

Bionic connections

*Translating technology,
Transforming lives*

Winter 2018

A 'fit-bit' for the brain

Over 250,000 Australians are currently living with epilepsy, which is the most common serious brain disorder worldwide and can affect people at any stage of their lives. Diagnosis can be difficult in some people, while others experience problems with effectively managing their seizures through drug therapies.

For over a decade, the Bionics Institute, with its collaborators at St Vincent's Hospital Melbourne and the University of Melbourne, have been researching and developing a small implantable device to improve the diagnosis and management of epilepsy and seizure-related conditions.

The Bionics Institute and partners are pleased to announce the launch of a new Australian venture to further develop this device, called Minder™.

Minder™ will be capable of monitoring brain activity over long periods of time. It will allow patients to go about their daily lives and provide clinicians with personalised and detailed data on their seizure activity. We believe this will lead to more effective treatments and provide greater independence to those living with epilepsy.

Minder™ was developed by a multi-disciplinary research team led by Professor Mark Cook, Neurologist at St Vincent's hospital and Chair of Medicine at the University of Melbourne, and Associate Professor Chris Williams from the Bionics Institute. They envisage that future generations of the device could include seizure detection and warnings of impending seizure events.

A newly established start-up company, Epi-Minder Pty Ltd, will enable clinical trial and commercialisation of the seizure monitoring device, and has received initial investment from Cochlear Limited and Australian private investors.



Left to right: Prof Mark Cook, and the Bionics Institute epilepsy team A/Prof Chris Williams, Dr Yuri Benovitski, and Mr Owen Burns.

In the news

Parkinson's breakthrough: surgery fears put to rest

Bionics Institute research was featured in the Herald Sun, the ABC, and Channels 7, 9 and 10 on May 5, 2018. Research engineer Nick Sinclair and colleagues discovered a brain signal that could guide the implantation of deep brain stimulation electrodes to treat the debilitating symptoms of Parkinson's disease. Their research was published in the prestigious scientific journal *Annals of Neurology* in May.

Laurel or Yanny explained: why do some people hear a different word?

Our Chief Technology Officer, Professor Hugh McDermott, provided his expert view in an article in *The Guardian (Australia)* on 16 May 2018. We think that what we see and hear is exactly what is out there in the real world, but the truth is our brains are filling in details all the time, and Laurel or Yanny is a great example of this phenomenon at work.

Breakthrough epilepsy monitoring device receives investment funding

The announcement of a new start-up company, Epi-Minder Pty Ltd, was featured in the Herald Sun on June 25, 2018. This company will develop a seizure monitoring device and builds on the research and intellectual property created by the Bionics Institute and its partners.



A word from our CEO



In the past few months we have been pleased to announce two major achievements – the formation of a new Australian biomedical venture and a breakthrough in Parkinson’s disease research.

The Bionics Institute, in conjunction with St Vincent’s Hospital Melbourne and the University of Melbourne, recently launched a new biotechnology company, Epi-Minder Pty Ltd. This company will develop a seizure monitoring device to improve the diagnosis and management of epilepsy, and is the culmination of a decade of research and development. The establishment of Epi-Minder is an example of what the Institute strives for – by creating a pathway for commercialisation, we can deliver our devices and clinical innovations to patients, and make a tangible difference to their lives.

In this edition of *Bionic Connections* we also highlight a recent research breakthrough in Parkinson’s disease treatment that received wide coverage in the media. This research is a great example of what can be achieved when scientists, engineers and clinicians work together towards a common goal.

In early July, the Bionics Institute was delighted to be a sponsor of the Graeme Clark Oration. Professor Paula Hammond, Head of the Chemical Engineering Department at the Massachusetts Institute of Technology, gave an inspiring oration on how engineering, biology and medicine can combine to tackle complex clinical problems. At the dinner following the oration, I was honoured to announce Professor Peter Seligman as the inaugural recipient of the *Bionics Institute Award for Excellence in Medical Device Innovation*.

Finally, I take this opportunity to sincerely thank the Lions Foundation for their generous support of the Clinical Hearing Research Fellowship which was recently established by an anonymous donor. Philanthropic supporters, such as the Lions Foundation, are crucial to our ongoing success.

Kind regards

Robert Klupacs
Bionics Institute CEO



Right: Dr Wes Thevathasan, Dr Kristian Bulluss and the neurological team performing deep brain surgery in a patient with Parkinson’s disease. Photo courtesy of Tony Gough and Herald Sun.

Brainwaves will allow Parkinson’s disease patients to sleep through surgery

Deep brain stimulation has transformed the lives of many people with Parkinson’s disease by reducing their tremors and other debilitating symptoms.

For this treatment, surgeons need to insert electrodes to stimulate a tiny part of the brain – the size of a coffee bean. To get the best results the patient has to be awake. And that’s scary for many patients.

Implanting the electrodes accurately is also very challenging. Missing the target region by a millimetre can cause side effects and reduce the effectiveness of the treatment.

Bionics Institute researchers and clinicians have recorded and studied the brainwaves of 19 patients during surgery: 14 with Parkinson’s disease and five with a condition called essential tremor. They discovered that the small brain area being targeted produces a unique brain signal that could be used to guide the surgeon.

This discovery could also enable the surgery to be performed without the need for the patient to be awake.

Dr Wesley Thevathasan, a neurologist involved in the study, expects this brain signal will allow surgical teams to improve the accuracy of electrode implantation, and perform the operation more quickly and efficiently.

“I have many patients who could benefit greatly from deep brain stimulation but are dissuaded by the thought of being awake during the operation,” he explains. “The prospect of being able to have the procedure whilst asleep and having a specific homing signal to improve the accuracy of electrode placement is vitally important.”

The researchers also believe they will be able to incorporate their discovery into an ‘adaptive’ deep brain stimulation (DBS) system that can detect changes in the brain signal and adjust the treatment in real time. This would be a great improvement on current DBS systems in which stimulation levels are fixed and cannot respond to a patient’s changing symptoms and needs.

We sincerely thank the supporters of this research program: Colonial Foundation, St Vincent’s Hospital Research Endowment Fund, the University of Melbourne, the Victorian Lions Foundation, and the National Health and Medical Research Council. The team worked with clinical partners St Vincent’s Hospital Melbourne and the Austin Hospital.



Below: As part of the Graeme Clark Oration 2018, a number of our staff participated in the Women in STEMM lunch.



Prof Peter Seligman, Senior Biomedical Research Engineer, Bionics Institute.

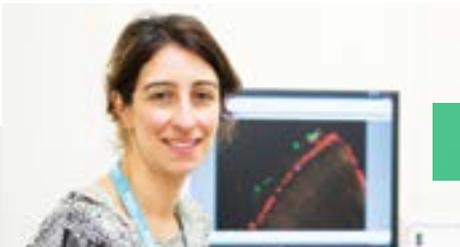
Professor Peter Seligman receives inaugural Bionics Institute award

Congratulations to Professor Peter Seligman, for being awarded the inaugural *Bionics Institute Award for Excellence in Medical Device Innovation*.

The award was announced and presented at the Graeme Clark Oration, held at the Melbourne Convention and Exhibition Centre on the 4th July.

We are very proud of Professor Seligman who received this award for his significant contribution to the development of cochlear implants. Peter's involvement in the development of a small and portable speech processor and new speech processing strategies underpinned the effectiveness and success of cochlear implants.

The award also recognises the significant input and mentorship he has provided to the Australian medical device development community. Peter has worked in the field for over 30 years, initially at the University of Melbourne and then at Cochlear Limited (1983 – 2009). He continues to contribute his wealth of knowledge to research as an Institute mentor, and is involved in our development of medical devices to assist in the management of epilepsy and to treat inflammatory bowel disease.



Dr Rachael Richardson.

Combining light and sound

Dr Rachael Richardson, a senior research fellow at the Bionics Institute, is exploring the use of light to improve the perception of sounds conveyed by cochlear implants.

Cochlear implants have restored hearing to hundreds of thousands of people worldwide. They work very well in quiet conditions, but in noisy environments speech perception can become quite difficult.

Dr Richardson and University of Melbourne colleagues are examining the use of light to activate the hearing nerve since light can be focussed more precisely than electrical stimulation. For light-based stimulation to work, nerves must first be made responsive to light by the addition of a gene. This field of science is called 'optogenetics'.



Dr Erol Harvey receiving the Clunies Ross Entrepreneur of the Year award (June 14, 2018).

Dr Erol Harvey receives prestigious award

Congratulations to Dr Erol Harvey, Bionics Institute's Strategic Advisor, on receiving the prestigious 2018 ATSE Clunies Ross Entrepreneur of the Year award.

The Australian Academy of Technological Sciences and Engineering (ATSE) awards recognise outstanding individuals who have developed technologies for the benefit of Australia. Dr Harvey received the award for his commercial and scientific development of micro- and nano-technologies. He co-founded the engineering company MiniFAB – a world-leading provider of custom-designed medical devices and other technologies.

Dr Harvey works closely with our research teams to guide the translation of our innovations into clinical products.

Erol said, "I have long admired the Bionics Institute as a team of uniquely talented multidisciplinary researchers combining engineering, electronics, biology and clinical interface. I am extremely excited to assist them as they translate their work into products that will make a positive change to people's lives."

Optogenetics has been used successfully to activate nerves in the brain, heart and other organs with high precision. Bionics Institute research has demonstrated the feasibility of the technique in the inner ear, and opens up the exciting possibility of improving the precision of auditory nerve stimulation and therefore the quality and complexity of sounds perceived by cochlear implant recipients.

We gratefully acknowledge a recent grant from Action on Hearing Loss, a UK philanthropic organisation. This funding will help Rachael and colleagues explore the possibility of a light-based cochlear implant over the next three years.

Raising awareness



World Inflammatory bowel disease (IBD) Day was held on May 19, 2018, to raise awareness of the impact of inflammatory bowel diseases on five million people worldwide. The Bionics Institute is involved in a collaborative project to create a novel implant that will safely and effectively monitor and treat the debilitating symptoms of IBD. Returned war veterans can be at higher risk of IBD, which may be stress-related. Because of the impact on veterans, the project has received a grant from the Defence Advanced Research Projects Agency (DARPA), an agency of the US Department of Defence.

Donor list

The Institute would like to thank the following individuals, organisations, trusts and foundations that have donated over \$200 since January 2018

- Colonial Foundation
- Victorian Lions Foundations
- The Garnett Passe and Rodney Williams Memorial Foundation
- The Harold Mitchell Foundation
- Capita Foundation
- AFL Players' Association
- Mr & Mrs Neville & Diana Bertalli
- Gillespie Family Foundation
- Nell & Hermon Slade Trust
- Lions Club of Longford
- Mr & Mrs J Prescott
- Dr Michael Allam
- Mr & Mrs G Ashby
- Mr Faleh Ashir
- Mr & Mrs John & Lesley Bailey
- Mrs Meg Bentley
- Mrs D.C. Bourke
- Mr & Mrs A & R Bradey
- Mr Roy Bridges
- Miss Joy Buckland
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- Mr & Mrs Robert & Beverley Squire
- Mrs Yvonne Sullivan
- Mr & Mrs Peter & Deryn Thomas
- Mrs Katrina Tull
- Mr Stephen Wargula
- Miss B M Webb
- Margaret Robertson Wilson Memorial
- Ms Helen Woods

Call for research participants

Are you the parent or guardian of a child between the ages of 2 months and 5 years?

We are currently seeking children in this age group, with no known hearing loss, to participate in a research project that aims to improve the early language development in children born with hearing loss.

If you would like more information about the project, led by Professor Colette McKay please contact us on (03) 9667 7522 or email the hearing study team at hearingstudy@bionicsinstitute.org.

Are you an adult with tinnitus?

We are currently seeking individuals over 18 with tinnitus. Tinnitus is the perception of sounds (ringing, buzzing, static) when there is no external sound present. We are specifically looking for people who are able to modify their tinnitus using head, neck or eye movements or have other ways of modifying their tinnitus.

If you are interested in taking part or would like to know more information, please contact Nicola Horvath at nhorvath@bionicsinstitute.org or phone (03) 9667 7515.

Your donations and contributions are vital for helping us to transform lives.

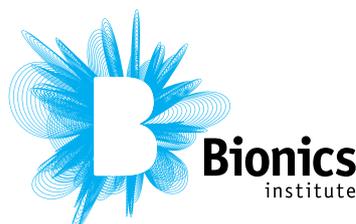
Your gift will support our dedicated research teams with their projects, equipment purchases and research fellowships. If you would like to help, then please visit our website to make an online donation www.bionicsinstitute.org or contact us directly on (03) 9667 7500.

Workplace giving

The Bionics Institute is a registered charity of [Good2Give](http://Good2Give.com.au). [Good2Give](http://Good2Give.com.au) workplace giving enables employees to make pre-tax donations to registered charities direct from their pay.

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