2016 with 609 domestic and 405 international RHD commencements.

Career Development Framework

The Career Development Framework (CDF) is a Graduate School initiative that provides a skills- and personal development-based approach to research training.

The CDF ensures that graduates are well-rounded, with the leadership, professional and research skills that will enhance their career prospects and help shape them into future knowledge leaders. In 2016, more than 2100 RHD candidates participated in the program—500 more than in 2015. More than 135 RHD candidates were provided with mobility experiences; 103 participated in networking breakfasts with industry; and the RHD placements program was extended to include social enterprise, as well as industry and government.

Three Minute Thesis

The Three Minute Thesis (3MT®) is a competition developed at UQ that challenges RHD students to communicate the significance of their projects to a non-specialist audience in just three minutes.

In 2016, competitions were run in more than 350 institutions around the world. The UQ final attracted an audience of more than 300 global researchers, industry leaders, PhD candidates and alumni. The inaugural Asia-Pacific 3MT® final, sponsored by Springer Nature, saw finalists from 50 universities across Australia, New Zealand and Asia gather at UQ to compete. The competition was live-streamed across the globe.



2016 3MT® people's choice and overall competition winner Anna-Lisa Sutt from the School of Medicine, who spoke about 'Dying to talk'.

Research infrastructure

Major research infrastructure

In 2016, the University continued to maintain a number of core research infrastructure facilities, including:

- **UQ Biological Resources:** provides modern, best-practice laboratory animal service and facilities to support UQ's major investment in biomedical and biomolecular research
- **Centre for Advanced Imaging:** provides access to state-of-the-art research imaging instruments
- **Marine Research Stations:** provide access and support for researchers at three island-based research stations and an aquaculture facility
- **Centre for Microscopy and Microanalysis:** promotes, supports and initiates research and teaching in the applications of microscopy and microanalysis
- **Research Computing Centre:** provides coordinated management and support of the University's sustained and substantial investment in supercomputers, tera-scale data archives, visualisation and network connections, together with coordinated research user support
- **Glassblowing Services:** provides scientific glass instrumentation and laboratory glassware for teaching and research at UQ
- **Glasshouse Services:** provides a range of centralised plant-growing facilities using Quarantine, Physical Containment Level 2, temperature-controlled and evaporative-cooled glasshouses, as well as services associated with the growing of plants

- **Radiogenic Isotope Facility:** provides isotopic and elemental analyses
- **Protein Expression Facility:** provides a full-service protein production and training capability with state-of-the-art infrastructure
- **TetraQ:** provides bioanalytical clinical trial and preclinical sample and metabolite analysis.

UQ has a number of NCRIS/EIF-funded national infrastructure initiatives including three NCRIS facilities where UQ is the lead Institute: Terrestrial Ecosystem Research Network (TERN), Research Data Services (RDS), and National Imaging Facility (NIF).

The University continued to invest strategic funding in research infrastructure—including more than \$4.3 million committed through the UQ Major Equipment and Infrastructure scheme—to 22 projects across the University to ensure research infrastructure remains at the cutting edge.

Commercialisation

UniQuest

UniQuest is UQ's main commercialisation company. Specialising in global technology transfer, it facilitates access for all business sectors to UQ's world-class expertise, intellectual property and facilities.

Since 1984, UniQuest has built, commercialised and managed an extensive intellectual property and asset portfolio, including more than 1500 patents and 70 companies resulting from University-based discoveries and expertise. Since 2000, UniQuest and its start-ups have raised over half a billion dollars to take UQ technologies to market. Net sales of products licensed by UniQuest total more than \$13 billion for the period 2007–2015.

UniQuest was responsible for the commercialisation of the HPV vaccine, Gardasil®; the Triple P – Positive Parenting Program; the imaging technology used in two-thirds of the world's MRI machines; and Spinifex Pty Ltd—a biopharmaceutical company acquired recently in one of Australia's largest ever biotech deals.

Commercialisation outcomes

2016 saw a €15 million (AU\$22 million) Series A investment in Inflazome Ltd, a company founded on research from UQ and Trinity College Dublin, developing treatments for inflammatory diseases. The investment, co-led by Novartis Venture Fund and Fountain Healthcare Partners, is one of the largest biotech Series A investments for intellectual property originating from an Australian university. UniQuest commercialised the research related to the deal on behalf of UQ and Trinity College Dublin.

Other highlights for the year included:

- The Queensland Emory Drug Discovery Initiative (QEDDI) became a fully equipped and operational drug discovery and development capability, with facilities and staff based at UQ's St Lucia campus. QEDDI was established in 2015 with support from UQ and the Queensland Government.
- UQ spin-out company Protagonist Therapeutics Inc listed on the NASDAQ stock market, raising US\$90 million (AU\$118 million) in its initial public offering. The company is developing peptide-based oral drugs for the treatment of gastrointestinal disorders such as Inflammatory Bowel Disease (IBD), and was recently recognised as the Australian Company of the Year at the AusBiotech and Johnson & Johnson's Innovation Industry Excellence Awards.
- A Memorandum of Understanding was signed with Redback Technologies, a start-up company developing low-cost solar energy solutions for residential and commercial users. Redback is based at UQ's ilab business accelerator and collaborates with UQ's research leaders in solar photovoltaic technology, energy distribution and software analytics.
- More than 100 people attended UniQuest's 2016 UQ Research Commercialisation Workshop, which provided an introduction to industry engagement for UQ researchers and staff.
- UniQuest hosted a number of tailor-made Industry Connect engagement events to showcase UQ's research capabilities and expertise to industry. Companies involved included Pfizer, Bayer, Meril, PepsiCo, PGG Wrightsons, Zoetis and CSL.
- UniQuest licensee ResApp Health Ltd was recognised as the Australian Emerging Company of the Year at the AusBiotech and Johnson & Johnson's Innovation Industry Excellence Awards. The company is developing a smartphone medical application for the diagnosis and management of respiratory disease, and has raised more than \$16 million since listing on the Australian Stock Exchange in 2015.
- Through UniQuest, UQ became the second Australian university to partner with Pfizer's Centres for Therapeutic Innovation (CTI). The collaboration provides UQ researchers with access to Pfizer's biologics drug discovery and development capabilities.
- An agreement was brokered with US-based company AngioStem Inc. for rights relating to a UQ-developed method for extracting large quantities of specialised stem cells from the placenta. The deal could result in new stem

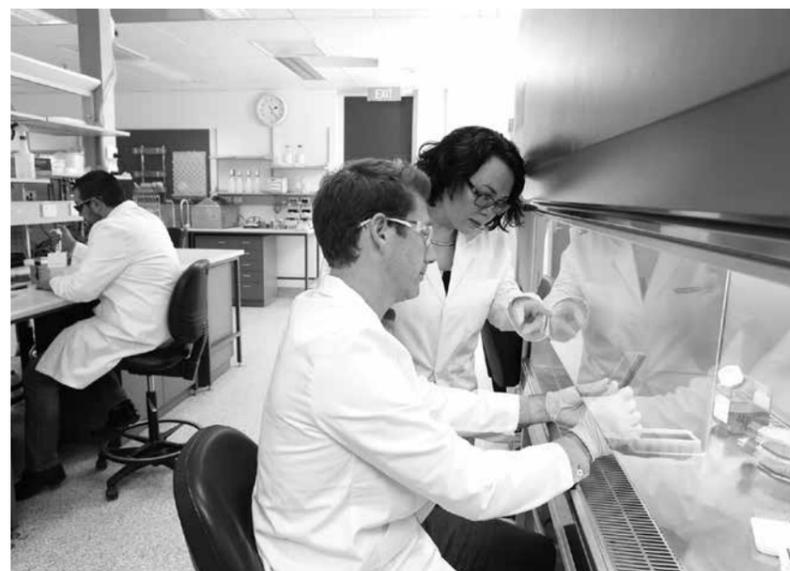


cell-based treatments for patients with heart failure, peripheral artery disease or stroke.

- A licensing deal was finalised with US-based pest control company SpringStar Inc. for rights relating to the design of an environmentally friendly cane toad trap. The company will work with UQ researchers to refine the design with the aim of making the trap commercially available.
- On behalf of UQ, UniQuest joined the University Industry Demonstration Partnership, an international organisation focused on driving best practice university/industry partnerships. UQ is the first Australian institution to be invited to join the organisation.
- A treatment developed at UQ's Advanced Water Management Centre for the control of sewer odour and corrosion has been licensed to USP Technologies, an Atlanta-based provider of chemical treatment programs for water and wastewater applications.
- Three projects were selected for funding under an 'open innovation' collaboration between UniQuest and pharmaceutical company AstraZeneca. The collaboration aims to repurpose AstraZeneca's preclinical and clinical compounds and identify new medical uses for them. The first three projects could lead to new treatments for ovarian cancer, liver disease and lung and colorectal cancers.

UniQuest brokered a licence deal with Canada's Center for Commercialization of Regenerative Medicine for rights to a UQ-developed method for producing a therapeutic dose of white blood cells—the technology could benefit cancer patients at risk of life-threatening infections following chemotherapy.

ResApp Health Ltd was awarded for its work on developing a smartphone medical application for the diagnosis and management of respiratory disease.



Researchers at work in a Queensland Emory Drug Discovery Initiative (QEDDI) laboratory.



UQ-developed Perkii drinks are now sold in outlets across the country, including Woolworths.

Uniseed

An early-stage investment fund, Uniseed commercialises intellectual property at UQ, the Universities of Melbourne, New South Wales and Sydney, and the CSIRO.

To date, Uniseed has invested \$20.8 million into 24 UQ start-up companies and facilitated start-up formations at UQ more often than any other investor (around one-third of UQ start-ups formed since 2000). Uniseed's investment has secured commitments of more than \$340 million of external funding to UQ start-ups from grants and other investment capital.

In 2016, Uniseed made further cash distributions to UQ from milestone payments relating to successfully exited start-up companies, including UQ start-up company Spinifex Pharmaceuticals, which is based on the work of Professor Maree Smith, and was acquired by Novartis International AG in 2015 for US\$1 billion; and Hatchtech Pty Ltd, which was awarded the Australian Venture Capital Association's Best Early Stage Deal of the Year for its head lice treatment deal with Dr Reddy's Laboratories in India, worth US\$200 million.

Much of the investment received by UQ companies has flowed back to the University through targeted research contracts, with UQ receiving more in research funding to university laboratories than it has contributed to the fund. Research supported by Uniseed companies has led to more than 300 publications that have been collectively cited more than 4000 times.

UQ companies supported by Uniseed include:

- **Perkii Pty Ltd**, which raised \$4 million in 2016 to support the release of its low-calorie probiotic fruit juice and water-based drink
- **ProGel Pty Ltd**, which was formed to commercialise an encapsulation technology based on the work of **Professor Bhesh Bhandari**, raising \$400,000 from Uniseed and Brisbane Angels
- **Hydrexia**, which is developing hydrogen storage equipment based on the work of **Professor Arne Dahle** and **Associate Professor Kazuhiro Nogita**

- **Q-Sera Pty Ltd**, which raised further funds from Uniseed and the Medical Research Commercialisation Fund (MRCF) to continue work with leading serum tube manufacturers for improved blood collection (based on the work of **Dr Paul Masci**, **Professor Martin Lavin**, **Emeritus Professor John De Jersey AM** and **Dr Goce Dimeski**)
- **Nexgen Plants**, which continues to work with Syngenta on virus-resistant vegetables, and has produced its first virus-resistant plants, based on technology developed by **Professor Peer Schenk**
- **TenasiTech**, which is developing better plastics, acrylics and nylons based on the work of AIBN's **Professor Darren Martin**.

JKTech

JKTech is recognised as a leader in the supply of innovative products and services to the global resources industry. JKTech's core business covers technical consulting and training services (in mining, metallurgy and processing), laboratory services, specialist testing equipment and simulation software products.

JKTech is wholly owned by UQ via UQ Holdings Pty Ltd, as the technology transfer company for the University's Sustainable Minerals Institute (SMI).

Significant activities and achievements during 2016 included:

- continued work to operationalise an International Centre of Excellence in Chile (SMI ICE Chile), in conjunction with SMI and the University of Concepción (Chile)
- commencement of activities under a five-year agreement with Metso Minerals (Chile) in relation to the *Next Generation Mine to Concentrator* project being run through SMI ICE Chile
- significant international projects to further strengthen and support JKTech's globally diversified customer base, including:
 - Laos (PanAust's Phu Bia Mining Limited)
 - Australia (South32's Cannington Mine)
 - Chile (AngloAmerican, Los Bronces Mine).

JKTech operated throughout 2016 in the context of a broad minerals industry slowdown, caused primarily by reduced commodity prices, environmental factors which significantly impacted client operations, and significant cost reduction activities and targets imposed within key clients' operations. In response to the tightening market conditions, JKTech's Board and Management constantly evaluates JKTech's delivery model so that it continues to be aligned with market demand and client expectations.

Selected research highlights

- UQ marine biologists are helping fight **climate change** on the Great Barrier Reef in the wake of the worst mass coral bleaching event in recorded history. Researchers used their existing underwater survey images to map the extent of recent damage. The findings were, in turn, used to inform policy and management plans for the natural wonder.
- Researchers at UQ have demonstrated that newborn babies do not—as previously believed—have an inborn capacity to imitate adults. The research re-opens fundamental debates about whether universal human capacities are innate or learnt, questioning what makes **humans unique as a species**.
- A UQ researcher contributed to the curation of *Doi Moi: Journey of Dreams* at the National Museum of History, Vietnam, which celebrates 30 years since the introduction of a 'socialist market-orientated economy'. Doi Moi captures the spirit of **innovation and change in Vietnam**, presenting the voices of politicians, scientists, farmers and historians, alongside ordinary men and women, who had the vision and foresight to build a better future for all.
- UQ scientists have identified the cause of a common **developmental brain disorder** called callosal agenesis—which affects 1 in 4000 people—and causes a range of physical, intellectual and social disabilities. In callosal agenesis, a cellular bridge fails to form preventing nerve fibres from making the normal connections between the brain hemispheres.
- UQ research has identified **sedentary workstyles** as a significant health hazard. A series of successful interventions to reduce prolonged sitting in the workplace is now informing a nationwide workplace initiative to encourage workers to stand up, sit less and move more, as well as UQ's own choices in office design.
- UQ's newly established **Centre for the Business and Economics of Health (CBEH)** has been made possible through generous philanthropic funding from an alumni family, together with internal strategic funding. CBEH will undertake evidence-based research and consultancies to evaluate strategic transformation within Australia's healthcare sector.
- A UQ research team has shown, for the first time, that **photosynthesis** occurs deep within the seeds of wheat, as well as in the plant's leaves. This



A diver investigates the coral bleaching at Heron Island in February 2016. Located close to the southernmost point of the Great Barrier Reef, this area was one of the first to bleach at Heron Island. Photo: The Ocean Agency / XL Catlin Seaview Survey.

photosynthesis discovery has turned half a century of plant biology on its head. Wheat covers more of the Earth than any other crop, and the discovery may lead to better, faster-growing, better-yielding wheat crops in geographical areas where wheat currently cannot be grown.

- A major international study, jointly led by UQ researchers, has identified genetic factors associated with **low birth weight** in children. The research has also shown there is some genetic link between birth weight and ill health later in life. Further investigation is now underway to understand how this develops.
- UQ scientists have used **spider venom** to identify a specific protein involved in transmitting mechanical pain, which is the type of pain experienced by patients with irritable bowel syndrome. The discovery will pave the way for developing much-needed treatments.
- Researchers at UQ have discovered intervention enhancements that broke the cycle of chronic **homelessness** through integrated support systems that provided supportive housing and improved self-identification. The evaluation of the Brisbane Common Ground project also identified annual community savings of \$13,000 per tenant and reduction in acute services demand.
- UQ research has created new knowledge of genetic processes underlying **pearl formation** leading to an understanding of the relationship between gene expression and pearl characteristics. In a ten-year partnership with one of the largest South Sea pearl companies in the world, the result is improved farming practices and increased productivity in the sector.
- A new start-up company using technology developed at UQ aims to revolutionise how cellular experiments are conducted. Scaled Biolabs Inc uses credit-card sized microfluidic chips that can run more than 8000 experiments simultaneously, rapidly surveying cellular environments and responses to significantly reduce development cycles for **cell therapies** and biologics.
- Pioneering research by UQ has led to the discovery of more than 150 **hyperaccumulator plant species** new to science in Malaysia and New Caledonia. This represents the most substantial addition to the global inventory of such plants to date. Plant species that naturally accumulate nickel in their biomass have high potential for utilisation in phytomining, an emerging technology for extracting nickel from sub-economic mineral deposits or minerals wastes.