

Brain Matters

News from the Florey Institute of Neuroscience & Mental Health



THE POWER OF THOUGHT

Professor Clive May channels a brilliant idea

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Director's Report

Professor Geoffrey Donnan, AO
Director, the Florey Institute of Neuroscience & Mental Health

Our cover story in this edition provides a powerful example of the way medical researchers can work together to improve the human condition.

The Florey's neurophysiologist, Professor Clive May and several other Florey researchers have collaborated with those from the Royal Melbourne Hospital and the University of Melbourne to invent a device to be implanted into the brain. Within a year, neurologists plan to implant this device into the brains of selected Australians with spinal cord injuries.

The level of innovative thinking and ingenuity required for inventions of this type is extraordinary. The collaborative effort, which developed quickly over five years, demonstrates the power of the Parkville precinct in bringing people together. Some 39 researchers from 16 institutes, hospitals and departments have combined to make this device a reality.

To find this level of expertise in one city, let alone within a radius of a few kilometres is unique. As a neurologist, I am incredibly excited by the potential for this device and others like it to improve the lives of people with spinal cord damage as well as those with neurological conditions including Parkinson's, epilepsy and stroke. The Florey is at the helm with our Parkville precinct colleagues and I'm very proud that people like Prof May can mentor young talent, to help them attract funding to a project like this – and to see it through to commercial development.

You can read about this exciting work on pages 4 and 5.

If you haven't already, could I recommend you visit florey.edu.au and check the dates of our 2016 public lecture series. If you can make it to Parkville, you will have direct access to some very senior clinicians and researchers who will speak on a range of topics relating to brain health. If you can't come to us, we'll come to you – via your computer. All lectures are recorded and posted within a few days of the event.

Wishing you well as we enjoy the change of season,

Geoffrey Donnan

A legend of the game



Many readers of *Brain Matters* will remember the days when Emeritus Professor Fred Mendelsohn AO, was the Director of the Florey. Prof Mendelsohn is still very active and attends many scientific events including, most recently, the Australasian Neuroscience Society's meeting in Cairns.

At this international gathering, Prof Mendelsohn was recognised by his peers for "an outstanding contribution by an individual to neuroscience in Australia".

Among his achievements over the course of his career are more than 300 publications, many of which were in leading journals including *Nature* and the *Proceedings of the National Academy of Sciences*.

His work has been cited more than 10,000 times and he has an H index of 56. Over 20 of Prof Mendelsohn's papers have been cited more than 100 times, a clear indication of the impact of his work. His research has focussed mainly on neuropeptides and their receptors, processing enzymes and actions, especially angiotensin and related peptides.

Congratulations to a great Australian. 🇺🇸

Improving rural stroke care



Professor Dominique Cadilhac has been recognised by Monash University for her outstanding contribution to stroke prevention and treatment. Her contribution to the Victorian Stroke Telemedicine program was recognised, especially for its support of health workers and medical practitioners in remote communities who now have access to Melbourne-based neurologists. Prof Cadilhac received the Vice-Chancellor's Excellence Award.

This award follows another for Prof Cadilhac relating to rural hospital healthcare. While attending the International Stroke Conference in Nashville, she won first prize in the prestigious American Stroke Association's Progress and Innovation Award for research presenting a new approach to data analysis with far-reaching implications for human health. 🇺🇸

Is junk food addictive?



Dr Robyn Brown

New research reveals brain changes commonly seen in drug addiction are also observed in animals fed a diet high in fat and sugar – similar to common fast foods like burgers, pizza and confectionary.

This work is the first to show that addiction and compulsive overeating share similar brain processes.

The work, headed by the Florey's Dr Robyn Brown, a Peter Doherty Research Fellow funded by the NHMRC, also involved scientists from Monash University and the Medical University of South Carolina in the US.

Animals were fed a tasty diet full of fat and sugar, but much like humans, only one third of them went on to develop obesity by overeating. By comparing the brains of the obese animals to animals who remained a healthy weight, the scientists showed their brains had similar impairments to those seen in drug addiction.

Brain changes included an inability to regulate eating behaviour, with the obese animals chewing through almost 60

per cent more food than their healthier counterparts, and brain activity changes associated with reward seeking.

This brain region, called the Nucleus Accumbens, is 'hijacked' by addictive substances, and the animals in this study showed the same brain changes seen in animals addicted to cocaine.

Dr Brown and her team are still unsure why some rats, and people, seem predisposed to overeating and addiction while others maintain a healthier eating regimen.

"Not everyone who uses drugs will become an addict: it's the same thing with food. Not everyone exposed to food that's high in fat and sugar, will become addicted."

Dr Brown explains that an obese individual who compulsively overeats knows they should stop eating and lose weight to improve their health and even save their own life. But, just like a drug addict, they won't be able to help themselves and continue to eat a diet rich in sugar and fat.

The research has important policy implications for treating obesity, because



To me, being an addiction neuroscientist, it's a warning sign that for some people, overeating and obesity is really an addiction-like disorder. And in some ways, it's also sort of insulting to tell an obese person who overeats just to eat less and exercise more."

for some people exposed to high amounts of high fat and sugar food, the inability to refrain from overeating might resemble addiction, rather than a lack of willpower.

"Framing the issue in this way means we will require a rethink of the entire health policy ecosystem, from food advertising standards, to medical treatment for people with compulsive eating habits.

"We know that there are pharmacological therapies that work in drug addiction. These therapies will be tested to see if they work for overeating.

"The good news is that these drugs are already approved and on the market so if they do work on people who overeat, we can get them out sooner."

Dr Brown is quick to emphasise that, like humans, only a third of the obese rats showed brain changes similar to addiction. Despite the "obesogenic environment" many of us live in, driving to the shops, school and work, sitting down all day and being exposed to saturation advertising of fatty, sugary, refined, processed foods, we can all try to improve our individual choices.

Much like the "every cigarette is killing you" advertising campaign, we should think hard about whether we really need that sugary soft drink or hamburger.

Dr Brown advises people who have issues with overeating to consider psychological and medical support to break a cycle of unhealthy eating and maintain a healthy weight.

"Society judges people who are obese quite harshly. But people with obesity need to say, 'Hang on. I could have what is more like an eating disorder'."

"If someone thinks they have a problem, they need to try and seek some help." 🇺🇸

The research was published in the prestigious medical research journal *Biological Psychiatry*, and is available from: DOI <http://dx.doi.org/10.1016/j.biopsych.2015.11.019>

COVER STORY

Moving with the power of thought

THE PROJECT

A bionic implant translating brain signals into messages for artificial limbs

THE BENEFICIARIES

People with spinal injuries

THE TALENT

The Florey's Professor Clive May and a team of 39 researchers from 16 organisations.

Florey scientists have helped develop a unique device to be implanted next to the brain's motor cortex - without the need for major brain surgery.

The device, a stent-based electrode known as a stentrode, could one day help paralysed people move their limbs. People with spinal cord injuries would use thought to wirelessly control their bionic limbs, wheelchairs, computers or when walking in powered body armour, known as an exoskeleton.

The stentrode, about the length of a matchstick, will be implanted in a blood vessel that sits over the brain. It will record high-quality signals emitted from the motor cortex, and will turn these signals into electrical commands.

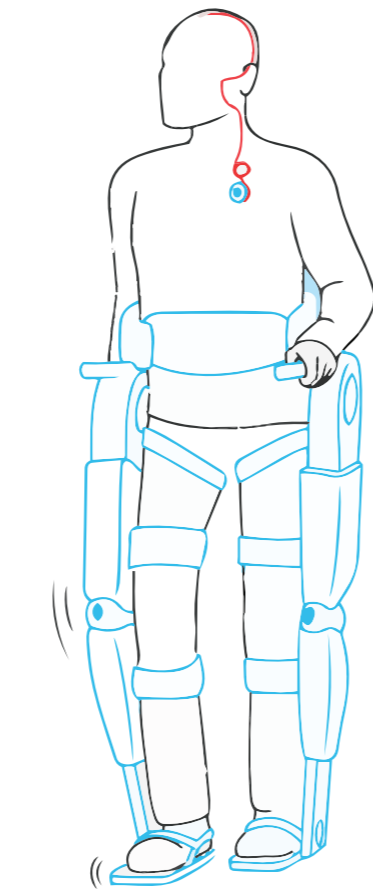
The work, a major collaboration between the Florey, the Royal Melbourne Hospital and the University of Melbourne, was published in February in the journal, *Nature Biotechnology*.

The initial idea for the breakthrough device came from Royal Melbourne Hospital neurologist, Dr Tom Oxley, a Research Fellow at the Florey and the University of Melbourne. Dr Oxley is interested in vascular systems and electrophysiology and has worked with senior Florey researcher, Professor Clive May since 2011.

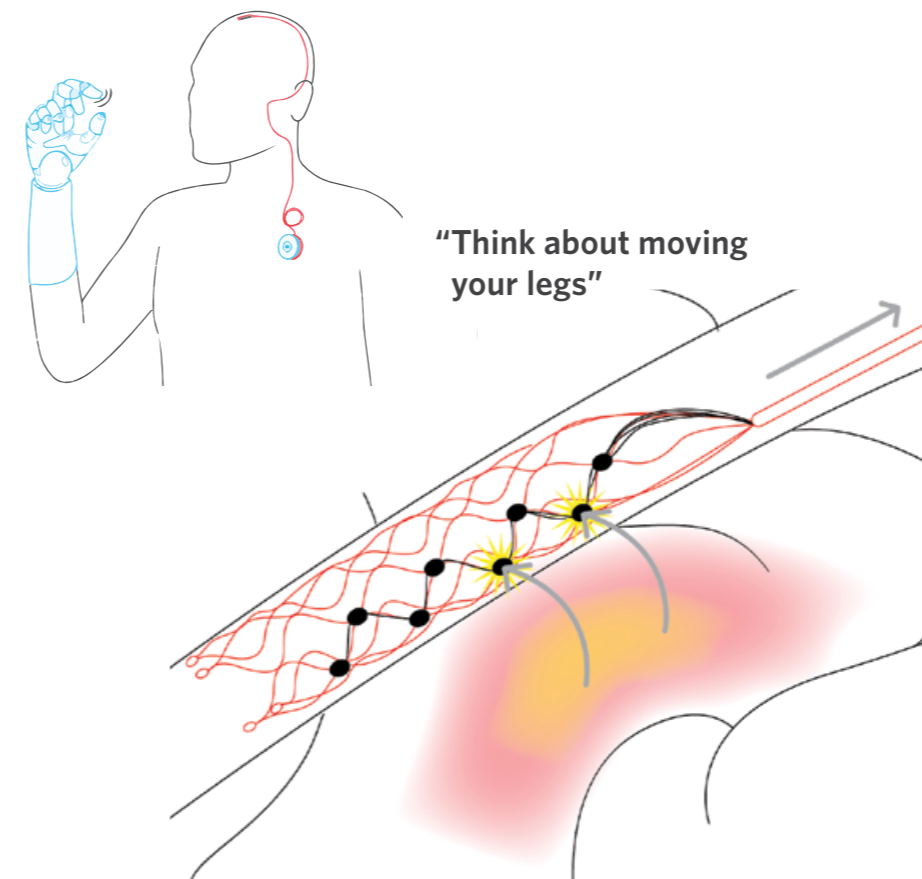
"Tom came to see me with this idea of creating a device which could be implanted in a blood vessel via the jugular vein," says Prof May, head of the neurocardiovascular lab. "It was one of those brilliant moments when you realise a great young mind has come up with something quite unique."

"I realised we had to support the project and make it work."

Major funding from the US Defense Advanced Research Projects Agency, and Australia's National Health and Medical Research Council followed. Dr Oxley then involved 39 great minds from 16 groups to develop the device with a vascular bionics catheter lab set-up at the Florey.



An exoskeleton could move with the power of the patient's thoughts



Fast-forward four years and the device is ready to be tested in humans.

It is expected that three candidates will be chosen from a specific patient cohort in 2017. The surgery will take place at the Royal Melbourne Hospital.

Stroke and spinal cord injuries are leading causes of disability, affecting 1 in 50 people. There are 20,000 Australians with spinal cord injuries, with the typical patient a 19-year old male. About 150,000 Australians are left severely disabled after stroke.

The device has applications far beyond assisting those with paralysis. The stentrode could be used to record brain waves for people living with epilepsy, helping them predict when they are about to have a seizure. People living with movement disorders like Parkinson's disease, multiple sclerosis or motor neurone disease may also benefit in years to come.

Quadriplegics in the human trials will be encouraged to 'learn to walk and stand again' by sending signals to their exoskeleton, according to fellow inventor, biomedical engineer Dr Nick Opie. "With our device, you've essentially connected an electronic limb to the patient's brain, but they have to learn how to use it."

Fast-forward four years and the device is ready to be tested in humans

Prof May says the device is well tolerated. "In fact, the longer the device is in the blood vessel, the better it seems to work. Unlike other devices of the past, this one is not rejected by the brain and is incorporated into the lining of the blood vessel ensuring long-term viability."

After it has undergone human testing and is ready for market, it is expected the device will be similar in cost to the cochlear implant — around A\$15,000 to A\$20,000 and will be ready for commercial use by 2022.

It is also hoped the stentrode will be as important to medicine as the cochlear implant, which was invented in Australia.

Professor Terry O'Brien, head of the Department of Medicine at the Royal Melbourne Hospital said the development of the stentrode has been the "holy grail" for research in bionics.

"To be able to create a device that can record brainwave activity over long periods of time, without damaging the brain is an amazing development in modern medicine," Professor O'Brien said.

Florey Director and neurologist, Professor Geoffrey Donnan, has welcomed the advance and believes it is a great example of the power of collaboration in the Parkville precinct.



Prof Clive May



Dr Tom Oxley

"Engineers, neuroscientists, surgeons, doctors and scientists have responded to Dr Oxley's call. Four years of design, development and testing has delivered us an ingenious stent device which can be implanted in a simple day procedure," Prof Donnan says.

"The Prime Minister has called on the nation to chase innovation. It's hard to imagine a more compelling example."

"In just 24 hours, this story had made it around the world, showcasing the amazing work of the Florey, the Royal Melbourne Hospital and the University of Melbourne."

Following the announcement, there were 200 separate TV and radio reports, seven major printed newspaper reports, and almost 500 online reports, reaching a massive global audience. 🌐

You can read the abstract of the *Nature Biotechnology* paper on www.nature.com/nbt/journal/vaop/ncurrent/full/nbt.3428.html

Making a big difference is easy

BEQUEST INFORMATION DAY

Have you ever dreamt about making a big gift to the Florey? Have you ever wondered how you can keep contributing to brain research well beyond your own lifetime? Do you think you're not wealthy enough to make a bequest?

If the answer to any of these questions is "yes", we'd like you to think again. We invite you to come to a bequest information session where you will learn about the importance of bequest gifts - even a small one - to the Florey. You will also hear about the benefits of making a Will from an independent legal expert and we will also have time for you to ask some questions. Each session will include a brief look behind the scenes of the Florey facilities in Parkville.

If you have already included a bequest to the Florey - as have our Director, Prof Geoffrey Donnan and our past Director, Prof Fred Mendelsohn - thank you! But don't keep it a secret from us. Let us know so we may thank you personally.

The human brain is the most challenging frontier of medical research and the Florey is a global leader. Our research impacts on all Australians and informs healthcare around the world. Please join us on our long and exciting journey.

YOU'RE INVITED TO OUR BEQUEST INFORMATION SESSIONS AND TOURS

WHEN

10.30-noon

Tuesday, 19 April or
Tuesday 21 June

WHERE

The Florey
Kenneth Myer Building
30 Royal Parade, Parkville
(opposite the Royal Melbourne Hospital).

Additional daytime sessions will be scheduled later in the year and if you are interested in an evening session, please let us know.

To enquire or to reserve your place please email irene.crebbin@florey.com.au or call Irene on 03 8344 1478.



Heroes, great and small

Dr Brad Turner recently welcomed Declan Zele, a grade 6 student at Kardinia International College in Geelong, to the Florey. Having lost a great grandmother to motor neurone disease, Declan had chosen an ambitious topic for his school exhibition project - *the effects of MND on the body and mind*.

After spotting Dr Turner and his lab on the TV news the night before, Declan made contact, visited the lab and asked some impressive questions for a grade 6 student. Declan went on to score the top mark for his project and even organised an ice bucket challenge at his school assembly, dunking his teachers and principal to the delight of his mates. This event raised nearly \$2,500 for the Cure for MND Foundation which Declan handed to its patron, football legend Neale Daniher. Declan kindly donated his masterpiece to Dr Turner's lab. We congratulate this young man on tackling this challenging project and raising much-needed funds and awareness. 🇺🇸

Participants wanted for Alzheimer's disease (pre) clinical study

If you are healthy and between the ages of 65 and 85, you could be eligible to participate in a new trial called **The A4 Study**, which aims to prevent memory loss caused by Alzheimer's disease.

About The A4 Study

The Anti-Amyloid Treatment in Asymptomatic Alzheimer's study (The A4 Study) is a pre-clinical trial to test a new drug on older individuals who may be at risk of suffering memory loss as a result of Alzheimer's disease.

Interested?

A screening process will be carried out to identify suitable participants. This will involve examining a variety of factors relevant to the trial, such as memory measures, health assessment and brain scanning. We are particularly interested in screening people who are in the 70-75 year age group, who have a normal memory, but who are worried about either getting dementia or who might have a family history of Alzheimer's disease.

**CONTACT US TODAY FOR MORE INFORMATION,
VISIT WWW.FLOREY.EDU.AU OR CALL 1800 443 253**

This study has been approved by the Austin Health Human Research Ethics Committee



Losing two children to a cruel disorder

Andrew and Kellie Adams are facing the saddest future any parent could contemplate. Both their beautiful children, Aaron 19, and Taylor, 22, suffer from a rare disorder for which there is no cure.

The Florey is the only place in Australia seeking to beat Niemann-Pick type C disease - also known as "childhood Alzheimer's".

For Aaron and Taylor to contract the disease, both their parents needed to carry one defective copy of the NPC1 gene. While the chances of being born with NP-C is low (1 in 120,000 live births), the ramifications are tragic. About one in 150 people in the population are carriers like Kellie and Andrew.

Andrew always expected he would be the one to succumb to early Alzheimer's having watched his dad, grandfather and uncle all succumb. He and Kellie set up a trucking business and worked hard to set up a future for the family. But then the unimaginable happened and both of their children were diagnosed within five weeks of each other with Niemann-Pick type C disease.

Aaron had been a keen reader and talented athlete but at 11, something seemed to be amiss. Today, he rarely speaks, has trouble swallowing and is gradually losing his mobility. Taylor is also in the advanced stages of the disease and also has trouble breathing and swallowing. Her vision has also deteriorated. Both need help showering, dressing and eating.

While Kellie and Andrew are working tirelessly to care for their children, they are dedicated fundraisers for the Florey's Dr Ya Hui Hung. Dr Hung is in regular contact with the families affected by the disease and is very grateful for their financial support via the Australian Niemann-Pick Type C Disease Foundation.

Her research is extremely important for the families affected by Niemann-Pick type C disease - and has significant implications for our understanding of Alzheimer's disease.

"For some reason, people living with Alzheimer's - and those with Aaron's and Taylor's disease - have a build-up of beta-amyloid protein and fibrous tangles in their brain. They also have problems handling metals and cholesterol," Dr Hung says.

But there is hope. Dr Hung is testing a library of new drugs using patient skin cells. There are promising metal-mobilising drug candidates that can partially correct the cholesterol problem in these cells.

The Florey seeks to find a treatment for both Niemann-Pick type C and Alzheimer's disease. Our researchers are in a race against time to test promising drugs designed to prolong a patient's lifespan and to improve cognitive and motor function. 🇺🇸

To donate, visit florey.edu.au, call 1800 063 693 or fill in the form attached to this story.

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- I would like more information about making automatic regular donations.
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Other ways to donate:

- Call our free call credit card donation line on 1800 063 693
- Fax your donation to us on (03) 9035 3107
- Online at www.florey.edu.au
- Send your donation to the Florey Institute of Neuroscience & Mental Health, Reply Paid 83037, 30 Royal Parade, Parkville, VIC 3052

Thank you for your valuable support. All donations are tax deductible.

Please let us know if you wish to change any of your personal details, contact preferences, or opt out, using any of the above contact methods. The Florey Institute of Neuroscience & Mental Health records information about its supporters that includes address and donation details, and is used solely by the institute but is not sold, traded or passed on to any third parties.



News & Events

FREE PUBLIC LECTURES

Time: 6.30pm-7.30pm

Where: The Florey, Kenneth Myer Building, 30 Royal Pde, Parkville (opposite Royal Melbourne Hospital)

Parking: Reasonably priced parking (including disabled) is under the building with easy access to the auditorium.

Public transport: Tram 19, stop 11 heading away from the city.

Queries: 1800 063 693. Email info@florey.edu.au

Register: www.florey.edu.au

Lectures are recorded and available on our website within a few days of each event.

Concussion in sport

Its impact on the brain – from young kids through to elite athletes

Speaker: Associate Professor Paul McCrory

Date: Wednesday April 6

Active memory: use it or lose it!

Sorry, this lecture is booked out

Date: Wednesday May 4

Alzheimer's disease

The latest research and a search for a cure

Speaker: Professor Paul Maruff

Date: Wednesday July 6

What causes Parkinson's disease?

We discuss brain changes and possible symptoms

Speaker: Professor Malcolm Horne

Date: Wednesday August 3

Major depression

An update on the latest research with a world leader in the field

Speaker: Professor Patrick McGorry AO

Date: Wednesday September 7

Recovery after stroke

Latest research from the Florey

Speaker: Professor Julie Bernhardt

Date: Wednesday October 5

Parkinson's disease

Through the researcher's lens

Speaker: Professor Malcolm Horne

Date: Wednesday October 26

Improve your brain health

Hear how you can keep your brain healthy and in peak condition

Speaker: Professor Anthony Hannan and an expert panel

Date: Wednesday November 9

Thank You

The Florey thanks our recent donors who kindly donated \$500 or more between Oct 2015 and Feb 2016.

Ms Christine Aarons | Mr James & Miss Judy Allen | ANZ Dividend Charity Donation Program | Australian Communities Foundation | Australian NPC Disease Foundation | The Baker Foundation | Mr Chris Baohm | Mr Nick Barton | Mr Walter Beale | Mrs Sandra Benjamin OAM | Mr John Bennetts | Mr John Bowen | Mr Graeme Bowker | Miss Elizabeth Butt | Ms Lyndsey Cattermole AM | Mr Anthony Conabere | Cure For MND Foundation | The Dowd Foundation | Jean Drury | The Eirene Lucas Foundation | Mr Andrew Erikson | Estate of Betty Elliott | Estate of Mary Eva Kentish | Estate of Geraldine Nicoll | Estate of John Shelton | Estate of Keith Williams | Evelyn Firstenberg | Dr Alan K Fryday | Geoff & Helen Handbury Foundation | Mr Peter Gillooly | Mrs Lesley Griffin | Mr Andrew Guy | Mrs Ronda Hall | Harold Mitchell Foundation | Mr Michael Hayja | Mr Robert Henwood | Mr Ian Jackson | Mr Andrew Keen | Mr Peter Kelly | Mr Peter Lumley | Mr Don Martin | Ms Heather Mason | Ms Joan Melville | Mr Andrew Miller | Mrs Roslynne Milne | Mr Richard Munt | National Australia Bank | Dr Frank Naylor | Nick Baldi Constructions Pty Ltd | The Hon Peter Nixon | Mrs Christine Oakley | Mr Ross Oakley | One in Five | Mrs Judith Overbeek | Parkinson's Victoria Inc | Pebilowe Pty Ltd | The Pratt Foundation | Mr & Mrs Alan & Christine Purton | Mr Anthony Pyman | Reece Australia | Mr Ralph & Mrs Ruth Renard | Rotary Club of Canterbury | Mr Graeme Samuel AC | Mr Bob Santamaria | Scots Glen Singers | Mr David Shaw | Robert & Elisabeth Sinclair | Miss Betty Smith | StepAhead Australia | Miss Jacqueline Stephens | Dr Takako Subocz | Dr Christine Sweeney | Dr & Mrs Gregory & Wendy Taggart | Mrs Kathryn Thaniel | Dr Michael Troy | Mr Duncan Tuck | Mr Richard Wall | The William Angliss (Vic) Charitable Fund | Mrs Sineke Winter | The Yulgilbar Foundation

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Gerard Green	Charlie Wittich
Andrew Harradence	Monita Woodward
Stefan Mayer	Glenys Wynn

Donations in celebration of

70th birthday of Sally Beavis
60th birthday of Peter Marks
70th birthday of Colin Wise

For more information contact the Editor, Amanda Place:
amanda.place@florey.edu.au or +61 411 204 526

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The Florey Institute of Neuroscience & Mental Health is the amalgamation of the Howard Florey Institute, the Brain Research Institute, The Mental Health Research Institute and the National Stroke Research Institute.

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