



THE UNIVERSITY  
OF QUEENSLAND  
AUSTRALIA

**IMB**

Institute for Molecular Bioscience

# YEAR IN REVIEW

Institute for Molecular Bioscience  
2016 Annual Report



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# ABOUT

The University of Queensland's Institute for Molecular Bioscience (IMB) is a global leader in multidisciplinary life sciences research. IMB brings together 500 researchers, students and support staff from across the globe, using life sciences research for disease discovery, application and sustainable futures.

Our research is framed through six research centres focusing on superbug infection, pain, heart disease, inflammation, solar biotechnology and the interplay of genomics and disease. We also undertake research in cancer, the environment and agricultural solutions.

IMB's combination of genomics, biostatistical, biological, pharmacological and chemical researchers means the Institute can take life science discoveries from the genome to drug design and application – for health, disease and for the sustainable solutions for our cities, fuels and foods. With 66 patents and 11 spin-outs to our name, UQ's IMB is driven to using life science research for discovery, invention and application.

## MISSION

Our mission is to advance scientific knowledge and deliver new health and industry applications from the best in life sciences research.

## VISION

Our vision is to be a global leader in the discovery and application of molecular life sciences research.

## RESEARCH CENTRES

- + Centre for Inflammation and Disease Research
- + Centre for Pain Research
- + Centre for Superbug Solutions
- + Centre for Solar Biotechnology
- + UQ Project Three Billion
- + UQ Centre for Cardiac and Vascular Biology




## STRATEGIC PRIORITIES

- + Discovery excellence
- + Translational impacts
- + Learning
- + Leadership and engagement
- + Equity and sustainability

## SHARE IN OUR DISCOVERIES

Subscribe to our IMB news and event updates  
[imb.uq.edu.au/subscribe](http://imb.uq.edu.au/subscribe)

## JOIN OUR SOCIAL COMMUNITIES

-  [Twitter.com/IMBatUQ](https://twitter.com/IMBatUQ)
-  [Facebook.com/InstituteForMolecularBioscience](https://facebook.com/InstituteForMolecularBioscience)
-  [Youtube.com/IMBatUQ](https://youtube.com/IMBatUQ)



## THE IMPACT OF OUR RESEARCH SPANS THE AREAS OF



Agriculture



Cancer



Solar  
biotechnology



Diabetes  
and obesity



Infection



Pain



Heart and  
cardiovascular  
diseases



Inflammation



Brain injury  
and disease

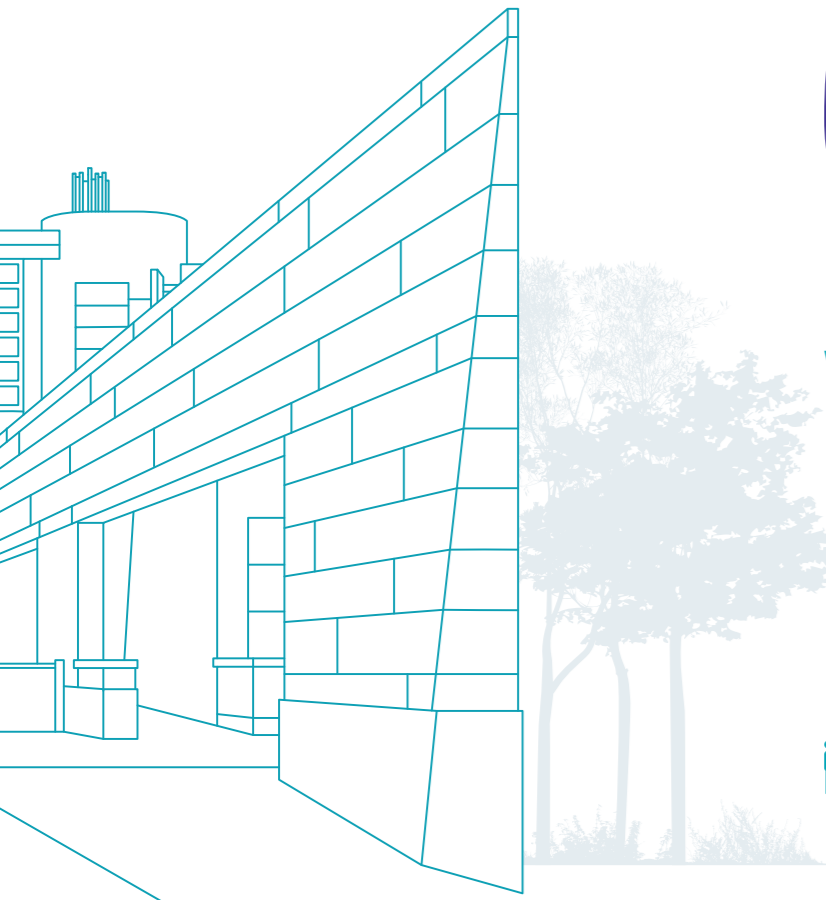


Rare and  
complex diseases



Superbugs

# 2016 SNAPSHOT



# 6

## research centres

- Centre for Pain Research
- Centre for Inflammation and Disease Research
- Centre for Superbug Solutions
- UQ Centre for Cardiac and Vascular Biology
- Centre for Solar Biotechnology
- UQ Project Three Billion

## world-class research facilities

# 7

# 500

researchers, postgrad students & support staff



# 121

active research higher degree students

# 364

publications



# 40

high-impact scientific publications

# 4

Thomson Reuters Highly Cited Researchers



# 7

Fellows of the Australian Academy of Science



# 41

research higher degree students graduated



Host of

the Queensland Emory Drug Discovery Initiative (QEDDI)

# 60

Honours, undergraduate, occupational trainee and coursework masters students

hosted at IMB

# 100%

honours students achieved first class honours



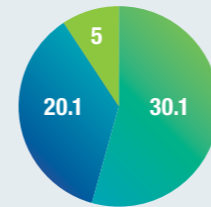
inflammatory disease research

secured up to a

# \$22M

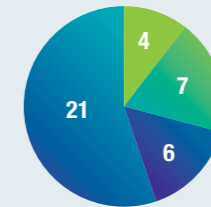
global investment

one of the largest biotech Series A investments for intellectual property originating from an Australian university



## total research income

- \$30.1M competitive funding
- \$20.1M operating
- \$5M philanthropy, commercialisation, other income and recoveries



## 38 patent families managed

- 4 agricultural/industrial biotechnology
- 7 diagnostic/devices
- 6 drug discovery tools
- 21 therapeutics

# \$10M



awarded from the National Health and Medical Research Council



# \$2.3M

grant awarded from the

AUSTRALIAN CANCER RESEARCH FOUNDATION

to establish the new ACRF Cancer Ultrastructure and Function Facility

# 8



new partnerships

formed in 2016

# 9

active Australian Research Council Linkage Projects with industry partners



# >5%

of IMB's publications include industry collaborations



over 1000 collaborations in

# 57

countries

# MESSAGE FROM THE VICE-CHANCELLOR AND PRESIDENT

A clear measure of success in science is the impact that discoveries have on the world and the lives of its people. The University of Queensland (UQ) has earned an international reputation for excellence in research, as signified by our performance in international rankings.



In 2016 the University advanced by 22 places in the Academic Ranking of World Universities, to rank 55th globally and second in Australia. UQ is the only Australian university to rank in the top 20 for life sciences – an impressive achievement. As our largest institute, the Institute for Molecular Bioscience plays a significant role in UQ's success.

However, research excellence in itself is insufficient for translating discoveries into meaningful outcomes with substantial impact. Such translation also requires engagement with exceptional partners in industry, government and the community, and with researchers who are connected across disciplines.

This is why the Institute for Molecular Bioscience is multidisciplinary. It brings together researchers with different perspectives and expertise, who share one goal: high quality Discovery and Translation. They exchange ideas across fields and challenge each other to look at things differently, to ask new questions, and to create new areas of science. They are working with partners on local problems with global impact, forging research discoveries with broad application to combatting disease and other global challenges.

## In 2016, their innovation delivered outcomes of global significance:

- + They started work on a new generation of drugs to be grown in plants;
- + They identified a treatment target for aggressive forms of breast cancer;
- + They grew beating human heart tissue from stem cells that will one day be used to regenerate the hearts of patients with heart disease;
- + They made a discovery that could lead to a new treatment for Parkinson's disease, and has potential applications for nearly 50 other disorders;
- + They progressed the development of new drugs that target the underlying cause of diabetes;
- + They identified four new classes of compounds that act against drug-resistant tuberculosis;
- + They identified interactions between immune system pathways that could improve treatment of autoimmune and inflammatory diseases;
- + They discovered a protein in spider venom that binds to and inhibits pain receptors, uncovering a promising future treatment for chronic pain; and
- + They found a diagnosis for some of the many Australians suffering from unresolved rare diseases.

Industry, international collaborators and funding bodies alike are recognising the Institute's ability to translate discoveries into solutions.

## By partnering with them in 2016, IMB has:

- + Created an organic insecticide that is protecting cotton crops and saving bees;
- + Uncovered compounds in tarantula venom that are a potential treatment for sheep parasites, a major cost for the international sheep industry;
- + Made clean fuel from green algae;
- + Attracted \$22 million in global investment to develop new treatments for inflammatory diseases such as Parkinson's and asthma;
- + Developed environmentally friendly cane toad traps to catch tadpoles before they can reproduce; and
- + Developed a model to more accurately forecast CO<sup>2</sup> emissions.

The discoveries made at the Institute and their applications attest to the power of a multi-disciplinary approach to creating impact in Life Sciences research.

I congratulate Director Professor Brandon Wainwright and the Institute for Molecular Bioscience team. Their curiosity in 2016 made an impressive contribution to advancing human knowledge, to creating change and to solving some of the world's greatest challenges.

**Professor Peter Høj**  
Vice-Chancellor and President  
The University of Queensland

# MESSAGE

## FROM THE DIRECTOR



Improving quality of life is the goal of research at IMB, from discovering new ways to diagnose and treat disease to providing sustainable solutions to fuel and food production. The IMB provides solutions to some of the world's most pressing problems.

To enhance our ability to bring discovery to disease application and sustainable futures, we launched a translation sub-committee in 2016. Its mission is to ensure partnership and engagement is fostered throughout the Institute, from research training students to postdoctoral fellows and senior faculty. Indeed, this culture of translation and innovation is what sets IMB apart.

Chairing the sub-committee is Bob Christiansen, who is a Knowledge Nation 100 founder and who is helping Australia to capitalise on the changing technological landscape to ensure the nation's prosperity.

Like the Knowledge Nation 100, IMB is capitalising on technological advancements to increase our rate of discovery, drive translation, and find new solutions to old problems.

### Here are some examples:

- + We created the world's first molecule bank, crowdsourcing antibiotic compounds from across the globe, to find new antibiotics to fight drug-resistant superbugs.
- + We have developed an app that uses DNA sequence data to rapidly detect antibiotic resistant genes in bacteria to help limit the spread of superbugs.
- + We developed a chronic pain App that will allow medical professionals to monitor and improve treatments based on patient data.
- + We repurposed glucose monitoring technology to develop a low cost, portable test for a range of infectious diseases like Zika Virus, using a microchip plugged into a smartphone.
- + We commenced UQ Project Three Billion (UQ3B) to identify and determine the functional significance of variation in the genome and to decode the critical DNA base changes that influence disease processes.
- + We opened the new Ramaciotti Facility for Producing Pharmaceuticals in Plants, potentially transforming sunflower seeds, tea leaves and even potato chips into the drug delivery packages of the future.

- + IMB secured funding, through an Australian Research Council Linkage Infrastructure, Equipment and Facilities grant and an Australian Cancer Research Foundation grant, to acquire new light imaging technologies that will set the Institute and The University of Queensland at the forefront of scientific imaging capability. The acquisition of the Lattice Light Sheet Microscope, for example - one of only a handful in the world - will allow researchers to watch and record cancer cells in real time, and recreate the cells in three dimensions.
- + We launched the Queensland Facility for Advanced Genome Editing (QFAGE) to provide rapid, precise and low-cost genome editing technology that is revolutionising functional genomic research.
- + We established the Centre for Solar Biotechnology to optimise algae production for the development of innovative biotechnologies to enhance future sustainability.

### IMB INNOVATORS MAKING AN IMPACT

One of the greatest signatures of the enduring quality of our achievements is our staff and research training students. Their success mirrors our investment in their development and our belief in their courage and capabilities. The quality of their work can be epitomised in the following notes of acclaim.

Postdoctoral Research Fellow Dr Rebecca Coll received the 2016 Research Australia Discovery Award for her work on identifying promising anti-inflammatory compounds that block the NLRP3 inflammasome, a key driver of inflammation.

The Commonwealth Health Minister's Award for Excellence in Health and Medical Research was awarded to Group Leader and Research Fellow Dr Joseph Powell. As the only Queensland recipient in the Award's 16-year history, the prestigious award recognised Joseph's research into the ways genetic differences in humans can affect disease susceptibility.

Professor Kirill Alexandrov received a Bill and Melinda Gates Foundation Grand Challenges Explorations grant to develop a low-cost diagnostic tool that uses well-established glucose biosensors to detect DNA of infectious pathogens.

One of UQ's most highly-funded National Health and Medical Research Council (NHMRC) projects was awarded to Associate Professor Ben Hogan. He received a \$1,228,364 project grant to investigate the molecular mechanisms behind cerebral cavernous malformations, common vascular anomalies that can lead to stroke.

### DISCOVERY DRIVES US FORWARD

Solutions to some of life's most complicated problems lie in discovering the essence of life itself. Disease discovery epitomises the mission of the IMB to translate our research to improve the sustainability of life, from agriculture, to clean cities, to disease solutions. Our many collaborators, industry partners, and our generous donors support that goal and believe in our mission. I acknowledge and thank them for their support.

I also acknowledge the professional support staff that underpin our progress; each of us has a contribution to make and an impact to leave. Together, we have had some outstanding achievements and successes in 2016 and I am proud to lead an exceptional team who make a valuable contribution to improving the lives and health of all Australians through leading discovery research.

**Professor Brandon Wainwright**  
Director, Institute for Molecular Bioscience

# 2016 HIGHLIGHTS

## RECOGNISING GLOBAL IMPACT

IMB researchers Professors Grant Montgomery, Peter Visscher, Phil Hugenholtz and Dr Mark Butler were named as some of the world's most influential scientific minds, as measured by the Thomson Reuters Highly Cited Researchers list. The annual list recognises leading researchers who rank in the top one per cent by citations for their field.

RIGHT PROFESSOR PETER VISSCHER



ABOVE QUEENSLAND PREMIER ANNASTACIA PALASZCZUK (LEFT) WITH PROFESSOR DAVID CRAIK (RIGHT)

## GROWING MEDICINE IN PLANTS

Queensland Premier Anastacia Palaszczuk opened the world-class Clive and Vera Ramaciotti Facility for Producing Pharmaceuticals in Plants at IMB. The Facility was made possible through a generous \$1 million Ramaciotti Biomedical Research Award from the Clive and Vera Ramaciotti Foundation and trustee Perpetual. Led by Professor David Craik and La Trobe University collaborator Professor Marilyn Anderson AO, the new Facility will transform plants into 'biofactories' to produce next-generation medicines that can be grown in fields rather than factories.



ABOVE PROFESSOR ALPHA YAP (RIGHT) SPEAKING AT THE ACRF CHAIRMAN'S DINNER



## PARTNERING WITH INDUSTRY FOR BETTER HEALTH

Inflazome Ltd, a company founded on research from the IMB Centre for Inflammation and Disease Research and Trinity College Dublin, closed a Series A financing round of up to €15 million (A\$22 million) to develop better treatments for inflammatory disorders including Parkinson's disease and asthma. The investment, co-led by two top global life science investment firms, Novartis Venture Fund and Fountain Healthcare Partners, is one of the largest biotech Series A investments for intellectual property originating from an Australian university.

LEFT INFLAMMATION RESEARCHERS ASSOCIATE PROFESSOR KATE SCHRODER (LEFT) AND DR REBECCA COLL (RIGHT)

## BRINGING GROUND-BREAKING DISCOVERIES TO MARKET

IMB spin-out company Protagonist Therapeutics Inc. listed on the NASDAQ and was named Australian Company of the Year at the AusBiotech and Johnson & Johnson's Innovation Industry Excellence Award. The clinical-stage biopharmaceutical company, founded by IMB researcher Associate Professor Mark Smythe, is developing oral drugs to treat gastrointestinal disorders such as inflammatory bowel disease.

## TRACKING AND VISUALISING CANCER

IMB researchers will soon be able to see cancer cells grow, spread and respond to drugs in real time, using three new hi-tech microscopes. A \$2.3 million grant from the Australian Cancer Research Foundation (ACRF) and \$840 000 from the Australian Research Council Linkage Infrastructure, Equipment and Facilities scheme was awarded to the Institute for Molecular Bioscience to establish the new ACRF Cancer Ultrastructure and Function Facility.

The new Facility will provide pioneering imaging capabilities for tracking and visualising cancer, which will help researchers learn how cancer cells behave and change, and develop new treatments to control cancer. The combination of advanced optical and electron microscopy technology, and a skilled multidisciplinary research team, means scientists can break through roadblocks that have stood in their path towards developing effective treatments.



ABOVE IMB EARLY CAREER RESEARCHERS AT BRISBANE'S 2016 HEALTHHACK

## CREATING CHANGE THROUGH ENTREPRENEURSHIP

Inspired to innovate, our early career researchers won first and third prize at Brisbane's 2016 HealthHack, which brings together researchers, software developers, designers, healthcare professionals and students to find solutions to health and medical problems. The winning team developed an app to track and map the presence of antibiotic-resistant bacteria, which could rapidly alert clinicians so they can limit the spread of bacteria and fight an outbreak in real-time.

# DISCOVERY



# SHINING A DIAGNOSTIC LIGHT ON RARE DISEASES

Navigating the challenges of a rare disease is often marked with feelings of confusion, fear of the unknown, and desperation for more information and support.

Rare diseases researcher Associate Professor Carol Wicking from the Institute for Molecular Bioscience (IMB), said approximately one in 12 Australians are living with a rare disease, many of whom are children.

“Although individually rare, these diseases are collectively common. Diagnosis – if it happens at all – is often delayed and difficult, with many people misdiagnosed at least once,” she said.

“Rare diseases can be life threatening and chronically debilitating, and often there are no effective treatments available.

“Families with rare diseases can feel forgotten as they try to access diagnoses or treatment, while clinicians are frustrated as they strive to achieve the best outcomes for patients, some with diseases they have never encountered before.”

## CHANGE ON THE HORIZON FOR RARE DISEASES

Technological advances are driving change for rare diseases, with scientists now able to sequence every gene, or in some cases every one of the three billion base pairs that make up an individual’s DNA.

“In many cases a rare disease may be primarily caused by a single mistake in one of these base pairs. With new technology we can potentially find these mistakes in a fraction of the time and cost compared to just five or six years ago,” Associate Professor Wicking said.

“As a result, the past decade has seen an explosion in the number of rare diseases for which the underlying defective gene(s) is known.

“Genetic diagnosis is important because knowing the underlying cause of a disease may inform future reproductive choices for families, and can provide hope in moving toward improved treatment and tailored disease management. It can also offer families the opportunity to connect with other families who are trying to navigate through life living with the same disease.”



## GENOME STUDY OFFERS NEW HOPE FOR CHILDREN WITH RARE DISEASES

Contributing to the increasing number of genetic diagnoses is IMB’s Dr Cas Simons. He is part of an international team who used advanced genome sequencing to diagnose 30 patients with unresolved rare diseases.

The patients were among 70 people with leukodystrophies, a group of genetic disorders that affect the brain’s white matter, and were examined using whole exome sequencing (WES) — a method that looks at all the genes in a person’s genetic code at once.

White matter disorders, which affect one in 7000 children born each year, damage the nerves that connect different brain regions to each other and the spinal cord, causing impaired brain function.

Dr Simons said white matter disorders could have a devastating impact on patients and families.

“Our study found that next-generation sequencing could shed light on an especially challenging group of genetic disorders that impact the brain’s white matter,” he said.

“Through the use of next-generation sequencing-based WES we were able to dramatically increase the diagnostic yield and reduce the time to diagnosis.”

The diagnoses led to refinements in some patients’ clinical care, with families carrying certain mutations referred to specialised clinics for monitoring for cancer.

“Standard approaches to diagnose white matter disorders, such as MRI, fail nearly 50 per cent of these children, complicating their care and exacting a substantial psychological toll on families.”

The researchers concluded that adding whole-exome sequencing to the diagnostic tools at clinicians’ disposal could decrease the number of patients with unsolved genetic white matter disorders from 50 per cent to less than 30 per cent.

## UQ PROJECT THREE BILLION

At the end of 2016 IMB’s Centre for Rare Disease Research joined with other research groups at UQ as part of UQ Project Three Billion (UQ3B).

This multidisciplinary team of researchers will apply advanced techniques in DNA and RNA sequencing, statistical genomics, epigenetics and functional biology, to decode the critical base changes that affect disease processes and explain variation between individuals.

The ultimate goal is to develop new diagnostic methods and treatments across a range of rare and complex diseases.

### UQ PROJECT THREE BILLION (UQ3B)

**DIRECTOR** Professor Grant Montgomery  
**DEPUTY DIRECTORS** Professor Naomi Wray,  
 Associate Professor Carol Wicking  
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**EMAIL** [g.montgomery1@uq.edu.au](mailto:g.montgomery1@uq.edu.au)

# IN THE FIGHT AGAINST SUPERBUGS

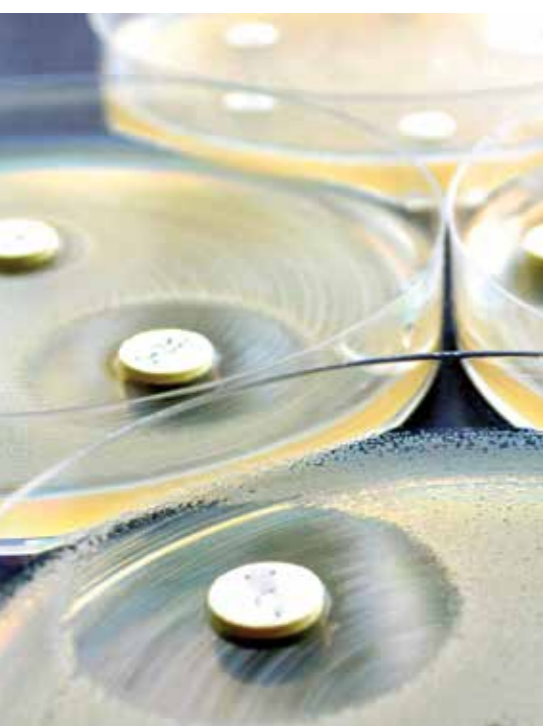
The rapid emergence of resistant bacteria has posed a serious threat to human health and is largely attributed to the misuse and overuse of antibiotics in humans and intensive agricultural practices.

Associate Professor Lachlan Coin from IMB's Centre for Superbug Solutions said multidrug-resistant bacteria, or superbugs, are serious cause for concern.

"Unless we can preserve the power of antibiotics, by 2050 superbugs could be claiming the lives of 10 million people each year," he said.

"A huge part of the problem is the overuse and misuse of antibiotics, with 50 per cent prescribed unnecessarily.

"To minimise the overuse of unnecessary antibiotics, researchers from the Centre for Superbug Solutions are developing a number of diagnostic tests to rapidly identify antimicrobial resistant bacteria in patients."



## BACTERIAL OR VIRAL?

One of the team's new inventions, born from a collaboration between IMB and Imperial College London (UK), is set to save lives and help reduce antibiotic use. Researchers have developed an innovative new method to distinguish viral and bacterial infections in children.

Associate Professor Coin said bacterial and viral infections could be difficult to tell apart. "Both types of infections can cause similar symptoms such as fever, sore throat, fatigue, vomiting and diarrhoea," he said.

"Many children around the world receive unnecessary antibiotic treatment for viral infections, while dangerous bacterial infections, such as meningococcal disease, are missed in others."

The Australian Commission on Safety and Quality in Health Care found antibiotic use to be particularly high in Australia, with more than 30 million prescriptions filled in 2014. Those most likely to be prescribed antibiotics are children aged 0-9 years old and the elderly.

Associate Professor Coin was part of an international team – led by Professor Levin of Imperial College London (UK) - who analysed gene patterns in the blood of children presenting with a fever at some hospitals in the United Kingdom, Spain, the Netherlands and the United States between 2009 and 2013.

"Over-prescription of antibiotics is significantly contributing to the rise of superbugs, so our research is a major breakthrough in this serious global challenge," Associate Professor Coin said.

The team discovered two genes that can distinguish bacterial infection from other causes of fever.

"Our goal is to create a portable tool for clinicians to conduct a simple blood test to rapidly diagnose children and reduce the incorrect and overuse of antibiotics," Associate Professor Coin said.

## DEVELOPING FASTER SUPERBUG TESTS

Along with a diagnostic tool to rapidly diagnose the existence of bacterial infections, Associate Professor Coin is also leading a team together with Professor Matt Cooper and Dr Mark Blaskovich to develop a powerful and portable diagnostic tool to rapidly diagnose which bacterial infection a patient has contracted.

"Current tests leave patients and doctors waiting 24-48 hours for a diagnosis, and they do not always deliver a clear answer," Associate Professor Coin said.

"This uncertainty and delay in diagnosis increases the risk of the infection spreading. It also leads to inappropriate antibiotic use as doctors often use a trial and error approach to identify an antibiotic that works.

"The diagnostic tool we are working on will allow clinicians to identify a patient's type of bacterial infection within 4-6 hours, which will allow them to rapidly respond with the right drug, minimising the overuse of unnecessary antibiotics and preventing the spread of hospital-acquired infections."

The project was awarded \$450,000 over three years in 2016 as part of the Queensland Government's Advance Queensland Innovation Partnership funding program. Partners include Children's Health Queensland and the Royal Brisbane and Women's Hospital.

### IMB CENTRE FOR SUPERBUG SOLUTIONS

**DIRECTOR** Professor Matt Cooper  
**DEPUTY DIRECTOR** Associate Professor Lachlan Coin  
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# AT THE CENTRE OF IT ALL, COULD UNDERSTANDING INFLAMMATION PROVIDE THE SILVER BULLET?

"This could lead to new treatments for patients with rheumatoid arthritis, inflammatory bowel disease, and neurodegenerative disease."

**PROFESSOR JENNIFER STOW, RESEARCH TEAM LEADER**

RIGHT PROFESSOR JENNIFER STOW (CENTRE) WITH RESEARCH COLLEAGUES DR ADAM WALL (LEFT) AND MR DARREN BROWN (RIGHT)



Across the globe, scientists are hard at work studying the processes behind the plethora of diseases affecting society. What if one process was at the centre of it all? Inflammation is associated with many, if not most, common diseases. It is triggered when the body's defence system identifies a problem.

When it works effectively, it solves the problem and protects us. When it goes wrong, however, uncontrolled inflammation can become the driver for disease throughout our bodies. It can drive the pathology and symptoms behind a diverse array of conditions like chronic liver disease, cancer, inflammatory bowel disease, cardiovascular disease, rheumatoid arthritis, sepsis and Alzheimer's.

The IMB Centre for Inflammation and Disease Research (CIDR) is identifying both the mechanisms that cause inflammation and novel ways to turn this process off. Could deciphering inflammation provide the silver bullet that halts the progression of many common diseases?

Director of CIDR Professor Matt Sweet said the innate immune system is our danger response system.

"The system detects when something is wrong, becoming activated in order to respond to the danger and repair the body. Once repaired, the system switches off and the body goes back to normal," he said.

"But when the body is in a disease state the innate immune system can not resolve the issue, because the triggers are constantly present, so it keeps responding. An ongoing response can be very harmful."

Inflammation can occur in specific areas of the body, as is the case for arthritis, or it can be systemic, spreading throughout the body, in the case of sepsis. At its most extreme, as in the case of septic shock, systemic inflammation can be fatal.

Professor Sweet said inflammation is important to understand because it is very hard to name a disease where inflammation is not the underlying cause of symptoms.

"The symptoms of inflammation are heat, redness, swelling and pain, which most people can relate to. But inflammation is also a driver for disease in ways that people are less familiar with. For example, for cancer to take hold, a tumour has to grow and spread. Inflammation is a key driver of this process. Inflammation is similarly instrumental in other diseases.

"Being able to control inflammation could help treat multiple diseases. Learning what the components of this danger response system are, and how to turn down or turn off the system, is the focus of our research," said Professor Sweet.

His research team is collaborating with a team led by Professor Jennifer Stow at IMB. Together they have uncovered a protein, the first of its kind, which is involved in triggering inflammatory responses.

It binds directly to pathogen receptors on immune cells, providing incredible specificity to the inflammatory response that is initiated.

This discovery has delivered an unprecedented opportunity to manipulate inflammation, for example by turning off the production of specific protein messengers called cytokines that contribute to destructive inflammatory processes in different diseases.

"We are currently characterising exactly how this protein interacts with pathogen receptors. Such an understanding could enable us to target this protein as a new anti-inflammatory approach. This is important because for some inflammatory diseases there are no effective treatments, and for others, treatments are often only effective for a sub-set of patients."

Understanding inflammation could be a game changer for the most common causes of death – including cancer and cardiovascular disease. This discovery epitomises the innovative, fundamental science conducted at IMB, which is changing the future of disease treatment.

### IMB CENTRE FOR INFLAMMATION AND DISEASE RESEARCH

**DIRECTOR** Associate Professor Matt Sweet  
**DEPUTY DIRECTOR** Associate Professor Kate Schroder  
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THE MYSTERIOUS LANGUAGE  
OF PAIN AND THE FIGHT

# TO SWITCH IT OFF



CREDIT DAVID MULLINS, MARINE IMAGES

“Sensory neurons transmit pain messages, and for a sting to be effective, it must be painful. So venomous animals and toxins have evolved to very specifically target sensory neurons. To treat pain, we also need to be able to target sensory neurons, so we’re examining the active components in venom and toxins to see if they can teach us how to do that.”

Within our bodies, we have an intricate network of nerve cells that help us to perceive the world. They are called sensory neurons. Sensory neurons convert external stimuli from the environment into messages within the body. One of their roles is to transmit pain messages to the brain. It is a useful process that protects us from damage (in the case of touching a hot surface), but with certain diseases, it can cause debilitating chronic pain that science is currently at a loss to treat.

The Vetter Group, led by Dr Irina Vetter, is part of IMB’s Centre for Pain Research. They are demystifying the different pathways that contribute to pain in various disease states so that we can help the one in five Australians that live with chronic pain.

“Chronic pain costs the Australian economy around \$40 billion per year and the global pain market continues to grow. It causes enormous disruption to people’s physical and mental wellbeing and their personal life. There is also a lot of stigma around pain because of the lack of understanding about its cause, and because you cannot see pain,” said Dr Vetter.

Current drugs either do not work or have terrible side effects, like addiction. But the Vetter Group is looking to change that. Through biomedical research and pharmacology, they hope to develop better treatments for pain - targeted treatments with no adverse side effects. They are searching for answers in what might seem like a peculiar place – venoms.

## A POTENTIAL NEW PAIN DRUG DISCOVERED

The Vetter Group is currently very excited by a venom-derived compound that targets a particular protein on a nerve whose role is to signal pain.

“The protein is not involved in touch or other sensations, so this compound has exciting prospects as a pain drug. It is very selective, which means it doesn’t have any side effects, so we will take this further and hopefully develop a new drug,” said Dr Vetter.

The group is confident that the drug will be effective against common types of acute pain as well as a rare and excruciating disease called Man on Fire Syndrome. They are also hopeful that it will be useful in treating a wide variety of disease-related pain such as postherpetic neuralgia, diabetic neuropathy, cancer pain, and chemotherapy-induced pain. Chemotherapy induced pain for example occurs in more than 90 per cent of patients, can force people to stop life-saving treatment, and can be irreversible.

The group is currently looking for funding to continue their research on the compound to explore which disease related pain and acute pain the compound would be effective against.

The translation of this research into a usable drug is a long process, but the Vetter Group is also employing unique pharmacological methods to repurpose existing drugs, for more immediate translations into clinical practice.

“We have a translational capability. We always make sure that what we find in a cell has meaning in an organism. We are well placed to deliver real outcomes.”

### IMB CENTRE FOR PAIN RESEARCH

**DIRECTOR** Professor Richard Lewis

**DEPUTY DIRECTOR** Dr Irina Vetter

**WEBSITE** [pain.imb.uq.edu.au](http://pain.imb.uq.edu.au)

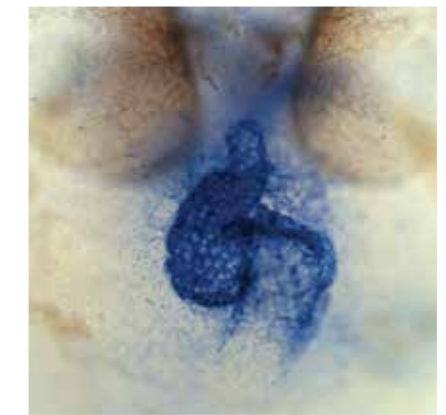
**EMAIL** [pain@imb.uq.edu.au](mailto:pain@imb.uq.edu.au)

# GROWING NEW ORGANS

– SCIENCE FICTION OR SCIENCE FUTURE?



ABOVE MS ALISHA TROMP (LEFT) AND DR KELLY SMITH (RIGHT)  
RIGHT DEVELOPING ZEBRAFISH HEART AT TWO DAYS POST FERTILISATION



The demand for organ donation increases every year, but the tissue available for donation remains static. Dr Kelly Smith, during her PhD, was in the place where surgeons performed Australia's first split liver transplant.

They were trying to get more out of the organs that they had, and Dr Smith thought 'we should be making these'. She had found her research passion. She is now leading a team of developmental biologists studying how the embryo forms from a single cell to a living, functioning organism.

The focus of their research is the heart. Heart attack and cardiac arrest is the biggest killer in the western world. Heart rhythm dysfunction affects 5 per cent of the aged population and arrhythmias 2 per cent of under 65-year-olds. Cardiomyopathy, where the heart becomes enlarged and thin, is responsible for many sudden deaths. Congenital heart defects affect one in 110 babies.

"How does a heart grow? How do the first cells in an embryo develop to form a beating muscle that pumps blood throughout the body?" said Dr Smith.

Understanding how the first cells in an embryo contribute to a specific organ and understanding how that organ develops is the first step in creating or healing that organ.

"Once we know what is causing the problem, we can look at strategies for how to fix it."

## SIX NEW GENES DISCOVERED – AND WHAT THEY MEAN FOR HEART HEALTH

The Smith Laboratory, which is part of the University of Queensland's Centre for Cardiac and Vascular Biology, conducts their research primarily using zebrafish. They create a fish version of a patient (an avatar) with a particular gene mutation and monitor what is happening within the embryo.

Through this process, with a very large sample of fish over a two-year period, the research team and collaborators screened over 400 families of fish with gene mutations. They found six new genes whose function has never been described before.

Dr Smith's research team discovered a gene that may be necessary for proper cardiac rhythm.

"When we knock this gene out in fish avatars, their hearts skip a beat – they have cardiac arrhythmias. It's early days, but we might be looking at something that we could target with a drug," Dr Smith said.

"Another exciting new discovery is a gene that is influential in the 'scaffold' that both holds the cells of the human body together, and allows them to communicate with each other. It's called the extracellular matrix, and its present in all tissues and organs.

"Our bodies are made of cells that are like bricks in a wall. The extracellular matrix is like the mortar that holds the cells together. It also provides a way for the cells to communicate with one another. We discovered a gene that makes a protein, which we think degrades one particular component of the matrix."

## THE SOLUTIONS OF THE FUTURE

The value of understanding also goes beyond finding a solution.

"We can screen foetuses for heart defects, and we can diagnose them. We can provide parents with peace of mind that the problem with their baby was not something they did wrong during pregnancy – it is genetic. We can also inform them of the risks of these defects being passed on again."

"I've always been a fan of science fiction. And while I don't think there will ever be a pill that can fix everything, I do think once we know how things work, we will find solutions to many problems."

Gene editing in humans, where we go in and correct genetic errors in our makeup, is a long way away. We first need to understand exactly what the role of every gene is and the repercussions of making any changes.

But with the progress being made by research like that of the Smith Laboratory, the possibility is no longer science fiction.

The UQ Centre for Cardiac and Vascular Biology brings together eight different research laboratories, including the Smith Laboratory, with a focus on research excellence in cardiac and vascular biology. Collaboratively, they study several different aspects of cardiovascular development, regeneration and disease.

### UQ CENTRE FOR CARDIAC AND VASCULAR BIOLOGY

CO-DIRECTORS Dr Ben Hogan (based at IMB), Professor Wally Thomas (based at UQ School of Biomedical Sciences)

WEBSITE [cardiovascularbiology.org.au](http://cardiovascularbiology.org.au)

EMAIL [cardiovascular@imb.uq.edu.au](mailto:cardiovascular@imb.uq.edu.au)

# GRANTS AND FELLOWSHIPS

## GRANTS

The quality of IMB research was recognised by the National Health and Medical Research Council (NHMRC) and Australian Research Council (ARC) through the award of the following grants which commenced funding in 2016:

- + 15 NHMRC project grants totalling **\$9,765,847**
- + 2 NHMRC Development grants totalling **\$1,938,856**
- + 15 ARC Discovery Project grants totalling **\$6,513,588**
- + 1 ARC Linkage Infrastructure, Equipment and Facilities (LIEF) grant **\$840,000**

## COMPETITIVE FUNDING

represented

# 54%



of IMB's total income in 2016

## FELLOWSHIPS

IMB researchers are supported by a range of competitive fellowship schemes. Thanks to the support of these funding organisations, IMB Fellows have the opportunity to conduct valuable research with the potential to advance global scientific progress and improve the health and wellbeing of people around the world.

### FELLOWSHIPS COMMENCED IN 2016

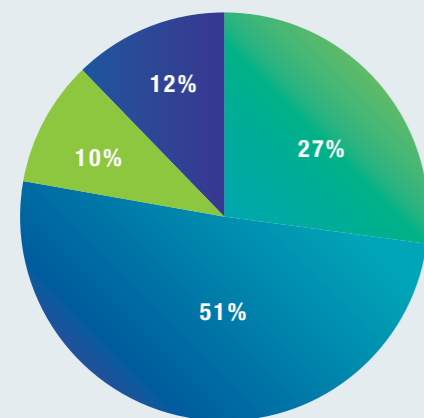
- + 1 ARC Discovery Early Career Researcher Award (DECRA) totalling **\$360,000**
- + 2 ARC Future Fellows totalling **\$1,485,684**
- + 1 NHMRC-ARC Dementia Research Development Fellow totalling **\$601,958**
- + 1 NHMRC Research Fellow totalling **\$622,655**
- + 2 NHMRC Career Development Fellows totalling **\$932,831**
- + 1 John Stocker Postdoctoral Fellow totalling **\$276,000**
- + 1 Motor Neuron Disease Research Institute of Australia Inc Postdoctoral Fellow totalling **\$330,000**

### TOTAL COMPETITIVE FELLOWSHIPS CONTINUING IN 2016

- + 1 ARC Australian Laureate Fellow
- + 5 ARC Future Fellows
- + 2 ARC Discovery Early Career Researcher Awards (DECRA)
- + 14 NHMRC Research Fellows
- + 3 NHMRC Career Development Fellows
- + 1 NHMRC/Heart Foundation Career Development Fellow
- + 1 The Viertel Charitable Foundation Senior Medical Research Fellowship
- + 3 NHMRC Early Career Fellows

### 2016 SOURCES OF COMPETITIVE FUNDING

- + Australian Academy of Technology and Engineering
- + Australian Research Council
- + Australian Tropical Medicine Commercialisation Programme
- + Bill and Melinda Gates Foundation (US)
- + Brain and Behavior Research Foundation
- + Cancer Council Queensland
- + Commonwealth Department of Foreign Affairs & Trade
- + Ferring Research Institute
- + Horizon 2020
- + International Association for the Study of Pain
- + John Stocker Postdoctoral Fellowship
- + Motor Neurone Disease Research Institute of Australia Inc
- + National Foundation for Medical Research and Innovation
- + National Health and Medical Research Council
- + Prostate Cancer Foundation of Australia
- + The Kids' Cancer Project
- + The Michael J Fox Foundation
- + Shake It Up Australia Foundation



### Competitive Funding Sources

- 27% ARC
- 51% NHMRC
- 10% Domestic
- 12% International



ABOVE PROFESSOR ROB PARTON (LEFT) AND DR TOM HALL (RIGHT)

# 2016 AWARD HIGHLIGHTS

## REPRODUCTIVE BIOLOGY RESEARCHER AWARDED FOR EXCELLENCE

Professor Peter Koopman is one of five top international researchers who were presented with a 17th Royan International Research Award in Reproductive Biomedicine by the Royan Institute. He received the Embryology Award for recent work on the molecular genetics of sex development, fertility, gonadal cancers and intersex conditions. Winners presented a lecture at the Royan Twin Congress on Reproductive Biomedicine and Stem Cell Biology and Technology.



ABOVE DR JOSEPH POWELL

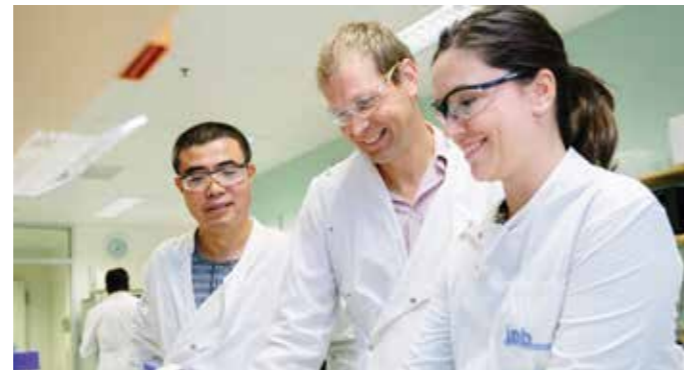
## IMB SCIENTIST WINS TOP MINISTER'S AWARD

Dr Joseph Powell was awarded the Commonwealth Health Minister's Award for Excellence in Health and Medical Research. The prestigious award, administered by the National Health and Medical Research Council (NHMRC), recognises Dr Powell's research achievements in the field of statistical genomics. Dr Powell's research uses large-scale genomic data to investigate the ways genetic differences in humans can affect their disease susceptibility.

Dr Powell is the only Queensland researcher to receive this accolade in its 16-year history. The award was presented at the Medical Research Week Dinner hosted by the Australian Society for Medical Research in Melbourne.

## VASCULAR BIOLOGY RESEARCHER AWARDED FOR LEADERSHIP

Associate Professor Ben Hogan was awarded the 2016 Emerging Leader Award from the Australia and New Zealand Society for Cell and Developmental Biology (ANZSCDB). He was acknowledged for his leadership and accomplishment in cell and developmental biology. Associate Professor Hogan's work investigates how the vascular and lymphatic systems form in the embryo to develop better treatments for cardiovascular diseases like stroke, macular degeneration, inflammation, and cancer metastasis.



ABOVE PROFESSOR KIRILL ALEXANDROV (CENTRE) WITH DR ZHONG GUO (LEFT) AND DR FERNANDA ELY (RIGHT)

## INNOVATIVE RESEARCH TO ASSIST ORGAN TRANSPLANT PATIENTS

Professor Kirill Alexandrov's research into developing personal diagnostic devices was recognised at the National Health and Medical Research Council Research Excellence Awards. He was acknowledged for holding the top-ranked Developmental Grant application for his project with Molecular Warehouse Ltd (UK). Point-of-care test for immunosuppressant drugs. Professor Alexandrov's work aims to assist patients who have had organ transplants, by developing a test for patients and clinicians to easily monitor immunosuppressant drug levels which is vital to avoid organ rejection by the body.

## SCIENTIST ACKNOWLEDGED FOR CONTRIBUTIONS TO PEPTIDE SCIENCE

Dr Markus Muttenthaler received the Miklós Bodanszky Award for his significant contributions to peptide-based drug research. The award was presented at the Opening Ceremony of the 34th European Peptide Symposium in Germany. Dr Muttenthaler is internationally recognised for discovering potentially therapeutic peptides in venoms. His work focuses on developing tools that facilitate basic fundamental research and the drug discovery process. Dr Muttenthaler also received a Ferring Innovation Award from Ferring Research Institute Inc to further a peptide-based drug research project in reproductive health.

BELOW DR MARKUS MUTTENTHALER



## PRAISING WORK TOWARDS DISCOVERING NEW ANTIBIOTICS

In recognition of their efforts in fighting the battle against antimicrobial resistance, IMB's Community for Open Antimicrobial Drug Discovery (CO-ADD) team received an award for research at the UK Antibiotic Guardian Awards. CO-ADD is a global open-access screening initiative established to screen the diverse chemical space of synthetic chemists around the world with the aim of uncovering compounds with antimicrobial potential.



## TOP MOLECULAR BIOLOGIST AWARDED RESEARCH MEDAL

Associate Professor Brett Collins was awarded the Merck Research Medal from the Australian Society for Biochemistry and Molecular Biology (ASBMB). The 2016 Merck Research Medal is awarded to an outstanding Australian biochemist or molecular biologist with less than 15 years' postdoctoral experience. As part of the award, Associate Professor Collins presented at the Merck Medal Lecture at the ComBio 2016 meeting.

LEFT DR SAROJA WEERATUNGA (LEFT) AND ASSOCIATE PROFESSOR BRETT COLLINS (RIGHT)



ABOVE DR REBECCA COLL

## YOUNG IMMUNOLOGIST AWARDED FOR IMPACT

In recognition of a discovery that could benefit patients living with inflammatory diseases, IMB early career researcher Dr Rebecca Coll was awarded the 2016 Research Australia Discovery Award. Dr Coll received her award at the Research Australia Health and Medical Research Awards ceremony in Sydney for her work in identifying promising anti-inflammatory compounds that block the NLRP3 inflammasome — a key driver of inflammation. Dr Coll studies the immune system and how it works to control inflammation in the body. Uncontrolled inflammation contributes to the progression of many diseases including diabetes, arthritis, cancer, multiple sclerosis and neurodegenerative diseases such as Alzheimer's and Parkinson's.

# LEARNING

# RESEARCH TRAINING

“The IMB’s strong commercial and translational focus is one of the main reasons why I was interested to work there. As a postgraduate student at the IMB, I was exposed to different aspects of research commercialisation, such as obtaining patent protection, seeking funding and starting up spin-off companies based on new discoveries. I was also provided with opportunities to further develop my understanding of research commercialisation. These experiences further piqued my interest in research commercialisation and also exposed me to various roles outside of research science, including my current role as a patent attorney.”

**SHEILA BARBERO**, IMB PHD GRADUATE, PATENT ATTORNEY

## PROVIDING A HIGH QUALITY STUDENT EXPERIENCE

IMB is committed to providing students with the best possible opportunities and experiences, to ensure students leave the Institute poised to create lasting change in the world. IMB supported 162 Research Higher Degree (RHD) students and 60 undergraduate students during 2016. The inquisitiveness and creative thinking they bring to their research teams is highly valued and no doubt contributes greatly to IMB’s success.

Working in a multidisciplinary environment with cutting-edge technologies at their fingertips, students are offered opportunities to team up with peers, attend workshops, meet with industry stakeholders, learn from experienced mentors and publish research findings. RHD students are also provided with a \$2000 travel scholarship to present their research at a conference within Australia or around the world.

## CELEBRATING STUDENT SUCCESS

An impressive 100 per cent of IMB’s graduating honours students received first class honours in 2016.

PhD candidate Bruno Madio won the people’s choice award at the UQ All-Institute Three-Minute-Thesis (3MT) competition. 3MT is a multi-national competition that cultivates students’ academic, presentation, and research communication skills.

PhD student Georgianna Kae Oguis (Craik group) won a poster prize at ComBio2016. ComBio is a major conference held annually, organised by the Australian Society for Biochemistry and Molecular Biology.

Jake Parker was one of the few students selected through UQ’s Idea Hub to participate in The China Mobility Program. This is a four-week international internship specialising in innovation and entrepreneurship, which is based at some of Shanghai’s best technology start-ups.

In recognition of entrepreneurial ability and skills gained through experience, training and practical application during the course of studies at IMB, ten students were awarded an *IMB Entrepreneur Training Award* in 2016. They were Kerstin Zoidl, Pengxiang Ji, Claudia Stocks, Sanjaya KC, Jonathan Bester, Jake Parker, Clarissa Rios Rojas, Eduardo Albornoz, Weili Wang, Pritesh Prasad, and Hoang-Nga Nguyen.

## WHERE ARE THEY NOW

Many graduates have gone on to secure research positions at leading institutions around the world.

- + **Dr Fabian Kurth** (formerly Martin group) is now Strategy and Operations Lead for Bristol-Myers Squibb in Germany.
- + **Dr Jordan Follett** (formerly Teasdale Group) is now working at the Department of Medical Genetics, University of British Columbia in Canada.
- + **Dr Angie Jarrad** (formerly Cooper Group) is now working at the Helmholtz Centre for Infection Research in Germany.
- + **Dr Julie Klint** (formerly King group) is now a Research Scientist at Lundbeck in Denmark.





# RESEARCH HIGHER DEGREE STUDENTS

Joanna Akello Agwa  
Eduardo Albornoz Balmaceda  
Mubarak Abkah H. Alzubaidi  
Chee Wei Ang  
Sungmin Baek  
Guillaume Bernard  
Damien Bierschenk  
Brandon Binnie  
Nayara Braga Emidio  
Lou Brillault  
Yuanzhao (Nick) Cao  
Samuel Capon  
Saskya Carrera Pacheco  
Amy Chan  
Irene Chassagnon  
Smrita Chaudhury  
Wenhan Chen  
Gamma Chi  
Ivy Chiang  
Chun Yuen (Jonathan) Chow  
Signe Christensen  
Vignesh Kartik Chundru  
Nicholas Condon  
Ben Cristofori-Armstrong  
Yi Cui  
Jason Da Silva  
Kaustav Das Gupta  
Thomas Dash  
Jessica De Angelis  
Darren Do  
Lilong Dong  
Junqiao (Helen) Du  
Kinga Duszyc  
Mriga Dutt  
Ingrid Edwards  
Sing yan Er  
Clayton Friedman  
Majbrit Froesig-Joergensen  
Emily Furlong  
Raul Gonzalez Pech  
Daniela Grassini  
Lin Grimm  
Jing Guo  
Shafali Gupta

Md. Mahadhi Hasan  
Anke Hering  
James Hill  
Marwa Hussain Ali  
Mathilde Israel  
Kapil Jain  
Penxiang Ji  
Keyi Jiang  
Yan Jiang  
Yuhong Jiang  
Wooram Jung  
Irfahan Kassam  
Sanjaya KC  
Shamsunnahar Khushi  
Hyun (Tom) Kim  
Lalith Kummari  
Hyun Jae (Josh) Lee  
Geraldine Ler  
Xuan Liang  
Ye-Wheen Lim  
Emma Livingstone  
Bruno Madio  
Alex McCann  
Helen Mendel  
Justin Mitchell  
Osama Mohamed  
Md Moniruzzaman  
Ambika Mosale Venkatesh Murthy  
Alexander Mueller  
Laizuman Nahar  
Pratik Neupane  
Hoang-Nga Nguyen  
Hoang Son Nguyen  
Georgianna Kae Oguis  
Jeroen Overman  
Jake Parker  
Blessy Abraham Paul  
Wanida Phetsang  
Gregoire Philippe  
Sarah Piper  
Miranda Pitt  
Kwan Yuen Eunice Poon  
Pritesh Prasad  
Anggia Prasetyoputri  
Haiou (Seagull) Qu

Sassan Rahnama  
Vanessa Raileanu  
Restuadi Restuadi  
Ignacio Retamal Lantadilla  
Clarissa Rios Rojas  
John Roles  
Jessica Rowley  
Manohar Salla  
Haojing Shao  
Shwetha Sivakaminathan  
Bronwyn Smithies  
Hana Starobova  
Maren Janina Steinbeck  
Timothy Stephens  
Jamie Stevens  
Claudia Stocks  
Rhia Stone  
Jasmin Straube  
Chandra Datta Sumi  
Li Chang Jessica Teo  
Samuel Tong  
Constanza Ludovica Vallergera  
Felicita Vernan  
Dan Wang  
Peiqi Wang  
Weili Wang  
Hongyang Wang  
Krishantha Pradeep Wardamune  
Gedara  
Kenneth Wee  
Andrew White  
Chongyang Wu  
Xiaosa Wu  
Yang Wu  
Yeping Wu  
Yue Wu  
Dake Xiong  
Weijun Xu  
Angli Xue  
Alina Zamoshnikova  
Qiang Zhang  
Chenxi Zhou  
Rebekah Ziegman  
Kerstin Zoidl

## RESEARCH TRAINING AT A GLANCE

41

research higher degree students graduated



121

active research higher degree students

30

different countries represented in our student cohort



100%

honours students received first class honours

60

Honours, undergraduate, occupational trainee and coursework masters students hosted at IMB



“The most important thing I learned at IMB is critical thinking and the importance of collaboration. Professor Capon taught me how to raise various hypotheses for an experimental phenomenon, how to find potential values from a project and explore a research topic in depth. I believe the way of thinking I learned is far more valuable than any skills or publications, and will promote me to be an independent scientist in the future.”

ALEX SHANG, IMB PHD GRADUATE

## DEVELOPMENT THROUGH MENTORSHIP

Students at IMB are encouraged to attend workshops and professional networking events to broaden their skill sets and assist them in reaching their full potential.

IMB's Postgraduate Office organised a range of extracurricular activities and programs during 2016, including:

- + **Oral Communication workshop** – facilitated by Emeritus Professor Roland Sussex OAM, this workshop is focussed on talking science to non-scientists, presentation skills, as well as lecturing and tutoring.
- + **Entrepreneurship workshop** – arming students with the necessary knowledge and skills to translate their research discoveries into potential inventions.
- + **UQ Idea Hub workshops** – focused on ideation, technology choices, prototyping, market validation and business modelling to help progress student projects to a prototype stage ready for market testing and validation.
- + **UniQuest Research Commercialisation workshop** – all IMB second year students were given the opportunity to participate in a Research Commercialisation Workshop, run by UniQuest, UQ's commercialisation company.
- + Venture capitalists extend opportunities to IMB students to meet with them on a regular basis.
- + **HealthHack** – a national event that brings medical researchers, health professionals, software developers, engineers, designers and students together to find solutions to important health problems.
- + Many students participated in additional workshops run by UQ's Graduate School, such as **Communicating for impact** outside Academia.
- + IMB offer workshops and seminars to support the development of students for careers in academia and beyond.

# 2016 RHD CONFERRALS

NAME	SUPERVISOR	DEGREE	THESIS TITLE
Hafiza Abdul Ghani	Professor David Craik	PhD	Engineering cyclotides as scaffolds for peptide-based drug design
Nikita Abraham	Professor Richard Lewis	PhD	Investigating nAChR structure and function using AChBP and $\alpha$ -conotoxins
Rubbiya Ali	Professor Ben Hankamer	PhD	Developing 3D novel edge detection and particle picking tools for electron tomography
Yingnan Cong	Professor Mark Ragan	PhD	Constructing genetic exchange communities among bacteria and archaea
Claudio Cortes Rodriguez	Associate Professor Carol Wicking	PhD	Novel regulators of primary cilium function revealed by molecular studies in ciliopathies
Zhenling Cui	Professor Kirill Alexandrov	PhD	Exploiting redundancy of the genetic code for site-selective unnatural amino acids incorporation in vitro
Tram Anh Do	Professor David Fairlie	PhD	Towards new drugs for treating colitis
Chun-Wei Feng	Professor Peter Koopman	PhD	Regulation of germ cell meiosis and differentiation in mice
Jordan Follett	Associate Professor Rohan Teasdale	PhD	The role of retromer in Parkinson's disease
Dejan Gagoski	Professor Kirill Alexandrov	PhD	Streamlined cell-free pipeline for production and analysis of recombinant proteins
Joel Goode	Professor George Muscat	PhD	Identification of the mechanisms underlying the endurance phenotype in transgenic mice that over express the nuclear receptor, Nor-1
Gisela Jakob	Professor Ben Hankamer	PhD	Scale-up cultivation of Australian algae New approaches to isolation, mid-scale cultivation and harvesting of Australian wild type algal strains
Angie Jarrad	Professor Matt Cooper	PhD	Novel nitroimidazole and glycopeptide antibiotics targeting enteric pathogens
Prerna Jha	Professor Matt Cooper	PhD	Structure-function studies of norepinephrine and the allosteric inhibitor $\chi$ -MriA at the human norepinephrine transporter
Husen Jia	Professor David Craik	PhD	Harnessing plants to produce cyclic peptide drugs
Prashanth Jutty Rajan	Professor Richard Lewis	PhD	The ecology, evolution and origin of conotoxins
Johan Kamal Hamidon	Professor David Fairlie	PhD	Characterising Novel and Potent Modulators of Complement Receptor C3aR
Marija Kojic	Professor Brandon Wainwright	PhD	Genetic Regulation of Development and Disorders of the Cerebellum
Soohyun Kwon	Professor David Craik	PhD	Applications of sortase A in disulfide-rich peptide engineering
Chao Liu	Professor Mark Ragan	PhD	Computational analysis of DNA repair pathways in breast cancer

NAME	SUPERVISOR	DEGREE	THESIS TITLE
Barbara Maier	Professor Melissa Little	PhD	Analysis of the recreation, maintenance and differentiation of nephron progenitors for use in disease modelling
Masuda Khurshied Nabi	Professor Kirill Alexandrov	Mphil	Development of a novel protein biosensor technology for the early diagnosis of prostate cancer
Daniel Nielsen	Professor David Fairlie	PhD	Structural features in orally bioavailable cyclic peptides
Tae Gyu Oh	Professor George Muscat	PhD	Understanding epigenetic signalling of nuclear receptor and coregulator in breast cancer: elucidating the novel role of ROR $\gamma$ , PRMT2 and PRMT6
Rosa Prah	Professor Glenn King	Mphil	Venoms-based discovery of novel modulators of human neuronal $\alpha$ 7 and $\alpha$ 3* nicotinic acetylcholine receptors
Reyna Michelle Quezada Iniguez	Professor Rob Capon	PhD	Microbial biodiscovery: Exploring venomous animal associated microbes as sources of new chemical diversity
Anjaneya Swamy Ravipati	Professor David Craik	PhD	Discovery and mode of action of cyclotides
Zoe Schofield	Professor Matt Cooper	PhD	Modulating innate immune responses through the putative anti-inflammatory target FFA2
Zhuo Shang	Professor Rob Capon	PhD	Unveiling the chemical diversity of marine intertidal fungal communities
Atefeh Taharian Fard	Professor Mark Ragan	PhD	Modelling the landscape of cellular development and disease
Wei Xuan Teo	Associate Professor Rohan Teasdale	PhD	Examining the contribution of host cell membrane trafficking pathways to intracellular infection biology
Vikas Tillu	Professor Rob Parton	PhD	Structural and functional characterisation of the cavin membrane coat complex
Zewen Tuong	Professor George Muscat	PhD	Retinoid-related Orphan Nuclear Receptor Alpha and Macrophages in Lipid Metabolism and Immunity
Darya Vanichkina	Dr Cas Simons	PhD	Marvellous complexity: Characterising the transcriptome of the mammalian nervous system using RNA sequencing
Jennifer Yarnold	Professor Ben Hankamer	PhD	Photosynthesis of microalgae in outdoor mass cultures and modelling its effects on biomass productivity for fuels, feeds and chemicals
Jeremy Changyu Yeo	Professor Jenny Stow	PhD	Molecular regulation of phagocytosis and signaling in macrophages
Kathleen Yin	Dr Irina Vetter	PhD	A pharmacological and transcriptomic approach to exploring novel pain targets
Eugene Zhang	Professor Ben Hankamer	PhD	Enhanced microalgae growth and lipid production: a study of cytostatic inhibitors and glycerol assimilation
Pabasara Kalansuriya	Professor Rob Capon	PhD	Microbial Chemical Diversity: Strategies to Stimulate Microbial Secondary Metabolite Potential
Samuel Perry	Professor David Fairlie	PhD	Towards cell permeable modulators of protein-protein interactions
Alina Zamoshnikova	Associate Professor Kate Schroder	PhD	Biochemical and Functional Characterisation of NLRP12

# ENGAGEMENT

# RESEARCH COMMERCIALISATION



ABOVE DR AVRIL ROBERTSON

## IMB SPINOUT RAISES UP TO \$22M

Researchers at IMB have been working to uncover what triggers the persistent inflammation in the body that has been linked to many diseases such as Alzheimers, type-two diabetes, Parkinson's disease and arthritis. Their discoveries have led to the formation of a new Company to develop treatments for inflammatory diseases.

Inflazome Ltd, the new Company headquartered in Ireland, raised up to A\$22 million in Series A financing in 2016, one of the largest biotech Series A investments for intellectual property originating from an Australian university.

Inflazome Ltd is developing treatments by inhibiting the inflammasome, a key biological pathway associated with a wide variety of diseases driven by chronic inflammation.

IMB is pursuing commercial opportunities to produce treatments to combat inflammatory diseases such as arthritis, asthma, Parkinson's, Alzheimer's and MS.

The potential for a small molecule inhibitor of this target is extremely promising, and over the next few years, the Company is working to progress this research to clinical trials.

The multi-million dollar investment means that Inflazome can develop new drug candidates for millions of people around the world who are affected by inflammatory diseases.

The intellectual property is based on work by IMB researchers Professor Matt Cooper, Associate Professor Kate Schroder, Dr Rebecca Coll and Dr Avril Robertson; in collaboration with Professor Luke O'Neill at Trinity College Dublin, Ireland.

Inflazome Ltd is just one example of how the commercialisation of IMB research is addressing global health challenges.

## PARTNERSHIP

Partnership and collaboration drive the research agenda of the IMB. Innovation cannot occur without discovery and IMB researchers are working with clinicians, industry partners and government agencies in order to use life sciences research to find new answers to old problems.

We welcome and invite enquiry through our Partnership and Engagement Office:

**Associate Professor Carol Wicking**  
 Manager, Strategic Research Engagement  
 ☎ +61 409 546 968  
 ✉ c.wicking@imb.uq.edu.au

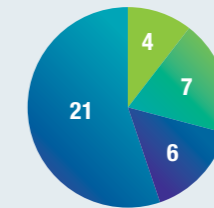
**Dr Peter Wilson**  
 Research Partnership Manager  
 ☎ +61 7 3346 2194  
 ✉ p.wilson@imb.uq.edu.au

## OUR COMMITMENT TO DELIVER

IMB works closely with The University of Queensland's commercialisation company, UniQuest, to translate our research discoveries for disease applications and sustainable futures.

Together with UniQuest, IMB's research teams are pursuing commercial opportunities in the following areas:

- + Human therapeutics – including new treatments for inflammation, pain, metabolic disorders, infection and cancer;
- + Agriculture – including insecticides, and pesticides; and
- + Biotechnology – including microalgae-based biofuels and production of high-value materials.



## 38 patent families managed

- 4 agricultural/industrial biotechnology
- 7 diagnostic/devices
- 6 drug discovery tools
- 21 therapeutics

7

new patents filed



8

new industry partnerships formed in 2016



IMB is a partner

in the ARC Training Centre for Biopharmaceutical Innovation

9

active Australian Research Council Linkage Projects



>5%

of IMB's publications include industry collaborations

IMB spinout Inflazome Ltd attracted up to

\$22M

in Series A financing



Industry partners hailed from around the globe

- USA
- UK
- Switzerland
- Ireland
- Korea
- Netherlands
- Denmark



IMB spinout Protagonist was listed on the NASDAQ in 2016, raising

AU\$118M

in its initial public offering, and awarded

Australian Company of the Year

# COMMUNITY ENGAGEMENT

## WORLD SCIENCE FESTIVAL

Professor Jennifer Stow presented a talk at the World Science Festival held in Brisbane. As part of her presentation, titled *Finding beauty in the breakdown: looking through the lens at disease*, Professor Stow showcased fantastic images created by members of her research group. She also discussed the advanced imaging techniques available today that allow us to watch the visual stories of our living cells unfold before our eyes with remarkable and unprecedented detail.

## INFLAMMATION SYMPOSIUM

IMB's Centre for Inflammation and Disease Research hosted a one-day inflammation symposium for research students, postdoctoral staff and senior researchers around Australia. The goal of the symposium is to provide scientific discussion and networking opportunities. Clinicians and researchers were able to develop new collaborations and partnerships in inflammation research.

## PAIN: MAKING IT PERSONAL

Scientists from IMB's Centre for Pain Research joined leading clinical pain scientist, Professor Lorimer Moseley and Chronic Pain Australia President, Dr Coralie Wales, for a community seminar held during National Pain Week. The speakers provided guests with a fascinating insight into the challenging and personal nature of pain management, and how it is inspiring a new generation of patient-focused treatments for one of the most poorly understood and undertreated conditions in modern medicine.

RIGHT PANEL MEMBERS AT IMB'S PAIN: MAKING IT PERSONAL EVENT. (LEFT TO RIGHT) DR JENNIFER DEUIS, PROFESSOR LORIMER MOSELEY, DR CORALIE WALES, PROFESSOR RICHARD LEWIS, DR IRINA VETTER.



## SUPERBUGS AT THE OLYMPICS

Following the 2016 Olympic Games, IMB's Centre for Superbug Solutions hosted a community event to discuss the health threat posed by superbug-infested waters during the Olympic Games in Rio. Held during Antibiotic Awareness Week in November, attendees heard from various sport and science experts. Speakers included bacterial sepsis survivor and Rio 2016 gold medalist Paralympian Chris Bond OAM, Rio Olympic rower Fiona Albert, IMB superbugs researcher Dr Mark Blaskovich and Triathlon Australia Chief Medical Officer Dr Mark Young.

LEFT ASSOCIATE PROFESSOR LACHLAN COIN

## BRAINCHILD FOUNDATION RESEARCH INFORMATION EVENING

Together with the Brainchild Foundation, IMB participated in a research information evening at Customs House in May. Professor Brandon Wainwright was a guest speaker during the evening, which was held to showcase the work of researchers supported by the Foundation. Guests heard about the research progress that has been made to date, and how Brainchild Foundation's generous grants are assisting researchers in the field of childhood brain tumours. Brainchild founder and Brisbane neurosurgeon Dr Martin Wood was a key speaker during the evening.

BELOW BRAINCHILD FOUNDER AND NEUROSURGEON DR MARTIN WOOD



## SCIENCE IN THE CINEMA

Researchers from IMB's Centre for Pain Research participated in an expert panel discussion as part of The Australian Society for Medical Research's Science in the Cinema event. IMB's Professor Glenn King and Dr Irina Vetter spoke about their chronic pain research and future treatment options following a screening of the film CAKE, a true-life drama about a chronic pain sufferer and how her pain and grief affected her behavior, relationships, and her ability to function in day-to-day life.

## TRANSLATING GENOMIC DATA INTO CANCER TREATMENTS

Professor Brandon Wainwright presented a talk to staff at Lady Cilento Children's Hospital's Oncology Services Unit, titled the challenges of converting genomic information to new therapeutics for medulloblastoma. IMB researchers are working with clinicians across the State and nationally to find treatments for cancers, rare diseases, Motor Neurone Disease (MND), heart and lung diseases.

## 3RD ANNUAL QUEENSLAND FORUM ON ANTIMICROBIAL RESISTANCE

Clinicians and researchers gathered at a forum to focus on a One Health approach to fighting antimicrobial resistance. They were given the opportunity to share ideas, build new collaborations and promote closer ties between academic researchers, clinicians and industry partners.

Guests included experts in infectious disease, microbiology, diagnostics, epidemiology, pharmacology, medicinal chemistry, agriculture and veterinary sciences. Held at the Royal Brisbane and Women's Hospital, the forum was hosted by IMB's Centre for Superbug Solutions, in collaboration with Queensland Health's Communicable Diseases Clinical Network and Queensland Statewide Antimicrobial Stewardship Program.

## THE PHARMA REVOLUTION: GROWING MEDICINAL DRUGS IN YOUR BACKYARD

IMB's Professor David Craik and Dr Sónia Henriques gave a fascinating presentation at the UQ Global Leadership Series about their work on growing medicines in plants. Guests heard how cancer could one day be treated by drinking tea, chronic pain controlled by swallowing sunflower seeds and obesity cured by eating fries made from genetically engineered potatoes.

CLOCKWISE DR SÓNIA HENRIQUES, PROFESSOR BRANDON WAINWRIGHT AND PROFESSOR DAVID CRAIK PROFESSOR DAVID CRAIK AND DR SÓNIA HENRIQUES SPEAKING AT THE UQ GLOBAL LEADERSHIP SERIES GUESTS AT THE UQ GLOBAL LEADERSHIP SERIES



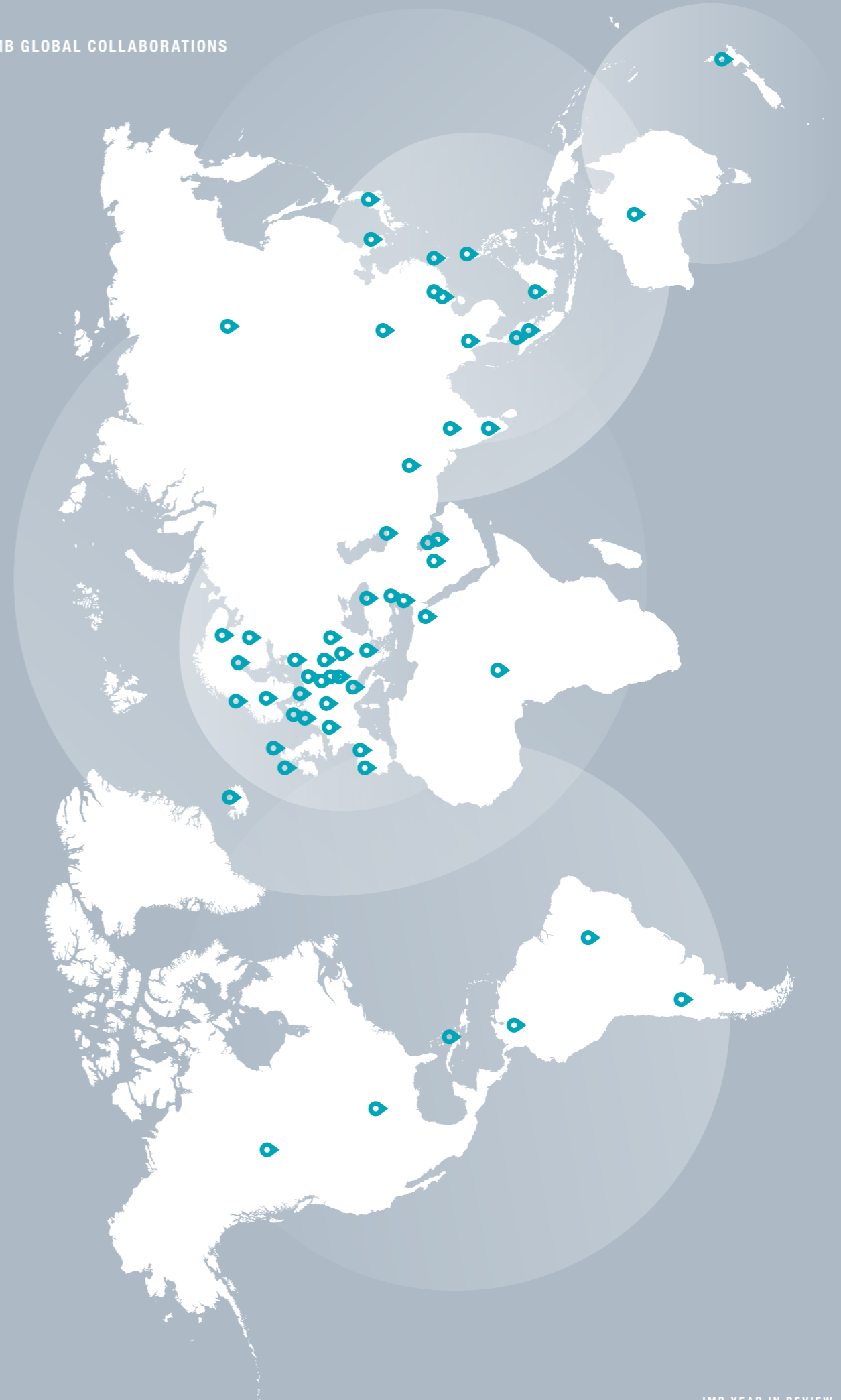
# 2016

## GLOBAL COLLABORATIONS

IMB connected with industry, education, government and clinical partners around the globe to share knowledge and work together to progress research towards significant healthcare outcomes for patients.

- + Australia
- + Austria
- + Bahrain
- + Belgium
- + Brazil
- + Canada
- + Chile
- + China
- + Colombia
- + Croatia
- + Czech Republic
- + Denmark
- + Egypt
- + Estonia
- + Finland
- + France
- + Germany
- + Greece
- + Hong Kong
- + Hungary
- + Iceland
- + India
- + Indonesia
- + Iran, Islamic Republic of
- + Ireland
- + Israel
- + Italy
- + Jamaica
- + Japan
- + Korea, Republic of
- + Lebanon
- + Macao
- + Malaysia
- + Netherlands
- + New Zealand
- + Nigeria
- + Norway
- + Pakistan
- + Philippines
- + Poland
- + Portugal
- + Qatar
- + Romania
- + Russian Federation
- + Saudi Arabia
- + Serbia
- + Singapore
- + Slovenia
- + Spain
- + Sri Lanka
- + Sweden
- + Switzerland
- + Taiwan, Province of China
- + Thailand
- + Turkey
- + United Kingdom
- + United States

### IMB GLOBAL COLLABORATIONS



# OUR PEOPLE

## LIST OF MEMBERS OF BOARDS AND COMMITTEES

### ADVISORY BOARD

**Professor Aidan Byrne** (Oct-Dec)  
Provost & Senior Vice-President, The University of Queensland

**Mr Bob Christiansen**  
Managing Director, Southern Cross Venture Partners

**Professor John W Funder AC**  
Senior Fellow, Hudson Institute of Medical Research  
Professor, Department of Medicine, Monash University  
Professorial Associate, Centre for Neuroscience, The University of Melbourne  
Honorary Professor, Institute of Molecular Biosciences, The University of Queensland

**Dr Anand Gautam**  
Senior Director, R&D Innovation Sourcing, Novo Nordisk

**Dr Cherrell Hirst AO** (Chair)  
Director of Medibank Private, Gold Coast Health and Hospital Service, and RSL Care

**Professor Max Lu** (Jan-Mar)  
Provost & Senior Vice-President, The University of Queensland

**Associate Professor Beverley Rowbotham**  
Director of Haematology at Sullivan Nicolaides Pathology  
Part of the Sonic Healthcare group  
Associate Professor of Cellular and Molecular Pathology, The University of Queensland

**Professor Stephen Walker**  
Executive Dean, Faculty of Science, The University of Queensland

**Professor Robyn Ward** (Mar-Sep)  
Deputy Vice-Chancellor (Research), The University of Queensland

**Dr Jane Wilson**  
Guardian, Future Fund  
Deputy Chancellor, The University of Queensland  
Director of Sonic Healthcare and General Sir John Monash Foundation

### TRANSLATIONAL SUB-COMMITTEE

**Dr Mark Ashton**  
Executive Director, Intellectual Property Commercialisation, UniQuest

**Professor Rob Capon**  
IMB Group Leader, Postgraduate Coordinator

**Mr Bob Christiansen (Chair)**  
Managing Director, Southern Cross Venture Partners

**Dr Cherrell Hirst AO**  
Director of Medibank Private, Gold Coast Health and Hospital Service, and RSL Care

**Mr Andy Jane**  
Managing Director, Life Sciences, Talu Ventures

**Associate Professor Kate Schroder**  
IMB Group Leader, Deputy Director of IMB Centre for Inflammation and Disease Research

**Ms Brigitte Smith**  
Co-founder and Managing Partner, GBS Venture Partners

**Professor Jennifer Stow**  
IMB Deputy Director (Research)

**Professor Brandon Wainwright**  
IMB Director

### STRATEGIC MANAGEMENT COMMITTEE

**Dr Mark Ashton**  
Executive Director, Intellectual Property Commercialisation, UniQuest

**Dr Jodi Clyde-Smith** (Sept-Dec)  
Deputy Director (Operations and Strategy)

**Professor Matt Cooper**  
Director, Centre for Superbug Solutions

**Professor David Fairlie**  
Head, Chemistry and Structural Biology

**Professor Ben Hankamer**  
Director, Centre for Solar Biotechnology

**Associate Professor Ben Hogan**  
Co-Director, UQ Centre for Cardiac and Vascular Biology Co-Head, Genomics of Development and Disease

**Professor Richard Lewis**  
Director, Centre for Pain Research

**Professor Grant Montgomery**  
Director, UQ Project Three Billion

**Ms Maureen O'Shea**  
Director of Advancement

**Professor Mark Ragan**  
Co-Head, Genomics of Development and Disease

**Professor Jennifer Stow**  
Deputy Director (Research)

**Associate Professor Matt Sweet**  
Director, Centre for Inflammation and Disease Research

**Dr Ian Taylor (Jan-Aug)**  
Deputy Director (Operations)

**Professor Brandon Wainwright**  
Director

**Associate Professor Carol Wicking**  
Director, Centre for Rare Diseases Research

**Professor Alpha Yap**  
Head, Cell Biology and Molecular Medicine



ABOVE ALEXANDROV GROUP

## OUR PEOPLE

### RESEARCH STAFF

**Alewood group:** Paul Alewood (Group leader), Andreas Brust, Zoltan Dekan, Jean Jin, Vincent Lavergne, Markus Muttenthaler, Jingjing Wan

**Alexandrov group:** Kirill Alexandrov (Group leader), Zhenling Cui, Selvakumar Edwardraja, Fernanda Ely, Dejan Gagoski, Zhong Guo, Wayne Johnston, Shayli Moradi, Sergey Mureev, Marinna Nilsson, Patricia Walden

**Capon group:** Rob Capon (Group leader), Lea Indjein, Venkatanambi Kamalakkannan, Zeinab Khalil, Angela Salim, Sean Xiao

**Coin group:** Minh Cao, Lachlan Coin (Group leader), Devika Ganesamoorthy

**Collins group:** Brett Collins (Group leader), Rajesh Ghai, Natalya Leneva, Suzanne Norwood, Saroja Weeratunga

**Cooper group:** Maite Amado, Mark Blaskovich, Mark Butler, Matthew Cooper (Group leader), Daniel Croker, Mathilde Desselle, David Edwards,

Alysha Elliott, Alejandra Gallardo-Godoy, Karl Hansford, Geraldine Kaeslin, Angela Kavanagh, Ruth Neale, Ruby Pelingon, Soumya Ramu, Janet Reid, Avril Robertson, Zoe Schofield, Danielle Sutherland, Robin Trauer, Daniel Watterson, Nicole Wheatley, Zytia Ziora, Johannes Zuegg

**Craik group:** Hadi Ahmad Fuaad, Angeline Chan, Olivier Cheneval, David Craik (Group leader), Thomas Durek, Edward Gilding, Peta Harvey, Crystal Huang, Mark Jackson, Quentin Kaas, Annie Kan, Nicole Lawrence, Aaron Poth, Tina Schroeder, Joakim Swedberg, Sonia Troeira Henriques, Conan Wang, Joachim Weidmann

**Fairlie group:** Aline Dantas De Araujo, David Fairlie (Division head and group leader), Rebecca Fitzsimmons, Maria Greenup, Tim Hill, Huy Hoang, Abishek Iyer, Woan Mei Kok, James Lim, Ligong Liu, Ken Loh, Rink-Jan Lohman, Jeffrey Mack, Robert Reid, Nick Shepherd, Jacky Suen, Chongyang Wu, Kai-Chen Wu, Annika Yau

**Francois group:** Frank Fontaine, Emmanuelle Frampton, Mathias Francois (Group leader), Cathy Pichol-Thievend, Renae Skoczylas

**Hankamer group:** Ben Hankamer (Group leader), Michael Landsberg, Melanie Oey, Ian Ross, Rosalba Rothnagel, Evan Stephens, Juliane Wolf

**Hogan group:** Neil Bower, Jun Chen, Kylie Georgas, Ben Hogan (Co-division head and group leader), Kaska Koltowska, Anne Lagendijk, Scott Paterson

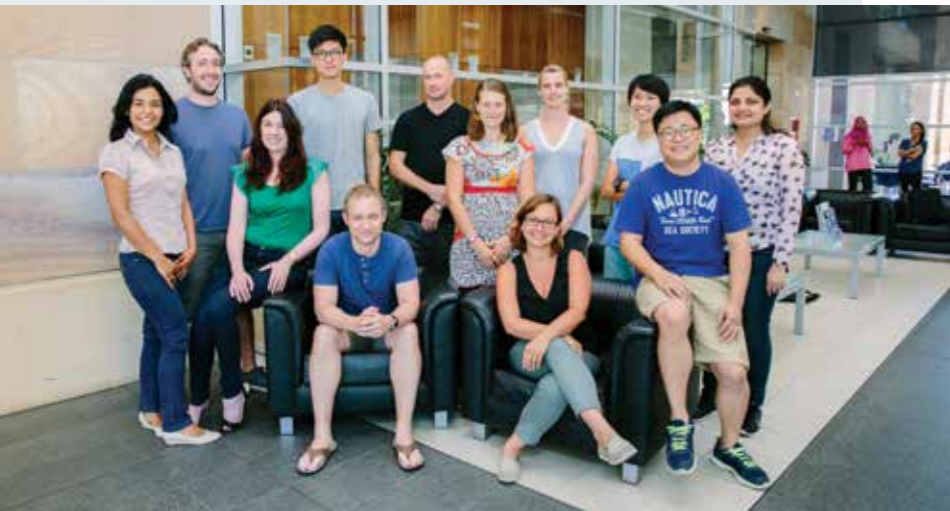
**King group:** Raveendra Anangi, Yanni Chin, Evelyne Deplazes, Maggie Hardy, Volker Herzig, Glenn King (Group leader), Linlin Ma, Sandy Pineda Gonzalez, Lachlan Rash, Natalie Saez, Sebastian Senff, Jennifer Smith, Eivind Undheim, Andrew Walker

**Koopman group:** Peter Koopman (Group leader), Ee Ting Ng, Liang Zhao

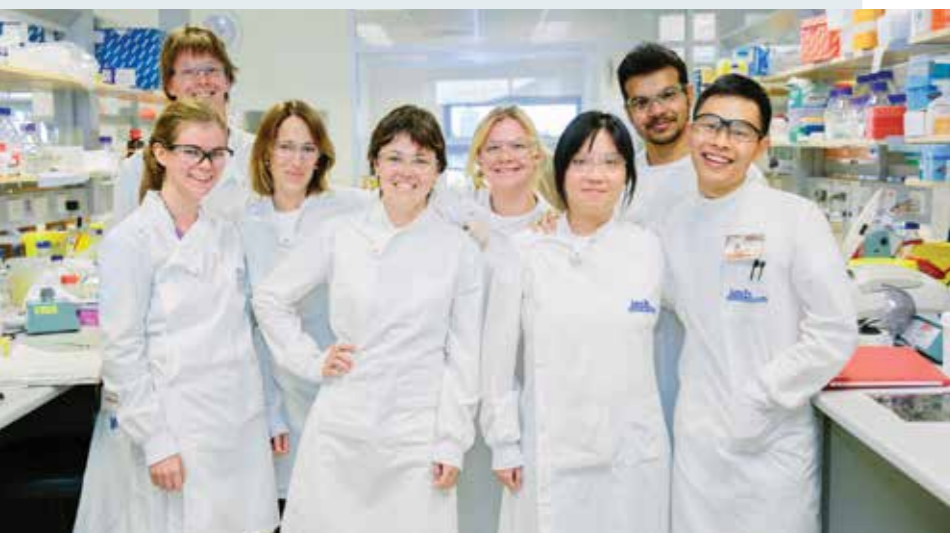




ABOVE CAPON GROUP



ABOVE HOGAN GROUP



ABOVE VETTER GROUP

**Lewis group:** Asa Andersson, Fernanda Caldas Cardoso, Jean Giacomotto, Richard Lewis (Group leader), Hoshyar Mohialdeen, Thea Monks, Lotten Ragnarsson-McGrath, Silmara Rodrigues De Sousa, Himaya Siddihalu Wickrama Hewage, Josh Wingerd

**Martin group:** Michelle Christie, Camila Cotrim, Shu-Hong Hu, Russell Jarrott, Jenny Martin (Group leader), Roisin McMahon

**Montgomery group:** Jenny Fung, Grant Montgomery (Group leader)

**Muscat group:** George Muscat (Group leader), Tae Oh, Mary Wang

**Palpant group:** Han Chiu, Nathan Palpant (Group leader)

**Parton group:** Nicholas Ariotti, Michele Bastiani, Charles Ferguson, Tom Hall, Dominic Hunter, Harriet Lo, Nick Martel, Kerrie-Ann McMahon, Susan Nixon, Robert Parton (Group leader), James Rae

**Powell group:** Jenny Fung, Alex Holloway, Rebecca Lim, Luke Lloyd-Jones, Sam Lukowski, Quan Nguyen, Joseph Powell (Group leader), Anne Senabouth, Peter Smartt, Emily Wong (visiting), Chloe Yap

**Ragan group:** Cheong Xin Chan, Alain-Dominique Gorse, Huanle Liu, Mark Ragan (Co-division head and group leader), Sriganesh Srihari, Lanna Wong

**Schroder group:** Dave Boucher, Kaiwen Chen, Rebecca Coll, Jennifer Dou, Caroline Holley, Mercedes Maria Monteleone, Kate Schroder (Group leader)

**Simons group:** Gregory Baillie, Stephen Bent, Joanna Crawford, Cas Simons (IMB Fellow), Douglas Stetner

**Smythe group:** Gregory Bourne, Christina Kulis, Jaimee McMahon, Mark Smythe (Group leader), Adam Stephenson, Jenny Zhang

**Smith group:** Jason Da Silva, Daniela Grassini, Angela Jeanes, Kelly Smith (Group leader), Alisha Tromp

**Stow group:** Darren Brown, Tatiana Khromykh, Lin Luo, Jennifer Stow (Group leader), Adam Wall

**Sweet group:** Ronan Kapetanovic, Divya Ramnath, Melanie Shakespear, Matt Sweet (Group leader)

**Teasdale group:** Markus Kerr, Xiaying Qi, Rohan Teasdale (Group leader), Zhe Yang

**Visscher:** Kathryn Kemper, Luke Lloyd-Jones, Allan McRae, Matthew Robinson, Peter Visscher (Group leader), Loic Yengo Dimbou

**Vetter group:** Jennifer Deuis, Irina Vetter (Group leader)

**Wainwright group:** Christelle Adolphe, Laura Genovesi, Marija Kojic, Amanda Millar, Gayle Petersen, Brandon Wainwright (IMB Director and Group leader)

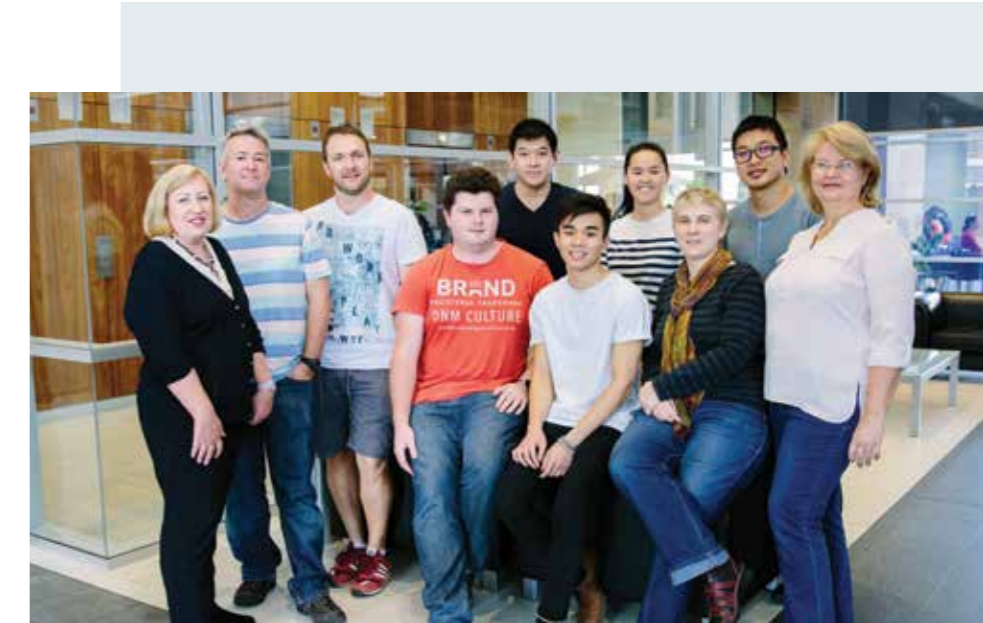
**Waters group:** Yash Chhabra, Michael Waters (Group leader)

**Wicking group:** Maria Rondon, Carol Wicking (Group leader)

**Wray:** Earlene Ashton, Beben Benyamin, Jolene Berry, Marie-Jo Brion, Enda Byrne, Fleur Garton, Jake Gratten, Anjali Henders, Tiana McLaren, Emily Thomson, Maciej Trzaskowski, Anna Vinkhuyzen, Leanne Wallace, Naomi Wray (Group leader), Hasti Ziaimatin

**Yap group:** Bipul Acharya, Srikanth Budnar, Guillermo Gomez, Tatiana Khromykh, Vanessa Tomatis, Suzie Verma, Alpha Yap (Division head and group leader)

**Yang:** Ting Qi, Jian Yang (Group leader), Futao Zhang, Zhihong Zhu, Jian Zeng



ABOVE STOW GROUP

## SUPPORT STAFF

**Administration support:** Sue Allen, Lucinda Essery, Katrina Garner-Moore, Gail Howard, Patricia Howarth, Barbara Synak, Deirdre Timo

**Advancement:** Maureen O'Shea (Director)

**Central sterilising facility:** Sol Koppmann, Dawn Walsh (Manager)

**Commercialisation team:** Mark Ashton\* (Manager), Yvonne Booth\*, Stephen Earl\*, Kylie Ellis\*, Peter Wilson  
\*Employed by UniQuest

**Communications:** Bronwyn Adams, Aimee Parker, Kate Sullivan, Gemma Ward

**External relations:** Melanie Gray

**Finance:** Robyn Craik, Angela Gardner (Manager), Louise Hendriks, Sanjay Sundarlal

**Grants officer:** Michelle Foley

**Human resources:** Fiona Davis, Caraine Gomez, Felicity Ray (Manager)

**IMB Biomathematics:** Nick Hamilton, James Lefevre

**Information technology:** Matthew Bryant, Lyndon Cook, Christian De Marco, Brett Dunsmore (Manager), Calvin Evans, Nelson Marques, Lance Rathbone, Yves St-Onge, Jimmy Wu

**Infrastructure support:** Kristie Barclay, Chris Barnett (Manager), Jill Bradley, Tim Bruxner, Karl Byriel, Angelika Christ, Christine Fraser, John Griffin, Jacky (Chung-Wei) Hung, Alun Jones, Miki Miyagi, Darren Paul, Alan Robertson, James Springfield

**Operations:** Ian Taylor (outgoing Director), Jodi Clyde-Smith (incoming Director)

**Postgraduate office:** Amanda Carozzi, Olga Chaourova, Cody Mudgway

**Safety manager:** Paul Lovelock,

**Stores:** Bob Allen, Mark McDade, Barry Pitt (Manager)

**QFAB Bioinformatics:** Anne Bernard, Pierre-Alain Chaumeil, Xin-Yi Chua, Dominique Gorse (CEO), Anne Kunert, Nicholas Rhodes, Justin Scott, Michael Thang

**Workshop and maintenance:** Gary Carloss, Jason Hurst, Leigh Rose, John Srnka, Mick Thwaite (Manager)

# JOINT APPOINTMENTS AND AFFILIATES

Joint appointments and affiliates foster research collaborations between IMB and other institutes and schools at The University of Queensland and around the world. Partners are actively involved in sharing resources and facilities, supervising students and supporting IMB initiatives.

## UQ JOINT APPOINTMENTS

### Professor Kirill Alexandrov

Australian Institute for Bioengineering and Nanotechnology

### Professor Philip Hugenholtz

School of Chemistry and Molecular Biosciences

### Dr Allan McRae

Queensland Brain Institute

### Professor Grant Montgomery

Queensland Brain Institute

### Dr Joseph Powell

Queensland Brain Institute

### Professor Peter Visscher

Queensland Brain Institute

### Professor Naomi Wray

Queensland Brain Institute

### Professor Jian Yang

Queensland Brain Institute

## HONORARY AND ADJUNCT APPOINTMENTS

### Associate Professor Timothy Bailey

University of Nevada, Reno

### Dr Peter Beattie

Former Premier of Queensland

### Professor Frances Brodsky

University of California, San Francisco

### Mr Bob Christiansen

Southern Cross Venture Partners Pty Ltd

### Dr Norelle Daly

James Cook University

### Dr Melissa Davis

The University of Melbourne

### Professor John Funder AO

Hudson Institute of Medical Research

### Professor Frank Gannon

QIMR Berghofer Medical Research Institute

### Dr Cherrell Hirst AO

Director of Medibank Private, Gold Coast Health and Hospital Service, and RSL Care

### Professor Wanjin Hong

Institute of Molecular and Cell Biology

### Professor David Hume

The Roslin Institute

### Dr Gary Leong

BGI Tech Solutions

### Professor Yingrui Li

BGI Tech Solutions

### Professor Melissa Little

Murdoch Childrens Research Institute

### Professor John Mattick AO

Garvan Institute

### Dr Wim Meutermans

Audeo Oncology

### Professor Nicos Nicola

Walter and Eliza Hall Institute of Medical Research

### Dr John Pearson

QIMR Berghofer Medical Research Institute

### Mr Ken Roberts

Former Managing Director of Wellcome Australasia Limited

### Professor Peter Turnbull

QFAB Bioinformatics

### Dr Nicola Waddell

QIMR Berghofer Medical Research Institute

### Dr Andrew Whitten

Australian Nuclear Science and Technology Organisation

### Professor Marino Zerial

Max Planck Institute of Molecular Cell Biology and Genetics

## UQ AFFILIATES

### Dr Antje Blumenthal

Diamantina Institute

### Dr Mikael Boden

School of Chemistry and Molecular Biosciences

### Dr Andrew Brooks

Diamantina Institute

### Professor Matthew Brown

Diamantina Institute

### Dr Richard Clark

School of Biomedical Sciences

### Professor Ian Frazer

Translational Research Institute

### Associate Professor Bryan Fry

School of Biological Sciences

### Professor Elizabeth Gillam

School of Chemistry and Molecular Biosciences

### Associate Professor Stuart Kellie

School of Chemistry and Molecular Biosciences

### Professor Bostjan Kobe

School of Chemistry and Molecular Biosciences

### Dr Hong Lee

Queensland Brain Institute

### Professor Alan Mark

School of Chemistry and Molecular Biosciences

### Dr Mehdi Mobli

Centre for Advanced Imaging

### Dr Zoltan Neufeld

School of Mathematics and Physics

### Dr Johan Rosengren

School of Biomedical Sciences

### Associate Professor Joseph Rothnagel

School of Chemistry and Molecular Biosciences

### Professor Maree Smith

Tetra Q

### Dr Kate Stacey

School of Chemistry and Molecular Biosciences

### Associate Professor Peter Thorn

School of Biomedical Sciences

### Professor Istvan Toth

School of Chemistry and Molecular Biosciences

### Associate Professor Christine Wells

Australian Institute for Bioengineering and Nanotechnology

### Professor Paul Young

School of Chemistry and Molecular Biosciences

THANK YOU TO OUR 2016

# SCIENCE AMBASSADORS

The IMB Science Ambassadors are a group of early-career researchers who are passionate about science communication. They are chosen to represent the Institute at events, such as the IMB Open Day and various community events held throughout the year. Ambassadors also share their knowledge and enthusiasm about IMB research with donors; students; and industry, clinical and academic partners, when they lead tours through the Institute.

Angie Jarrad (Cooper group)

Abishek Iyer (Fairlie group)

Claudia Stocks (Sweet group)

Nikita Abraham (Lewis group)

Mriga Dutt (Lewis group)

Ed Gilding (Craik group)

Christina Schroeder (Craik group)

Dejan Gagoski (Alexandrov group)

James Hill (Cooper group)

Prashanth Jutty Rajan (Lewis group)

Guillaume Bernard (Ragan group)

Rink-Jan Lohman (Fairlie group)

Guillermo Gomez (Yap group)

Natalie Saez (King group)

Avril Robertson (Cooper group)

Atefeh Taharian Fard (Ragan group)

Lou Brillault (Hankamer group)

Emma Livingstone (Martin/Collins group)

Marija Kojic (Wainwright group)

Alan Robertson (Coin group)

Lin Luo (Stow group)

Melanie Oey (Hankamer group)

Sarah Piper (King group)

Ambika Murthy (Sweet group)

Daniela Grassini (Smith group)

Michelle Christie (Martin group)

Miranda Pitt (Cooper group)

Jessica De Angelis (Smith group)

Jeroen Overman (Francois group)

Christina Kulis (Smythe group)

Juliane Wolf (Hankamer group)

Melanie Shakespeare (Sweet group)

Annie Kan (Craik group)

Mathilde Desselle (Cooper group)

Ben Cristofori-Armstrong (King group)

Mark Jackson (Craik group)

Emily Furlong (Martin group)

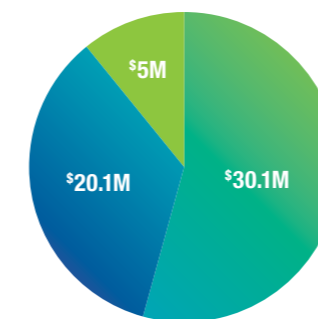
# SUPPORTING INFORMATION

# FINANCIAL STATEMENT

INCOME	2014 \$'000	2015 \$'000	2016 \$'000
<b>Peer Reviewed Income</b>			
ARC Grants	7,355	7,814	8,339
NHMRC Grants	18,843	16,327	15,625
State Government Grants	1,035	356	59
Other Peer Reviewed Grants – Domestic	3,735	1,753	2,951
Other Peer Reviewed Grants – International	914	3,523	3,715
<b>Operating Income</b>			
UQ Awarded Grants	3,571	3,377	5,296
UQ Operating Funding	9,419	14,221	14,578
State Government Grants	5,000	0	0
Sales and Services Revenue	2,554	1,730	1,027
<b>Other Income</b>			
Philanthropy	309	335	379
Commercialisation	2,761	2,293	2,938
Other Income & Recoveries	835	905	1,769
<b>Total Income</b>	<b>56,330</b>	<b>52,634</b>	<b>56,676</b>

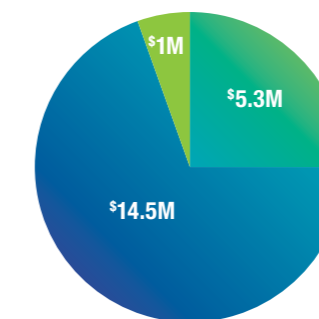
EXPENDITURE	2014 \$'000	2015 \$'000	2016 \$'000
<b>Remuneration Expenditure</b>			
Researchers	33,635	28,351	29,385
Infrastructure	2,879	2,819	2,794
Administrative	2,242	2,475	2,975
<b>Research Expenditure</b>			
Research Services	15,356	12,534	12,571
Commercialisation	35	26	44
Research Higher Degree Support	1,563	1,149	1,476
UQ Internal Collaborations and Agreements	820	950	719
<b>Operating Expense</b>			
Capital Equipment	2,355	2,735	5,832
Information Technology	749	606	535
Administration and Support	409	496	620
Infrastructure and Development	857	950	1,000
<b>Total Operating Expenditure</b>	<b>60,899</b>	<b>53,093</b>	<b>57,950</b>
<b>Net Surplus/(Deficit)</b>	<b>(4,569)</b>	<b>(459)</b>	<b>(1,274)</b>

## IMB INCOME AND EXPENDITURE AT A GLANCE



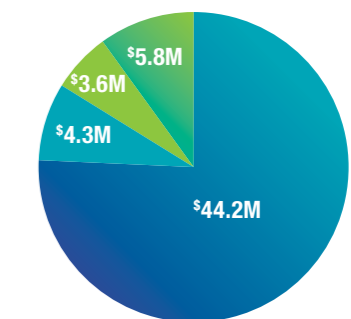
Total income

- 54% Peer reviewed (competitive) funding
- 37% Operating
- 9% Philanthropy, commercialisation, other income and recoveries



Operating (core) income

- 25% UQ awarded grants
- 70% UQ operating funding
- 5% Sales and services revenue



Distribution of expenditure

- 76% Research
- 8% Infrastructure
- 6% Administration
- 10% Capital equipment

# RESEARCH GRANTS

NEWLY AWARDED GRANTS COMMENCING IN 2016 TOTALLED \$37,545,292.

IMB researchers are indicated in bold.

GRANTING BODY	INVESTIGATORS	PROJECT TITLE	DURATION	TOTAL GRANT
ARC Discovery Projects	<b>ALEWOOD, Paul F</b>	Novel cysteine-rich conotoxin frameworks from Australian cone snails	3 years	\$210,000
ARC Discovery Projects	<b>LEWIS, Richard J; ALEWOOD, Paul F &amp; DUTERTRE, S.</b>	Structure and function of predatory and defensive venoms in cone snails	3 years	\$469,986
ARC Discovery Projects	<b>FAIRLIE, David</b>	Engineering peptides into superglues selective for target proteins	3 years	\$534,602
ARC Discovery Projects	<b>SCHRODER, Kate</b>	A molecular timer for inflammation and cell death	4 years	\$494,400
ARC Discovery Projects	<b>KOOPMAN, Peter A</b>	Systems analysis of a critical regulatory hub in sex determination	3 years	\$399,100
ARC Discovery Projects	<b>ALEXANDROV, Kirill; STEIN, Viktor &amp; GUO, Zhong</b>	Engineering electrochemical protein biosensors	4 years	\$650,300
ARC Discovery Projects	<b>COLLINS, Brett M</b>	The endosome at atomic resolution	4 years	\$438,100
ARC Discovery Projects	<b>TEASDALE, Rohan D</b>	Defining the membrane protein cargo transported by Retromer	4 years	\$468,100

GRANTING BODY	INVESTIGATORS	PROJECT TITLE	DURATION	TOTAL GRANT
ARC Discovery Projects	<b>KING, Glenn F;</b> UNDHEIM, Eivind A B & JENNER, R.	Unravelling the molecular diversity and evolution of centipede venoms	3 years	\$320,700
ARC Discovery Projects	<b>KING, Glenn F</b> & WALLACE, B.	Voltage-dependent structural changes in voltage-gated sodium channels	3 years	\$435,700
ARC Discovery Projects	<b>HANKAMER, Benjamin;</b> STAHLBERG, H. & HIPPLER, M.	Molecular Resolution 3D Atlas of the Photosynthetic Machinery	3 years	\$584,800
ARC Discovery Projects	SMYTH, Ian; <b>HAMILTON, Nicholas</b> & HENKELMAN RM	Morphological development of the kidney - a paradigm for organogenesis	3 years	\$488,100
ARC Discovery Projects	<b>MARTIN, Jennifer;</b> <b>CHOUDURY, HASSANAL;</b> DREW, David; ROBINSON, Carol	Structure and function of human zinc transporter membrane proteins	4 years	\$497,400
ARC Discovery Projects	<b>ROBINSON, Matthew &amp; VISSCHER, Peter</b>	The genetics of ageing in human populations	3 years	\$361,900
ARC Discovery Projects	<b>VISSCHER, Peter</b>	Phenotypic profiling from DNA using genetic and epigenetic information	3 years	\$328,700
ARC Discovery Projects	<b>YANG, Jian</b> & GODDARD M	The role of X-chromosome inactivation in quantitative trait variation	4 years	\$319,800
ARC Discovery Projects	GODDARD M & <b>YANG, Jian</b>	The extent, causes and implications of pleiotropy among complex traits	3 years	\$338,300
ARC Discovery Early Career Researcher Award	<b>UNDHEIM, Eivind</b>	Unravelling the structural evolution of centipede toxins	3 years	\$360,000
ARC Future Fellow	<b>GOMEZ, Guillermo</b>	The mechanochemical basis of cell polarity	4 years	\$680,524
ARC Future Fellow	<b>SCHROEDER, Christina</b>	The potential of membranes - peptide engineering to modulate ion channels	4 years	\$805,160
ARC Industrial Transformation Training Centres	MAHLER, Stephen M; <b>ALEXANDROV, Kirill;</b> BARNARD, Ross T; <b>FRANCOIS, Mathias;</b> GRAY, Peter P; HODSON, Mark P; HOU, Jeff; HOWARD, Christopher B; JONES, Martina L; LUA, Linda H; OSBORNE, Geoffrey; SCHULZ, Benjamin L; YOUNG, Paul R & others	ARC Training Centre for Biopharmaceutical Innovation	5 years	\$4,340,802
ARC Linkage Infrastructure, Equipment and Facilities	<b>CRAIK, David J;</b> DALY, N.; WILLIAMS, Craig M; <b>FAIRLIE, David;</b> BURN, Paul; MOBLLI, Mohammadmehdi; LOUKAS, A. & LOPATA, A.	A nuclear magnetic resonance facility for modern molecular analysis	1 year	\$840,000
Australian Academy of Technology and Engineering	<b>BLASKOVICH, Mark A</b>	Global Connections Fund Priming Grant: Antibody-antibiotic conjugates to treat drug-resistant bacteria	1 year	\$7,000

GRANTING BODY	INVESTIGATORS	PROJECT TITLE	DURATION	TOTAL GRANT
Australian Tropical Medicine Commercialisation Programme	BLUMENTHAL, Antje & <b>CAPON, Robert</b>	Developing new antibiotics to treat tuberculosis	3 years	\$275,000
Bill & Melinda Gates Foundation	<b>ALEXANDROV, Kiril</b>	Repurposing glucose monitoring technology for DNA detection	2 years	\$133,511
Brain and Behavior Research Foundation	<b>GRATTEN, Jake</b>	Genomic Analysis of Sex Differences in Prevalence of Psychiatric Disorders	2 years	\$82,354
Cancer Council Queensland	<b>MUSCAT, George E;</b> CLYNE, C.; DOWNES, M.; CLARKE, C.; DRAY, Eloise & GALLEGO Ortega, D.	Elucidating the role of the nuclear hormone receptor RORy1 in breast cancer	2 years	\$200,000
Cancer Council Queensland	<b>FRANCOIS, Mathias &amp; HOGAN, Benjamin</b>	SOX18-VEGF cross-regulation during angiogenesis and blood vascular development	2 years	\$200,000
Commonwealth Department of Foreign Affairs & Trade	<b>COOPER, Matthew &amp; BLASKOVICH, Mark A</b>	Community for Open Antimicrobial Drug Discovery (CO-ADD) Indonesian Engagement Program	1 year	\$7,150
Ferring Research Institute	<b>MUTTENTHALER, Markus</b> & BRIERLEY, S	Mapping the location and function of oxytocin and vasopressin receptors throughout the gut	1 year	\$186,213
Horizon 2020	<b>HÉNRIQUES, Sonia</b>	Research and Innovation Staff Exchange (RISE) – INPACT project	4 years	\$26,831
International Association for the Study of Pain	<b>VETTER, Irina</b> & DID-HAJI Sulayman	The role of Nav 1.6 in peripheral pain pathways	1 year	\$19,643
John Stocker Postdoctoral Fellowship	<b>HANKAMER, Benjamin;</b> <b>YARNOLD, Jennifer E</b> & RALPH, P.	Engineering photosynthesis for sustainable food, fuels and chemicals	3 years	\$276,000
Motor Neurone Disease Research Institute of Australia Inc	<b>GARTON, Fleur</b>	MND Postdoctoral Fellowship – To identify novel genetic loci and pathways associated with ALS through interrogation of multiple integrated genomics data sets	1 year	\$110,000
National Foundation for Medical Research and Innovation	<b>SMYTHE, Mark L &amp; KULIS, Christina</b>	The Development of Human Hematopoietic Prostaglandin D2 Synthase Inhibitors (HPGD2S) For Allergic Asthma	1 year	\$80,078
NHMRC Career Development Fellowship	<b>POWELL, Joseph</b>	Control of genome regulation and its role in human disease	4 years	\$469,180
NHMRC Career Development Fellowship	<b>FRANCOIS, Mathias</b>	Decoding the transcriptional program of vessel growth in health and disease	4 years	\$463,652

GRANTING BODY	INVESTIGATORS	PROJECT TITLE	DURATION	TOTAL GRANT
NHMRC-ARC Dementia Research Fellow	<b>GHAJ, Rajesh</b>	Towards targeting the endosome in neurodegenerative disease	4 years	\$601,958
NHMRC Development Grant	<b>COOPER, Matthew; BLASKOVICH, Mark A; PATERSON, David; ROBERTS, Jason A &amp; HANSFORD, Karl A</b>	Novel membrane-targeted antibiotics against drug-resistant Gram-positive bacterial infections	3 years	\$1,351,496
NHMRC Development Grant	<b>ALEXANDROV, Kirill</b>	Point-of-Care test for immunosuppressant drugs	3 years	\$587,360
NHMRC Equipment Grant	SMITH, Maree T; KUO, Andy; KHAN, Nemat U; <b>KING, Glenn F; LEWIS, Richard J &amp; WILLIAMS, Craig M</b>	Novel Pain therapeutics discovery: Probing molecular mechanisms	1 year	\$213,462
NHMRC Project Grant	<b>COOPER, Matthew &amp; SCHEMBRI, Mark A</b>	Membrane-active antibiotics against multi-drug resistant Gram negative bacteria	4 years	\$942,299
NHMRC Project Grant	<b>VETTER, Irina; MOBLI, Mohammadmehdi &amp; ZIMMERMANN, K.</b>	A pharmacological approach to define the contribution of Nav1.7 to pain pathways	3 years	\$501,467
NHMRC Project Grant	<b>SCHRODER, Kate; BEZBRADICA MIRKOVIC, Jelena &amp; DERETIC, V.</b>	Autophagic suppression of ASC inflammasomes	3 years	\$556,950
NHMRC Project Grant	LITTLE, Melissa; <b>SIMONS, Cas; SMYTH, Ian; MALLETT, Andrew J &amp; ALEXANDER, S.</b>	Applying functional genomics to kidney disease	4 years	\$1,229,316
NHMRC Project Grant	<b>SWEET, Matt &amp; STOW, Jennifer L</b>	A new master adaptor protein for Toll-like Receptor signalling	4 years	\$869,288
NHMRC Project Grant	<b>HOGAN, Benjamin &amp; SIMONS, Cas</b>	Characterisation of a newly identified, indispensable, transcriptional regulator of lymphangiogenesis	3 years	\$535,224
NHMRC Project Grant	<b>FRANCOIS, Mathias; HARVEY, N. &amp; SIERECKI, E.</b>	Deciphering the transcriptional program that instructs lymphatic endothelial cell fate.	3 years	\$541,950
NHMRC Project Grant	<b>KOOPMAN, Peter A; BOWLES, Josephine &amp; SPILLER, Cassy</b>	Molecular regulation of pluripotency in the mammalian germline	3 years	\$611,935
NHMRC Project Grant	<b>SMITH, Kelly &amp; FRANCOIS, Mathias</b>	Examining an extracellular matrix regulator required for cardiovascular development	4 years	\$732,600
NHMRC Project Grant	<b>COLLINS, Brett; ANGGONO, Victor &amp; TEASDALE, Rohan D</b>	Sorting out the synapse: the role of intracellular trafficking in NMDA receptor homeostasis	3 years	\$631,966
NHMRC Project Grant	<b>PARTON, Robert G; HALL, Tom;</b>	Molecular characterisation of transverse tubule development in skeletal muscle	4 years	\$951,321
NHMRC Project Grant	<b>STOW, Jennifer L &amp; BLUMENTHAL, Antje</b>	Cellular regulation of receptor signalling and cytokine responses	4 years	\$859,288
NHMRC Project Grant	<b>CRAIK, David J &amp; WANG, Conan K</b>	New drug leads for cholesterol	3 years	\$619,986

GRANTING BODY	INVESTIGATORS	PROJECT TITLE	DURATION	TOTAL GRANT
NHMRC Project Grant	GAMBIN, Yann; ROSSY, Jeremie; SIERECKI, Emma; <b>ARIOTTI, Nicholas; VE, Thomas</b>	Prion-like behaviour in immunity: super-sized signalling platforms?	3 years	\$611,995
NHMRC Project Grant	<b>GRATTEN, Jake &amp; VISSCHER, Peter</b>	Genetic analysis of the relationship between parental age and risk of psychiatric disorders	3 years	\$301,012
NHMRC Project Grant	MARTIN, Jennifer; <b>COLLINS, Brett; &amp; HU, Shu-Hong</b>	Unraveling the dynamic Munc18a:Syntaxin1 interaction required for neurotransmission	2 years	\$653,472
NHMRC Project Grant	ROGERS, Peter; <b>MONTGOMERY, Grant &amp; GIRLING J</b>	Identification and function of genes that increase risk for endometriosis	4 years	\$1,180,912
NHMRC Project Grant	<b>YANG, Jian &amp; MCRAE, Allan F</b>	Methods and software tool for complex trait analyses using multi-omics data	4 years	\$573,999
NHMRC Project Grant	<b>BOWLES, Josephine</b>	Exposing the mechanisms underlying mammalian meiotic onset	3 years	\$536,562
NHMRC Research Fellowship	<b>SWEET, Matt</b>	Pattern Recognition Receptors in Inflammation and Infection	5 years	\$622,655
Prostate Cancer Foundation of Australia	<b>ALEXANDROV, Kirill; STEIN, Viktor</b>	Development of highly sensitive diagnostic test for active form of prostate specific antigen	1 year	\$100,000
The Kids' Cancer Project	<b>WAINWRIGHT, Brandon J</b>	Targeting the cell cycle regulators CDK4/6 to treat medulloblastoma	2 years	\$260,420
Shake It Up Australia Foundation	<b>COOPER, Matthew; WOODRUFF, Trent; SCHRODER, Kate; GORDON, Richard &amp; ROBERTSON, Avril</b>	Blocking inflammasome-induced neuroinflammation in PD with a potent, orally available small molecule	2 years	\$293,979
The Michael J Fox Foundation Therapeutic Pipeline Program	<b>COOPER, Matthew; WOODRUFF, Trent; SCHRODER, Kate; GORDON, Richard &amp; ROBERTSON, Avril</b>	Blocking inflammasome-induced neuroinflammation in PD with a potent, orally available small molecule	2 years	\$881,931
UQ Early Career Researcher Grant	<b>KHALIL, Zeinab</b>	Wollamide B, a new anti-tubercular agent	1 year	\$24,500
UQ Early Career Researcher Grant	<b>MA, Lin Lin</b>	Discovery and characterisation of novel antagonists of the Kv10.1 channel with therapeutic potential	1 year	\$24,760
UQ Early Career Researcher Grant	<b>MUTTENTHALER, Markus</b>	Intranasal Oxytocin - does it reach the central nervous system?	1 year	\$24,962
UQ Fellowships	<b>COLL, Rebecca;</b>	Defining the mechanism of action of MCC950, a small-molecule inhibitor of NLRP3 for the treatment of inflammatory diseases	3 years	\$166,909

GRANTING BODY	INVESTIGATORS	PROJECT TITLE	DURATION	TOTAL GRANT
UQ Fellowships	<b>STEPHENS, Evan D;</b>	Microalgae Biotechnology for Commercial Applications	3 years	\$197,818
UQ Foundation Research Excellence Awards – DVC(R) Funding	<b>POWELL, Joseph</b>	Investigating genetic control of disease susceptibility through trans-eQTL regulation	1 year	\$97,210
UQ Major Equipment and Infrastructure	<b>CAPON, Robert; FAIRLIE, David; ALEWOOD, Paul F; COOPER, Matthew; CRAIK, David J; KING, Glenn F; LEWIS, Richard J; HANKAMER, Benjamin; VETTER, Irina; WAINWRIGHT, Brandon J &amp; FRANCOIS, Mathias</b>	4D Mass Spectrometer	1 year	\$240,000
UQ Major Equipment and Infrastructure	<b>KING, Glenn F; ALEWOOD, Paul F; CAPON, Robert; CLARK, Richard J; CRAIK, David J; FRY, Bryan G; HANKAMER, Benjamin; LEWIS, Richard J; LYNCH, Joseph W; MOBLI, Mohammadmehdi; RASH, Lachlan; SCHROEDER, Christina; SIMONS, Cas &amp; others</b>	Patch-clamp electrophysiology platform for drug and insecticide discovery	1 year	\$64,000
UQ Major Equipment and Infrastructure	FRY, Bryan G; <b>ALEWOOD, Paul F; ALEXANDROV, Kirill; ASGARI, Sassan; BARNES, Andrew C; CAPON, Robert; CHENEY, Karen L; CLARK, Richard J; COOPER, Matthew; CRAIK, David J; CRIBB, Thomas H; FANTINO, Emmanuelle; FAIRLIE, David &amp; others</b>	Integrative blood coagulation research core facility	1 year	\$182,500
UQ Major Equipment and Infrastructure	THOMAS, Ranjeny; FRAZER, Ian H; GANDHI, Maher; EVANS, David; MORRISON, Mark; KHOSROTEHRANI, Kiarash; <b>COOPER, Matthew; HUGENHOLTZ, Philip; HOLTSMANN, Gerald J; McGuckin, M.; PHIPPS, Simon; O CUIV, Paraic &amp; BLUMENTHAL, Antje</b>	Establishing a gnotobiotic germ-free mouse facility	1 year	\$172,500
UQ Major Equipment and Infrastructure	TRAU, Matt; ROWAN, Alan E; MONTEIRO, Michael J; <b>ALEXANDROV, Kirill; YOUNG, Paul; MAHLER, Stephen M; WHITTAKER, Andrew K; THURECHT, Kristofer J; WANG, Yuling; GRONDAHL, Lisbeth; TOTH, Istvan; BIRKETT, Greg R; BOTELLA, Jimmy &amp; others</b>	Exosome and Bio/Nanoparticle Characterisation Facility	1 year	\$126,323
UQ Major Equipment and Infrastructure	MOYLE, Peter M; LITTLE, Peter J; CABOT, Peter J; PAREKH, Harendra; ROSS, Benjamin P; <b>VETTER, Irina &amp; TOTH, Istvan</b>	Establishing a High-Throughput, Microwave-Assisted Automated Peptide Synthesis Facility at PACE	1 year	\$81,500
UQ Major Equipment and Infrastructure	<b>POWELL, Joseph; COIN, Lachlan J M; FRANCOIS, Mathias; HOGAN, Benjamin; PALPANT, Nathan; SIMONS, Cas; SMITH, Kelly; BARTLETT, Perry; OSBORNE, Geoffrey; WRAY, Naomi; PORRELLO, Enzo; WOLVETANG, Ernst &amp; CARROLL, Bernard J</b>	Single Cell Transcriptomic Laboratory	1 year	\$232,421
UQ Major Research Facility Fund	BRERETON, Ian M; REUTENS, David C; MOBLI, Mohammadmehdi; SCHIRRA, Horst J; PIERENS, Gregory; <b>KING, Glenn F; CRAIK, David J; LEWIS, Richard J; ALEWOOD, Paul F; FAIRLIE, David; COLLINS, Brett M; CAPON, Robert; GARSON, Mary J &amp; others</b>	Advanced Ultra-high Field 900 MHz Biomolecular NMR Facility	1 year	\$652,000

# RESEARCH FACILITIES

In partnership with industry, government and donors, IMB have and continue to invest in major research infrastructure – to provide leading technologies for scientists to facilitate cutting-edge research to address global health, disease and sustainability issues.

IMB's research facilities span imaging, computational biology, bioinformatics, genome sequencing and analysis, statistical genetics, genome editing, chemistry, structural biology and drug discovery, and high performance computing. This means the Institute can take life science discoveries from the genome to drug design and application.

## ACRF CANCER BIOLOGY IMAGING FACILITY

The Australian Cancer Research Foundation (ACRF) Cancer Biology Imaging Facility is one of the largest and most comprehensively equipped facilities in Australia. Founded in 2010 with a \$2.5 million ACRF grant, the facility houses 23 high-performance microscopes and provides on-site expert technical support and training. In 2016, over 200 unique users across UQ used the facility.

By using techniques such as laser scanning and spinning disc confocal microscopy, deconvolution, high-throughput multi-well imaging and 3D optical projection tomography, researchers made breakthroughs in a range of areas. A notable breakthrough came when researchers identified a mechanism involved in kidney development. Using this knowledge, they generated kidney organoids that contain multiple cell types arranged to mimic human kidney structure and function.

With the Facility's support, these and other studies published in 2016 have uncovered important new knowledge in health and disease.

IMB researchers will soon be able to see cancer cells grow, spread and respond to drugs in real time, with the establishment of the ACRF Cancer Ultrastructure and Function Facility. The new Facility, which will be established in 2017 is the result of a \$2.3 million grant from the Australian Cancer Research Foundation (ACRF) and \$840 000 from the Australian Research Council Linkage Infrastructure, Equipment and Facilities scheme.

## IMB SEQUENCING FACILITY

The IMB Sequencing Facility (ISF) provides sequencing services to IMB, UQ and the research community in the greater Brisbane region. The ISF provides library preparation and sequencing services on Illumina's NextSeq 500 and MiSeq platforms.

The Facility offers sample preparation for sequencing of RNA from any species, whole exome sequencing for human DNA and whole genome sequencing for non-human species. The ISF also offers sample preparation and sequencing of custom projects including large-scale projects, for which the Facility is equipped with a high-throughput sample preparation robot.

In 2016, 26 unique research groups and 39 individual users accessed the Facility for sample preparation and sequencing services.

## MASS SPECTROMETRY FACILITY

IMB's Mass Spectrometry Facility (MSF) provides researchers with state-of-the-art mass spectrometry, high-performance liquid chromatography and robotic instrumentation.

The MSF provides technical advice and research and training support in a number of mass spectrometric applications, including investigating protein interactions and structures, amino acid sequence determination, post-translational modification discovery and quantification, compound stability, and bioavailability of potential therapeutics in a range of biological systems.

In 2016, 138 unique users and 29 research groups from UQ, CSIRO, QIMR Berghofer Medical Research Institute, University of the Sunshine Coast, Griffith University and James Cook University accessed the Facility for guidance and support with experimental design, methodology, data acquisition, data processing, project reporting and publication.

The Facility supported a number of projects resulting in major discoveries and over 45 publications, including the use of mass spectrometry to study the stability and bioavailability of potential therapeutics, protein biomarker discovery and quantification, toxin evolution, protein interaction networks and peptide/protein composition of animal venoms under varying biological conditions.

The Facility acknowledges funding from the Australian Research Council Linkage Infrastructure, Equipment and Facilities (LIEF) Project.



ABOVE KARL BYRIEL, UQ ROCX CRYSTALLISATION AND X-RAY DIFFRACTION FACILITY



ABOVE MELANIE OEY, SOLAR BIOFUELS RESEARCH HUB



ABOVE ANNE KUNERT, QFAB

### BIOMOLECULAR NMR FACILITY

IMB's Biomolecular Nuclear Magnetic Resonance (NMR) Facility makes the powerful technique of NMR spectrometry accessible to our research and industry clients. The Facility comprises a 600 MHz spectrometer equipped with a cryoprobe and autosampler, and a 500 MHz spectrometer equipped with a robotic sample changer.

Access is also available to the extensive NMR infrastructure housed throughout IMB, most notably a 900 MHz spectrometer equipped with a cryoprobe and sample changer. The latter is an instrument of the Queensland NMR Network and is the most powerful state-of-the-art NMR spectrometer in Australia.

Key discoveries made in 2016 using the facility included structural characterisation of plant defensins having antifungal potential, and of numerous venoms (from cone snails, snake and scorpion); and the experimental structure confirmation of computationally designed hyperstable constrained peptides.

The Facility is available on a user-pays system to researchers from a range of scientific disciplines both within IMB and across UQ. The Facility also holds collaborations with researchers from other Australian universities as well as several international collaborations, most recently with scientists from Belgium, China, and the United States.

### UQ ROCX CRYSTALLISATION AND X-RAY DIFFRACTION FACILITY

The UQ Remote Operation Crystallisation and X-ray Diffraction (UQ ROCX) Facility provides research training and support for protein structure determination.

This support includes protein crystallisation condition screening, crystal diffraction screening, data collection, data processing, and structure determination.

The diffraction Facility has Queensland's brightest research X-ray source and the state's only robotic sample storage and retrieval system, which allows for multiple data sets to be collected without user intervention.

In 2016, 66 unique users accessed the Facility for its high-throughput applications, namely crystallisation condition screening, especially for membrane proteins; and screening fragment libraries for drug leads.

Collectively, users performed 176,064 crystallisation experiments, over 800 data sets were collected at the Australian Synchrotron by UQ ROCX Users from over 2600 frozen crystals shipped. Users also collected 16 in-house diffraction data sets and published 14 scientific papers supported by UQ ROCX access in 2016.

### QUEENSLAND FACILITY FOR ADVANCED GENOME EDITING

The Queensland Facility for Advanced Genome Editing (QFAGE) provides expert genetic modification (GM) services using CRISPR/Cas9 genome editing and standard transgenic (TG) mouse production technologies.

Established in January 2016, QFAGE offers a flexible service to help life sciences and biomedical research groups make the most of this valuable technology that allows the modification of DNA at the cell or whole organism level. One of the major applications of this approach is for the production of animal or cell models of human disease.

The Facility is available on a user-pays system to researchers within IMB and across UQ, making mice with a number of types of genomic modifications. CRISPR/Cas9 approaches offered include gene knockout, insertions, modeling small specific DNA changes, and the generation of conditional alleles to allow gene disruption in a spatio-temporal manner.

The mouse operations of QFAGE are directed by Professor Peter Koopman with the support of Facility Manager Dr Johnny Huang. Late in 2016 the facility was expanded to include genome editing in human cell lines, resulting in the appointment of Dr Nathan Palpant as co-director of QFAGE.

### SOLAR BIOTECHNOLOGY FACILITY

IMB's former Solar Biofuels Research Centre was established as a research hub for industry and university partners skilled in biotechnology, engineering and systems development. The research and production facility now constitutes part of IMB's new Centre for Solar Biotechnology (CSB) and has a much broader scope of applications.

Located at Pinjarra Hills in Brisbane, the advanced pilot-scale test facility develops high-efficiency microalgae systems and processes for the production of high value products as well as bulk commodities. These include foods, renewable fuels, advanced bioproducts and bioremediation.

Facility capabilities within the CSB include strain purification, cryopreservation, nutrient and light optimisation, metabolic engineering, high-value product development and screening, photobioreactor and raceway system design, and techno-economic analysis.

Following the establishment of the new Centre at the end of 2016, the pilot-scale test facility at Pinjarra Hills is currently being upgraded. The new Centre for Solar Biotechnology Pilot Plant will include additional capabilities and facilities such as improved containment and safety, enhanced monitoring and control systems, extensive equipment upgrades, new sterilisation facilities, and PC2 laboratories.

### QFAB BIOINFORMATICS

**QFAB Bioinformatics (QFAB) provides customised services in bioinformatics, biostatistics and biodata to life sciences and health researchers.**

Working closely with researchers, QFAB team members apply data management, integration, analysis and visualisation techniques to unlock the full value of large-scale biological and clinical datasets.

QFAB develop software and web applications, as well as maintaining, hosting and supporting tools developed by researchers. IMB research projects that have been supported by QFAB include the development of a laboratory management system to track the screening activities of the Community for Open Antimicrobial Drug Discovery (CO-ADD) and deploying a computational platform to undertake large-scale multi-omics based research.

To empower researchers in mastering their data generation and analysis, QFAB has developed a training portfolio and offer workshops and courses covering statistics, data processing and bioinformatics. Consultations during weekly clinics are also available to researchers who require assistance with research projects and grant applications.

QFAB's systems biology platform consists of leading software packages, data repositories and workflow engines deployed in a scalable high-performance computational environment. This platform enables investigations across the biological continuum by combining bioinformatics and cheminformatics approaches.

QFAB Bioinformatics partners with UQ, Queensland University of Technology and Griffith University.



# PUBLICATIONS

For a full list of 2016 publications please visit [imb.uq.edu.au/publications](http://imb.uq.edu.au/publications)

## HIGH-IMPACT PEER REVIEWED PAPERS\*

1. Arbore, G., West, E., Spolski, R., Robertson, A., Klos, A., Rheinheimer, C. et al. (2016) T helper 1 immunity requires complement-driven NLRP3 inflammasome activity in CD4+ T cells. *Science*, 352 (6292): 1424+-U95. doi: 10.1126/science.aad1210 **IF: 34.661**
2. Baile, P., Chang, D., Nones, K., Johns, A., Patch, A., Gingras, M. et al. (2016) Genomic analyses identify molecular subtypes of pancreatic cancer. *Nature*, 531(7592): 47-52. doi: 10.1038/nature16965 **IF: 38.138**
3. Basiorka, A., McGraw, K., Eksioglu, E., Chen, X., Johnson, J., Zhang, L. et al. (2016) The NLRP3 inflammasome functions as a driver of the myelodysplastic syndrome phenotype. *Blood*, 128(25): 2960-2975. doi: 10.1182/blood-2016-07-730556 **IF: 11.841**
4. Bhardwaj, G., Mulligan, V., Bahl, C., Gilmore, J., Harvey, P., Cheneval, O. et al. (2016) Accurate de novo design of hyperstable constrained peptides. *Nature*, 538(7625): 329-335. doi: 10.1038/nature19791 **IF: 38.138**
5. Bowles, J., Feng, C., Miles, K., Ineson, J., Spiller, C. & Koopman, P. (2016) ALDH1A1 provides a source of meiosis-inducing retinoic acid in mouse fetal ovaries. *Nature Communications*, 7: 10845.1-10845.8. doi: 10.1038/ncomms10845 **IF: 11.329**
6. Budden, K., Gellatly, S., Wood, D., Cooper, M., Morrison, M., Hugenholtz, P. et al. (2016) Emerging pathogenic links between microbiota and the gut-lung axis. *Nature Reviews Microbiology*, 15(1): 55-63. doi: 10.1038/nrmicro.2016.142 **IF: 24.727**
7. Bussotti, G., Leonardi, T., Clark, M., Mercer, T., Crawford, J., Malquori, L. et al. (2016) Improved definition of the mouse transcriptome via targeted RNA sequencing. *Genome Research*, 26(5): 705-716. doi: 10.1101/gr.199760.115 **IF: 11.351**
8. Cao, M., Allison, L.Dix, T. & Boden, M. (2016) Robust estimation of evolutionary distances with information theory. *Molecular Biology and Evolution*, 33(5): 1349-1357. doi: 10.1093/molbev/msw019 **IF: 13.649**
9. Carstens, B., Berecki, G., Daniel, J., Lee, H., Jackson, K., Tae, H. et al. (2016) Structure-Activity Studies of Cysteine-Rich  $\alpha$ -Conotoxins that Inhibit High Voltage-Activated Calcium Channels via GABAB Receptor Activation Reveal a Minimal Functional Motif. *Angewandte Chemie - International Edition*, 55(15): 4692-4696. doi: 10.1002/anie.201600297 **IF: 11.709**
10. Castro, J., Harrington, A., Garcia-Caraballo, S., Maddern, J., Grundy, L., Zhang, J. et al. (2016)  $\alpha$ Conotoxin Vc1.1 inhibits human dorsal root ganglion neuroexcitability and mouse colonic nociception via GABAB receptors. *Gut*. doi: 10.1136/gutjnl-2015-310971 **IF: 14.921**
11. Clairfeuille, T., Mas, C., Chan, A., Yang, Z., Tello-Lafoz, M., Chandra, M. et al. (2016) A molecular code for endosomal recycling of phosphorylated cargos by the SNX27-retromer complex. *Nature Structural and Molecular Biology*, 23(10): 921-932. doi: 10.1038/nsmb.3290 **IF: 13.338**
12. Eggers, S., Sadedin, S., van den Bergen, J., Robevska, G., Ohnesorg, T., Hewitt, J. et al. (2016) Disorders of sex development: insights from targeted gene sequencing of a large international patient cohort. *Genome Biology*, 17(1). doi: 10.1186/s13059-016-1105-y **IF: 11.313**
13. Eskandari, S., Guerin, T.Toth, I. & Stephenson, R. (2016) Recent advances in self-assembled peptides: Implications for targeted drug delivery and vaccine engineering. *Advanced Drug Delivery Reviews*. doi: 10.1016/j.addr.2016.06.013 **IF: 15.606**
14. Field, Y., Boyle, E., Telis, N., Gao, Z., Gaulton, K., Golan, D. et al. (2016) Detection of human adaptation during the past 2000 years. *Science*: 1-10. doi: 10.1126/science.aag0776 **IF: 34.661**
15. Fu, T., Li, Y., Lu, A., Li, Z., Vajjhala, P., Cruz, A. et al. (2016) Cryo-EM structure of caspase-8 tandem DED filament reveals assembly and regulation mechanisms of the death-inducing signaling complex. *Molecular Cell*, 64(2): 236-250. doi: 10.1016/j.molcel.2016.09.009 **IF: 13.958**
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\* Impact factor >10

# DISCOVERIES

## INSPIRED BY LIFE

These life changing research projects are on the cusp of making an enormous difference in the world. Can you help?

### HELP US, HELP OUR DAUGHTERS: SOLVING ENDOMETRIOSIS



Inside one in ten women an invasive disease is ravaging reproductive and surrounding organs. It causes serious pain and infertility. It's called endometriosis and it's strongly influenced by genetics.

Using advanced techniques for gene mapping, Professor Grant Montgomery and his research team are leading a global effort to identify the genes that increase a woman's risk for endometriosis. Funding will open the door to effective prevention, diagnosis and targeted treatment.



### HEALING HEARTS

Heart disease is the single leading cause of death in Australia. One

Australian dies of Coronary Heart Disease every 27 minutes. It's no wonder the heart is at the centre of a multitude of IMB's research projects with the UQ Centre for Cardiac and Vascular Biology. They are discovering more about the genes, cells and tissues involved in vascular formation, cardiac development and cardiovascular regeneration every day. How does a heart grow? Understanding the fundamentals of development is the first step to creating new treatments. Your support will help us save the lives of patients suffering genetic and acquired heart disease.



### ONGOING, DEBILITATING PAIN – AND THE VENOM PEPTIDE THAT COULD SWITCH IT OFF

One in five Australians lives with ongoing pain. Changes to their sensory neurons (the network of nerve cells that transmits pain messages to the brain) force their nerves to keep firing unnecessarily.

Dr Irina Vetter and her team may have found a way to switch it off. They've found a venom-derived compound that targets a protein on a nerve whose role is to signal pain. The compound has exciting prospects as a pain drug.

The group is confident that the drug will be effective against common types of acute pain and are hopeful that it will be useful in treating a wide variety of disease-related pain. Your support will enable discovery and translation of innovative, effective treatments for pain.

### PROGRESSING A NEW TREATMENT FOR STROKE TO HUMAN CLINICAL TRIALS



Stroke is the second leading cause of death worldwide. In Australia, there will be one stroke every 10 minutes in 2017. Every year, five million survivors are left with a permanent disability. There are no drugs available to protect the brain from stroke-induced damage.

But Professor Glenn King's research team has identified a potential new treatment that's showing great promise in pre-clinical trials. It massively reduces the brain damage following stroke and improves outcomes when administered up to eight hours after stroke has occurred. Your support will accelerate this world first, novel treatment through to human clinical trials.

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