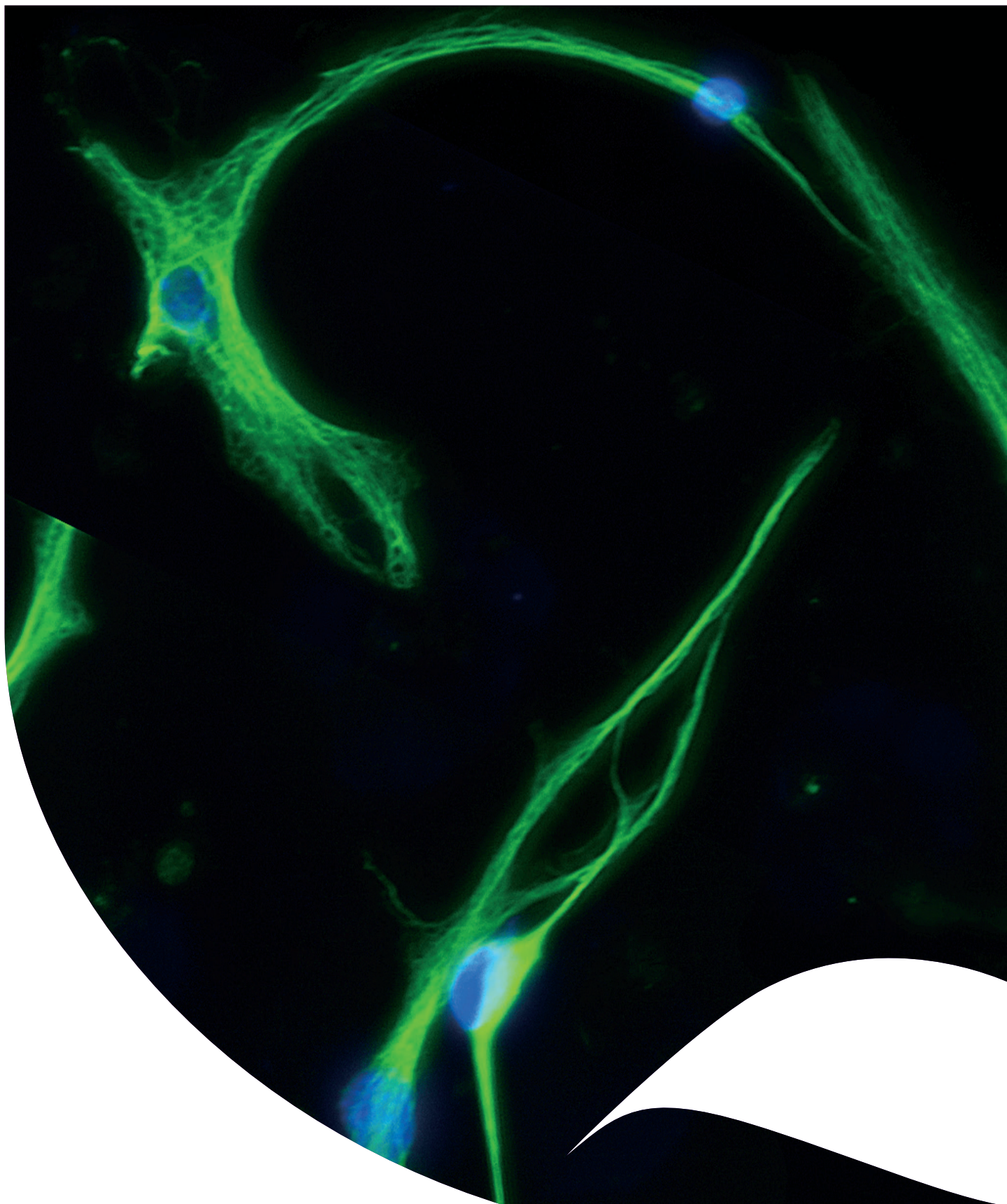


Queensland Brain Institute
Annual Report
2019





Vice-Chancellor's message

Front cover: Astrocytes, the most common neural cell type, grown on a dish. These cells were used to study glioblastoma, the most common malignant brain cancer in adults. By Zorana Lynton, Richards group, People's Choice Winner, 2019 Art in Neuroscience competition.

Above: Jacaranda blooms in UQ's Great Court.

The Queensland Brain Institute (QBI) is a world-leading neuroscience research institute, located on our St Lucia campus. It is dedicated to unravelling the secrets of our brain, an immensely complex structure at the core of every activity we undertake as humans.

QBI research has the potential to not only unlock fundamental knowledge about who we are and how our brain works, but also to stem the growing tide of brain diseases that have such a devastating social and economic impact on our world.

2019 saw some important steps forward in this mission.

One of the most exciting projects at QBI, and one which elicits great interest from around the world, is the ultrasound technology from the laboratory of Professor Jürgen Götz, Director of QBI's Clem Jones Centre for Ageing Dementia Research. Professor Götz and his team are working on an ultrasound device that could more effectively deliver therapeutics to the brain for the treatment of Alzheimer's disease. The team has spent the past 12 months working towards a first-in-human trial of their device.

In addition to the potential for this technology to improve our healthcare and quality of life, the development of an effective device to treat brain diseases would also seed opportunities in the medical device industry and create jobs within manufacturing and with service providers. In recognition of this technology's potential, the Australian Government awarded \$1 million in funding from a fiercely competitive scheme

within the Medical Research Future Fund to create a business case for the establishment of a new industry sector in therapeutic ultrasound. The work is being done in collaboration with partners from across Australia and New Zealand and was the only project in Queensland to receive Stage One funding from the MRFF Frontier Health and Medical Research scheme.

QBI research has also provided the basis for a trial into the effect of exercise on cognitive function in ageing adults. The trial aims to establish the level and intensity of exercise that improves cognitive function, and also to investigate the underlying mechanisms that enable exercise to positively affect the brain. This research, which is generously supported by the Stafford Fox Foundation, has been proceeding in partnership with UQ's School of Human Movement and Nutrition Science. It is hoped that a full analysis of the data gathered will be available in 2020. We are grateful to all of the members of our community who helped drive this research by participating in the trial.

The trials outlined above are excellent illustrations of projects that began through curiosity-driven, fundamental research, and are now being translated to improve lives through better health. As competitive funding continues to emphasise

translational research, it is important to acknowledge that translation requires a foundation of knowledge from which to draw. In recognition of the importance of discovery research aimed at generating new knowledge, and to provide funding certainty, QBI has established a Discovery Research Endowment Fund.

This fund, which will be officially launched in 2020, is an ambitious, long-term undertaking that recognises the importance of pursuing avenues of enquiry without immediate gain. The vision is to provide QBI researchers with the intellectual freedom to investigate the brain and tackle projects where the benefit may not be immediately apparent during the course of the standard grant cycle.

QBI is one of the forces behind UQ's continued position in the world's top 100 universities, providing high-quality neuroscience research, driven through local and global collaborations with researchers, industry, government and philanthropists.

Congratulations to Professor Sah and the QBI team on their commitment and their excellent results. I look forward to watching QBI continue to create positive change in the years to come.

Professor Peter Høj AC

Vice-Chancellor and President
The University of Queensland





Chairman's Message

2019 has been an outstanding year for QBI, with significant accomplishments across many areas.

The past year was marked by the introduction of QBI's Discovery Research Endowment Fund which will focus on the future sustainability of QBI. The greatest barrier to QBI's future success is financial: without sustainable funding, the Institute will find it increasingly difficult to retain high, performing staff and support critical research areas. The Endowment Fund has been established and will continue to build over the coming years helping to support all scientists in the Institute who are concentrating on curiosity-driven research in the hope of making the next big scientific discovery.

In yet another busy year for the Institute, I would like to extend a personal thank you to my fellow board members for their commitment and ongoing support of QBI. The advice and guidance provided from the Board's perspective has helped raise awareness of the work of QBI to a broader audience. A special thank you also goes to Provost, Professor Aidan Byrne and Pro-Vice Chancellor, Professor Tim Dunne, for their attendance at our Board meetings, which helps provide a better understanding of how the University functions and QBI's role in this process.

The addition of one of QBI's researchers presenting at each meeting has enabled the Board to gain a greater understanding of the many and varied research activities which take place at the Institute. I would like to thank Professor Linda Richards, Dr Steven Zury, Dr Susannah Tye and

Professor Annemaree Carroll for taking the time to provide us with an insight into their very interesting and ever-evolving work.

Thanks also to Professor Pankaj Sah for his continued leadership of the Institute and reappointment as Director for the next five years. His guidance through this year's UQ 7-Year Review process also resulted in very positive results for the Institute, which is an outstanding achievement.

Some highlights of the year included:

- The establishment of the Human Brain Studies Unit which will facilitate more efficient translation of science to clinical practice, and provide QBI with an accessible public face through its human research activities.
- Successful fundraising events including the Hand Heart Pocket Alzheimer's Gala and the Ross Maclean Race Day, which helped contribute to continued philanthropic growth.
- A high level of grant success.

I am also grateful to all at QBI: our researchers, and our support and technical staff, for their passion and tireless commitment to the science that underpins our success, plus the Advancement team for their wonderful support to QBI in all areas.

The Board would like to express its deep gratitude to the Government, foundations, corporates, industry partners and countless individuals for generously supporting QBI's work over the past year. I would like to especially mention the Clem Jones Foundation, Brazil Family Foundation and the Stafford Fox Medical Research

Foundation, whose continued generous support has helped QBI to continue its important work.

QBI's success in its field is a testament to the efforts of the entire team of scientists and support staff, whose passion and tireless commitment to the science that underpins our success, helps ensure that we continue to be a world leader in the area of neuroscience research. The progress of QBI's dementia research, is just one example of how QBI is leading the way through cutting-edge research. Professor Jürgen Götz and his team within QBI's Clem Jones Centre for Ageing Dementia Research are currently working towards the first stage of a clinical safety trial for their non-invasive ultrasound technology in tackling Alzheimer's disease, while Emeritus Professor Perry Bartlett, Founding Director of QBI, is leading the development of a clinical trial for a potential treatment for motor neurone disease.

The urgent need to find strategies to prevent, diagnose and treat dementia, and many other brain-related diseases, is the focus of QBI's researchers who are working hard towards achieving this goal. Based on our history of achievement and current initiatives at QBI, and with strong ongoing support from UQ and our external partners and donors, we will capitalise on our many successes and face challenges as they arise. I am looking forward to supporting QBI in the exciting times ahead.

Jeff Maclean
Chairman
QBI Advisory Board

Director's Message



Looking back on 2019, I'm proud to say we've gone from strength to strength, continuing to grow our reputation as an institution of excellent neuroscience research that is delivering real impact in understanding the brain.

There's no doubt that this is the result of the outstanding accomplishments made across so many areas of QBI by the talented researchers, teams and partnerships behind them.

We underwent our second 7-year UQ Academic Board review, an important chance to not only reflect on all we have achieved in the past seven years, but also present our vision for the future. The Review Committee was impressed with the high quality of our research, our enviable track record in grant funding, and the standards of our technical and support staff.

The Committee also offered some sound recommendations that we have started to implement, and will continue rolling out in 2020. These include organising our research into a number of themes, developing a clinical trial unit to progress our research to the clinic, and encouraging all members of our diverse workforce to achieve their best by establishing an Equity, Diversity and Inclusion committee, and supporting our early- and mid-career researchers towards independence.

Our researchers continued to secure competitive grants at rates above national averages, including \$1 million from the Medical Research Future Fund's Frontier Health and Medical Research scheme to develop the therapeutic ultrasound industry

in Australia, keeping up the momentum to continue our life-changing work advancing treatments for Alzheimer's disease and brain diseases more generally.

Our grant success was complemented by philanthropic funding from our generous donors. This supports research that may not be funded through other national schemes, and accelerates discoveries for the benefit of the community. To secure this support into the future, we established a Discovery Research Endowment Fund, which will launch officially in 2020. This is an ambitious, long-term project that will provide stability and certainty for our research programs, and allow us to back exciting blue-sky research.

Congratulations to Professor John McGrath on receiving the Lieber Prize for Outstanding Achievement in Schizophrenia Research, awarded by the New York-based Brain & Behavior Research Foundation. We were also pleased that Professor Linda Richards was acknowledged for her commitment to neurobiology research and to community engagement in science, being named an Officer in the Order of Australia.

Professors Joe Lynch and Mandyam Srinivasan retired following very successful careers. I was delighted that the Vice-Chancellor conferred them both with the well-deserved title of Emeritus Professor.

We also learned of the sad passing of Emeritus Professor Jack Pettigrew in May. We held a celebratory retrospective in October showcasing his life in science, including his time as Director of the UQ Vision, Touch and Hearing Research Centre.

We also built on our existing global partnerships, with exciting advances in our collaboration with the Southern University of Science and Technology (SUSTech) in Shenzhen, China. Together with researchers from UQ's Faculty of Engineering, Architecture and IT, we progressed a joint SUSTech-UQ neural bioengineering Masters program, where students will be able to complete three years of an undergraduate degree in engineering at SUSTech, before undertaking a further two years at UQ. It is hoped that many of these students will then choose to enrol in a PhD program.

I would like to thank UQ's Vice-Chancellor Professor Peter Høj and Provost Professor Aidan Byrne for their unwavering support of the Institute, as well as Advisory Board Chair Mr Jeff Maclean and our other Board members for their astute guidance throughout the year.

Thank you to my Deputy Directors: Professor Linda Richards (Research), Ms Stephanie Jillett and Ms Jill Penridge (Operating – Stephanie to June, and Jill from June to year-end) for their assistance and dedication towards the day-to-day management of the Institute.

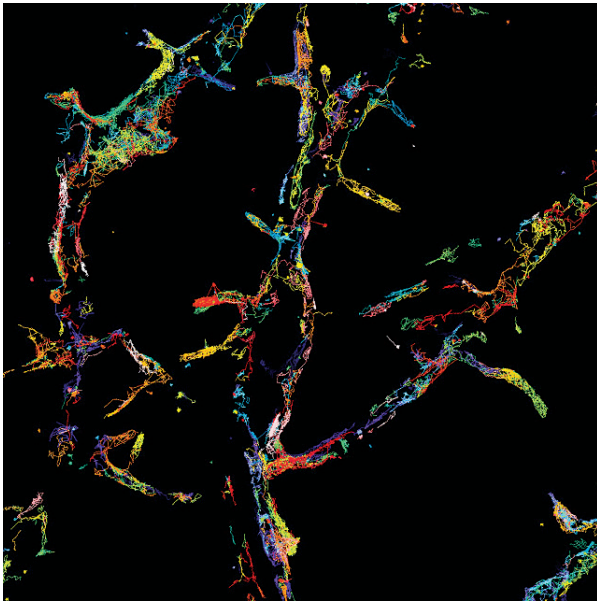
Lastly, I'm extremely indebted to all at QBI, for their passion, their commitment to our research vision, and their ongoing contributions to our success.

I am looking forward to an even greater 2020.

Professor Pankaj Sah
Director

Research themes

Our research is divided into four themes that collectively encompass neuroscience discovery from the level of individual cells to entire organisms to the clinic.



Synaptic, Cellular and Molecular Neuroscience

Our researchers investigate how our brain operates at the level of individual cells, encompassing both the inner workings of cells and their interactions with one another. The brain is unique because its cells communicate with each other, a process that can adapt and change depending on an individual's experience – the source of the brain's amazing plasticity. Drug therapies also operate at this scale, so by understanding the workings of the brain at the cellular and molecular level, we are much more likely to find targets for conditions such as Alzheimer's disease, schizophrenia, motor neurone disease and more.

Faculty:

Professor Fred Meunier (Theme Co-ordinator)

Professor Helen Cooper

Professor Elizabeth Coulson

Professor Geoffrey Faulkner

Professor Jürgen Götz

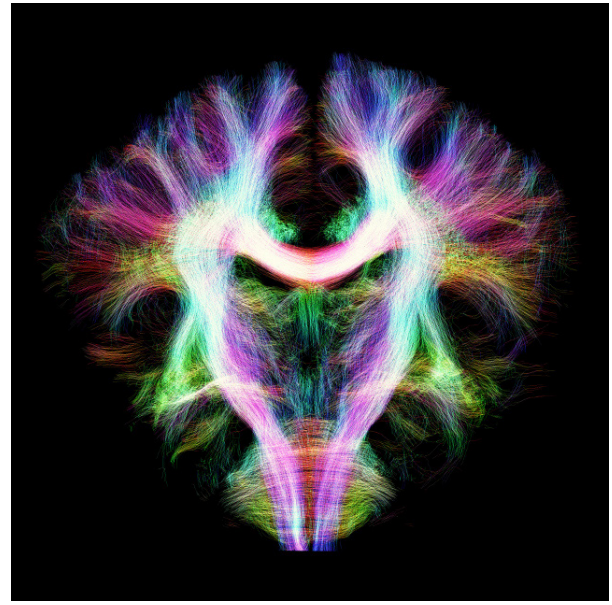
Professor Massimo Hilliard

Dr Zhitao Hu

Dr Jana Vukovic

Dr Adam Walker

Dr Steven Zuryn



Circuits, Systems and Computational Neuroscience

We explore how groups of cells, often in different parts of the brain, interact with each other. This includes studying which way the information travels and how groups of cells control the flow of information. Our computational neuroscience researchers take the complexities of the brain and simplify them into mathematical models, based on available experimental data, that give us hypotheses about how the brain might function. These hypotheses can then be tested by experimental neuroscientists, whose findings further inform the computational models in a cycle that delivers us ever-more detailed information and predictions about brain function. This level of neuroscience is the most likely to provide us with knowledge about how the brain actually works: how information is transferred to ensure the right parts of the brain are active to achieve tasks, and other parts of the brain do not interfere. It is also the level about which we know the least, making our efforts in this area key to understanding the brain.

Faculty:

Professor Stephen Williams
(Theme Co-ordinator)

Dr Victor Anggono

Associate Professor
Kai-Hsiang Chuang

Professor Geoff Goodhill

Dr Dhanisha Jhaveri

Professor Tianzi Jiang

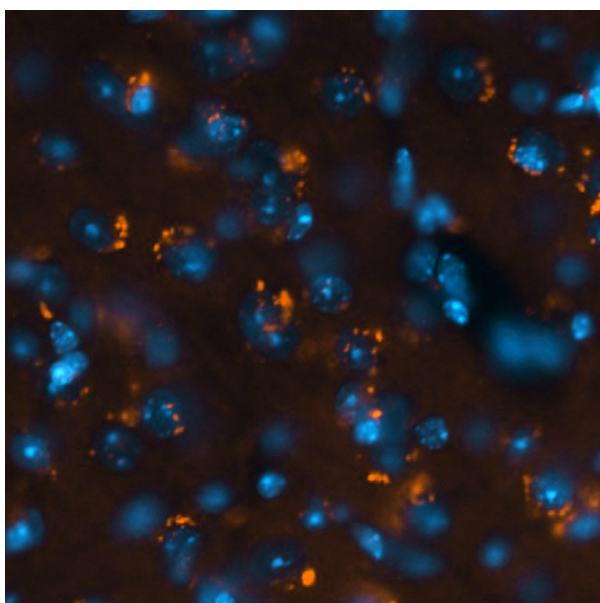
Dr Zhaoyu Li

Dr Fatima Nasrallah

Dr Patricio Opazo

Professor Linda Richards

Professor Pankaj Sah



Cognitive, Behavioural and Sensory Neuroscience

Research in our theme focuses on sensory processing, brain functions and resulting behaviours that affect the whole of an individual. This includes tracking inputs to the brain through multiple sensory systems and brain outputs in the form of cognition and behaviour. If we want to understand the brain and ourselves, we need to understand how sensory inputs shape the responses of humans, and a variety of model animal systems, to the environment and to the specific needs of each species. In the case of humans, we may think of this how brain activity drives cognition and behaviour, including capacities such as attention, learning, memory and decision making.

Faculty:

Professor Jason Mattingley (Theme Co-ordinator)

Associate Professor Timothy Bredy

Associate Professor Thomas Burne

Professor Barry Dickson

Professor Darryl Eyles

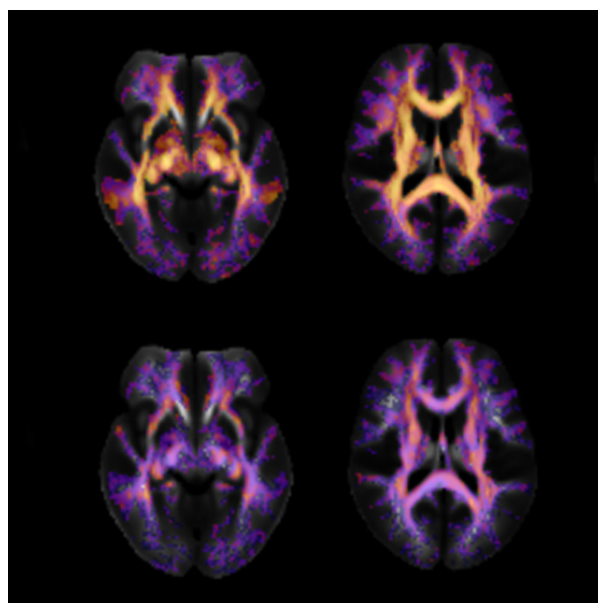
Professor Justin Marshall

Associate Professor Gail Robinson

Emeritus Professor Mandyam Srinivasan

Dr Susannah Tye

Associate Professor Bruno van Swinderen



Genomics and Clinical Neuroscience

Our genomics researchers explore brain function by investigating the genome and how our DNA influences our behaviour, brain structure and function and our predisposition to neurological and mental health disorders such as schizophrenia and motor neurone disease. Our clinical researchers work directly with patients to improve prevention strategies, diagnoses and treatments. They are on the front line of developing new treatments and diagnostics to improve quality of life for affected people and their families.

Faculty:

Professor Peter Nestor (Theme Co-ordinator)

Emeritus Professor Perry Bartlett

Associate Professor Terry Coyne

Professor John McGrath

Professor Bryan Mowry

Professor Peter Silburn

Professor Naomi Wray

Associate Professor Margie Wright

Research highlights

Life expectancy mapped for people with mental disorders

People with mental disorders have a life expectancy up to a decade shorter than the general population, a research team co-led by Professor John McGrath found. The study, which was published in *The Lancet*, found that mental disorders shortened life expectancy by an average of 10 years for men and seven years for women.

Deep-sea fish use colour to see in the dark

An international team of researchers, including Professor Justin Marshall and Dr Fabio Cortesi, discovered that certain species of deep sea fish may have highly sensitive colour vision. In particular, they have shown that the visual system of the silver spinyfin (*Diretmus argenteus*) has the highest number of light-sensitive proteins, called opsins, of any vertebrate known to date, even though it lives at depths where most sunlight has been filtered out. The research was published in *Science*.

Extinguishing fear memories relies on an unusual change to DNA

Researchers led by Associate Professor Tim Bredy and Dr Xiang Li discovered a DNA modification that enhances our ability to extinguish fear, a finding that could help guide the development of new treatments for fear-related anxiety disorders. In a study published in *Nature Neuroscience*, the researchers found that fear extinction memories form thanks to a modification, to the DNA base adenosine, that increases the activity of certain genes.

How an Alzheimer's disease protein impairs brain cells

Scientists have shed more light on the way a key toxic protein in Alzheimer's disease damages brain cells. Research from the laboratories of Professor Jürgen Götz and Dr Steven Zuryn, published in *The EMBO Journal*, found that the protein tau impairs the ability of neurons to recycle and remove waste of the cell's energy-maker: the mitochondrion.

18-year study uncovers new clue to treating schizophrenia

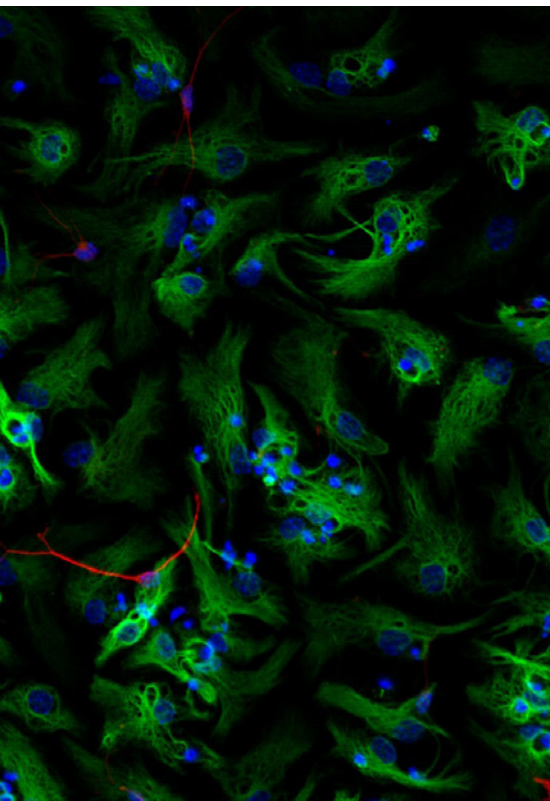
A joint Australian-Indian study published in *JAMA Psychiatry* has identified a new clue about the causes of schizophrenia and possible development of potential treatments. A collaboration between QBI researchers, including Professor Bryan Mowry, and a team of Indian researchers led by Professor Rangaswamy Thara, co-founder and director of the Schizophrenia Research Foundation in Chennai, searched the genomes of more than 3000 individuals and found those with schizophrenia were more likely to have a particular genetic variation.

Blood cells the missing link in post-exercise boost

An international team including Dr Tara Walker and Dr Odette Leiter discovered a new way in which exercise boosts the brain. The team investigated the blood to see what changes occur after exercise, and found that platelets cause neural stem cells to multiply and develop into new neurons. The study was published in *Stem Cell Reports*.

The silver spinyfin has the highest number of light-sensitive proteins of any known vertebrate, despite living in the dark.

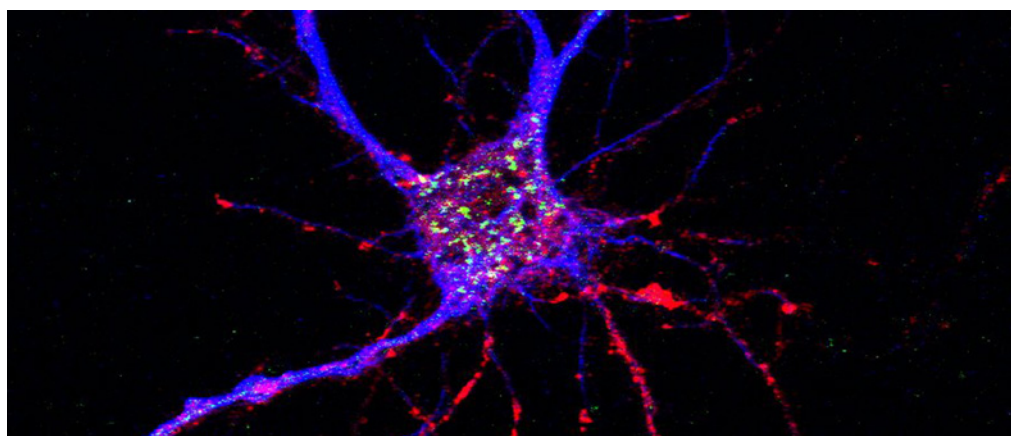
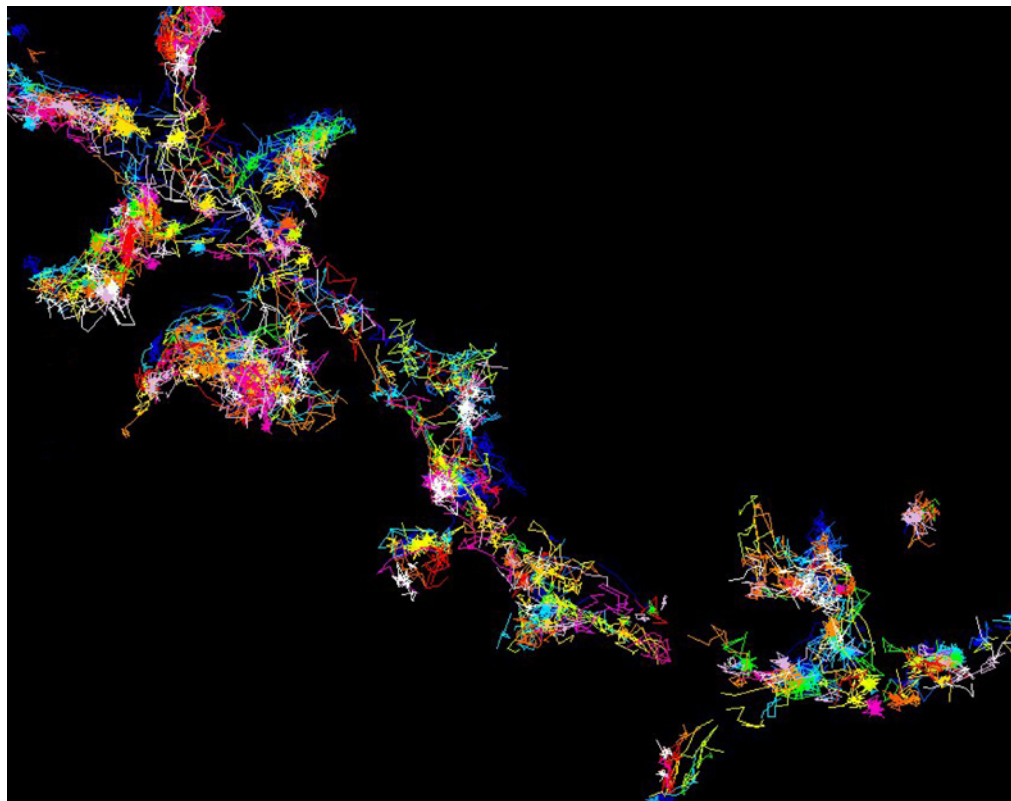




Above: Platelets cause neural stem cells (pictured) to multiply and develop into new neurons following exercise.

Above right: The signalling protein Fyn moving and forming clusters in living brain neurons – viewed using super-resolution microscopy.

Right: By studying brain neuronal and immune cells, a potential drug target for Alzheimer's disease has been discovered.



Microscopic worms could provide key to repairing injured nerves

Researchers including Professor Massimo Hilliard, Dr Rosina Giordano-Santini and Dr Casey Linton discovered key information on how the microscopic roundworm species *C. elegans* spontaneously reconnects severed nerves. They discovered the protein RAB-5 controls the level of the molecule that begins the process of fusing separated axons, a finding published in the *Journal of Neuroscience*.

Stopping enzyme could launch two-pronged attack on Alzheimer's disease

Targeting an enzyme that affects both the immune and nervous systems could combat Alzheimer's disease on two fronts, Dr Ramón Martínez-Mármol and Professor Frédéric A. Meunier found in a study published in the *Journal of Neuroscience*. The enzyme dPI3K produces a toxic peptide which accumulates into plaques in the brain of Alzheimer's patients. The research found the enzyme is also involved in the secretion of an important signalling protein involved in inflammation.

Dementia clue found by tracking single molecules in living brain cells

Super-resolution single molecule microscopy has allowed researchers led by Professors Frédéric Meunier and Jürgen Götz to give insight into the organisation of key proteins in living brain cells. The finding that the protein Tau, involved in Alzheimer's disease, affects the organisation of the signalling protein Fyn, which plays a key role in memory formation, is a step towards discovering the cause of the most common type of dementia. It was published in *eLife*.

Researchers net new theory on vitamin D and cognitive disorders

Associate Professor Thomas Burne and team published two papers in *Brain Structure and Function* and *Trends in Neuroscience* that show vitamin D levels influence the integrity of a type of 'scaffolding' in the brain called perineuronal

nets, which provide a supportive mesh around certain neurons and stabilise the contacts these cells make with other neurons. The research may explain why vitamin D is so important to brain plasticity and how vitamin D deficiency leads to a range of cognitive disorders, including depression and schizophrenia.

New model offers hope for schizophrenia treatments

Professor Darryl Eyles led a team that developed a new animal model of schizophrenia that will enable researchers around the world to better understand the disease and develop new treatments. The model, described in a paper in *Nature Schizophrenia*, elevates dopamine in a region of the brain called the dorsal striatum.

Grants and Fellowships

Alzheimer's Association (USA)

Alzheimer's Association Research Fellowship grant

J Camats Perna – Impact of Tau aggregation on the anti-inflammatory properties of IL37 in AD, 01/01/2019 – 31/12/2019, \$2,000.

Atmosphere and Ocean Research Institute

Interdisciplinary Collaborative Research Program

Y Iwata, **W S Chung**, N Sato – Evolution of courtship behaviour in squid (awarded to and administered by the University of Tokyo), 01/09/2019 – 01/09/2020, \$35,000.

Australian Academy of Science

France and Europe Early- and Mid-Career Researcher (EMCR) Mobility Grants Program

X Cui – PET imaging in a novel animal model of schizophrenia: enhanced dopamine in prodromal, 29/09/2019 – 30/06/2020, \$5,000.

Australian Government Cooperative Research Centres (CRC) program

Autism CRC Innovation Project Grant

L Richards, G Robinson, C Franklin & D Trembath – The detection of white matter microstructural alterations in autistic individuals at clinical magnetic field strengths, 01/07/2019 – 31/12/2019, \$17,680.

Australian Research Council

Discovery Early Career Researcher Awards

W Harrison – Memory of natural visual environments, 09/07/2019 – 08/07/2022, \$385,288.

M Joensuu – A novel role for saturated fatty acids in memory and learning, 08/07/2019 – 07/07/2022, \$422,107.

X Li – Functional role of a novel DNA modification in the adult brain, 01/01/2019 – 31/12/2021, \$374,433.

Discovery Project Grants

V Anggono, A Keramidas & B Collins – Regulation of glutamate receptor dynamics in mammalian central neurons, 21/05/2019 – 20/05/2022, \$508,397.

T Bredy – Defining novel neuroepigenetic pathways that influence learning and memory, 10/01/2019 – 09/01/2022, \$430,000.

J Götz – Regulation of mRNA translation by the microtubule-associated protein Tau, 01/01/2019 – 31/12/2021, \$464,000.

F Meunier – Unveiling the nanoscale organisation and dynamics of synaptic vesicle pools, 01/01/2019 – 31/12/2021, \$668,000.

Future Fellowship

J Yang – Deciphering the genetic architecture of human complex traits (awarded to and administered by UQ's Institute for Molecular Bioscience), 01/07/2019 – 30/06/2023, \$918,125.

Australian Research Data Commons

ARDC Discovery Activities Institutional Role in a Data Commons

N Durisic & R Amor – Australian Neuroscience Microscopy Data Sharing Platform, 5/15/2019 – 9/02/2019, \$49,999.

Brain Foundation

Research Gift Grants

R San Gil & A Walker – Genome-wide CRISPR screens to reveal regulators of TDP-43 aggregation and toxicity in motor neurone disease and frontotemporal dementia, 01/11/2019 – 31/10/2020, \$25,000.

Brisbane Diamantina Health Partners

Brain and Mental Health Theme Translational Research Partnerships Seed Funding

J Kesby & S Suetani – The impact of associative striatal dysfunction on decision-making and cognitive flexibility in treatment-refractory schizophrenia, 01/01/2019 – 01/01/2020, \$9,000.

Cancer Council Australia

Project Grant

S Kisely, S Jordan, D Lawrence, G Sara, B Kendall, L Brophy, **D Siskind** & M Protani – What is the impact of the national bowel cancer screening program on colorectal cancer outcomes for people over the age of 50 with severe mental illness? (awarded to and administered by UQ's School of Medicine), 01/06/2019 – 31/05/2022, \$651,026.

Children's Hospital Foundation

Children's Hospital Foundation Research Program

B Wainwright, B Day, S Trost, N Bradford, **J Bunt** & G de Zubicaray et al – Virtual centre for child and adolescent brain cancer research (awarded to and administered by UQ's Institute for Molecular Bioscience), 01/01/2019 – 30/06/2021, \$3,500,000.

Ecological Society of Australia

Holsworth Endowment Round 1

H Middleton – Behavioural evidence of pheromone use by an elasmobranch, 20/07/2019 – 20/07/2020, \$6,375.

Engineering and Physical Sciences Research Council (EPSRC)

EPSRC International Centre-to-Centre Research Collaborations

A Philippides, T Nowotny, P Graham, J Marshall, M Mangan, E Vasilaki, **B Van Swinderen**, A Barron & K Nordstrom – ActiveAI – active learning and selective attention for robust, transparent and efficient AI (awarded to and administered by University of Sussex), 01/07/2019 – 30/06/2022, \$917,753.

German Research Foundation

DFG Fellowship

I Kirmes – Unravelling a small non-coding RNA interface between the mitochondrial and nuclear genomes (In German), 01/04/2019 – 31/03/2021 (Administered by DFG host university).

Great Barrier Reef Foundation

Reef Trust Partnership – Community Reef Protection Grant Program – Stage 1: Citizen Science

CoralWatch – Educating communities to help ACT and PROTECT our Great Barrier Reef, 31/05/2019 – 31/05/2021, \$99,200.

Illawarra Health and Medical Research Institute

Justin Yerbury Travel Scholarships

R San Gil – Travel award, 01/01/2019 – 31/12/2019, \$2,500.

Mater Misericordiae Ltd

Project Grant

J Vukovic & I Winkler – Helping damaged brains recover (awarded to and administered by UQ's School of Biomedical Sciences), 27/06/2019 – 27/10/2021, \$45,100.

Medical Research Future Fund

MRFF Accelerated Research – Clem Jones Centre for Ageing Dementia Research

J Götz & P Sah – Breaking through dementia – The Clem Jones Centre for Ageing Dementia Research, 01/04/2019 – 31/04/2023, \$10,000,000.

MRFF Frontier Health and Medical Research Program

J Götz, E Wolvetang, A Whittaker, A White, K Iyer, N Smith, P Harris, J Gamble, T McSweeney, P Thomas, K McMahon, R Steck, & C Brown – Therapeutic ultrasound for the treatment of brain disorders, 07/01/2019 – 30/06/2020, \$1,000,000.

Motor Neurone Disease Research Institute of Australia

Betty Laidlaw MND RIA Research grant

M Morsch, **A Walker**, A Lee & R Chung – Targeting the nucleo-cytoplasmic transport machinery in sporadic and familial ALS (awarded to and administered by Macquarie University), 01/01/2019 – 31/12/2019, \$250,000.

MND RIA Jenny and Graham Lang Collaboration Travel Grant

B Berning – Golgi dysfunction is an early event associated with TDP-43 pathology formation in ALS, 04/12/2019 – 06/12/2019, \$1,500.

Motor Neurone Disease Victoria

MND (Victoria) – The Nina Buscombe Award

H Brown-Wright – 2019 Nina Buscombe Award, 12/04/2019 – 12/06/2019, \$1,600.

R San Gill – 2019 Nina Buscombe Award, 12/04/2019 – 12/06/2019, \$1,600.

J Venturato – 2019 Nina Buscombe Award, 12/04/2019 – 12/06/2019, \$1,600.

National Foundation for Medical Research and Innovation

National Foundation for Medical Research and Innovation grant

R Chung, **A Walker**, L Ittner, A Lee & S Rayner – Pre-clinical evaluation of novel therapies for clearance of TDP-43 in amyotrophic lateral sclerosis (awarded to and administered by Macquarie University), 01/01/2019 – 30/06/2020, \$183,488.

National Health and Medical Research Council

Project Grants

T Bredy – Toward a deeper understanding of new DNA modifications in fear-related learning, 01/01/2019 – 31/12/2022, \$666,876.

E Coulson & K-H Chuang – Mechanisms and consequences of cholinergic neuron degeneration in sleep apnea (awarded to and administered by UQ's School of Biomedical Sciences), 01/01/2019 – 31/12/2021, \$932,284.

J Götz & J Polanco – Unravelling how exosomes induce and propagate tau pathology, 01/01/2019 – 31/12/2021, \$827,521.

R Harvey & **A Keramidias** – Investigating NMDA receptor-mediated pathological mechanisms underlying epilepsy and associated neurological disorders (awarded to and administered by the University of the Sunshine Coast), 01/01/2019 – 31/12/2021, \$592,755.

M Hilliard – Understanding the role of the metalloprotease ADM-4/ADAM17/TACE in promoting axonal repair, 01/01/2019 – 31/12/2021, \$676,653.

M Hilliard – Understanding the role of UNC-71 in axonal regeneration, 01/01/2019 – 31/12/2021, \$676,653.

J Mattingley, E Arabzadeh & **M Tang** – How do visual predictions affect neural coding? From whole brain systems to single neurons, 01/01/2019 – 31/12/2021, \$709,254.

B Mowry & J Giacomotto – Investigating the neuro-developmental role of schizophrenia-associated genes using the zebrafish, 01/01/2019 – 31/12/2021, \$481,890.

P Opazo & D Choquet – The role of calcium/calmodulin-dependent protein kinase II in Alzheimer's disease, 01/01/2019 – 31/12/2021, \$684,920.

S Naismith, **M O'Sullivan**, C Klijn, R Al-Shahi Salman, X Wang, M Barnett, C Carce & Z Zhou – Triple therapy prevention of Recurrent Intracerebral Disease Events Trial (TRIDENT) – Cognitive sub-study (awarded to and administered by Sydney Medical School, University of Sydney), 01/01/2019 – 31/12/2023, \$1,416,383.

L Richards, G Goodhill & R Suárez – Role of spontaneous activity in the formation of functional cortical circuits in vivo, 01/01/2019 – 31/12/2021, \$528,990.

P Sah, D Jhaveri – Unravelling amygdala-hippocampus neural circuitry of anxiety: Role of adult-born neurons, 01/01/2019 – 31/12/2022, \$874,384.

J Scott, S Blum, B Lennox, J Greer, B O'Donoghue, M Benros, D Siskind & **S Suetani** – Identifying and treating patients with psychosis who are positive to anti-neuronal antibodies (awarded to and administered by UQ's Centre for Clinical Research, Faculty of Medicine), 01/01/2019 – 31/12/2021, \$810,745.

S Tye – Circuit, cellular and synaptic mechanisms of nucleus accumbens deep brain stimulation, 01/01/2019 – 31/12/2022, \$642,948.

B van Swinderen – Bridging the gap between electrical and molecular sleep functions in the brain, 01/01/2019 – 31/12/2021, \$435,792.

B van Swinderen – Presynaptic control of general anaesthesia, 01/01/2019 – 31/12/2022, \$786,568.

S Zuryn – Molecular protection against mitochondrial DNA damage, 01/01/2019 – 31/12/2021, \$525,157.

Research Fellowship

F Meunier – Senior Research Fellow B – Nanoscale imaging of presynaptic proteins in health and disease, 01/01/2019 – 31/12/2023, \$717,275.

Pacific Coral Reef Institute & OPT ECO

Early Career Researcher Grant

L Fogg – Illuminating the impact of light pollution on the visual development of reef fish in French Polynesia, 01/09/2019 – 30/09/2020, \$7,600.

Port of Brisbane Pty Ltd

Community Grant Program

J Marshall, K Hofman & D Kleine (CoralWatch) – Moreton Bay corals at your doorstep- Education package, 01/07/2019 – 30/06/2020, \$15,000.

Queensland State Government

Advance Queensland Women's Research Assistance Program (WRAP)

R Giordano Santini – 25/11/2019 – 25/05/2020, \$19,500.

J Widagdo – 05/10/2019 – 06/04/2020, \$19,393.

J Zhao – 16/09/2019 – 26/04/2020, \$19,500.

Department of Environment and Science: 2019 National Science Week- Regional STEM Program

CoralWatch – Virtual Reality (VR) Experience Training, 01/07/2019 – 06/09/2019, \$2,832.

Advance Queensland: Citizen Science Grant Round 1 2019

CoralWatch – Get Involved – Colours of the Reef, 01/08/2019 – 31/08/2021, \$29,022.

National Science Week grant

CoralWatch – Coral Reefs – Immerse, Learn and Act, 8/10/2019 – 8/18/2019, \$17,037.

Rebecca L. Cooper Medical Research Foundation

Research Grants

J Giacomotto – Unveiling the pathogenic role of the schizophrenia and autism risk-gene NRXN1 in synaptogenesis, 04/01/2019 – 31/03/2021, \$100,000.

UQ Heron Island Research Station Scholarships

H Middleton – Behavioural evidence of pheromone use by an elasmobranch, 26/06/2019 – 25/06/2020, \$2,000.

US Dept. of Defence Office of the Congressionally Directed Medical Research Programs (CDMRP)

Amyotrophic Lateral Sclerosis Research Program (ALSRP) Therapeutic Development Award

M Wilson, **A Walker** & A Laird – Rapid flow cytometry screen for identifying novel ALS drug leads (awarded to and administered by The University of Wollongong), 01/01/2019 – 31/12/2020, \$763,452.

Walter and Eliza Hall Institute

2019 Walter and Eliza Hall Travelling Scholarship

V O'Callaghan – Genetic and environmental influences associated with sleep and depression in adolescent twins, 11/01/2019 – 31/12/2020, \$2,627.

The University of Queensland

UQ Genomic Innovation Hub

R San Gil & A Walker – Genome-wide CRISPR screening for modifiers of diverse cellular phenotypes, 01/07/2019 – 30/06/2020, \$51,842.

E Wolvetang, J Mar & **S Ngo** – Automated single cell quantitative in situ gene expression in cells and tissues (AutoMerFISH) (awarded to and administered by UQ's Australian Institute for Bioengineering and Nanotechnology), 01/01/2020 – 31/12/2020, \$50,000.

Major Equipment and Infrastructure grants (MEI)

P Sah, L Richards, J Götz, H Cooper, G Goodhill, F Meunier, A Yap, **D Eyles**, A Rowan & G Xu – Histology and Advanced Microscopy Research Facility upgrade, 01/01/2019 – 31/12/2019, \$250,000.

K Barlow, R Boyd, L Cocchi, C Middeldorp, **J Mattingley**, H Heussler, M Meinzer & G Wallace – KidSTIM: A non-invasive neuromodulation laboratory to simultaneously improve insight and treatment of brain disorders for children in Queensland (awarded to and administered by UQ's Child Health Research Centre), 01/01/2019 – 31/12/2019, \$240,700.

J Stokes, G Xu, M Gidley, A Nguyen, S Wu, L Wang, A Whittaker, **H Cooper**, L Ye, D Batstone, H Smyth, H Huang, M Heitzmann, S Mahler, C Yu, N Mitter, K Thurecht, B Carroll, Y Sultanbawa, T Mahony, P Jensen, M Dargusch, P Mills,

P Meehan, L Wang, B Laycock, K Steel, H Shewan, G Zhao, L Li & D Harrich – Advanced nanoparticle, colloid and microparticle characterisation and precision engineering nanosystems facility (awarded to and administered by UQ's School of Chemical Engineering), 01/01/2019 – 31/12/2019, \$243,939.

P Burn, P Young, B Schulz, M Walker, M Schembri, J Fraser, C Williams, E Gillam, G Schenk, J De Voss, J Rothnagel, M Fortes, M Monteiro, V Ferro, U Kappler, I Toth, J Clegg, R Hall, **K Cheney**, T Woodruff, A Tabor, P Ebert, R Clark, S Mahler, C Beveridge, B Gilbert, D Batstone & A Nouwens – A versatile accurate mass, high resolution QTOF mass spectrometer for chemistry and proteomic applications (awarded to and administered by UQ's School of Chemistry and Molecular Biosciences), 01/01/2019 – 31/12/2019, \$320,317.

E Coulson, S Walters, M Piper, O Rawashdeh, M Reichelt, L Kaminskas, K Borges, G Gobe, T Woodruff, M Ruitenbergh, D Simmons, J Cuffe, T Svensen, D Ng, M Smith, M Bellingham, C Stephan, J Cooper-White, B Rolfe, K Schroder, A Van Der Ent, E Assadi Soumeih, F Davis, M Short, B Degnan & **A Walker** – Advanced Brightfield and Fluorescent High Speed and Throughput Slide Scanner for biological, medical, materials science, and agricultural applications (awarded to and administered by UQ's School of Biomedical Sciences), 01/01/2019 – 31/12/2019, \$274,725.

Research Facilities Infrastructure grant (RFIG)

D Abramson, B Lovell, E Scott, I McCulloch, X Zhou & **J Carroll** – Expanding Wiener, a high-performance GPU cluster (awarded to and administered by UQ's Research Computing Centre), 01/01/2019 – 31/12/2019, \$590,000.

D Reutens, N Kurniawan, A Rowan, K Thurecht, **K-H Chuang, F Nasrallah, E Coulson**, & C Chen – Dissolution DNP Hyperpolariser (awarded to and administered by UQ's Centre for Advanced Imaging), 01/01/2019 – 31/12/2019, \$220,000.

R Wepf, B Hamilton, I Brereton, K Thurecht, E Undheim, M Mobli, D Craik, G King, A Jones, M Garson, **K Cheney**, R Fry, & **F Meunier** – Imaging mass spectrometry at higher mass resolution (awarded to and administered by UQ's Faculty of Science), 01/01/2019 – 31/12/2019, \$529,896.

Amplify Women's Academic Research Equity (AWARE) Program

G Bodea – UQ AWARE (awarded to QBI but transferred to UQ-MRI in 2019) 14/01/2019 – 12/07/2019, \$50,000.

F de Busserolles – UQ AWARE, 25/01/2019 – 14/01/2020, \$50,000.

J Widagdo – UQ AWARE, 10/4/2019 – 4/3/2020, \$50,000.

Early Career Researcher Grants

Z Li – Molecular mechanisms of temporal motor control, 01/01/2019 – 31/12/2019, \$35,000.

S Tye – Common mechanisms of anti-suicidal drug action, 01/01/2019 – 31/12/2019, \$32,000.

Promoting Women Fellowship

X Cui – Promoting Women Fellowship 2019 Round, 01/01/2019 – 31/12/2019, \$12,500.

UQ-NHMRC Equipment Grant

L Richards, P Sah, F Meunier & R Amor – Advanced microscopy facility camera upgrades, 01/01/2019 – 31/12/2019, \$79,181.

Awards

Queensland Brain Institute

QBI Travel Award for Best Postdoctoral Publication

A Ahier - First Prize (2018), 01/01/2019 – 31/12/2020, \$1,000.

F Cortesi - First Prize (2019), 01/01/2020 – 31/12/2020, \$1,000.

Australian Institute of Policy and Science (AIPS)

Young Tall Poppy Science Awards

L Fenlon - 2019 AIPS Young Tall Poppy Science Award, 13/09/2019 – 12/09/2021, \$10,000.

J Kesby - 2019 AIPS Young Tall Poppy Science Award, 02/08/2019 – 31/12/2019, \$10,000.

Australian Academy of Health and Medical Sciences

2019 Australian Academy of Health and Medical Sciences Fellow

P Sah - Fellow of the Australian Academy of Health and Medical Sciences.

Australasian Neuroscience Society

Mark Rowe Award

X Li - Prize for best publication of the year, 01/01/2019 – 31/12/2019, \$1,000

Australasian Community for Advanced Organic Semiconductors (AUCAOS)

Oral Prize for an outstanding oral presentation of organic semiconductor research

M Kielar - Ultra-low light detection through changes in open-circuit voltage in organic photodiodes, 01/01/2019 – 31/12/2019, \$200 (gift voucher).

Commonwealth of Australia

Order of Australia Medal

L Richards - 2019 Order of Australia recipient

Falling Walls Lab

2019 Falling Walls Lab Queensland

S Bandhavkar - Breaking the Wall of Depression, 12/04/2019 – 30/09/2019.

2019 Falling Walls Lab Australia

A Zhou - Breaking the wall of age-related memory deficits, 03/09/2019 – 08/11/2019.

National Alliance for Research on Schizophrenia and Depression

2019 NARSAD Lieber prize

J McGrath - 11/01/2019 – 31/12/2020, \$37,500.

2019 NARSAD Maltz prize

J Kesby - 08/06/2019 – 31/12/2019, \$20,000.

Life Sciences Queensland

Rose-Anne Kelso Commemorative Award

S Ngo - (awarded to and administered by UQ's Australian Institute for Bioengineering and Nanotechnology) 01/01/2019 – 31/12/2019, \$3,000.

The Cajal Club

2019 Krieg Cortical Kudos Explorer Award

R Suárez - 20/10/2019 – 19/10/2020, \$3,000.

Australasian Chronobiology Society

2019 Australasian Chronobiology Society Research Excellence Award

V O'Callaghan - 15/10/2019 – 14/10/2020.

The University of Queensland

UQ Award for Excellence in Higher Degree by Research Supervision

T Burne - 01/01/2019 – 01/01/2019, \$5,000.

Our Communities



Our internal 2019 award winners. (L-R): Harrison Evans and Sean Keating (back). Cheryl Filippich, Heather Smith, Rachel Gormal (front).

Early-Career Researchers

We are home to a thriving community of early-career researchers, whose passion and energy is advancing our neuroscience research and unravelling the mysteries of the brain.



Top left: Drs James Kesby and Laura Fenlon received Tall Poppy Awards. Bottom left: Dr Rodrigo Suárez won the Cortical Explorer Award. Right: Dr Rebecca San Gil was awarded a \$300,000 grant from FightMND.

Some of the 2019 highlights from our ECR community are:

Dr Fabio Cortesi was co-first author on a *Science* paper that revealed that certain species of deep sea fish may have highly sensitive colour vision. The paper found that the silver spinyfin possessing the highest number of light-sensitive proteins, called opsins, of any vertebrate known to date, despite living at depths where most sunlight has been filtered out. The paper, which made the journal cover, also involved QBI ECR Dr Fanny de Busserolles.

Our ECRs received local, national and international awards in recognition of their world-class research. **Dr James Kesby** was presented with the US\$20,000 Maltz Prize for Innovative and Promising Schizophrenia Research from the New

York-based Brain & Behavior Research Foundation for work focused on understanding the relationship between cognitive problems and psychotic symptoms in people with schizophrenia.

Dr Kesby and Dr Laura Fenlon received Queensland Young Tall Poppy Awards for demonstrating excellence in both research and science communication. Dr Kesby is focusing on ways to improve the long-term outcomes for people with schizophrenia by studying decision-making skills, while Dr Fenlon investigates connections in the brain, which has implications for conditions such as autism and schizophrenia and also for improving brain function and recovering from disease.

Dr Rodrigo Suárez received the Krieg Cortical Explorer award for his outstanding

contributions to the understanding of the development and evolution of the cerebral cortex. The award was presented during the Society for Neuroscience meeting in Chicago.

Our ECRs were also successful in winning independent competitive funding to progress their research and drive the generation of fundamental knowledge and the advancement of new therapies for neurological disorders. **Dr Rebecca San Gil** received a \$300,000 grant from FightMND to study how nerve cells die in motor neurone disease. **Dr Laura Fenlon** was awarded an Emerging Leadership Fellowship worth more than \$500,000 to investigate the capacity of the brain for neuroplasticity during different stages of brain development.

QBI Students

In 2019, QBI had 100 Higher Degree by Research students enrolled, including 95 PhD students, one Master of Philosophy (MPhil) candidate and four MPhil in Neuroscience candidates.

Eight QBI students were conferred their PhDs, and three students were awarded their MPhil.

Alessandra Donato PhD

Principal advisor: Professor Massimo Hilliard
Neuronal response to reactive oxygen species and axonal compartmentalization in *C. elegans* neurons

Lee Fletcher PhD

Principal advisor: Professor Stephen Williams
Dendritic integration in principal neurons of the primary visual cortex

Andrea Giorni PhD

Principal advisor: Professor Pankaj Sah
Neurophysiological insights from micro-electrode recordings in DBS patients

Se Eun Jang PhD

Principal advisor: Dr Victor Anggono
Characterisation and roles of the postsynaptic Ca²⁺ sensor Copine-6 in primary neurons

Ravi Kiran Kasula PhD

Principal advisor: Professor Frederic Meunier
Dynamic re-organisation of Munc18-1 and syntaxin-1A nanodomains on the plasma membrane of neurosecretory cells during exocytosis

Martin Luehrmann PhD

Principal advisor: Professor Justin Marshall
Colour vision diversity in coral reef fishes: Cardinalfish (Apogonidae)

Jessica Jean McFadyen PhD

Principal advisor: Dr Marta Garrido
Shortcuts for fear in hierarchical visual systems

Xiaoqing Zhou PhD

Principal advisor: Professor Perry Bartlett
The structural and functional changes observed in the aged murine hippocampus are ameliorated by physical exercise in a neurogenesis-dependent manner

Drew Cylinder MPhil

Principal advisor: Associate Professor Bruno van Swinderen
The effects of the general anaesthetic propofol on *Drosophila* larvae

Clare Harris MPhil

Principal advisor: Dr Marta Garrido
Modelling the brain as it models environmental statistics under different levels of volatility, threat and attention: Using Bayesian Model Selection on neuroimaging data to examine regularity learning under different levels of volatility, threat and attention

Chai Chee Ng MPhil

Principal advisor: Dr Steven Zuryn
Discovery of molecules that suppress the effect of mitochondrial genome damage.



Graduate Profile: Alessandra Donato

Years of hard work have led Dr Alessandra Donato to the cusp of a discovery that could result in new treatments for neurodegenerative diseases like Alzheimer's and Parkinson's disease.

After moving to Australia from Italy in 2013, she completed her PhD in Neuroscience in the Hilliard laboratory at the Queensland Brain Institute in March, 2019.

Dr Donato studied oxidative stress in neurons in the roundworm *Caenorhabditis elegans*.

Dr Donato undertook vital experiments on how to stop the neurons from dying – a hallmark of neurodegenerative diseases.

"The molecule I identified in my PhD as protecting against oxidative stress in roundworm neurons is now being tested in mammals."

Dr Donato has relished her time at UQ, describing the Queensland Brain Institute as a place of excellence, and said she was excited to continue her work here.

"What I am trying to achieve is really so much bigger than me – we are trying to find something that will help people and will improve our understanding of the biological process of oxidative stress in neurons and the consequent neurodegeneration."



Scholarship Winner

Sachithrani Umada Madugalle from Associate Professor Timothy Bredy's lab was one of only 17 students nationwide to receive a 2019 Westpac Future Leader Scholarship, awarded to exceptional thinkers with ambition, drive and a generosity of spirit.

"We're interested in neuroplasticity – how the brain learns from experience – in particular, fear learning," Ms Madugalle said. "When you have a fearful experience, the brain learns to associate that experience with an environmental cue. To abolish that fear, the brain must be repeatedly exposed to that cue without any negative consequences."

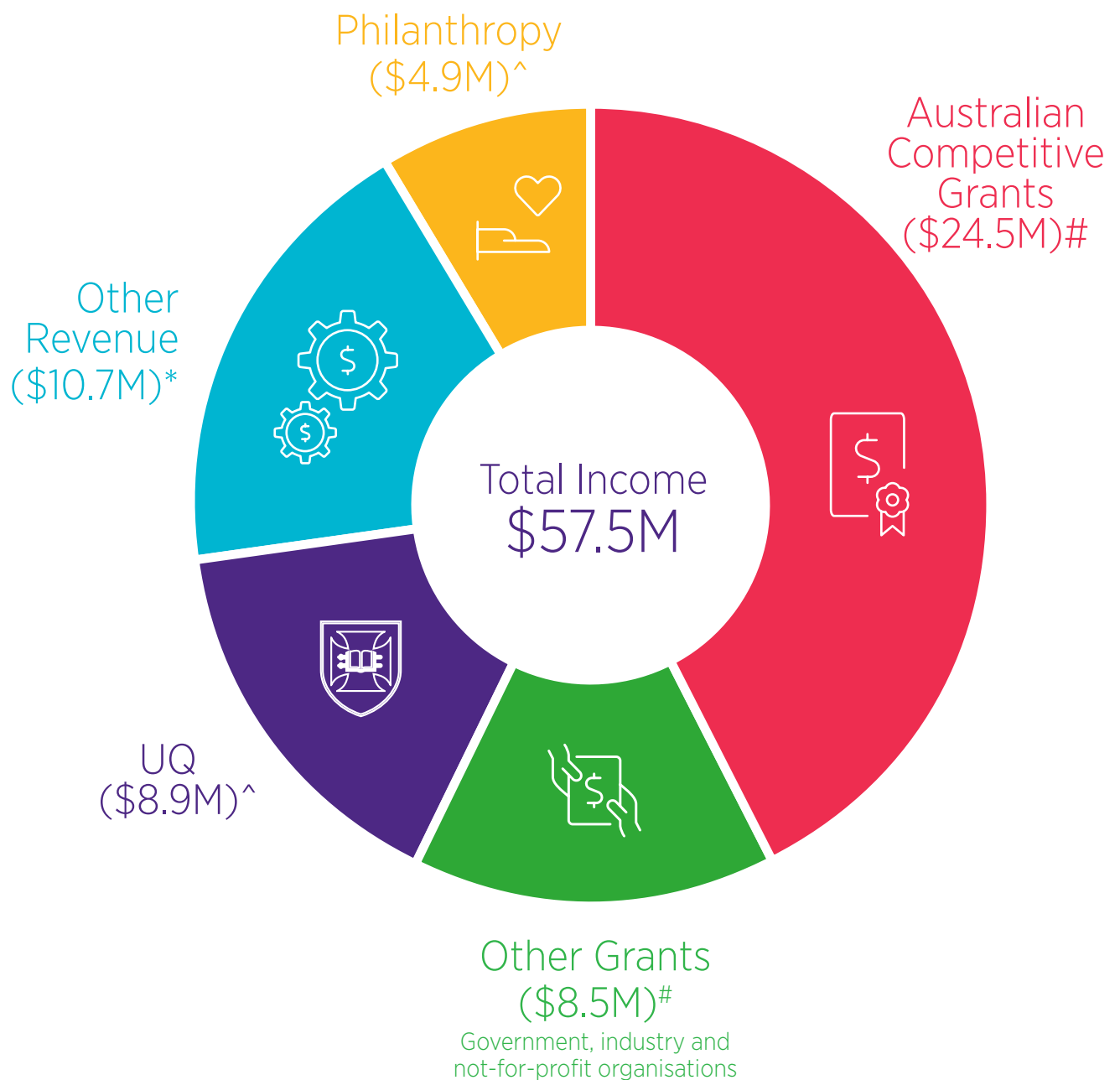
"Underlying this process is a whole suite of genetic responses known as epigenetics, which is when changes in gene expression occur in response to the environment, or any mechanism other than changes to the underlying genetic sequence.

"My project involves developing innovative techniques that do not exist anywhere in the world to enable us to study how fear learning occurs in the brain at the level of our genes."

It's important fundamental research that will not only provide insights into how our brain functions, but could also form the basis of treatments for fear-related disorders.

"In the future, if we can identify which types of genes and how they're changing in response to the environment, maybe we can therapeutically manipulate them as well to provide a therapy for PTSD or phobias," said, Ms Madugalle, who is the third student from the Bredy lab in three years to win one of the prestigious scholarships.

Funding and income



Amount allocated for 2019

^ Amount received in 2019

* Includes: Commonwealth Research Block Grant; commercial services, fees & charges; and other operating income

Impact of Philanthropy

In 2019, with the incredible support of QBI's long-term partners, UQ, Government, philanthropic foundations and, most importantly, our valued individual donors, we have been able to continue to grow and progress our important research programs.

QBI raised a total of \$6.81M from 668 donors in 2019. We pride ourselves on working hard to meet the expectations of our generous donors, ensuring their experience is meaningful.

All gifts, whether large or small, are important. Philanthropic donations are crucial in supporting QBI's early-stage,

fundamental research, which is at the core of allowing our researchers to discover what happens in both the healthy and diseased brain, to achieve translational outcomes.

This year, the establishment of QBI's Discovery Research Endowment Fund, was an important achievement, which will help ensure the future sustainability of QBI and support all scientists who are concentrating on curiosity-driven research. This funding gives them the freedom to focus on uncovering entirely new possibilities which may potentially unearth major discoveries.

We cannot thank our many donors and community advocates enough, who continue to support QBI and give so generously each year. Your donations and support, in raising awareness of QBI, is indispensable,

and a vital means of cultivating the next generation of scientists and innovators.

QBI brings together smart minds in a smart environment to explore areas that may lead to medical breakthroughs, including combating some of humanity's biggest health issues. Through the continued support of our donors, in the long term, QBI researchers may produce outcomes that could one day change the world. Your support helps us maximise our impact for the future.

Thank you to our valued donors for your support in 2019. We would especially like to acknowledge the generous and continued support of the Clem Jones Foundation, The Brazil Family Foundation and the Stafford Fox Medical Research Foundation.



(L-R): Andrea Markey, Director of Advancement; Jeff Maclean, Chairman, Advisory Board; Dr Rebecca San Gil, researcher.

How your donations helped

NFIA Trekkers do the hard yards for QBI

Through the hard work of Brian Davies, a successful businessman and immediate past-president and patron of the National Fire Industry Association (NFIA), and his wife, Liz, QBI was the joint-recipient of a donation of over \$250 000 in 2019. This incredible effort was the result of the NFIA Patron's Walk held in October, which may sound like a scenic walk in the park but Brian, Liz and seven other NFIA members spent three days enduring driving rain and winds of close to 50 knots coming straight off Antarctica.

The idea for the walk came while the couple were completing the Three Capes Walk to raise money for the Queensland Brain Institute in 2018. On that walk, Liz suggested to Brian that as the patron of the National Fire Industry Association, he could create his own patron's walk for charity. Mr Davies believes that corporate Australia has a big responsibility to give back, which is testament to the success of the inaugural walk. The money raised was shared between the Queensland Brain Institute and the Gallipoli Medical Research Foundation.

The NFIA walk is the first of three walks to raise money for research at QBI and GMRF, with the aim of raising \$500 000 in three years. The donation from the NFIA walk will help QBI's research into motor neurone disease, dementia, Parkinson's disease, stroke and QBI's Discovery Research Endowment fund, which enables fundamental research into major health issues, including depression, anxiety, PTSD and epilepsy. QBI is extremely grateful to Brian and Liz and the NFIA team for their support in 2019.



In 2019, the National Fire Industry Association (NFIA) Australia Patron's Annual Walk for Charity, along the Great Ocean Walk, raised over \$125 000 to support priority research at the Queensland Brain Institute (QBI) at The University of Queensland (UQ).



Since 2014, The Stafford Fox Medical Research Foundation has supported healthy ageing and stroke-induced dementia research at QBI, donating \$8.5M. Paul (Stafford Fox Foundation Trustee) and his wife, Susan, visited QBI in October, 2019, to meet with Professor Pankaj Sah (QBI Director) and Dr Steven Zurn and Emeritus Professor Perry Bartlett AO (back row).

The Stafford Fox Medical Research Foundation

In 2019, The Stafford Fox Medical Research Foundation confirmed its continued generous support of the prestigious \$2.5 million philanthropically funded international fellowship to Dr Steven Zurn at the Queensland Brain Institute to fight stroke-induced dementia, also known as vascular dementia. The Foundation also continues to support the work of Emeritus Professor Perry Bartlett's research into prevention of dementia in ageing by improving cognition through exercise.

The Stafford Fox Medical Research Foundation was established in 2013 following the death of Moyna Fox, and named in honour of her late husband, James Stafford Fox, a former BP Australia chief executive. Stafford and Moyna Fox started one of Australia's wealthiest medical research foundations after many years of careful planning, resulting in a fund worth over \$100 million. It was only publicly revealed in Moyna's will when she died in 2013, many years after her husband.

James Stafford Fox was a private person, tall, physically imposing, but without a

particularly dominant personality. He rose from a position as a junior clerk at the Port Melbourne depot of the Commonwealth Oil Refineries (COR) in 1932, to become the first Australian chief executive of BP Australia Ltd in 1971. In World War II, Stafford served in New Guinea where, in 1944, he was mentioned in despatches for bravery. He contracted malaria and spent many months recuperating in Melbourne but his military service triggered qualities of leadership and marked the beginning of a steady rise in the business world, and of careful investment in the future. One of his first partners was John Holland, later to become Sir John Holland AC, founder of one of Australia's great engineering and construction firms, involved in building the Snowy Mountains Scheme, Parliament House and many other projects. Stafford Fox was a colleague of Holland's in the army in Darwin, and an early investor in Holland's business, serving as a director for 36 years from 1949.

Stafford spent three years at the helm of BP Australia, and retired in 1974 at age 60,

remaining on several boards until 1985. By 1990, he was in poor health, suffering, among other things, from dementia. He entered a nursing home and died in 1994. By that time, he had already charted the course that would lead to the establishment of the foundation. Moyna lived on Research for more than 18 years, knowing what would happen after her death, but never revealing it publicly. Eventually, she too succumbed to dementia and died in 2013. The couple, who were so careful with their money and who clearly had no desire for fame and prominence during their lifetime, will now forever be remembered for their generosity in setting up the Stafford Fox Medical Foundation.

The Foundation's support of QBI is crucial in enabling Emeritus Professor Bartlett and Dr Steven Zurn to continue their work in finding solutions for the growing challenge of dementia today. This cutting-edge research is helping put Queensland and Australia at the forefront of world medical research.

2019 Donors

Bequests

QBI expresses its sincere appreciation for the charitable bequests received from estates in 2019.

Principal Gift – Organisations

The Brazil Family Foundation

The Stafford Fox Medical Research Foundation

Major Gifts – Organisations

Josef Reisinger Foundation
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The Donald and Joan Wilson Foundation
The MND and Me Foundation Limited
The Terry and Maureen Hopkins Foundation
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Elizabeth Jameson	Robert and Pam MacDonnell	Maureen O'Driscoll	Catherine Simons	Jessica Weatherall
Abdul Jarrah	James MacDonnell	Ruth O'Hanlon	Roger Simons	Nicole Weatherley
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Stephanie Jillett	Jeff and Fran Maclean	Ong Family	Debbie Smart	Guyatt West
Ronald Johnson	Hilda Maclean	Andy Opanowycz	Anthony Smith	Charlotte West
Eddie Johnstone	Daphne Maclean	Narelle O'Shanesy	Kim Smith	Kate Weston
Jamie Jones	Annie Macnaughton	Gabrielle O'Shea	Dorothy Smith	Ja Wheatley
Ellie Jones	Peter Madsen	Peter O'Sullivan	Ian Smurthwaite	Wendy Whitby
Steven Jones	Christine Mah	Jenette Otter	Stephen Smykowski	Darryl White
Annie Jordan	King Mak	Peter Paine	Ann Spargo	Janice Wilke
Paige Karklis	Sarah Manson	Jodie Paine	Robyn Staggs	Margaret Wilkins
Lee Kemp	Pamela Mar Fan	Suzanne Parker	Elke Stapf	Greg Willcox
Jennifer Kennedy	Giles Markey	Johanne Parsons	Dr Margaret Steinberg AM and Richard Steinberg	Kym Willey
Geoffrey Kent	Andrea Markey	Francesca Paterson	Brigit Steindl	Clive Williams OAM
Ruth Kerr OAM	Janice Marshall	Sharon Payne	Glenn Stephenson	Caroline Williams
Helen Kerr	Barrie Mawby	Graeme Pearce	Maureen Stevenson	Darryl Woodrow
Bobby Ketchersid CPA	Gail McCallum	Erin Pearl	Kevin Stewart	Peter Woodward
Anne Keys	Donald McClintock	Jill Penridge	Fiona Stewart	Cameron Worley
Nur Khan	Elizabeth McCowan	Andrew Pentland	Edward Stoios	Lorinda Wright
Judith Kincade	Margaret McDonald	Andy Perry	Rachael Stowasser	Christopher Wright
Jerusha King	Margaret McGregor	Suzie Phillips	Lloyd Studders	Irene Yii
Steven Kirby	Moya McKenzie	Clare Phillips	Leanne Sturgess	Andrew Young
Yvonne Kirkegard	Alana McLelland	Karen Platz	Lois Sullivan	Billy Young
Terrence Kitchin	Cath McMurchy	Glenda Powell AM	Geoffrey Swartz	Frank and Patsy Youngleson
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Helen Kornoff	Steven Miles MP	Beverly Quinn	Aimee Thomson	Neil Zouaoui
Maria Kravchenko	Peter Millar	Judy Quintal	Jacob Tilse	Jeannette Zubevich
Amadeo Kuypers	John Miller	Linda Rahrs	Anne Tobin	
Sandra Lacey	Lesley Mills	Camille Rains Johnson	Heather Todd	
Jeanette Lamont	Guy Mitchell	Joady Raph	Anthony Toohey	
William Lanagan	John Morris	Philip Reeves	Fiona Treadwell	
Manus Lang	Kelly Morrow	Suzie Reid	Elise Treleaven	
Noel Langford	David Muir	Colin Rendell	Steve Trevor	
Nikki Langton	Andrew Muir	Brooke Reynolds	Janet Trevorrow	
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A sincere thank you to our donors who prefer to remain anonymous.

How to support the Queensland Brain Institute

Donations

There are many ways in which you can help support QBI's research effort, including:

- Make a donation for a specific research area
- Make a donation for the purchase of scientific equipment
- Fund scholarships for talented students
- Provide fellowships for early- to mid-career scientists
- Support Professorial Chairs
- Undertake laboratory dedications
- Provide gifts in memoriam
- Fundraise using the community fundraising platform Everyday Hero.

Bequests

By leaving a bequest to QBI in your will, you are leaving a lasting legacy that accelerates current research and preserves future projects. Bequests can include:

- A percentage of an estate
- The residuary of an estate (what remains after all other gifts and costs have been deducted)
- A gift of a specific sum of money
- A particular asset, such as property, works of art, shares, or an insurance policy.

Under current legislation, gifts to the Queensland Brain Institute are tax deductible. To discuss how you can support the Institute, please contact us at:

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Public and scientific engagement



Queensland Brain Institute's Associate Professor Bruno van Swinderen presented on "The science of sleep" as part of The University of Queensland Global Leadership Series in March, 2019.

Public engagement

Our public engagement gives us the chance to inform the community about our research, educate the public on the importance of neuroscience research and create a shared sense of pride in what we are achieving in Australia with their support. We also find that bringing people through our laboratories, or sending scientists into the community, can result in our researchers feeling a renewed sense of purpose and inspiration in their work.

In 2019, our public engagement spanned named lectures, community events and talks and tours through the QBI laboratories. We once again held a series of breakfasts covering research into motor neurone disease, artificial intelligence, stroke and dementia. Another annual highlight is hosting rounds of the Australian Brain Bee. Established by Professor Linda Richards, our Deputy Director (Research), in 2006, these events challenge some of the nation's brightest school students to learn more about the brain, as well as neuroscience research and careers. Some of the top-performing students then undertook work experience in our laboratories later in the year. With previous winners going on to join us as research students, the Brain Bee is a very valuable opportunity for both QBI and the students.

Peter Goodenough Memorial Lecture

One of the highlights of our engagement calendar each year is the Peter Goodenough Memorial Lecture, which recognises the generosity of Peter Goodenough in leaving a bequest to establish an MND research laboratory.

In 2019, we were privileged to welcome Dr Norman Swan to deliver the lecture. Dr Swan is one of Australia's leading health communicators, who combines mass public appeal with rigorous credentials. A former clinician, he is

now the host of ABC Radio National's *The Health Report*, which is the world's longest-running health program in the English-speaking world. Dr Swan has won numerous awards, including the nation's top prize for journalism, the Gold Walkley.

In his lecture, which drew an audience of scientists, clinicians and community, Dr Swan explored key features of medical research: serendipity, curiosity and goal-driven. He discussed the balance of curiosity-driven research versus goal-oriented investigation and how we ensure that both can be accommodated to provide effective prevention, cures and new treatments. Dr Swan also covered the expectations of donors, and how philanthropy could enable such research, now and into the future. The captivating talk also included anecdotes from his time in media, including as medical consultant for reality show *The Biggest Loser*.



Dr Norman Swan, Professor Pankaj Sah and co-trustees of the Peter Goodenough Bequest, Mr Clive Jackson and Mr Neil Matheson

Memorial Celebration of Emeritus Professor Jack Pettigrew's Life in Science

We were privileged to host a memorial celebration for Emeritus Professor Jack Pettigrew, who passed away suddenly in May. The celebration, which was held in October, brought together family, past colleagues and students to pay tribute. Jack was a world-leading neuroscientist with a colourful personality who made seminal discoveries in vision including the neural basis for binocular vision, and was a Fellow of both the Royal Society of London and the Australian Academy of Science.

Speakers reflected on aspects of Jack's life including his time at medical school,

Berkeley, Caltech, his leadership of National Vision Research Institute of Australia in Melbourne, and then his appointment as a Professor of Physiology and head of UQ's Vision, Touch and Hearing Research Centre, the first ARC centre funded in Queensland. Also highlighted was Jack's love of the bush and his passion for hiking and rock climbing – he was one of the first people to explore some of the Blue Mountains canyons, and made the first ascent on many rock climbs, including being part of the first group to climb Ball's Pyramid, the world's tallest volcanic stack. Jack

was hailed as inarguably one of the great polymaths, interested in a range of topics that extended in his retirement to rock art and baobab trees, of which he discovered a new species in 2012.

Thanks to everyone who attended in person and virtually, particularly those who spoke: Tara Kurrajong, Chloe Callistemon, Pankaj Sah, Perry Bartlett, Takuji Kasamatsu, Justin Marshall, Olivia Carter, Donald Mitchell, Valerie Beral, Susan Pond, Chris Wildsoet, Trung Ngo, Herbert Huppert, Rama Vilayanur, Paul Martin, John Drennan and Claudia Vickers.

Named Lectures

Peter Goodenough Memorial Lecture

Dr Norman Swan
ABC Radio National
20 August

Community events and talks

Centacare Community Services

5 March

Gossips Aphasia Group

6 March

International Women's Day panel discussion

8 March

Brain Bee Round 1

13 March

Global Leadership Series – The science of sleep

19 March

MND breakfast

3 April

Hand Heart Pocket Gala

26 April

Golf Day in support of MND and dementia

28 April

Souths vs Sunnybank rugby match in support of MND

2 May

Rotary Club of Brisbane Mid-City talk

10 May

APCN Patient Information Session

13 May, 13 July

QBI Director's Donor Roundtable Lunch

14 May

HopgoodGanim talk

20 May

White Label Noba launch

27 May

Brisbane Club talk

30 May

QBI Alumni Breakfast

1 June

AI Breakfast

12 June

Clem Jones Centre for Ageing Dementia Research Public Dementia Forum

3 July

U3A talk

8 July

Rotary Club of Stones Corner

15 July

Preventing Dementia Forum – Redlands

15 July

Brain Bee Round 2

17 July

Lavinia's Ladies Luncheon

2 August

Ross Maclean Race Day

24 August

Bridge to Brisbane fun run

25 August

Pier Apartments Residents Group talk

2 September

Coming of Age: A symposium on cannabis and the brain

4 September

Stroke Week Breakfast

5 September

Bardon Lions Club talk

26 September

Dementia Breakfast

2 October

Bayside Ladies Social Club talk

3 October

Lions Club of Capalaba

8 October

QBI Director's Donor Roundtable Lunch

15 October

St Margaret's WNB Cocktail Event

17 October

2019 National Fire Industry Association Great Ocean Road Charity Walk

17 – 21 October

Stafford Fox Boardroom Lunch

21 October

Morgans Morning Tea

23 October

MND Thank you morning tea

30 October

Wynnum Manly and District Men's Shed talk

6 November

Lions Club Brisbane Inner North talk

12 November

McKinney's Morning Tea

13 November

PriceWaterhouseCoopers event

14 November

Churchie Cricket Lunch

20 November

Research tours of QBI

National Youth Science Forum

11 & 15 January

MND tour

14 & 19 February

Scifleet tour

13 March

Pine Rivers Rotary Group tour

16 April

UQ Staff Donors tour

23 May

Donor tours

20, 26 & 27 June

Scientist for a Day

21 June

Kate Jones MP tour

11 July

Ross Vasta MP and Dementia Friendly Group Wynnum tour

18 July

Ted Sorenson MP tour

29 July

Healthy Brains tour

22 August

Rotary Club of Brisbane Mid-City tour

30 August

Peak Partnership Directors tour

2 September

Brain Bee Work Experience Placements

24 September – 8 October

Lord Mayor Adrian Schrinner tour

1 October

Churchie Tour

29 October

Sallyanne Atkinson's Bridge to Brisbane supporters tour

18 November

Queensland Symphony Orchestra tour

3 December

Koda Financial tour

3 December

Scientific seminars and symposia

QBI/Mater Research Symposium

12 October

Australian *C. elegans* Symposium

23-25 October

SLRC Symposium – The Science of Learning: An Evidence Base to Education in the 21st Century

1-2 November

Scientific engagement

Our scientific events and seminars play a major role in the advancement of neuroscience in the Asia-Pacific region. The primary goal of hosting events for the scientific community is to promote excellence in neuroscience through the exchange of ideas, establishing new collaborations and augmenting partnerships already in place.



Assistant Professor Christian Frøkjær-Jensen from King Abdullah University of Science and Technology (KAUST), Saudi Arabia, at the Australian *C. elegans* Symposium.

Scientific seminars & symposia

Neuroscience Seminars

Associate Professor Jeremy Dittman
Cornell Medical School, New York, USA

Molecular control of synaptic vesicle fusion

Associate Professor Bruno van Swinderen

Queensland Brain Institute, The University of Queensland

Understanding general anaesthesia: why loss of consciousness is interesting

Kiaran Lawson

Queensland Brain Institute, The University of Queensland

From bugs to bots: examining insect flight behaviour for potential robotic applications

Dr Alexandra Grubman

Monash University

Distinct microglial phenotypes in Alzheimer's disease are controlled by amyloid plaque phagocytosis

Dr Martin Smith

Garvan Institute of Medical Research, Going beyond the basepair with nanopores

Associate Professor Naotsugu Tsuchiya

Monash University

Conscious perception and its neural substrate: integration and dynamics

Dr Laura Gummy

University of Otago, New Zealand

MAP2-dependent regulation of axonal transport

Professor Luis Puelles

University of Murcia, Spain

An introduction to the prosomeric model

Dr Dorit Kliemann

Caltech, USA

Functional brain networks in hemispherectomy

Dr Graham Murray

Institute for Molecular Bioscience, The University of Queensland

From dopamine to delusions – what is the evidence for the predictive coding account of schizophrenia?

Professor John Nurnberger

Indiana University School of Medicine, USA

Emerging themes in the genetics of bipolar disorder

Professor Preben Bo Mortensen

Aarhus University, Denmark

iPSYCH: studying nature and nurture in mental disorders in Denmark

Professor Elly Nedivi

Massachusetts Institute of Technology, USA

Visualizing molecular events in synapse formation in vivo

Associate Professor Tom Burne

Queensland Brain Institute, The University of Queensland

The role of vitamin D in the adult brain

Dr Matilde Balbi

University of British Columbia, Canada

Activity dependent neuroprotection in the acute phase after stroke

Professor Nancy Kanwisher

Massachusetts Institute of Technology, USA

Functional imaging of the human brain: A window into the architecture of the mind

Professor Michael Hausser

University College London, UK

All-optical closed-loop manipulation of neural circuits in vivo

Dr Michael Lazarou

Monash University

Culling bad mitochondria: The molecular mechanisms of PINK1/Parkin mitophagy

Dr Tim O'Shea

University of California, Los Angeles, USA

Bioengineering neural repair in the central nervous system

Dr Albert Lee

Macquarie University

Application of proteomics to characterise mechanisms of neurodegenerative disease

Dr Dimitri Perrin

Queensland University of Technology

Whole-brain 3D imaging and quantitative analysis

Associate Professor Jared W. Young

University of California, San Diego, USA

Delineating potential mechanisms underlying bipolar disorder using cross-species testing

Professor Helen Cooper

Queensland Brain Institute, The University of Queensland

Understanding the molecular origins of cortical malformations

Professor Tod Kippin

University of California, Santa Barbara, USA

There's an Ap(tamer) for that! A generalizable biosensor platform for evolving pharmacological and neuroscience research

Professor Alice Pebay

The University of Melbourne

Modelling neurodegeneration using patient induced pluripotent stem cells

Professor Amparo Acker-Palmer

Goethe University, Germany

Neurovascular interactions during CNS development

Professor Jürgen Götz

Queensland Brain Institute, The University of Queensland

From basic mechanisms to antibody- and ultrasound-based therapeutic interventions for Alzheimer's disease

Professor Geoff Goodhill

Queensland Brain Institute, The University of Queensland

The development of neural coding in zebrafish, and a new method for analysing calcium imaging data

Associate Professor Zachary Knight

University of California, San Francisco, USA

The neurobiology of homeostasis

Professor Gord Fishell

Harvard Medical School, USA

Making up your mind, the specification and integration of interneurons into the cortex

Dr Eva Hoch

Ludwig-Maximilians-Universität, Germany

Cannabis: Potential and Risks. A scientific analysis

Professor Warwick Bowen

School of Mathematics and Physics, The University of Queensland

Quantum and precision sensing: advances and applications in the biosciences

Dr Rodrigo Suarez

Queensland Brain Institute, The University of Queensland

Clues from the past: marsupials reveal new principles of evolutionary, developmental and systems neuroscience

Dr Victor Anggono

Queensland Brain Institute, The University of Queensland

Molecular mechanisms of glutamate receptor trafficking

Dr Asheeta Prasad

University of New South Wales

Neural modulation of dopamine networks

Professor Naomi Wray

Institute for Molecular Bioscience and Queensland Brain Institute, The University of Queensland

Progress in ALS genomics research from the Ice Bucket Challenge Grant

Professor Steven Petrou

Florey Institute of Neuroscience and Mental Health, The University of Melbourne

Precision medicine in genetic epilepsies: have we arrived?

Dr Zhaoyu Li

Queensland Brain Institute, The University of Queensland

Functional connectomics: understanding neural network integration in *C. elegans*

Professor Fred Meunier

Queensland Brain Institute, The University of Queensland

Dynamic nanoscale organisation of the neurotransmitter release machinery

Dr Adam Walker

Queensland Brain Institute, The University of Queensland

Mechanisms of neurodegeneration and neuroprotection in motor neuron disease and frontotemporal dementia

Professor Oliver Hobert

Columbia University, New York, USA

Homeoboxes build the *C. elegans* nervous system

Professor Hollis Cline

The Scripps Research Institute, USA

Brain development and plasticity: using developmental plasticity mechanisms to rehabilitate the injured brain

Associate Professor Mazen Khairbek

University of California, San Francisco, USA

Encoding of emotionally relevant stimuli in hippocampal circuits

Professor Subhojit Roy

University of California, San Diego, USA

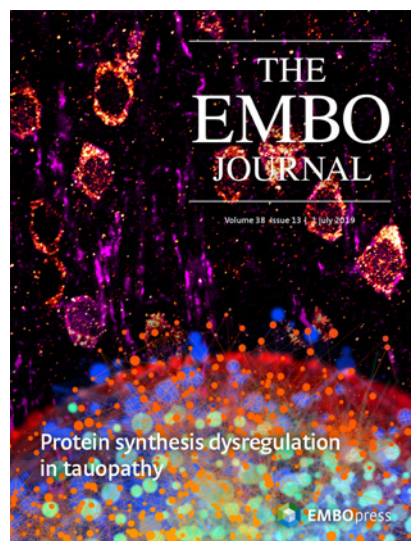
Unusual trafficking Routes in axonal transport

Publication List

QBI publications (peer-reviewed journal articles, books, book chapters, conference papers) appearing in 2019 either as epublications or in print. Some epublications have appeared in print in 2020 and have been updated to reflect this.

1. Abdellaoui A *et al.* (2019) Genetic correlates of social stratification in Great Britain. *Nature Human Behaviour* 3: 1332-1342.
2. Abramson D *et al.* (2019) Book Chapter: A cache-based data movement infrastructure for on-demand scientific cloud computing. In D Abramson & BR de Supinski (Eds.), *Super Computing Frontiers* (pp. 38-56). Cham, Switzerland: Springer International Publishing.
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4. Adams SD *et al.* (2019) Development of a miniature device for emerging deep brain stimulation paradigms. *PLoS One* 14: e0212554.
5. Al-Amin M *et al.* (2019) Vitamin D deficiency is associated with reduced hippocampal volume and disrupted structural connectivity in patients with mild cognitive impairment. *Human Brain Mapping* 40: 394-406.
6. Al-Amin Md *et al.* (2019) Adult vitamin D deficiency disrupts hippocampal-dependent learning and structural brain connectivity in BALB/c mice. *Brain Structure and Function* 224: 1315-1329.
7. Ali A *et al.* (2019) Developmental vitamin D deficiency produces behavioral phenotypes of relevance to autism in an animal model. *Nutrients* 11: 1187.
8. Andlauer TFM *et al.* (2019) Bipolar multiplex families have an increased burden of common risk variants for psychiatric disorders. *Molecular Psychiatry* – doi: 10.1038/s41380-019-0558-2.
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11. Ashton MM *et al.* (2019) The therapeutic potential of mangosteen pericarp as an adjunctive therapy for bipolar disorder and schizophrenia. *Frontiers in Psychiatry* 10: 115.
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14. Australian Brain Alliance *et al.* (2019) A neuroethics framework for the Australian Brain Initiative. *Neuron* 101: 365-369.
15. Autuori E *et al.* (2019) rSK1 in rat neurons: a controller of membrane rSK2? *Frontiers in Neural Circuits* 13: 21.
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19. Barker MS *et al.* (2020) Idea formulation for spoken language production: The interface of cognition and language. *Journal of the International Neuropsychological Society* 26: 226-220.
20. Bates TC *et al.* (2019) Social competence in parents increases children's educational attainment: replicable genetically-mediated effects of parenting revealed by non-transmitted DNA. *Twin Research and Human Genetics* 22: 1-3.
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22. Baumann O *et al.* (2019) Survival of the fittest: increased stimulus competition during encoding results in fewer but more robust memory traces. *Frontiers in Psychology* 10: 21.
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26. Blauwendraat C *et al.* (2019) Parkinson's disease age at onset genome-wide association study: Defining heritability, genetic loci, and α -synuclein mechanisms. *Movement Disorders* 34: 866-875.
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31. Brownsett SLE *et al.* (2019) Language deficits following dominant hemisphere tumour resection are significantly underestimated by syndrome-based aphasia assessments. *Aphasiology* 33: 1163-1181.
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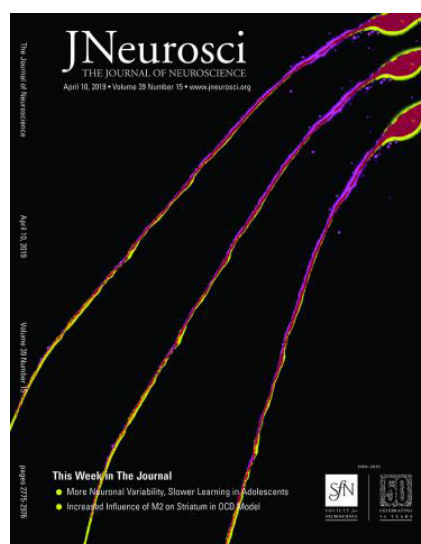
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Occupational Health and Safety



QBI's Occupational Health and Safety team drives the implementation of UQ's Health, Safety and Wellness Strategy 2017-2021 throughout the Institute and promotes the highest practicable standard of occupational health, safety and wellness, while supporting and encouraging a positive OHS culture, and facilitating compliance with legislation and national standards.

The team provides advice and support in health, safety and wellness matters to

QBI Executive, and liaises closely with the central UQ Health, Safety and Wellness (HSW) Division to maintain consistency of implementation of the UQ HSW Strategy, and to identify and respond to University-wide HSW priorities.

In 2019, the safety team led a project comprising researchers and workshop technicians to design and construct a specialised piece of equipment that reduces worker exposure to waste gas.

This team was nominated for a UQ Award for Excellence in mental and physical health, safety and wellness. Other highlights from the year include the successful opening of a Human Studies Unit, and arranging mental health seminars and an R U OK Day event, ensuring that the team are supporting the mental as well as physical health of staff and students.

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