

The Current

Bionics Institute Newsletter

SPRING 2021

Electric Medicine:

What It Means For You

What's The
Connection Between
**Jewellery And
Electrodes?**

**Living With
Arthritis?**

Find Out About *Our
Innovative Research*



A Word From Our CEO



Robert Klupacs
CEO, Bionics Institute

A handwritten signature in black ink, appearing to read 'Robert Klupacs'.

I am delighted to welcome you to our Spring 2021 newsletter.

Like every other organisation across the country COVID-19 has had a major impact on the Bionics Institute. It truly has highlighted the importance of medical research, and the significant role it plays in lessening the impact of disease and maintaining our health. Thanks to the resilience of the amazing people here at the Bionics Institute and the work they do, our research has been maintained throughout this difficult time. I couldn't be prouder of what they have been able to achieve.

I would like to officially welcome Ann Fazakerley as our new Head of Philanthropy. Ann brings a wealth of experience to the Institute and it is great to have her on board.

In this newsletter we look at the pioneering work that James Fallon and his team are doing with the vagus nerve. Their bold research is meeting our goals of creating game-changing outputs that have real world impact and have put us at the forefront of developing peripheral nerve medical devices.

Over the last 30 years our teams have developed some extraordinary skills in how to make electrodes and devices at the nano scale. Through the launch of our new medical device prototyping facility, Neo-Bionica, we can now take those skills and translate them all the way through to the clinic.

Meet Our Research Director

A/Prof James Fallon first joined Bionics Institute to work as a Research Fellow in the Auditory Neuroscience research program and was the Lions International Hearing Research Fellow from 2008 to 2010.



In 2016 he became a Principal Research Fellow and was appointed Research Director of the Bionics Institute in 2017 and head of the Medical Bionics Department, University of Melbourne in 2019. He leads our electric medicine research. A/Prof Fallon says he didn't set out to be in the field of medical research.

"The way I ended up here was following interesting things and working with interesting people, and that's really been my motivator - to work with interesting people on challenging topics," he said.

A key example of this, and a personal career highlight for James, is the ground-breaking pelvic nerve research and development of a new vagus nerve device, explained by Dr Payne in our next article.

He said: *"For the first time we're getting clever about listening to what's happening in the nerves. Our aim is to harness the body's own signaling system with our medical devices."*

"The vagus device began as the seed of an idea for the treatment of inflammatory bowel disease and has now, within only 4 years, got to clinical trial stage."

"To see an idea we've come up with and worked on potentially be used to help a patient is pretty exciting."

What is electric medicine?

Electrical medical devices can be used to alter the activity of nerves to treat a wide range of diseases that aren't responding to drug treatments. At the core of this 'electric medicine' research lies the vagus nerve which runs from the brain to the gut and controls many processes in the body.



Not only that, but the team have also been able to translate the device into a potential treatment option for other conditions as well, including diabetes and arthritis.

"For me that's the key. To translate a good idea; to inspire other researchers to drive their own research; and more importantly to translate a good idea into a commercial product so that it makes it into the clinic and ultimately improves patients' lives."

"At the Bionics Institute that's what we want to do and what we focus on."

Research News

Electric medicine may hold the key to a drug-free treatment for rheumatoid arthritis, a condition that affects over 20 million people worldwide, including 500,000 Australians.

Bionics Institute's Dr Sophie Payne and her team are investigating how a new medical device developed at the Institute can be used to electrically trigger the body's natural anti-inflammatory response to treat this debilitating auto-immune disease.



Arthritis research project leader Dr Sophie Payne

Drug resistance

Rheumatoid arthritis occurs when the body's immune system attacks its own tissues. Currently there is no cure and drug treatments can cause unpleasant side effects. To compound this issue, many patients don't respond to treatments and continue to live with pain and inflammation in their joints.

Rheumatoid arthritis can be so severe young mums can't even hold their babies, due to the pain and swelling in their hands.

Is electricity the answer?

Sophie explains: "Our research looks at how we can use a unique medical device to deliver electricity to alter nerve activity and stimulate specific areas of the body. This allows targeted treatment of diseases that don't respond to drug treatments".

Harnessing the vagus nerve

The device targets the vagus nerve which runs from the brain to the gut and controls many processes in the body including the autoimmune inflammatory response.

Vagus nerve stimulation has already been used extensively to treat depression and epilepsy. Bionics Institute researchers have recently developed a new vagus nerve stimulation device to treat inflammatory bowel disease, which has been adapted to treat rheumatoid arthritis.

Sophie says: "The beauty of this device is that it kick-starts the body's natural reflexes, which means there are fewer side effects than with drug treatments."

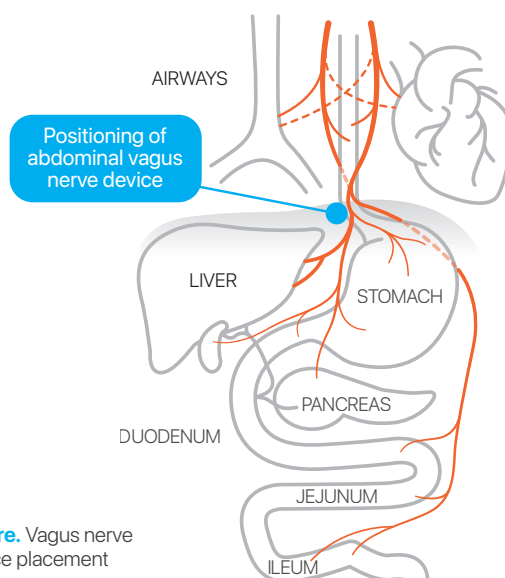


Figure. Vagus nerve device placement

Dampening the immune system

This device has been adapted to treat rheumatoid arthritis with the aim of calming the body's overactive immune response to prevent long-term damage to joints, and improve mobility for patients to help give them back control of their lives.

Next steps

With support from clinical collaborator A/Prof Evange Romas, Sophie and the team's next steps are to consolidate preclinical data plan for a clinical trial, where the device will be implanted into people with drug-resistant rheumatoid arthritis using key-hole surgery.

"Eventually, we hope that this device will help people with rheumatoid arthritis live free of inflammation and pain."

Upcoming Events



Rethinking Rheumatoid Arthritis
Free Bionics Institute online information session: 16 October 2021 at 9:00am

Join us via Zoom to hear about how we are rethinking treatment of rheumatoid arthritis.

Send an expression of interest to:
supporterupdates@bionicsinstitute.org

— OR —

Register using this QR code:



What's The Connection Between Jewellery And Electrodes?

It takes unexpected skills to turn medical device research into reality.

The highly specialised electro-fabrication team are based at our new prototype manufacturing facility, Neo-Bionica. It houses purpose-built cleanrooms for custom, high-quality medical device development.

What are electrodes for?

Engineer, Ross Thomas says that electrodes are a key element of medical devices developed at the Bionics Institute.

He said: "In many medical devices, electrodes are essential for gathering data and providing treatments. Electrical impulses generated by implanted electrodes mimic impulses of the nervous system. This allows a device to bypass damage (as is the case in cochlear implants) or stimulate nerve activity (as is the case in our vagus nerve device)."

It's a team effort

The electro-fabrication team make electrodes for a wide range of medical device research projects.

Working alongside Bionics Institute engineers and researchers they provide expert advice in the design and manufacture of devices to ensure that they will be safe to implant in a human body.

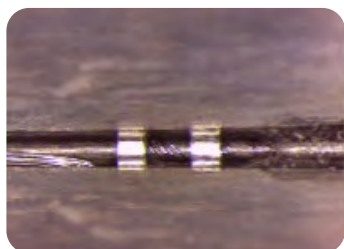
"We turn the design concepts into the initial prototype implants that meet the requirements of specific research problems, so that researchers can execute their projects," Ross concluded.



Electro-fabrication expert holds completed r-ring electrodes for a cochlear implant

How are they made?

Making electrodes is an incredibly intricate and manual process completed using a high precision microscope. The electro-fabrication team are often handling wires that are just a quarter the diameter of a human hair!



An electrode shown under a microscope. Each ring is 0.3mm wide

Electro-fabrication technician, Jenny Zhou says the team assemble the electrodes manually using platinum wires, rings and foils.

She said: "For this reason patience is critical for us to sit down and work for a few hours under microscope."



Making an electrode implant using a high-powered microscope

A varied team

Our electro-fabrication team have come from a diverse range of backgrounds. From microbiology and jewellery to a master cake baker!

Ross says: "What they all have in common is an incredibly steady hand, lots of patience and a desire to contribute to new treatments that can help people."

Every implant is different

Each research project is different and being able to make custom implants designed specifically for each purpose is essential to getting the best possible results.

This means the electro-fabrication team are continually refining and perfecting all the elements of an electrode implant to improve its efficiency and the quality of data it collects. This includes size, shape, materials, and the number of electrodes included, which can range from 4 in the vagus nerve device to 44 in the bionic eye!

Neo-Bionica creates new opportunity

Neo-Bionica is an end-to-end medical device prototype development facility.

The first and only facility in Australia with the bioengineering expertise and cleanroom technology required to create first-in-human prototypes for clinical trials, Neo-Bionica is a joint initiative of the Bionics Institute and The University of Melbourne.

Located in St Vincent's Hospital in Melbourne, Neo-Bionica provides access to the full range of medical device prototype manufacturing from initial concept through to clinical testing.

The Current is published by the Bionics Institute

For the Bionics Institute's latest research news, visit www.bionicsinstitute.org

If you would like to receive our email updates or have any queries, please contact us:

✉ supporterupdates@bionicsinstitute.org ☎ +61 (3) 9667 7500

384-388 Albert Street, East Melbourne, VIC 3002



Philanthropy Update



I joined the Bionics Institute in April 2021 and I continue every day to be impressed by the calibre of our researchers, scientists and engineers. I love the way that we bring together innovative new ideas with clinical needs, doing truly translational research to bring products to market.

We would like to acknowledge the support of all our donors this year; your help really does help us to make a difference.

Your support is vital to help us develop new treatments and diagnostic tools that change the lives of people with a range of conditions, including hearing impairment, Parkinson's disease, Crohn's disease, rheumatoid arthritis and type 2 diabetes.

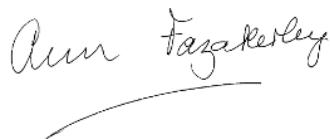
Please take a look overleaf to see how your support has helped us recently.

I am so grateful to those members of our donor community who have been loyal to us for over twenty years. We really appreciate your long-standing fidelity and we are looking forward, in early February 2022, to recognising your support in a more formal way.

I hope that I will get the chance to meet more of you in person later this year and certainly in 2022. We would like you to come to our planned Meet the Researcher events and learn from the team about how, together, we can help transform lives.

Thank you.

Ann Fazakerley
Head of Philanthropy

A handwritten signature in black ink that reads "Ann Fazakerley".

Bionics Institute In The News

Read more about our research highlights on the Bionics Institute website
www.bionicsinstitute.org/News

EarGenie gets a step closer to being used in clinics

A new hearing test for babies developed by the Bionics Institute is moving to the next stage of development to enable its use in audiology clinics.



EarGenie participant baby Charlie

Medical device data boost gives hope to people with epilepsy

A new collaboration between Seer Medical and Epiminder means a medical device developed at the Bionics Institute that monitors brain activity in people with epilepsy, may soon be able to predict seizures.



Professor Mark Cook with Epiminder clinical trial participant Gary Coban

Bionics Institute PhD student wins national prize for science communication

Elise Ajay has won the national 'Pitch It Clever' competition with a video pitch on her research into improving the cochlear implant.



Bionics Institute PhD student Elise Ajay

Harnessing light to improve cochlear implants

Bionics Institute researchers are investigating how a combination of electricity and light stimulation could improve sound and enjoyment for people with a cochlear implant.



Child with cochlear implant playing piano

Medical treatments set to be fast-tracked

Launch of the Neo-Bionica medical device prototype manufacturing facility is set to fast-track new treatments for people with diseases such as epilepsy, Parkinson's disease, hearing loss, stroke and diabetes.



Engineer creating part of a medical device

Thank You To Our Donors

We have been privileged to receive some wonderful gifts this year, which have allowed us to accelerate our work in developing innovative devices, diagnostics and therapies to help transform people's lives.

Your generosity has quick impact; some of our current research is likely to be used in clinics within the next three to five years, so you can see the effects of your donations in the short-term.

Your generous donations to our Christmas appeal for tinnitus are helping us move faster to trial stage. We continue to receive news from people with this debilitating condition, who are anxious to see an objective diagnostic test become available in clinics.

We were delighted to host a launch event in May for Neo-Bionica, our medical device prototype manufacturing facility, a joint venture with the University of Melbourne. We look forward to talking to more of you about this exciting new venture, which means that devices developed in Australia can also be prototyped for clinical trials in Melbourne, rather than overseas. We thank the Ian Potter Foundation for the seed funding that meant we could start this important work in 2021.

We are most grateful to all of you who donated to our annual tax appeal in June, to help babies with hearing loss have the best start in life and not fall behind at school, through access to our innovative EarGenie test. Your support will allow us to fast-track our technology and get to clinical trial stage earlier.

The generous gift from the estate of the late Dr Brian Entwisle has allowed us to continue to track patients involved in the Bionic Eye clinical trial, work which could herald improvements in future devices, as well as support to our hearing loss research.

Thanks to an anonymous donation, matched by funding from the Lions Clubs of Victoria and the Entwisle estate, we were able to recruit Associate Professor Gérard Loquet to work in our hearing loss research.

Generous donations from Di and Neville Bertalli in support of Associate Professor James Fallon over the last three years have resulted in some very interesting breakthroughs in adapting technology into other diseases such as arthritis, type 2 diabetes and incontinence.

Thank you for your support. All gifts count, large or small, whether lifetime gifts or gifts in Wills. Thank you for being part of the Bionics Institute community.

We will keep you up to date with developments; it is looking to be a major year for innovation at the Bionics Institute.

Donation Form

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You are welcome to call and give us your credit card details over the phone: 03 9667 7500, or donate online at www.bionicsinstitute.org

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