

THE FLOREY ANNUAL

2018-2019

Focussing on epilepsy **PAGE 8**

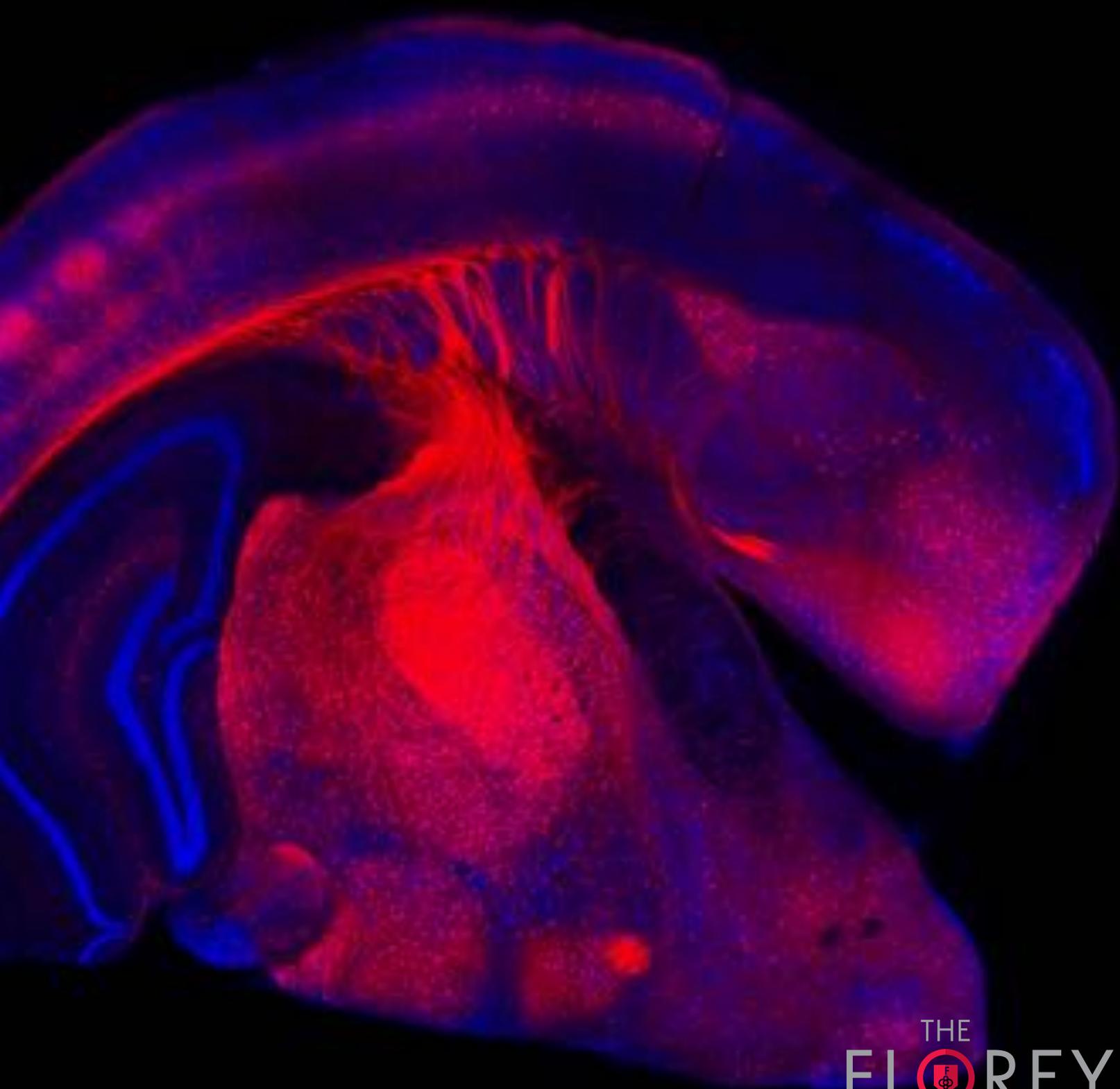
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A deep dive into slumber.



THE
FLOREY

INSTITUTE OF NEUROSCIENCE & MENTAL HEALTH

Welcome to the Florey Annual

Report from the Chairman of the Board, Mr Harold Mitchell AC, and the Scientific Director, Professor Steven Petrou.



From the Chairman

It's been an exciting year at the Florey. As was foreshadowed in last year's annual report Professor Geoffrey Donnan stepped down as Director in 2018. I'd like to thank him for his service to the Florey over the past 11 years and wish him well in his ongoing research into stroke.

A change of Director provides an opportunity for new ideas and, as always, careful consideration of how the Florey can continue to meet its purpose to improve lives through brain research. The Board decided that an ideal candidate would have a track record of excellence in research, commercial acumen, be passionate about meeting the Florey's mission and be globally recognised for their leadership by scientists, clinicians and advocacy groups.

We undertook an extensive and rigorous six month search by an international recruitment firm and to our delight found the ideal candidate working at the Florey already - a testament to the high standard of scientific endeavour taking place at the institute. Appointed as Director in July 2018, Professor Steven Petrou is a leader in precision medicine in epilepsy, has co-founded two successful biotechnology companies to commercially develop new treatments and has a record of having worked collaboratively and productively with researchers, clinicians and advocacy groups. I hope you join me and the Board in our enthusiasm for his appointment and the excellent work he's undertaken so far.

A highlight of the year was the launch of the Florey Future Fund. Upon learning that most medical researchers spend large amounts of time and effort preparing submissions for grant funding that typically have very low success rates, philanthropists Carl and Wendy Dowd sought to provide a transformative contribution to the Florey.

Their generous donation of \$5 million is the leadership gift for the newly established Florey Future Fund, which will maintain the principal amount in perpetuity with 100% of the interest earned being ploughed into funding research. I thank Carl and Wendy for their generosity and their leadership - we're very lucky to have them as wonderful supporters of the Florey. The Fund will allow us to fast-track brain research, enabling scientists to continue work uninterrupted by cyclical shortfalls which are typical in grant-funded research. I'd encourage anyone considering donating to do so.

I'd like to expressly thank all board members for their contributions, with particular thanks to Professor James Angus AO for his exceptional service during his tenure.

I thank all of those involved with the Florey for their fantastic efforts this year. I hope you enjoy reading this year's annual report and learning more about the inspiring contributions that have been made to better understanding and improving treatment of diseases and disorders of the brain. 



From the Director

It's an absolute privilege to take up the mantle as Director of the Florey. Over the past year, we've made significant progress on understanding some of the most complex disorders and diseases which affect the brain.

As well as the stories you'll read in this report, in 2018 Florey researchers were the first in the world to show that gut health may play a significant role in Huntington's disease after finding significant differences in mouse models. Our researchers conducted sophisticated experiments to identify a key brain region that appears to be involved in relapse in alcohol drinking and also found that making improvements in blood pressure and cholesterol in mid-life can play a role in preventing in later life cognitive decline. As part of an international collaboration effort Florey scientists identified a gene that influences recovery for people who have had a stroke. We also identified ways to speed up imaging and detection of the brain regions which are generating epileptic seizures in people.

Many of these fascinating research discoveries have only been possible thanks to collaborations – with other researchers, with our clinical and hospital partners and patients. It's been a pleasure this year to invigorate the strategic alliance between the Florey and the University of Melbourne. With over 100 postgraduate students shared at our organisations, this long-standing relationship is critical to securing a pipeline of talented researchers into the future.

I'd also like to reflect on the difference that an individual can make. We pay tribute to Dr Ian Davis, a tireless campaigner and valued friend

of the Florey who died from motor neurone disease in December. His creation of FightMND along with Neale Daniher was an important part in helping us to drive this research forward.

While his loss meant deep sorrow for us, his example of enthusiasm, scientific rigor and unflagging optimism has left a very tangible legacy. It is heartening that Florey researchers have recently been integral to the development of a new drug which appears to delay motor neurone disease progression and improve cognitive and clinical symptoms in a trial.

As watchers of the science field will be aware, the external funding environment has been shifting for medical research over the past few years. The grant system is now hyper-competitive with estimates that in 2019 less than 10% of grants submitted will be funded. The Medical Research Future Fund has offered both an opportunity and a challenge with its explicit focus on advancing health systems and medical technologies. Front of mind for all of us at the Florey is how we, through the efforts of our world class research teams, our support staff and our tireless board, can continue to serve the community.

Thank you to all who have contributed to the important work undertaken by the Florey over the past year – donors, researchers, support service staff, students, government supports and our board members.

I look forward to keeping you updated as we seek to provide hope, answers and new treatments for diseases and disorders of the brain which affect so many people. 🍷

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Highlights of the Florey's laboratory and clinical research can be found by visiting our website at florey.edu.au

For copies of this report and comments, please email amanda.place@florey.edu.au

OUR COVER PHOTO

Image credit: Dr Julia Oyrer and Qays Kharouf.

We know that the connection between the cortex and the thalamus is critical for the spread of seizures in the brain. The thalamus (centre of the image) can be thought of as a central hub that links other regions of the brain. A subset of brain cells in this hub contains a pacemaker channel that controls the transmission of electrical signals. The cover image shows brain cells that have these pacemaker currents in pink and how their axons connect to the cortex. This gives us important clues on where to look to better understand how these cells control the excitability of the whole brain. We think that if we can block these pacemaker channels in the hub, we can stop the spread of seizures.

Florey stars shine

Looking to the future

In October, an extraordinary couple, Wendy and Carl Dowd, announced a \$5million gift to the Florey Future Fund. No sooner had they declared their gift during a gala dinner at the Melbourne Museum, than the Florey Chairman, Mr Harold Mitchell AC, matched their gift. The Florey's endowment campaign is off to a flying start as we aim for \$50 million.

According to Mr Mitchell: "A well invested endowment is crucial, as is our commercial income and royalties from patents. Philanthropy is essential if we are to support our scientists".

Wendy Dowd reflected: "We are excited by the thought that a significant fund will support the brilliant minds to actually conduct research, rather than have them

spend so much time and effort writing up submissions for funding."

The entire Florey community thanks the Dowd family and Mr Mitchell for their extraordinary generosity. For more on the Florey Future Fund, please see page 20.

Carl & Wendy Dowd





Dr Yen Ying & Dr Caroline West

And ACTION!

During 2018, Florey scientists shared their research findings with audiences across the world. Our stories reached a huge audience with nearly half our coverage appearing in international media as well as on Australian platforms and through social media. In an ABC TV episode of the science show Catalyst, Dr Yen Ying Lim talked about the Healthy Brain Project with presenter, Dr Caroline West. As a result, the Healthy Brain Project attracted more than 1000 new participants, adding to the 5000 who have already signed up to help us understand the ageing process.



Prof Julie Bernhardt

Australians all let us rejoice

Professor Julie Bernhardt has been recognised with an Australia Day honour for her leadership in stroke research over 30 years and her advocacy for women in science. Julie is a Deputy Director of the Florey, the Director of the Centre for Research Excellence, Stroke Rehabilitation and Brain Recovery, and is a Professor of the University of Melbourne. Among her many senior positions, Julie is on the Board of Directors of the World Stroke Organization, and is the Chair of the research committee of the World Federation of Neurorehabilitation, influencing research practice on a global scale. Congratulations to the Florey's co-head of our large stroke research team, Professor Julie Bernhardt AM!

Pictured: Professor Julie Bernhardt with Florey Patron, Her Excellency the Honourable Linda Dessau AC, Governor of Victoria.

Florey attracts US biotech

The Florey recently partnered with US biotech company Praxis Precision Medicines to announce the establishment of their Asia Pacific research and development centre in Parkville. The company develops therapeutics to treat neurologic and psychiatric disorders and their formation was the result of more than a decade of research at the Florey. Victorian Minister for Economic Development, Mr Tim Pallas MP, recently announced that 100 new jobs will be created in the Melbourne Biomedical Precinct, building on the state's reputation as a medical technology and pharmaceutical centre of excellence. Praxis founder, Dr Kiran Reddy, says the biotech company plans to continue their involvement with the Florey and plans to deliver new medicines for patients with disorders including epilepsy, autism and mental illness. The Florey is pleased to continue its commitment to the health and wealth of the nation by further developing Australian discoveries on home soil.



Pictured: Dr Kiran Reddy, parent and advocate Sara James, Mr Pallas and Professor Steven Petrou.



The clock starts now

In 2018, the Florey released its assessment of the Pulsara app used by Victorian paramedics to speed up the care of stroke patients travelling to Ballarat and Bendigo hospitals. The results are stunning. It's well known that every minute counts when someone has suffered a stroke. The app starts a clock from the moment a stroke is suspected, with Ambulance Victoria paramedics recording real-time clinical data while in transit. The information is sent to the medical team awaiting their arrival at the hospital emergency department, eliminating initial patient assessment on arrival so treatment can begin immediately. Specialists, including stroke neurologists, can also watch the patient's progress from any location. There has been a two-fold increase of patients treated within 60 minutes between 9am and 5pm and also after hours when staffing levels are lower. The app is now being used by a helicopter crew in the Loddon Mallee region and is soon to be used by paramedics serving the Gippsland region. Due to the success of the trial, use of the app is expanding to help emergency responders in trauma, cardiac arrest and for those affected by sepsis. Victoria is the first place to trial the app outside the USA after Florey researchers approached Pulsara in their ongoing quest to improve stroke care.

Pictured: Paramedics Christine Findlay and Dan Magill can send patient details and condition reports directly to specialists at Ballarat Base Hospital using the new Pulsara app.



Dr Yugeesh Lankadeva

Saving lives during surgery

Florey researchers have found that delivering oxygen to the kidney may reduce the risk that patients will develop life-threatening kidney injuries after open heart surgery. They will soon start a clinical trial and believe their findings could eventually change standard practice during cardiac surgery.

Almost a quarter of patients who undergo heart surgery requiring cardiopulmonary bypass (via the heart-lung machine) later develop acute kidney injury, greatly increasing their risk of dying in hospital or of developing chronic kidney disease. The inner part of the kidney, the medulla, suffers from a lack of oxygen (hypoxia) during heart surgery, according to Yugeesh. This hypoxia damages the kidney tissue, leading to acute kidney injury and possible later kidney failure.

"We found that if we increased the rate that the heart-lung machine pumped blood around the body, or increased blood pressure, we improved oxygenation in the kidneys."

The team included the Florey's Prof Clive May, Monash Biomedical Discovery Institute's Prof Mark Evans, cardiac surgeon Associate Professor Andrew Cochrane from Monash Health, perfusionist Mr Bruno Marino from Cellsaving and Perfusion Resources, and Professor Rinaldo Bellomo from Austin Health.

Of mice and milkshakes



“Our mice are trained to do things even some young children would struggle with, like standing still and paying attention.”

The mice in Dr Emma Burrows' laboratory use touchscreens, much like iPads, when they are at work. If they do a good job, they receive a strawberry milkshake.

It's a reward for correctly identifying one image amongst a series of images displayed on the touchscreen.

It reinforces what Emma has known since she got her first pet mouse as a six-year-old. These animals are smart.

“Our latest research has shown we can get a mouse to undertake very sophisticated behaviours using screens,” she says. “Our mice are trained to do things even some young children would struggle with, like standing still and paying attention.”

It may sound like fun but there is serious work underway within Emma's Epigenetics and Neural Plasticity lab.

Touchscreens are a novel way to study a mouse's cognitive abilities. Made with mice in mind, the screens are so sensitive they respond to the swipe of a whisker.

It allows researchers to measure the animals' reaction times and ability to pay attention while using the same tests clinicians use when studying people with autism spectrum disorder.

Autism has a large genetic component, so Emma works with mice with a genetic mutation found in people with the condition.

Like those with the disorder, Emma has found these mice had a superior focus in attention tests. With daily training they were also faster to choose the correct image of five. However, as the time the image was displayed on the screen was shortened, the test became trickier - and the mice with mutations didn't fare as well.

So, instead of a milkshake reward the house lights come on - a less than ideal scenario for these nocturnal creatures.

Using a novel approach, Emma's lab is changing the way cognitive disorders in mice are assessed. Her goal is to “humanise the tests” in mice, so that research can be better applied to people with conditions such as autism and Alzheimer's disease. [📖](#)

Florey in a flash

Dr Gawain McColl
Head, Molecular
Gerontology laboratory



What lives in murky ponds, damp compost heaps and your neighbourhood creek or billabong? Well, it's not a bunyip. In fact, it's as far from a mythical creature as you could think to get. The roundworm, *Caenorhabditis elegans*, is probably the best-characterised animal on the planet.



First things first. **Dr Gawain McColl's first name is pronounced Gavin.** He was born and raised in Melbourne to an Edinburgh-born father and a second generation Australian mother of Irish extraction. The father of two regularly assists people with pronouncing his Welsh (or Gaelic, depending who you ask) name.



Gawain believes that worms could help explain a question that fascinates him daily. **How do we age?** "If I'm feeling cheesy, I'd describe myself as an immortal."



So how does a researcher specialising in ageing live his life?

Gawain says he doesn't apply his research to his lifestyle, though he does stay fit by running and swimming regularly. He also eats a balanced whole food diet.



A geneticist by training, Gawain runs the molecular gerontology laboratory at the Florey. He wants to know **if ageing isn't a trait, what is going on at a biological level?** And can we intervene to come up with a drug, a compound or a lifestyle intervention that will make a difference to how we age? The answer, Gawain thinks, lies in the humble worm.



Why worms? Simple really. Gawain works with an organism that has a shorter lifespan than he does. However, we're not talking your garden-variety worm but the one millimetre long *Caenorhabditis elegans* roundworm.



Yes, but why is this worm so cool?

As it happens this worm was the first animal ever to have its genome sequenced, and every single cell has its own name. And because we know so much about them, they are a researcher's dream model. This worm grows from a single cell into an adult in three days. They die of old age in two weeks.



But how do you know if you have a youthful, healthy worm? **You can't ask a worm 'how are you feeling today?'** So he measures mobility. Like humans, ageing worms slow down, lose muscle mass and accumulate fat. These transparent worms also lose control of the way the body stores iron. This results in the excess iron being stored in tissue, including in the brain. The resulting build-up is associated with Alzheimer's disease. His research suggests that targeting iron storage during ageing will have a significant impact on the lifespan and "healthspan" of a worm. If his theories prove correct, there is potential for humans to live longer, healthier lives.

Sixty minutes with...

Professor Graeme Jackson is a neurologist and Deputy Director of the Florey Institute. Dr Mangor Pedersen is a PhD research fellow in Graeme's Imaging and Epilepsy team.

Professor Graeme Jackson

“Our first meeting was very memorable. I'd been trying to recruit someone to work in connectomics using graph theory methods and machine learning, to apply to our functional imaging data from epilepsy patients. And in walks this guy, I don't know how he got to have an interview with me, and he just used all those terms. That's what he wanted to do. He didn't have the epilepsy focus but he wanted to use all these techniques, and look at the brain, and he had a very clear idea of where his future was. He was describing exactly the direction that I wanted to go.

I said to him: 'Alright, if you want to do that and you're serious, I can offer you a job now, but you have to say yes, right now'. What I didn't realise was that a couple of days before he had already accepted a job somewhere else, so he was put on the spot a bit. But he said yes and came to work with me.

It's funny - asking him to agree there and then wasn't something I would normally do, it wasn't my normal game, but I thought: 'I like this guy'. I felt natural, like I could work with him, so thought I'd give it a go.

In fact, Mangor is one of the best examples of the intersection of preparation and opportunity

“We're good partners, have been complementary to one another and I've really enjoyed the journey.”

leading to success because that moment in time was a PhD and two post docs ago.

We're good partners, have been complementary to one another and I've really enjoyed the journey.

Mangor and I see each other most days. I'm on the move a lot, doing clinical rounds, and I have my work at the Florey, and clinical work at the Austin. Mangor learned early on that when I walk past him, the best plan is to just stand up and walk beside me and capture my attention, and once my attention is captured, that's it.

He's in an open work space, so I pop by and see how he's going and look at the latest data. He's always got another step done and is showing me the results so we can chew them over.

I love it. My fingers aren't on the keyboards doing analysis anymore and haven't been for many years, but I still like looking at data and

trying to see what the data is saying. Mangor is really good at generating challenging data. Science is about listening to what the data is trying to tell you rather than imposing your pre-existing thoughts on it, which a lot of people do.

I don't really feel the age difference with younger scientists like Mangor. I just see it as people having talented brains and you interact with them and it's great fun. It just means I'm good at some things that young people are not good at, and young people are good at stuff that I'm not good at. You get your skills together and figure out what works. It just means they have different skills; possibly even the skills I used to have.

I'm proud of the work Mangor has done in my team. We've taken the idea of epilepsy as a network disorder and it's really coming together as an academic framework. It's not just one good piece of science, it's a whole framework, and looking at what he has done, it's been a good partnership. We're good at different things and the story is coming together, the science of applying the techniques and making them meaningful.

”



Dr Mangor Pedersen

“ I am originally from Norway, with five years in London, but moved with my wife to Australia in 2012.

In early 2013, I really wanted to pursue a PhD so I got a meeting with Graeme, was offered 15 minutes, and I remember we sat down and he didn't have time to interview me - he is one of the busiest people you'll ever meet - and so he just said: 'You've just got to tell me why you want to be one of the best scientists in Australia. I've just got to know now'.

I had prepared for so many questions but that was one I really hadn't prepared for. I think I outlined my plans, that being in the middle of clinical work and mathematics is really where I wanted to go. I wanted to use advanced brain imaging to try and help people with neurological disease. Somehow, he went all in and said: 'You've got to commit to this, now'. I did and from that moment, we trusted each other. I trusted his decision and he trusted mine. It's been a good vibe.

Back in 2013, we really rode the wave of mixing scanning and mathematics, which hadn't been done before for epilepsy. We really established and progressed epilepsy research at that time, which has helped us a lot in the field. Graeme was awarded the American Epilepsy Society

“What I needed was a mentor who had the expertise I needed, both in MRI and epilepsy, so Graeme has been fantastic for me. Working with him gives me a lot of freedom to pursue ideas and I know that with the knowledge he has, I can put findings in front of him and he'll know immediately if it's ground breaking or just good, or if it's something I've done wrong.”

Award in 2016 as senior investigator and I received their young investigator award in 2017.

What I needed was a mentor who had the expertise I needed, both in MRI and epilepsy, so Graeme has been fantastic for me. Working with him gives me a lot of freedom to pursue ideas and I know that with the knowledge he has, I can put findings in front of him and he'll know immediately if it's ground breaking or just good, or if it's something I've done wrong. He can tell straight away; it's that intuition you only get from experience, to know what's biology or not.

I think curiosity is still what drives Graeme. He's a neurologist but he's also a scientist and I think questions drive him: what does the brain do and why? And why does it go wrong in epilepsy? It's easy to ask those questions but harder to answer them ... we hope we can provide better outcomes for patients in the next 10 years.

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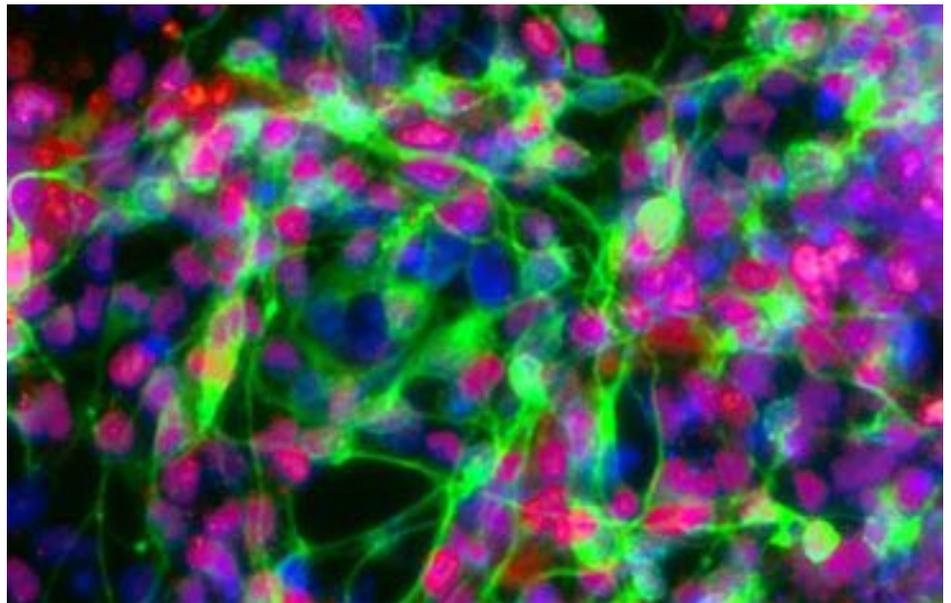
Focusing on epilepsy - a kaleidoscopic approach

Globally, 60 million people live with epilepsy. Of these, 30 per cent are resistant to drug treatments and 80 per cent are not suited for surgical intervention. Combined, this represents 15 million people around the world who are looking to researchers for help with what is often a devastating disability.

The Florey is home to a team of 40 medical researchers dedicated to understanding the full spectrum of epilepsies with a particular emphasis on very young children. They look into the causes of genetic epilepsies, design and test new medications, and study large populations in an effort to test their discoveries in the lab. Our imaging team creates detailed images of the brain to reveal electrical activity and guide surgeons in theatre when surgical intervention is possible.

The goal? Improved treatments to control abnormal brain activity and seizures.

Dravet syndrome is a particular focus of our team. Children affected by this genetic dysfunction of the brain experience severe developmental disabilities and rely on a range of specialists and combinations of ineffective medications to limit the impact of this devastating disease. Our scientists hope that by identifying and targeting the effects of the underlying mutations they will make a meaningful difference to these children's lives.



Nº1

Unique treatments using stem cells

A growing collection of patient samples from all over the world are being used to study severe genetic epilepsies in children using a stem cell "brain-in-a-dish" technique.

The team in the Ion Channels and Human Disease laboratory works closely with the families and clinicians of affected children. In parallel, valuable and detailed clinical information has been collected by clinicians from Austin Health and the Murdoch Children's Research Institute to help understand the natural history of the disease, and the specific features of each patient's condition.

Starting from patient biopsies, individual skin cells are 'sent backwards' through development, and turned into stem cells, which can then be instructed to turn into brain cells. This provides an opportunity to investigate the underlying genetic basis of each patient's condition, and to screen the safety and effectiveness of different therapies. The ultimate aim is to translate lab-based discoveries into targeted therapies for individual patients, providing hope to the families and health carers battling the severe and incurable early onset epileptic disorders.

Nº2

Modelling epilepsy in mice

A collaborative approach across the Florey and hospitals ensures clinical and geneticist colleagues identify mutations that cause devastating epilepsies in children. This has important implications for diagnosis but is really just the start of trying to understand why these children have seizures. Florey researchers are using this human genetic information to mimic epilepsy in mice that closely resembles the human disease - using CRISPR technology. The science is exciting Florey researchers for a few reasons. Firstly, they can more easily interrogate the brain mechanisms that cause seizures and gain a better understanding of the underlying disease process. The CRISPR technique is already allowing them to screen new or existing 'precision' medicines that are targeted to a particular genetic cause of epilepsy. The new medicines are rapidly trialled on the animal model in a way that would be impossible in humans. Medicines that work in the mice are likely to be helpful in the patients because the underlying genetic mutations are exactly the same as the human disease.

Nº3

Spider toxin and cannabinoids to treat Dravet syndrome

Dravet syndrome is a devastating neurological disease which presents in a child's first year of life and there is no effective treatment, driving our researchers and clinicians to find answers. Children have multiple seizures and experience severe intellectual and learning delays. They also have a high risk of premature death. In collaboration with national and international experts, Florey researchers are exploring new therapies from surprising sources. When given to a mouse with a human-like Dravet syndrome, a tarantula venom protein can precisely act on the faulty neurons and rescue normal function, stopping seizures and preventing premature death.

The team is also exploring the effect of medicinal cannabinoids as a potential therapy. Clinical trials of medicinal cannabis show promise in the treatment of Dravet syndrome, which has led to their approved use in the USA. The Florey's goal is to optimise safe and effective cannabinoid therapeutics for paediatric epilepsies here in Australia.



Nº4

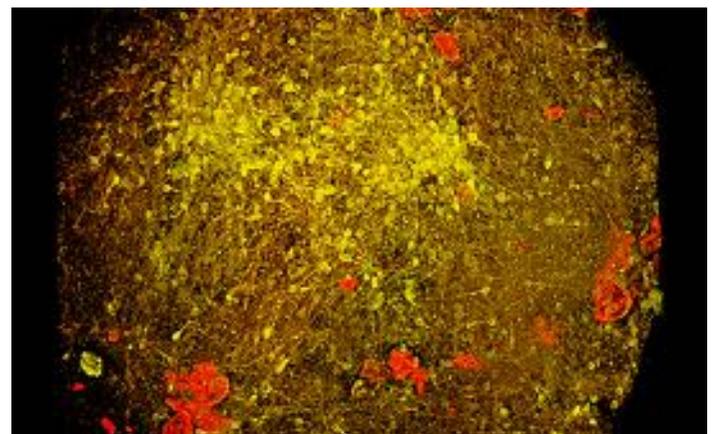
Watching epilepsy brain cell activity

Developmental epileptic encephalopathies (cumulative brain damage caused by severe epileptic seizures) are serious treatment-resistant disorders that usually appear in infancy or early childhood. Florey scientists have found that mutations in ion channels - the 'gatekeepers' in brain cells that allow them to be electrically active - are usually the underlying cause.

The Ion Channels and Human Diseases team is using a novel approach to predict how ion channel mutations, and potential drug therapies, affect brain cell excitability.

Understanding the mechanisms causing these encephalopathies will help clinicians decide how to offer personalised treatment to each of these very sick patients.

Pictured above: Dr Snezana Maljevic, a Senior Research Fellow with the Ion Channels and Human Diseases team.



Nº5

Brainoids

Our brains are complicated three dimensional objects. Typically, scientists study the brain's wiring in a flat, 2D environment rather than in 3D, limiting their capacity to see how the brain behaves naturally. Enter the mini-brain. Also known as a brainoid, scientists can now study how cells develop and communicate in a 3D environment. Florey scientists are watching neurons freely self-organise and form networks as they would in our brains. Researchers look inside the mini-brains at their organisation and wiring patterns using state-of-the art laser microscopy. They are watching the way the brain's wiring behaves when affected by a genetic disease and then comparing this with healthy controls. The electrical signalling between the cells can even be recorded using flashes of light instead of spikes of electricity.



Gut feelings

It is being described as the “forgotten organ” and within it, the “second brain”. The gut – and the universe of bacteria that live inside it – has emerged as a powerful and promising route to preventing and reversing many chronic illnesses.

It is this gut-brain axis, the two-way communication between the gastrointestinal tract and the central nervous system, that Florey researchers are tapping into in the hunt for new treatments for disease.

Florey neuroscientist Dr Martin Stebbing is leading a research team that is working to uncover how the brain controls the gut; specifically the interaction between the immune system, the nervous system and gastrointestinal inflammation.

“Gut bacteria can affect the brain, but there are also nerves that carry information bi-directionally between brain and gut,” he says.

“We have shown there are mechanisms activated in the gut when it’s inflamed that involve reflex responses via these nerves.

“Under normal circumstances we think this reflex controls inflammation. That is possibly something we can harness.

“If we can work out a way to activate the body’s inflammation control mechanisms via the nervous system, it could open up a whole new field of medicine.”

The focus of their research is the vagus nerve, one of the longest nerves running from the brain stem to the stomach, and branching into organs in between.

The Florey’s Professor John Furness is leading a team of neuroscientists, engineers, surgeons and neurophysiologists from the Bionics Institute, Austin Health and University of Melbourne to develop an implantable bionic device to stimulate the vagus in the gut to treat chronic digestive tract conditions.

Inflammatory Bowel Disease is their first target. This cluster of diseases involving chronic inflammation of the digestive tract, which includes Crohn’s disease and ulcerative colitis, are lifelong, painful conditions that are poorly treated.

The research has kindled the interest of the US Department of Defense due to the huge cost of these diseases on combat veterans.

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Chronic digestive tract inflammation is one of the damaging side-effects of post-traumatic stress disorder, with the incidence of Inflammatory Bowel Disease twice as high in combat veterans. The science arm of the US military, the Defense Advanced Research Projects Agency, has invested \$7 million into the Florey’s “electroceutical” project.

The device will see a small wand of electrodes wrapped around the 2mm wide branches of the vagus nerve in the abdomen. This will be connected to a stimulator implanted under the skin. The implant would control the severity of inflammation in the gut wall in real time via electrical stimulation of the nerves to curb the inflammatory response in the gut.

Published studies in sheep have shown the implantable device is safe, while Martin says their use of a miniature version of the device in rats showed it was able to turn down gut inflammation.

Now, after four years of animal studies and device design, the team is preparing to start the first human clinical trial this year in patients with Crohn’s disease.

“The device design phase is over and there has been much back and forth with the surgeons to design the surgery,” he says.

“We’ve looked at the variability in human vagus nerves, so we know our device is the right size. It’s quite a complicated process of designing a device that interacts with the nerve, but doesn’t damage it.”

A prototype of the device is on display at the Gut Feelings exhibition at Melbourne Museum, running until February next year. The installation explores the clever ways our gut talks directly to our brain and body, via trillions of microorganisms.

But it is not just the nervous system’s connection between the gut and brain that are offering new avenues for potential treatments. Evidence is growing that the microbiota, the constellation of micro-organisms and bacteria that live in the intestinal tract, are modifiable and potential treatments or preventives for a range of conditions.

A pioneering finding linking gut health to brain disease came late last year when the Florey’s Professor Anthony Hannan and his research team, including PhD student Geraldine Kong, published the first evidence that gut microbiota are imbalanced in a mouse model of Huntington’s disease.

This study, published in the international journal *Neurobiology of Disease*, marks a new direction for researchers into this inherited and fatal disease.

“There is a lot of excitement because it was thought Huntington’s disease was just a brain disease,” he says. “But if the Huntington’s gene can lead to changes in the gut microbiome then it raises a whole number of questions about where the disease originated from and how it might be modified.”

Anthony’s team is now investigating whether correcting this imbalance of bacteria in the gut can slow disease progression or delay onset of symptoms in this mouse model. The gut microbiome of families with Huntington’s are also being studied with collaborators in Melbourne.

“We’re wanting to see whether a change in the bacteria of the gut is actually involved in the onset or progression of Huntington’s disease,” he says. “This could lead to potential future therapies for this devastating incurable condition.”

Also at the Florey, Dr Shanti Diwakarla is investigating the link between the brain and gut disorders of Parkinson’s disease. Surprisingly, about 90 per cent of people with Parkinson’s disease have a gut dysfunction. Shanti has found a new way in which the brain defects of Parkinson’s disease are communicated to the gut.



Dr Martin Stebbing and Professor John Furness at the Gut Feelings exhibition at Melbourne Museum.

The secret life of stem cells

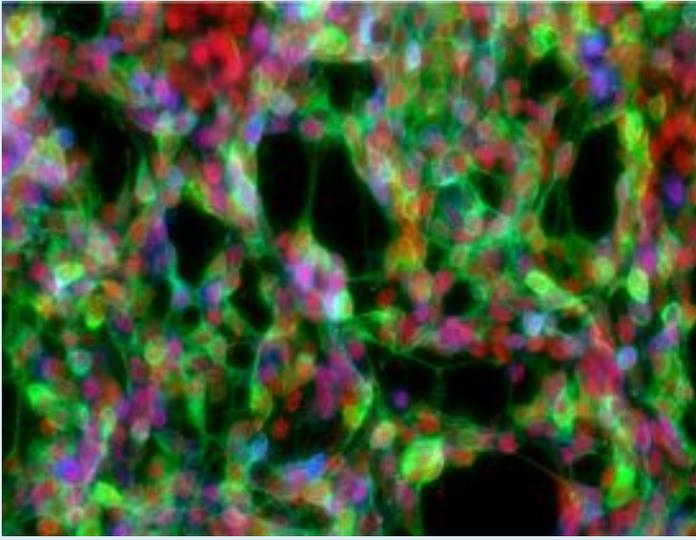


Associate Prof
Clare Parish



The Stem Cells and Neural Development laboratory, headed by Associate Professor Clare Parish, wants to repair the injured brain by understanding brain development. Their idea is that to treat degenerative diseases like Parkinson's, or damage after stroke, the brain will need to replay early developmental stages.

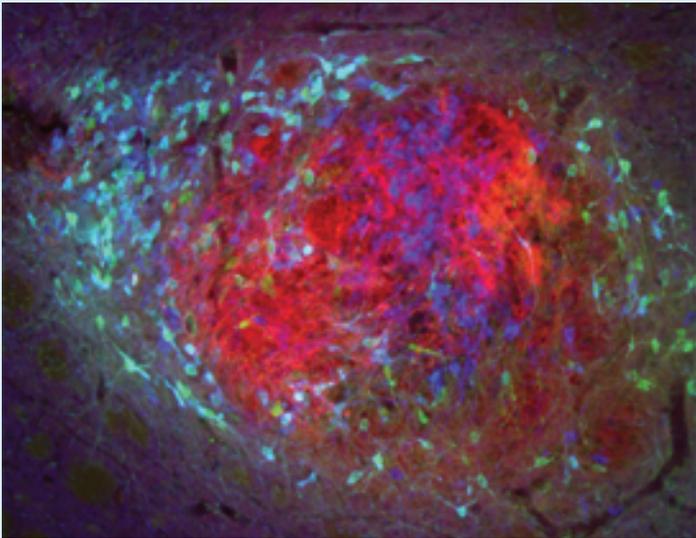
Pictured above (L-R): Brianna Xuereb, Kevin Law, Dr Cameron Hunt, Isabelle de Luzy, Vanessa Penna, and Carlos Gantner from the Stem Cells and Neural Development laboratory



Nº1

Turning stem cells into brain cells

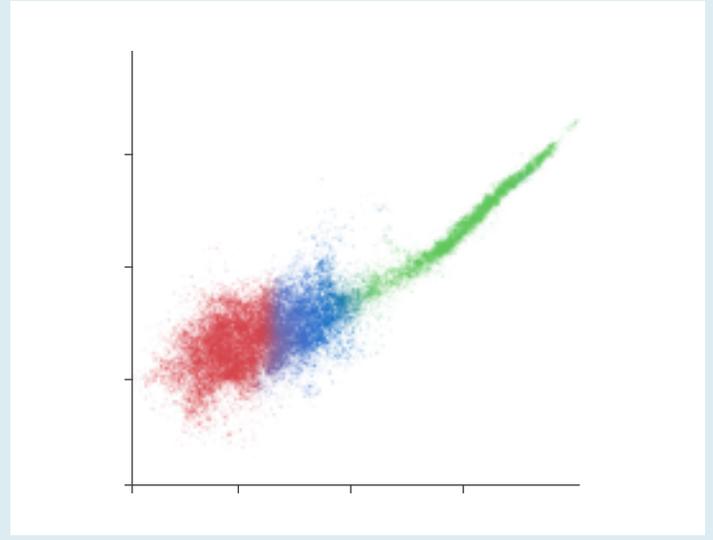
Human pluripotent stem cells are a valuable resource in regenerative medicine. These cells are available in unlimited supply and can be made into any cell type in the body – when given the right instructions. Associate Professor Clare Parish's lab specialises in turning these cells into brain cells that contain dopamine – the type of cells that die in Parkinson's disease. Clare's team is working towards a clinical trial to test whether injecting these cells into Parkinson's patient's brains can treat their symptoms.



Nº3

Scaffolds for brain repair

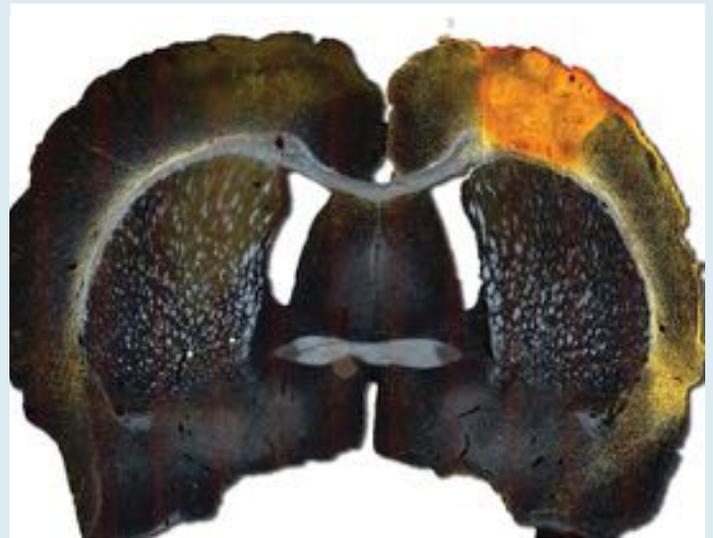
Much like an underground train station needs reinforcing beams and struts to hold the roof up, the injected brain cells need a scaffold to support their growth while they knit into the surrounding brain tissue. Clare's group is engineering unique gels that provide structural support and also deliver 'fertilisers' to the cells to help them survive and function at their optimal level in the brain. These scaffold gels are being tested for Parkinson's disease and stroke.



Nº2

Purifying cells for transplantation

The lab is expert at turning stem cells into dopamine-containing brain cells, but the final sample of cells needs to be absolutely 100 per cent pure. Any contaminating stem cells could develop into a tumour or other rogue cell type, which can have negative impacts if implanted into a patient's brain. The lab is developing ways to eliminate the unwanted cells (red) and only transplant the 'good' dopamine cells (green).



Nº4

Tracing new connections

To test if their cell transplantation techniques work, the team adds coloured tags to their stem cells that enable them to trace the connections the grafted cells (yellow) make with the host brain. This allows them to confirm that the graft is healthy, contains the right cell types and makes the appropriate connections in the brain that lead to optimal functioning.



Mental illness: Searching for new leads

Why do people develop schizophrenia, depression and anxiety?

Can anyone develop a mental illness?

AG I heard this quote once which said that mental illness doesn't discriminate; everyone is vulnerable to it but there are certain factors that make us more susceptible – environmental factors and genetic factors. It's usually a combination of these that triggers the onset. My research looks at environmental factors, namely sex hormones - oestrogen, testosterone and progesterone, the main gonadal hormones. I'm interested in how these hormones affect our brain.

Outside of your work, do you get a sense of how much mental illness affects people in the community?

AG I know a lot of people who have a mental illness, a few with severe conditions. I realise this more and more as I talk to people. All you have to do is listen and people open up. I've got so many friends that have depression, post-natal depression, anxiety disorders and schizophrenia. It's becoming so common. People perceive that there are more people with these disorders today than in the past. I don't think the numbers have changed so much but we weren't able to label the conditions.

When you have a mental illness, you think it's just you and it's your thoughts and your feelings and that's your personality. It's not you. It's the illness in your brain, you just can't see it. It's not like cancer where you can image a tumour and it makes your leg hurt – you can't see anything with mental illness. When experiencing delusions (a major symptom of schizophrenia), you don't just 'have a strong imagination'. Your brain is actually firmly showing you this image but it's not really there. That always blows my mind. I think it's so fascinating that the brain can do that.

As a scientist can you 'see' mental illness?

AG Yes, you can measure it and get an objective, quantifiable measurement of some changes in the brain. With schizophrenia though it's tricky because there isn't a single big change that happens in the brain, there are lots of subtle changes.

“When you have a mental illness, you think it's just you and it's your thoughts and your feelings and that's your personality. It's not you. It's the illness in your brain, you just can't see it. It's not like cancer where you can image a tumour and it makes your leg hurt – you can't see anything with mental illness.”

Dr Andrea Gogos

You've worked in this area for some years. What motivates you?

AG I've wondered why I love this so much. I think for me it's really about helping people and it has to be something that I have skills in. I can't be a medical doctor, that's not me, but I love science and I love psychology, which I studied along with pharmacology. My work combines all these factors.

I hope that what I do will lead to better treatments because the drug treatments that are available aren't great. There are a lot of severe and obvious side effects.

When I meet families they talk about how the delusions and hallucinations of their son, for example, are under control but that he gained 40 kilograms and then had all these heart and cholesterol issues that came with this increased body weight.

Are you pursuing any promising treatments?

AG Generally, we're looking at whether oestrogen can be used as a treatment and if not oestrogen, other oestrogenic compounds, and which particular symptoms they might be able to target. By oestrogen I mean the compound 17 β -oestradiol – oestrogen is a group term – which is the most effective compound in reversing behaviours in rodents that are schizophrenic-like or depression-like. However, there are a number of side effects associated with long-term oestrogen use such as the 'feminising' side effects that men might not like, so we're looking at other compounds that might have the same positive effects without the negative. One is a compound called raloxifene, used in osteoporosis and breast cancer therapy. The next step is to tease out what these drugs are doing in the brain and to improve on them.

The mental disorders you study, like other illnesses including autism, Alzheimer's disease and multiple sclerosis have strong sex differences. It seems that research scrutinising these sex differences has been a long time coming...

AG Yes, schizophrenia predominantly affects males, while depression and anxiety are more female oriented. When I started doing my research 20 years ago it wasn't popular to research sex differences, hormones and mental illness. In fact very few people talked about it. I was one of few researchers in Australia who focussed on female subjects. Everyone then was saying 'why are you working with female rats, they're too hard to work with' (because of their fluctuating hormonal cycles).

There are so many repercussions with this. Drug companies have been testing their medications predominantly on male animals and then in male subjects even if they are studying a condition predominantly affecting females.

A few years ago, the National Institutes of Health in the US made it mandatory that if you wanted to get funding you needed to have males and females in your research. If not, you had to have a good reason why not. Now everyone's caught up with the times and researchers are finding all these amazing differences. Last year several journals came out with special themed issues on sex differences and I edited one of them.

Your brain in a flash



Dr Sarah Gordon, head of the Presynaptic Physiology laboratory, loves teasing apart the factors involved in dysfunction in presynaptic proteins – in diseases at either end of the age spectrum. Here she talks about ground-breaking research she began at the University of Edinburgh.

You're passionate about researching a protein called synaptotagmin-1. Why do you find this protein so interesting?

SG Synaptotagmin is absolutely essential for communication between brain cells. It controls the timing of the release of chemical messengers that transmit information from one brain cell to another. If you have mutations to synaptotagmin this causes intellectual disability.

Your lab work into a mutation to this protein took an unusual turn...

SG A paediatric clinician and geneticist from Cambridge, Kate Baker, told me, coincidentally, that she had a patient with a very severe neurodevelopmental disorder who had the synaptotagmin mutation. The mutation was in an absolutely essential part of this hugely important protein; I was surprised you could even survive. We collaborated. I found that the mutation slowed down the ability of neurons to communicate with each other.

This led to a rare honour for you, can you tell us about that?

SG After that first study we had clinicians from all over the world contact us saying they had kids with similar disorders and that they'd genetically sequenced these children and found they had mutations in the same gene. We then found that those mutations in children with the most severe clinical presentations of this disorder caused the greatest slowing in brain communication. We were kind of amazed that the model disease we had in a dish mapped really closely to the clinical presentations of these kids.

Last year the syndrome was named after Kate Baker and myself – a bizarre thing to happen!

Why is it important to study Baker-Gordon syndrome?

SG What happens to these kids is really important to us because we're the only ones in the world doing this research. We had a family in Melbourne with a girl with the syndrome visit the lab last year. It was a really profound experience as it put a face to this disorder. This family appreciated so much that there was someone out there trying to do something for them.

Any leads on possible treatments?

SG We have hopes based on our previous findings that if you modulate calcium, that might help speed up brain communication between neurons; synaptotagmin is the calcium-sensing protein.

It's a rare disease, how many children could your research potentially help?

SG We don't know how many kids are affected because it's such a new disorder. What we learn here might apply to other kids with mutations in similar proteins – it's going to have wide impact. 🇬🇧



Andrew Lawrence:

Alcohol and its true cost

Nº1

Alcohol is deeply embedded in Australian culture. For most people it's not a problem but for a large number of people, it's a huge problem. Globally, the single largest cause of death for people aged 15-49 is alcohol abuse and excessive alcohol use. It's a huge social and financial burden - on the healthcare, social welfare and legal systems.

Nº3

I would argue addiction is a pathological habit, one that has become aberrant and is causing harm and therefore is a disease. The problem with addiction is you can sometimes be treating broken people to start with. There are often a whole range of adverse life factors that have come together in a constellation that has precipitated the drug or alcohol use. **I've never once met an addict who is pleased they're an addict.** Most people have some innate protective mechanism that stops them becoming addicted whereas other people clearly don't, but it's a bit like Russian Roulette; until you start that behaviour you don't know whether you have that protective mechanism or not.

Nº4

I do drink. I consume alcohol socially and I like to have a glass of wine with dinner. I feel like I'm in control of my alcohol intake and it's not problematic. **If I thought that I was losing control or it was becoming a health problem or a relationship problem, I would seek immediate assistance.**

Nº2

I have always been fascinated by the brain. When I was seven or eight years old, I said to my mum I wanted to take a brain to show-and-tell. I think that stopped her in her tracks momentarily but then she said, "Righto". She marched me to the butcher's shop, bought a sheep's brain, put it in the fridge overnight and I took it into show-and-tell the next morning. I think my teacher was surprised.

Nº5

Back in 2006, I demonstrated that the endogenous orexin system was critically involved in relapse to alcohol seeking in rodents. We're about to run a proof-of-concept clinical study at St Vincent's Hospital with alcohol dependent in-patients, targeting the orexin system with a drug made by Merck and a placebo in a double-blind trial. **Hopefully we can target multiple facets of addiction, including reducing the unpleasant experience of acute withdrawal, help normalise sleep patterns and also reduce cravings** and therefore reduce the propensity to relapse. But it's not a magic bullet. A range of treatments, pharmaceutical and behavioural, will always be required.

Professor Andrew Lawrence is the head of the Addiction Neuroscience laboratory and leads the Florey's mental health research stream.

Sleeping our cares away

Dr Laura Jacobson's research is helping us understand the way we process emotional memories and may even help us diagnose and slow Alzheimer's disease.

It's amazing that we wake up from a good night's sleep feeling "rested" because the way Dr Laura Jacobson tells it, our brain does nothing but work, work, work the entire time we're catching zZZz's. The wiring in our brain is furiously using the downtime to test connections, replay key moments and, in computer-speak, "to reconfig". Sleep is also the state where the brain "takes out the garbage", washing out waste products generated during the day's activities.

"We spend a third of our lives asleep," Laura says. "It's not wasted time, it's critically important."

Laura is the Florey's Head of the Sleep and Cognition laboratory. She spends her days considering the impact of sleep architecture; the balance of non-rapid eye movement (NREM) and REM sleep; and its impact on learning and memory, during those hours when we are not awake. She is deeply involved in exploring the ramifications of REM sleep in particular. While the vast majority of international sleep research and drug development has focused on activating GABA_A receptors to turn off neurons in the brain to promote sleep, Laura is involved in a different line of research. She is concentrating on the orexin system, neurons which control our awake-sleep activity, as well as affecting our appetite and eating behaviours. The catchily-titled dual orexin receptor antagonists (better known as DORAs) are drugs (such as Suvorexant; "Belsomra") that target the receptors that are activated by orexin when we're awake. By blocking them, you "turn off 'wake'", as Laura puts it.

Currently, there is a fundamental difference between standard drugs like the so-called z-drugs (e.g. zolpidem) that make people sleep (in Laura-speak: "like a starfish in 20 minutes") versus Laura's work that uses DORAs designed to stop your brain being awake in a new way. For starters, by inhibiting the orexin receptors in mice in the lab, she creates a state of non-wake that allows more rapid eye movement (REM) sleep. Laura studies the consequences of this on different types of learning and memory. In this way her work could define different ways of approaching the treatment of brain disorders by manipulating sleep.

REM is a sleep state that comes and goes during our slumber. In a normal human's night, sleep proceeds in approximately 90-minute cycles. In the early part of the night most of these cycles are comprised of NREM sleep with just a

few minutes of REM sleep, but then as the night passes, REM begins to dominate. In humans REM comprises about 20-25% of sleep - much more than in other animals (e.g. monkeys have about 9% and mice 5-10% depending on the light/dark phase).

But this sleep state is essential because we process emotional memories during REM sleep.

Laura is asking whether more REM sleep could help recovery from post-traumatic stress disorders (PTSD), as well as slow the effects of Alzheimer's disease.

Her PTSD work focuses on traumatic memory extinction - resetting the brain and body's inappropriate stress responses to otherwise benign stimuli - think an Iraq veteran diving under the table when a barista drops a coffee cup.

Her PTSD work focuses on traumatic memory extinction - resetting the brain and body's inappropriate stress responses to otherwise benign stimuli - think an Iraq veteran diving under the table when a barista drops a coffee cup.

Laura hopes her work will ultimately have therapeutic implications for personnel in combat zones or civilian first-responders (e.g. paramedics, police and firemen), who are both exposed to potentially traumatic events and have frequently interrupted sleep and fractured REM cycles. She worries that some may have problems processing feelings and extinguishing memories during sleep, through reduced pruning back of unnecessary synaptic branches - another key process that occurs during healthy sleep.

But what about the rest of us who struggle to sleep, maybe after a bad day at work or with a new baby in the house?

"We remember almost everything each day in amazing detail. Some of it we keep and some we don't, and sleep is one of the major mechanisms by which we keep or dump it. My opinion is that dreaming is in part a re-run of aspects of the day's memory and it's testing out the wiring. We can see this in animals. We can't really fully understand dreaming in animals, because we can't talk about the contents of dreams with them, but we can measure activity and make



What books are you reading?

Why We Sleep by Matthew Walker (of course!).



What music are you listening to?

Soundtrack to *Amélie*.



Favourite recent movie?

The Sisters Brothers.



Recent travel adventures?

Grampians - hiking and wine touring in Great Western over Christmas at 40 degrees Celsius.



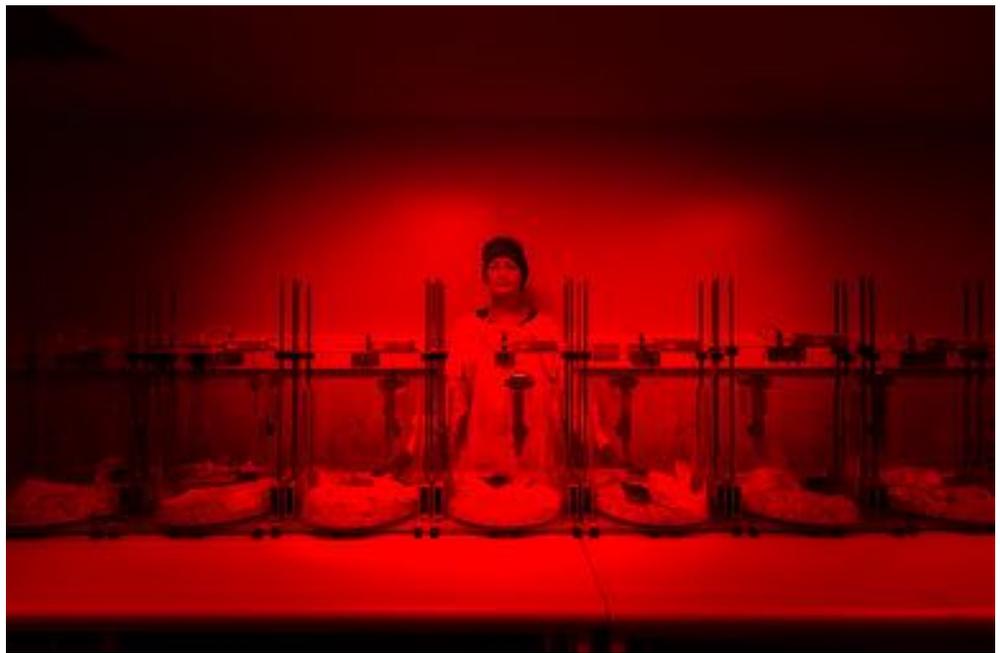
estimations of what type of neural patterns are associated with that. For example, there has been some research done on 'place cells' - when an animal runs in a maze, they make a mental map of the maze and as they go through it, with different cells in the brain's memory region firing depending on where they are in the maze. We can actually see that process re-running in their brain during their sleep."

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"REM sleep is also important for making associations across different types of memory and helping us to make links and intuitive leaps in understanding. Babies have, and need, a lot of REM sleep as their brain is testing and growing the wiring. The amount and nature of the sleep you have changes as you go through your life cycle."

Studying sleep allows a glimpse into the causes and impacts on other diseases, too.

Dementia scientists have shown that clumps of a protein in the brain known as tau indicate that someone is developing Alzheimer's, as well as another form of dementia, fronto-temporal dementia. Tau build-up appears to run alongside elevated levels of orexin in the fluid surrounding the brain. Broken or reduced sleep and increased time awake is often a symptom of Alzheimer's, well before any memory issues become apparent, so Laura is exploring whether manipulating sleep architecture using DORAs to block orexin activity, along with other methods, might help slow Alzheimer's disease progression. "In our work with animal models of Alzheimer's disease, we are testing whether reducing time awake and increasing REM sleep can help to improve memory and slow the development of Alzheimer's pathology. Achieving this would be a very welcome development for individuals and families affected by this devastating disorder." 📌



Dr Laura Jacobson watches as mice prepare nests for the night in her unique sleep laboratory.

Laura's tips for a better night's sleep:

1. Go to bed at a regular time. We set our alarm clocks to get up but having a regular bed time is equally as valuable.
2. Aim for about eight hours of sleep but note that some need more or less than others. Your body clock will tell you - your most alert time should be around 11 AM. If you are tired then, you definitely need more sleep.
3. Remove all electronic devices from your bedroom: this is where you sleep (not surf, tweet, text, game or post). Your bedroom should be cool, dark and comfortable. Don't use an illuminated alarm clock as 'clock-watching' can block sleep.
4. Get plenty of blue light during the day when you can (morning is best) but avoid it at night. Turn your devices to filter out blue light in the evening.
5. Establish routine "getting ready for bed" habits that are regular and relaxing - take your time doing this to unwind.
6. Avoid caffeinated drinks from the afternoon onwards - caffeine is a stimulant that takes about eight hours to clear your system.
7. Daytime power naps are great but keep them short (10 - 30 mins) and don't take them after 3 PM.
8. Exercise (regular!) is great for promoting good sleep. Keep it to periods well away from bedtime (no closer than three hours before bed).
9. When trying to sleep, if daytime thoughts intrude, imagine a nice place that you remember e.g. an empty beach with gently lapping waves, rain on the roof when warm and cosy in a hiking hut, strolling in a leafy forest. Explore and embellish your place. When other thoughts intrude, gently push them away and go back to "your peaceful place". This mental exercise takes practice but can help to block "ruminating" thoughts that prevent sleep.
10. If you can't sleep after about 20-30 mins, don't push it. Getting anxious about not sleeping can prevent sleep. Get up and do something, ideally calming or boring, or even frankly silly (no one else will ever know!) to snap off ruminating thoughts - a small laugh at yourself can help you to relax.

Transformative gifts with enduring impact





Pictured above: Carl and Wendy Dowd.

In October, an extraordinary couple, Wendy and Carl Dowd, announced a \$5 million gift to the Florey to benefit its endowment, the Florey Future Fund.

Philanthropists to the Florey for the past two decades, Wendy and Carl's gifts to the Institute have grown over time. They have also become more involved, as they supported the work of our researchers, who they champion strongly.

In 2017, they planned to make a significant contribution. From their generous intention came a transformative gift that sets the Florey on a path to a secure long-term future.

Florey Chairman, Mr Harold Mitchell AC, lauded this initiative. "Some people in Australia make a real difference. They achieve much in their life but after that, they leave something there which just goes on, makes a difference to all Australians. Carl and Wendy Dowd are such people. They are great Australians that are making a difference at the Florey, they are incredible people," Harold said on the evening of the Florey Future Fund launch.

Harold immediately decided to partner with the Dowds by pledging \$5 million to match their gift. As part of their philanthropic partnership, he also committed to work with them to tap their networks to create interest in and support for the Fund.

Wendy and Carl's vision is to enable researchers to work unimpeded by the worry that they may not have a job next year because of the funding system for medical research in Australia. Interest income from the corpus of the Dowds' donation within the fund will be used to establish 'The Carl and Wendy Dowd Professorial Fellowship'.

“We are excited by the thought that a significant fund will support the brilliant minds to actually conduct research, rather than have them spend so much time and effort writing up submissions for funding.”

“We are excited by the thought that a significant fund will support the brilliant minds to actually conduct research, rather than have them spend so much time and effort writing up submissions for funding.”

Florey Director, Professor Steven Petrou, paid tribute to the Dowds and Harold Mitchell on behalf of everyone at the Florey.

“Thank you for helping the Florey in the most extraordinary and meaningful way. This is tangible, this is a game changer. I would like to extend heartfelt thanks to you for your leadership commitment to the Florey that has enabled us to establish our endowment fund and we look forward to sharing the research this generosity has supported.”

About the Florey Future Fund

Your gifts to the Florey to benefit the Florey Future Fund will strengthen our financial foundation. Growing capital within the fund will provide perpetual funding for brain research through investment income.

The Florey Future Fund is an endowment, with its capital protected. Endowed gifts will add to its capital. Only the return on its investments may be distributed annually. The investment management of the endowment is outsourced to a top tier global investment manager, Morgan Stanley, via the Florey's Investment Committee which is chaired by Mr Stephen Spargo AM, also a Florey Board member.

Today's research idea is tomorrow's healthy future. Give to the Florey to benefit our endowment and take us closer to our goal of \$50 million. If you would like to partner with the Florey, Wendy and Carl Dowd, Harold Mitchell and the other donors who have followed their lead, please have a conversation with us about the Florey Future Fund today.

Thank you

The Florey thanks our supporters with a special message from the Foundation Council's Chairman, Mr Ross Oakley OAM.

It is always a pleasure for me to write a message in the annual as Chair of the Florey Foundation Council. I not only reflect on all the important and exciting work that has been done at the Florey in the past year I, more importantly, think about all our valuable supporters who have helped realise our objectives in the past year. Thank you for your donations and gifts to the Florey in 2018. We could not have achieved all that we have without you.

Many of you are long-time loyal supporters of the Florey and have been donating to us and engaging with us over many years. A number of you have started a relationship with us, having decided to support us financially in response to one of our fundraising appeals or after learning more about our work through our public lectures, articles in our newsletter, *Brain Matters*, news or TV articles and our website. However long or short your association with the Florey has been as a supporter, you are part of our success in raising \$6.8 million in philanthropic funds through Trust and Foundation grants, gifts in Wills, major gifts, various individual gifts, workplace giving, corporate philanthropy and community fundraising activities. Donations were also received from our very popular giving circle, the *Brains Trust*. These gifts, small and large, come from across Australia and we thank all our donors for their loyal support. These contributions not only help us in our day to day operations and research programs, but they also help us plan for the future.

However long or short your association with the Florey has been as a supporter, you are part of our success in raising \$6.8 million in philanthropic funds through Trust and Foundation grants, gifts in Wills, major gifts, various individual gifts, workplace giving, corporate philanthropy and community fundraising activities. Donations were also received from our very popular giving circle, the *Brains Trust*.

An important development in 2018 was the launch of our endowment fund, the Florey Future Fund. We were able to announce publicly our aim of establishing this fund as a source of perpetual funding for brain research through the leadership gift pledges of \$5 million each from Wendy and Carl Dowd and Harold Mitchell AC, the Chairman of the Florey Board of Directors. Since the launch in October 2018, a few other donors have contributed for its benefit and our work continues in earnest to attract other supporters who can help make this fund grow. If you would like to help secure the

long-term future of our research and have an impact on one in four people affected by mental or neurological disorders, more information on the Florey Future Fund is available at florey.edu.au/donate/major-gifts.

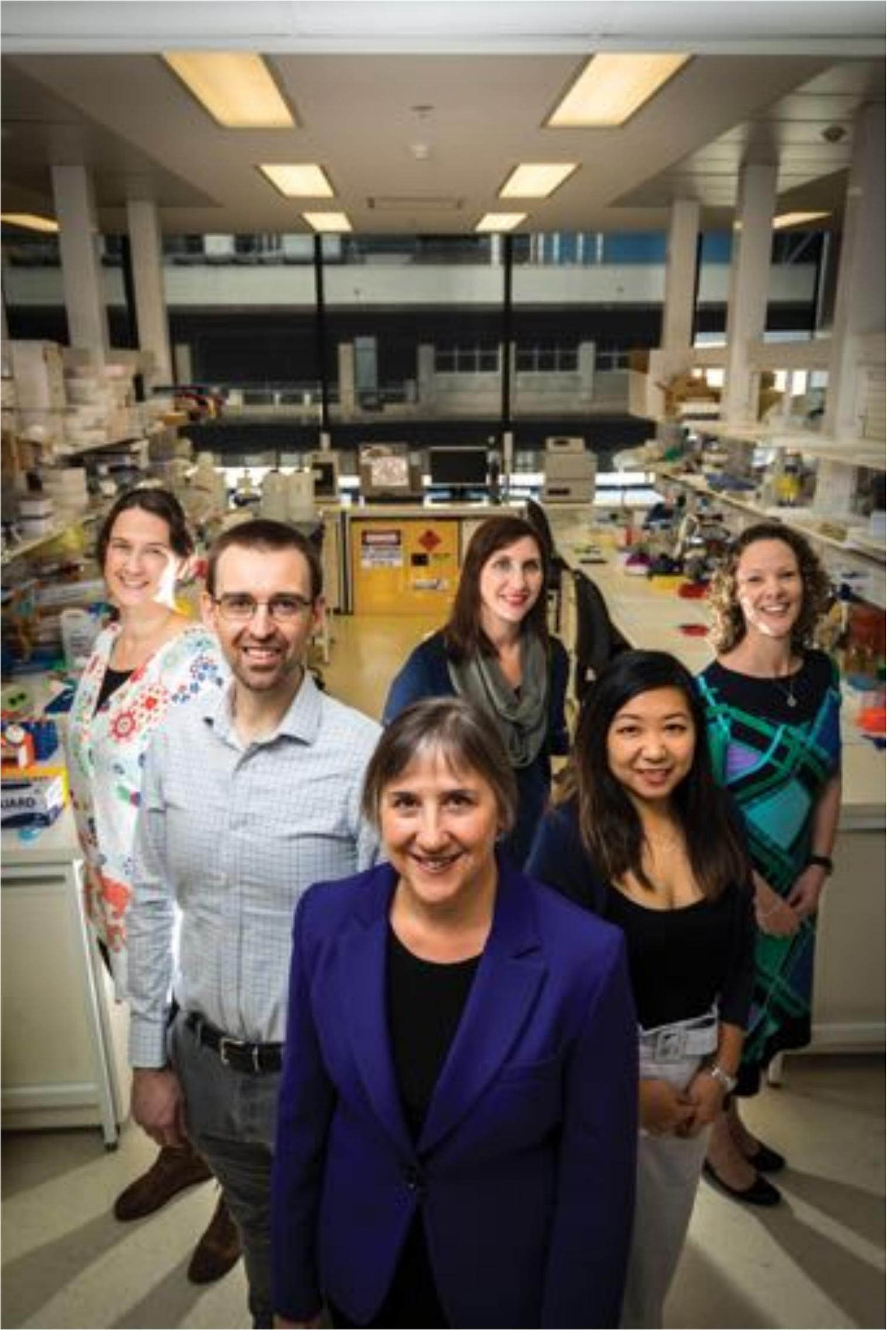
I would like to take this opportunity to pay tribute to the late Patricia O'Donnell. Patricia was well-known for her significant contribution to Melbourne's culinary scene, but her influence extended beyond this. Her leadership in the cultural life of the city will also be remembered and missed. Patricia was a Brains Trust Ambassador for the Florey and was integral in the development of our popular Dine and Discover program of events. These events broaden our researchers' reach beyond the auditorium at lectures and showcased our expertise in relaxed settings, accompanied by top quality food, wine and company. It was also an opportunity to raise funds for the Florey. Patricia helped us secure the in-kind support of Andrew McConnell of Cumulus and Supernormal and Matt McConnell of Bar Lourinha for these events. I would like to thank Andrew and Matt for their contributions.

Thank you to my fellow Foundation Council members for their work throughout the year. I appreciate their passion for raising awareness about our critical work at the Florey and helping us raise funds to achieve the Institute's mission. In 2018 the Florey Foundation Council members were Andrea Hull AO, Kate Joel, Graeme Kelly, and Stephen Spargo. Ex officio members were Directors Professor Geoffrey Donnan AO and Professor Steve Petrou, former Deputy Director Henry De Aizpurua, former Manager of Fundraising and Marketing Jane Standish and former Head of Philanthropy Elouise Holmes. We are very grateful to these individuals who have contributed to the organisation with their expertise.

Yours sincerely,

Ross Oakley OAM
Chair 

Pictured (L-R): Dr Robyn Brown, Dr Scott Ayton, Professor Julie Bernhardt AM, Professor Dominique Cadilhac, Dr Yen Ying Lim and Associate Professor Clare Parish: winners of NHMRC Research and Career Development Fellowships.



Our donors

During 2018, the pace and potential of lifesaving research has vastly accelerated at the Florey. Contributions by generous benefactors provide essential support, alongside government grants. Backing from donors, corporations, foundations and organisations act as a catalyst for our scientists, funding new ideas and innovations as they emerge – driving our ability to chase discoveries and to improve lives. We are grateful for the generous investment from all of our supporters in our relentless pursuit to improve the prevention, detection and treatment of brain diseases and mind disorders.

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acknowledge the
tireless efforts
of people in the
community who raise
funds to support our
research, and thank
the donors who have
supported them.

Run Melbourne 2018

Sara Robinson

**Run for Mental
Health at Melbourne
Marathon 2018**

Michael Julian
Dominique Gash
Matthew Hoyne
Liam Werrett

**Run for Aaliyah at
Melbourne Marathon
2018**

Martine Marchio
Run for Aaliyah Team
members

**In celebration of
their engagement**

Jennifer Liebenenthal and
Lenny Gropok

**In celebration of their
birthday**

Richard Wall
Wendy Taggart
Simon Gomalinski &
George Braitberg
Douglas Wren

Financial snapshot

	2018
	\$M
INCOME	
Grants	41.9
Philanthropy	6.8
Other	28.2
Total income	76.9

EXPENSES	
Salary and wages	(44.9)
Other research expenditure	(26.5)
Depreciation and amortisation	(3.5)
Other items (non-cash)	2.0
Total Expenses	(72.9)

SURPLUS / (DEFICIT)	4.0
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FINANCIAL POSITION

Current assets	50.9
Non-current assets	62.7
Total assets	113.6
Liabilities	(13.6)

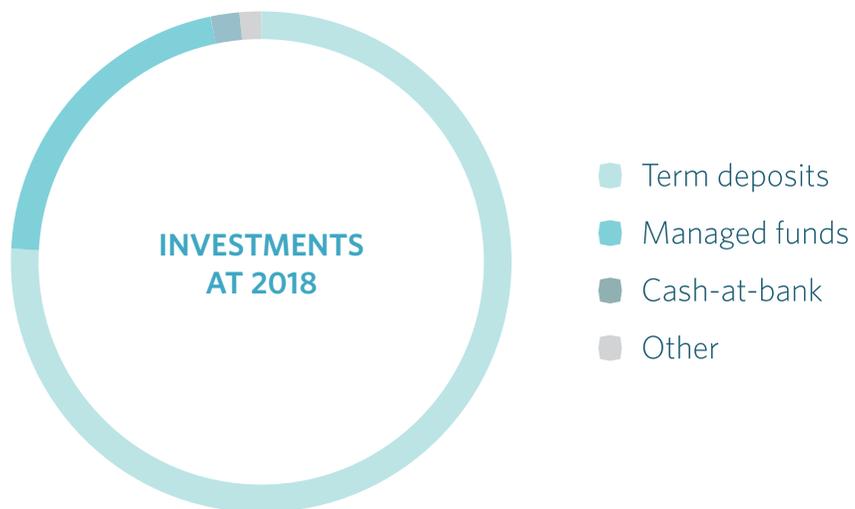
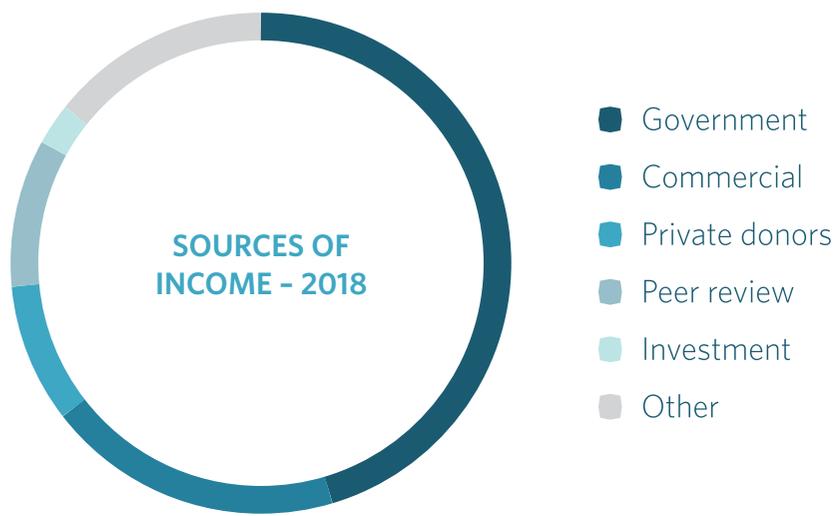
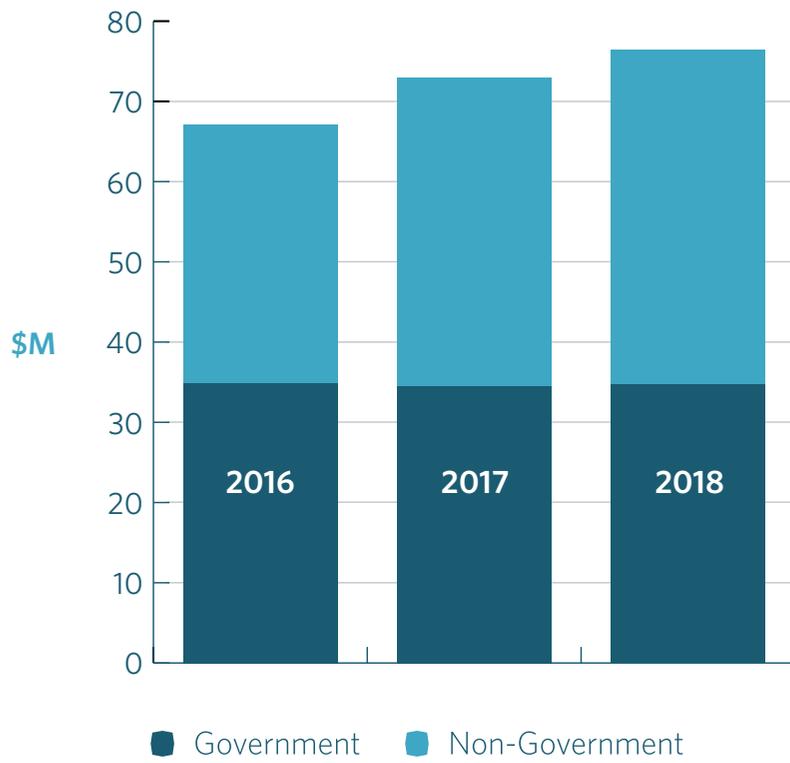
NET ASSETS	100.0
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	2018
	\$M
SOURCES OF INCOME	
■ Government	34.7
■ Commercial	16.7
■ Private donors	6.8
■ Peer review	7.1
■ Investment	1.3
■ Other	10.3
TOTAL	76.9

	2018
	\$M
INVESTMENTS	
■ Term deposits	17.5
■ Managed funds	4.9
■ Cash-at-bank	0.5
■ Other	0.1
TOTAL	23.0

Please visit the Australian Charities and Not-For-Profits Commission website for detailed financial reports of the Florey's 2018 year.

FLOREY INCOME 2016-2018



Meet: Craig Thomson and his son, Jack

Craig Thomson's first job as a technician working within the Florey sheep labs has turned into a lifelong commitment. Thirty years later, Craig is renowned for his energetic, warm, intelligent and dedicated service to scientists working with the Institute's Animal Services as manager.

From the early days of working with Professors Michael McKinley and Clive May - who he describes as wonderful mentors - Craig was trained-up to conduct procedures and experiments. Constantly seeking new challenges, Craig says the Florey has provided a stimulating environment where ethics and high standards are paramount.

"We do our work quietly and efficiently to support the scientists. I feel I am respected and have been treated as an equal through the whole journey," he says. "I've worked with every director that has led the Florey and I'm confident that I can have a chat with anyone in the institute and be able to have a bit of a laugh."

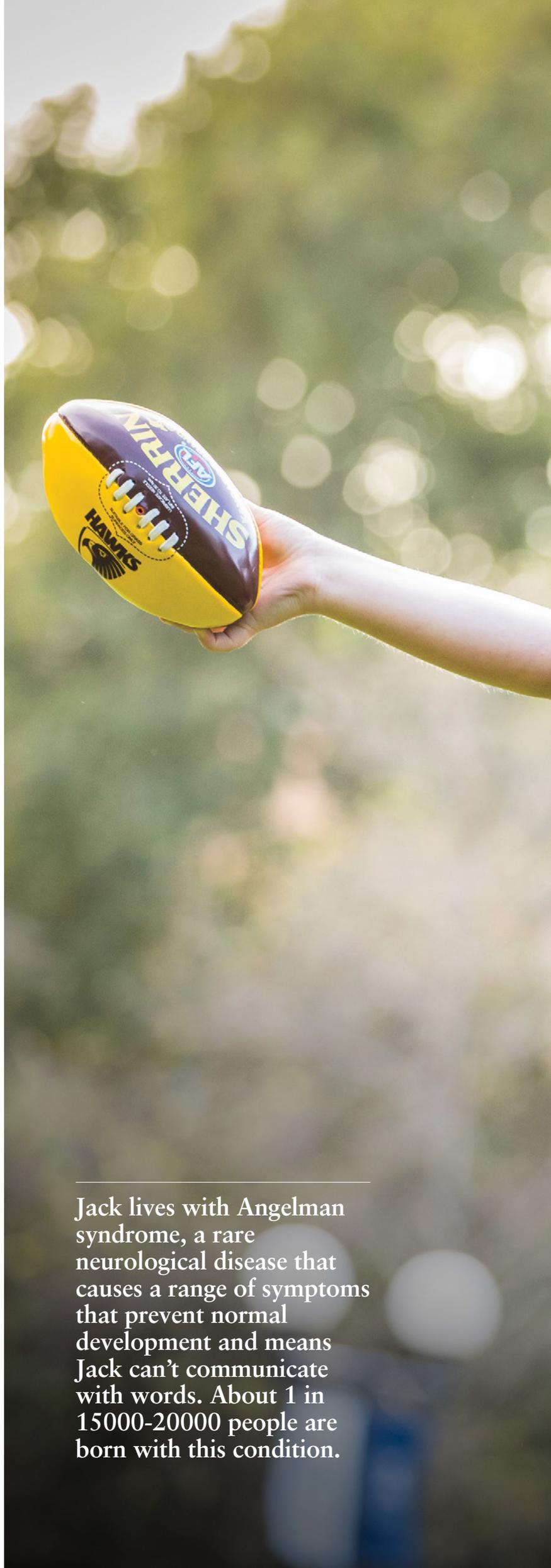
Craig and his wife Julie are parents of four children Luke, 15, Jack, 12, Matthew, nine and Emma, five. Jack lives with Angelman syndrome, a rare neurological disease that causes a range of symptoms that prevent normal development and means Jack can't communicate with words. About 1 in 15000-20000 people are born with this condition. Jack may only reach the intellectual capacity of a five-year-old and appears to be extremely happy most of the time - a typical trait of the syndrome. While children with Angelman's seem to be full of joy, Craig says that if he could ask Jack just one question, it would be "Are you really happy?"

Over the years, Craig has been supported by several senior researchers who help him better understand the neuroscience behind Jack's genetic disorder.

"When Jack was first diagnosed, people like Steve Petrou, Mal Horne, Elisa Hill and Andy Lawrence really supported and helped me understand it. And Andy still sends me papers that relate to Angelman's. Chris Reid is a great source of information too."

While he enjoys liaising with a large number of researchers during his working week, Craig feels a deep sense of satisfaction when supporting those trying to understand a rare form of epilepsy that severely affects the development of children around the world.

"Obviously, I can relate to it from a personal perspective. It's incredibly satisfying to see the researchers chipping away at the science, the passion they bring and progressing towards discoveries that will help kids like Jack in the future." 



Jack lives with Angelman syndrome, a rare neurological disease that causes a range of symptoms that prevent normal development and means Jack can't communicate with words. About 1 in 15000-20000 people are born with this condition.



The Florey Institute of Neuroscience and Mental Health is one of the largest brain research centres in the world and the biggest in Australia. Our scientists share a common goal – to improve people’s lives through brain research and, ultimately, to influence global wellbeing and health economics.

Perhaps you would like to help us cure one of the many serious brain diseases affecting one in four people, young and old.

Your gift could help us reveal the causes of brain diseases affecting so many people; conditions like stroke, Alzheimer’s disease and schizophrenia.

Our research aims to transform lives for patients in Australia and around the world.

There are many ways you can help to fund our research.

- Give today.
- Pledge over time – join our Brains Trust.
- Plan for the future – make a gift in your will.

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Online: florey.edu.au

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Thank you for backing our great researchers.

The Florey Institute of Neuroscience and Mental Health is one of the largest brain research centres in the world and the biggest in Australia. Our scientists share a common goal - to improve people's lives through brain research and, ultimately, to influence global wellbeing and health economics.

Neuroscience is an area of medical research attracting enormous attention as our understanding of the brain rapidly evolves. Internationally, populations are ageing and there is a sense of urgency to find causes, treatments and cures for conditions affecting the brain and mind. We are addressing these conditions to avoid suffering and to contain health-related expenditure.

The Florey is a world leader in imaging technology, genetics, stroke rehabilitation and epidemiological studies. Mental health research is a growing focus with psychotic illnesses and neurodegenerative diseases demanding attention.

We study:

- Addiction
- Alzheimer's disease
- Anxiety
- Autism
- Bipolar disorder
- Cardiovascular disease
- Concussion
- Depression
- Epilepsy
- Huntington's disease
- Motor neurone disease
- Multiple sclerosis
- Parkinson's disease
- Schizophrenia
- Stroke
- Traumatic brain and spinal cord injury

To keep up to date with Florey events, news and research, visit florey.edu.au or email: info@florey.edu.au



The Florey Institute of Neuroscience and Mental Health acknowledges the traditional owners of this land, the people of the Wurundjeri people and the Kulin Nations. We pay our respects to their elders, past and present. We would like to acknowledge that our three sites rest on this precious land.

