



30 years

Connecting
research
to results

Neuroscience Research Australia



NeuRA

Discover. Conquer. Cure.

Profile 2022

For three decades Neuroscience Research Australia has been redefining the frontier of neuroscience as we know it. Here we celebrate the extraordinary contribution our researchers have made, and look toward the next **30 years of impact.**

In 1996, renowned Australian photographer Robert Billington shot a series with NeuRA (then named POWMRI) researchers titled "Guinea Pigs: The Human Face of Research." Here, falls research subjects Alan and Merle Campbell step out on the research plate as Professor Stephen Lord looks on.

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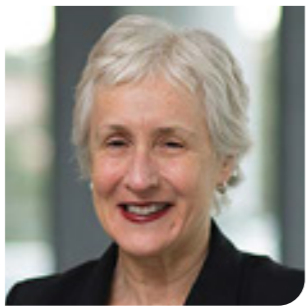
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In Memory of Betty Lynch OAM

Betty Lynch OAM was a passionate supporter of our research into mental health, particularly bipolar disorder. In 2017 she made a gift to enable construction of the John & Betty Lynch Seminar Room, because - in her own words - 'Improving world health demands effective scientific interaction'. In 2019, Betty passed away, leaving an even more generous bequest in her will. In 2021, that \$3 million gift was realised. Betty would have been proud of her 30th anniversary timing. She will always have our deepest gratitude.



WELCOME



The Board has presided over a bumper year of research productivity and leadership, despite the obstacles of COVID-19. I am proud to celebrate our impact in this 30th anniversary edition of Profile.

NeuRA researchers launched the eWALK clinical trial, using neurostimulation combined with physical therapy to help people with incomplete spinal cord injury walk again. Multiple interventions for chronic pain were generated, including graded sensorimotor retraining and a digital tool to help regulate emotions and reduce flare-ups. The latest report of the Australia New Zealand Hip Fracture Registry revealed disparities in mobilisation practices after surgery and has driven improvements in hip fracture care. Our pilot trial of intergenerational activities, bringing pre-schoolers and older people together to combat frailty, received an enthusiastic response from the community. Globally, we contributed to the largest ever genetic study of bipolar disorder which identified 64 genomic regions associated with the illness. We collaborated with researchers in Norway and the UK in a trial of a program designed to help people with early dementia and their carers.

I warmly thank my Deputy Chair Alice Kase and fellow Directors for their service as we focus on meeting some of the key challenges facing NeuRA, like all Australian medical research institutes: the competition for talent; the need for scale; and the battle for funding. Finally, I am delighted to welcome Colin Tate AM as the new Chair of the Foundation Board. Colin brings a wealth of experience and an impeccable track record as a fundraiser, strategist and philanthropist.

The Hon Justice Anna Katzmann BA (Hons) LLD
Chair



Welcome to this 30th Anniversary edition of Profile, celebrating 30 years of impact. In this report, we look back at some key achievements of our research programs, as well as looking forward at some of our new studies. In particular, we profile the talent of our research leaders – those who have chosen to grow their careers with NeuRA, as well as the next generation who we hope will do the same.

In 2022, we launched our PhD Pearl fundraising program (30th anniversaries are associated with the pearl). One of our key responsibilities is fostering and training the next generation of neuroscientists, those who will solve major health problems like dementia and mental illness. I am very grateful to existing and new supporters who have chosen to become the early adopters of this program (listed on page 9).

In my 18 years to date as CEO, it has been my privilege to be associated with researchers of amazing passion and talent. To succeed in research requires endless curiosity and resilience in the face of what is now frequent rejection by grant funding bodies. Regardless, in 2021 our research groups received competitive grant revenue of over \$17 million. We raised \$9 million in philanthropic revenue which included our largest bequest of \$3 million from the Estate of the Late Betty Lynch OAM. The generosity of the community is so deeply appreciated – we could not achieve what we do without it.

I have every confidence the next 30 years at NeuRA will be even more impactful than the first.

Professor Peter Schofield AO FAHMS PhD DSc
Chief Executive Officer

NeuRA'S IMPACT

BUILDING GLOBAL KNOWLEDGE

32

clinical trials

394

new discoveries

added to the global bank of neuroscience knowledge through publications in 2021

1,991

publications

(excluding books and chapters) over the past 5 years

COLLABORATION

Between 2016-2021 NeuRA researchers collaborated with institutions all over the world. Here's where our top 100 collaborating institutions are and how many co-authored publications we had. (Source: SciVal 30 May 2022)



ATTRACTING SUPPORT

Fundraising revenue

\$9m

Grant revenue

\$17m

Research grants 2021

Number of funding bodies 50

Number of new grants awards 37

Overall number of active grants 162

Prizes/Awards 17

THREE DECADES OF IMPACT AT NEURA

What started in 1990 as discussion around a kitchen table between four scientists has by 2022 become a 300-person strong institute with 28 research groups and purpose-built facilities that enable us to remain at the forefront of neuroscience.

Prince of Wales Medical Research Institute (POWMRI) is established by Profs Ian McCloskey (founding Director), David Burke AC, Simon Gandevia and Erica Potter with the support of the Eastern Sydney Area Health Service and the University of New South Wales.



POWMRI research facilities are officially opened.



Neurochemist Dr Kay Double develops the world's first blood test for early detection of Parkinson's disease.

A new and expanded POWMRI opens doubling research capacity. HRH The Prince of Wales sends his congratulations.



Former US President Bill Clinton headlines a national fundraising tour that raises \$1 million for five Australian charities including POWMRI.



The Mayne Clinical Research Imaging Centre (now NeuRA Imaging) opens.

Prof Stephen Lord develops FallScreen, the falls risk calculator, now used worldwide.



Prof Peter Schofield AO commences as the institute's second Director.



Prof Tony Broe AM commences the Koori Growing Old Well Study, showing the prevalence of dementia is three to five times higher in Aboriginal Australians.



Human cerebellum at the Sydney Brain Bank

The Sydney Brain Bank opens, the only bank in Australia focused on neurodegenerative disorders.



NeuRA celebrates 30 years of impact with staff and supporters.



The Spinal Cord Injury Research Centre is opened by NSW Treasurer Dominic Perrottet and Health Minister Brad Hazzard. A year later, the eWALK clinical trial commences, using neurostimulation to help people with incomplete spinal cord injury regain movement.



Prof Kaarin Anstey and A/Prof Ruth Peters contribute to WHO guidelines on dementia risk.



A new Philips 3T MRI scanner, devoted entirely to research, is installed at NeuRA Imaging.



Prof Cyndi Shannon Weickert discovers immune cells in brains of many people with schizophrenia opening new avenues for treatment.



Scientia Professor George Paxinos AO discovers a previously hidden region of the brain: the Endorestiform Nucleus.

A/Prof Ingvars Birznies cracks the neural code used to signal touch sensation.



The Transurban Road Safety Centre opens, accelerating the reduction of injury risk on Australian roads.

With Federal and State Government support and transformational philanthropy supporting fit-out, the Margaret Ainsworth Building is opened by Health Ministers, the Hon Tanya Plibersek and the Hon Jillian Skinner.



Adoption of National Child Restraint Guidelines developed by Prof Lynne Bilston and A/Prof Julie Brown reduces child fatalities in motor vehicles by 45%.

Profs Jacqui Close and Ian Harris establish the Australian and New Zealand Hip Fracture Registry improving care outcomes.



POWMRI renames itself Neuroscience Research Australia (NeuRA).



Watch our video for more!



Charting the uncharted brain

World-renowned brain cartographer Scientia Professor George Paxinos AO has been relentlessly focused on mapping the brain – not only in humans, but rodents, primates and even birds. These exhaustive maps are then assembled in atlases guiding researchers to generate models of disease and analyse behaviour, and neurosurgeons to ensure accurate and precise incisions.

Professor Paxinos has published 59 scientific books and discovered 94 hitherto unknown regions of the brain. His team at NeuRA and collaborators are embarking on their most ambitious work yet: using NeuRA Imaging's state-of-the-art MRI technology to develop a 3D map of the living human brain.

The Human Brain Atlas project has involved imaging the living human brain at high resolution to identify approximately 1,200 structures. The team is now working to provide open access high-resolution templates and segmentations to allow clinical and scientific data to be aligned into their reference frame, as well as a 3D digital atlas optimised for modern tablet computers.

Professor George Paxinos AO (right) with long-term collaborator Professor Charles Watson AM



Banking on new discoveries in neurodegeneration

Human brain tissue studies are vital to understanding neurodegenerative disorders, mental illness and normal ageing. Having access to brain tissue enables researchers to identify different pathologies, and see the cellular changes that occur. This then enables accurate studies of complex disorders.

Since 2009, the Sydney Brain Bank has been a vital resource for global research, facilitating over 350 studies and providing more than 38,000 specimens of donated neurological tissue. This has led to the development of diagnostic tools, the discovery of new disorders, novel genes and disease subtypes, the elucidation of disease mechanisms and the development of therapeutic strategies.

Today, the Bank holds brain tissue from over 750 donors with diverse neuropathologies including Alzheimer's disease, Lewy body disease, motor neuron disease, Huntington's disease, frontotemporal lobar degeneration, multiple system atrophy, chronic traumatic encephalopathy as well as age-related change.

Today, the Bank holds brain tissue from over 750 donors with diverse neuropathologies.

30 years of global reach

Investigating biomarkers to predict familial Alzheimer's disease

Professor Peter Schofield AO and Dr Bill Brooks are founding members of the Dominantly Inherited Alzheimer Network (DIAN) study – a significant collaborative effort studying familial Alzheimer's disease through sites in the US, Australia, England and Germany.

In 2012, DIAN researchers showed the onset of symptoms in Alzheimer's disease is preceded by the accumulation of amyloid (abnormal protein) in the brain over a period of 15 to 20 years. This study paved the way for using biomarkers as surrogate end points in clinical trials.

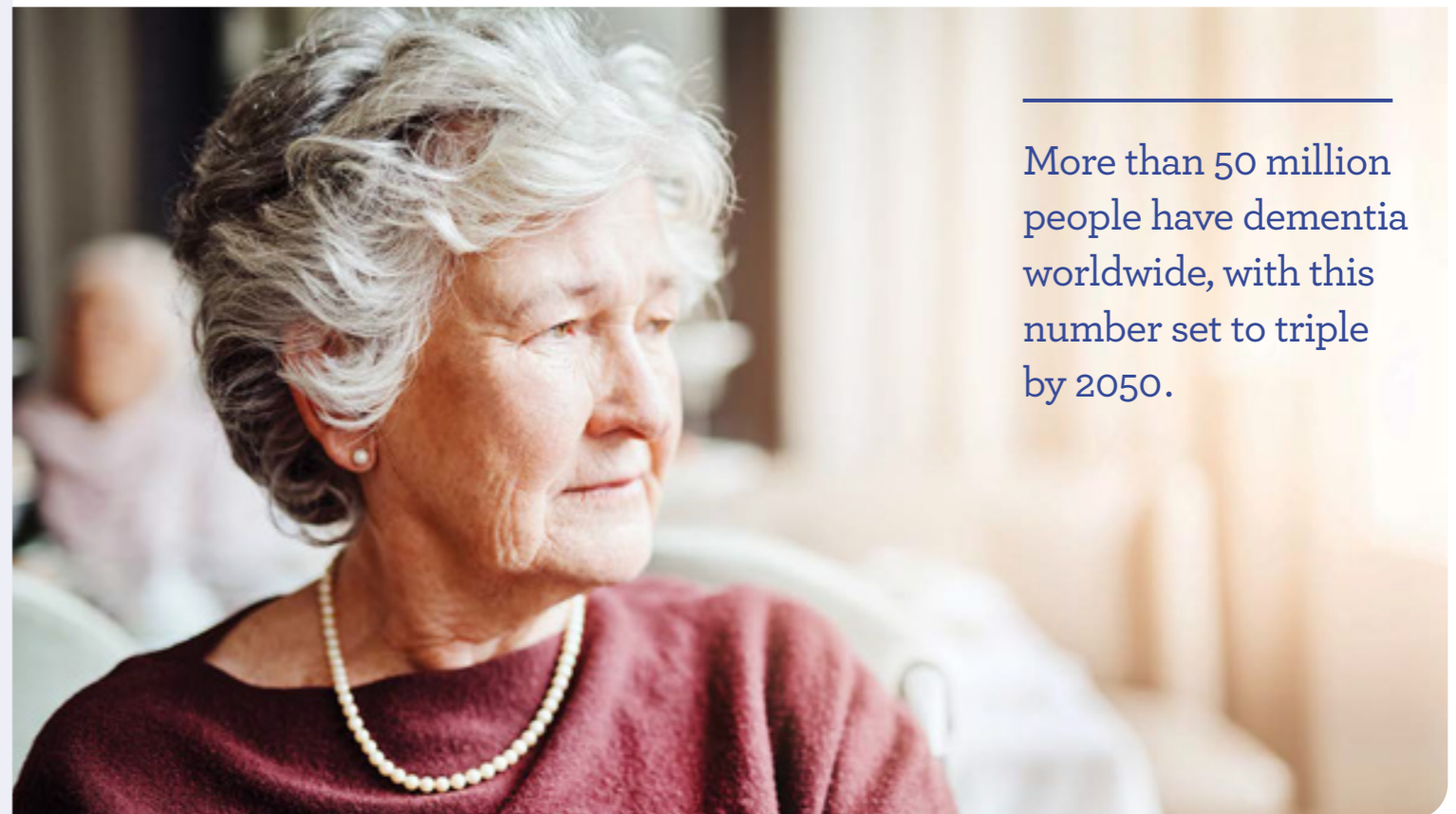
Contributing to WHO Guidelines on risk reduction of cognitive decline and dementia

More than 50 million people have dementia worldwide, with this number set to triple by 2050. A condition with no curative treatment, and significant social and economic impact – reducing modifiable risk factors for dementia is therefore of critical importance.

Scientia Professor Kaarin Anstey and Associate Professor Ruth Peters were key contributors to the World Health Organization Guidelines on risk reduction of cognitive decline and dementia released in 2019. The Guidelines provide evidence-based recommendations on relevant lifestyle behaviours and interventions. They are designed to be a vital tool for health care providers, governments and policy makers.

Collaborating to identify genetic signatures associated with bipolar disorder

Associate Professors Jan Fullerton and Tom Weickert and Professors Peter Schofield AO, Melissa Green and Cyndi Shannon Weickert were recently involved in the world's largest bipolar genetics study, comprising 200 institutions and over 415,000 research participants. The study identified 64 genomic regions that make people more susceptible to bipolar disorder – more than doubling the number of regions previously identified – and pinpointed the specific genes and pathways impacted. The study also revealed DNA sequence differences in specific genes that are involved in the therapeutic action of antipsychotics and a range of other medicines, which could lead to the development of more targeted medications, or the repurposing of existing medications as potential treatments.



More than 50 million people have dementia worldwide, with this number set to triple by 2050.



Professor Simon Gandevia

Founding Scientist
and Deputy Director

“Neuroscience, as we practice it at NeuRA - has grown well beyond what we could have predicted when we started 30 years ago. As founding scientists, we wanted to bridge the gap between clinical practice in hospitals and what academics were researching in universities. And I think we have, but we need to keep going.

As a clinician scientist, being able to work with patients is a privilege I'm very grateful for. It allows me to see where the research is up to, but where it's still deficient in a real clinical setting. It lets me tackle things from the perspective of, for example, 'we need to know more about how we actually breathe' to 'here's a person in intensive care, they can't breathe, what can we do to help them?' There's an interaction between those two things and I've always tried to sit in that place where they overlap as a strategy throughout my career.

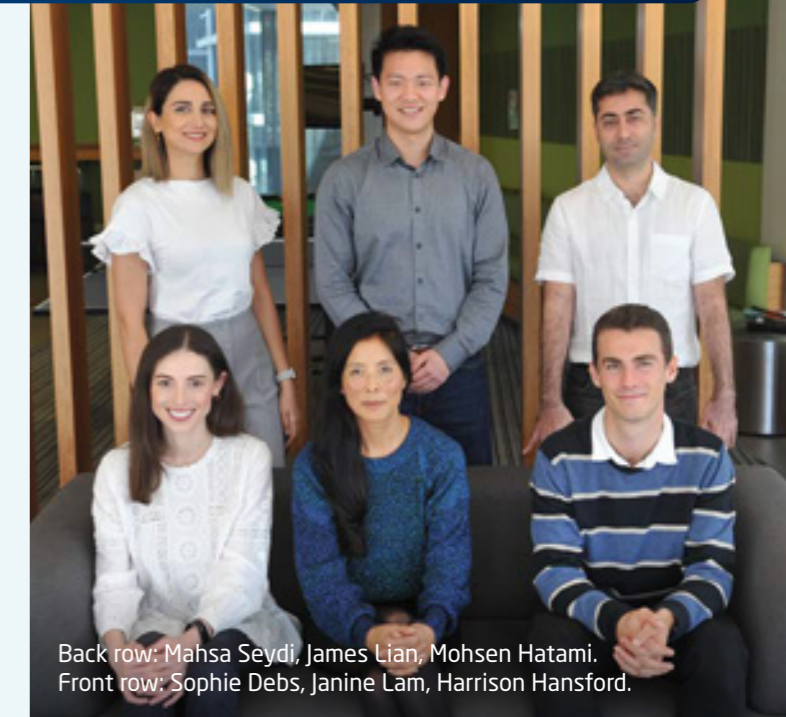
A particular passion of mine is research quality, integrity and reproducibility. I consider it our responsibility to train and educate the next generation on research quality, how to use the appropriate statistical methods, and prioritise the most robust science and ensure the validity of research findings. If we can achieve that, we will be placing the future in good hands.”

The next generation

At any given time, NeuRA hosts and fosters a cohort of 50+ students undertaking their PhD. A PhD is the highest level of study offered in Australia, and requires conception and management of a self-directed research project which will make a unique and novel contribution to the field.

In 2022 NeuRA launched its PhD Pearl Program to better support our next generation of neuroscientists. Our sincere thanks to the donors who have chosen to be early adopters of our Pearls:

Lucinda Christie
David Gonski AC
Alice and Mik Kase
The Hon Justice Anna Katzmann
David Lesnie
Felicity Nicholson
Paul Salteri AO and Sandra Salteri



Back row: Mahsa Seydi, James Lian, Mohsen Hatami.
Front row: Sophie Debs, Janine Lam, Harrison Hansford.

Professor Peter Schofield AO
Emma and Dominic Stevens
Colin Tate AM
Tucker Family
Penelope and Lee Valentine
Paul and Mira Brassil
Jane Taylor and Scott Malcolm



PREVENTING DEMENTIA AND FRAILTY

Understanding dementia across the life course with Aboriginal Australians

Aboriginal and Torres Strait Islander Australians are ageing rapidly and expected to reach half a million older people by 2051. The health and quality of life of older Aboriginal Australians, and younger carers, is threatened by rates of dementia and cognitive impairment three to five times higher than other Australians.



Colleen Cawood and Professor Tony Broe AM



Alison Timbery and Associate Professor Kylie Radford discuss data from the Koori Growing Old Well Study

In 2008, the Koori Growing Old Well Study (KGOWS) was established by Professor Tony Broe AM to examine healthy ageing and dementia in five NSW Aboriginal communities. The study documented health and social experiences from birth. Five years later, the study was followed up under the direction of Dr Kylie Radford.

The third wave of KGOWS, launched in 2018 and titled Our MOB (Mind Our Brain), is designed to generate culturally appropriate strategies for healthy brain ageing, ultimately to prevent or delay the onset of dementia. It will, for the first time, enable neuroimaging of Alzheimer's disease and cerebrovascular conditions in older Aboriginal participants with cognitive decline or dementia compared to cognitively intact controls. Importantly, this project will also build researcher capacity and leadership in the area of Aboriginal ageing.

Today, NeuRA's Aboriginal Health and Ageing Group continues to work in partnership with communities and Aboriginal health services to ensure research and translation outputs are co-designed.

We would like to thank Paul Salteri AO and Sandra Salteri for their invaluable support of this program. Through their gift to NeuRA and other philanthropy through the CAGES Foundation, the Salteris are committed to ensuring Aboriginal and Torres Strait Islander people have access to culturally safe services.

Prevention is the word at the 2022 World Dementia Council Summit

Scientia Professor Kaarin Anstey, Senior Principal Research Scientist and Director of UNSW's Ageing Futures Institute, presented at the 2022 World Dementia Council Summit. This brought together dementia leaders, policymakers, industry and advocates.

Professor Anstey shared her expertise and insights on population health approaches to dementia prevention. "I was really pleased to see dementia prevention at the top of the agenda this year – and the fact that the plenary I was invited to take part in was all women from different prevention perspectives was also fantastic".

"This year there was an increased focus on big data and its potential for modelling around dementia – whether that's care, predicting hospitalisations, identifying drug targets, analysing population-wide trends or linking health system data to other data sources."

"There's also an increasing awareness of equity and inclusion. There has been a lack of inclusion of minority groups in



Professor Kaarin Anstey presents at the 2022 World Dementia Summit in London

dementia research globally so it's great to see this is starting to be addressed."

Professor Anstey highlighted the increasing levels of collaboration in dementia care and research, with different sectors and countries working more closely on large-scale problems using new tools and techniques.

"It was exciting to see collective recognition of not just the scale of the problem, but also the scale of the solution. Solving dementia globally means looking at government, early health education, health systems and even how things like air pollution can impact brain health, in addition to drug development. This has been scaled up in ways it's never been before."



Dr Bill Brooks

Research Fellow

"After ten years of clinical medicine I joined Professor Tony Broe's team at Concord Hospital to study familial Alzheimer's disease. My first task was to connect with the descendants of a family of 10, seven of whom had been affected.

I'm still involved with that family, 34 years later. I'm happy to say that although there isn't yet a treatment, there is now light at the end of the tunnel.

Tony moved to the Randwick campus and I followed to work for Professor Glenda Halliday at NeuRA. Professor Schofield's lab had been doing the genetic work for these families and when he came to NeuRA in 2004 we were then all on the same campus. In the early days we did a lot of field trips throughout Australia to see the families. Since 2008 we have been part of the international DIAN study which provides funding for family members to come to NeuRA.

I've never regretted my decision to leave the clinic and embrace research, because working with the families does push all your buttons as a clinician anyway. I've been privileged to have the opportunity to work with them over generations, because that's how Alzheimer's events unfold in these families. I think it's important for them to consistently see the same face and I remember them all very fondly."

Ebony Lewis

Scientia PhD Scholar

"I'm a proud Wiradjuri woman and passionate about end-of-life care, healthy ageing and Aboriginal health and wellbeing. I am also a registered nurse. I've worked in both Emergency and in the community undertaking older adult health assessments.

I came to NeuRA in 2020 as a UNSW Scientia student to do my PhD in frailty and ageing, specifically investigating how to combat frailty across the life course.

Frailty is not an inevitable part of ageing, but an accumulation of physical, social and cognitive health deficits during the life course. Research shows that the onset of frailty can be delayed, prevented or even reversed. In Australia, over half of the population 65 years+ is estimated to be frail or at risk of frailty. The prevalence of frailty is much greater in Indigenous populations. In Australia, Canada, the US and New Zealand, studies have found that frailty occurs at a much younger age.

I want to tackle frailty and other conditions such as dementia which disproportionately impact Indigenous populations by co-designing culturally appropriate evidence-based programs to delay onset of frailty and improve quality of life with these communities. These programs need to be translatable into clinical and community practice. I have a passion for improving health and wellbeing in later life, and that's why I'm in research, and hope to remain in this field."

PRESERVING MOBILITY AND INDEPENDENCE



Professors Ian Harris, Peter Schofield AO and Jacqui Close

10 years of the Australian and New Zealand Hip Fracture Registry

Hip fracture is a common and life-changing injury sustained by older people. There are approximately 22,000 new hip fractures in Australia and 4,000 in New Zealand each year, with one in four adults over the age of 50 dying within the first 12 months of fracture.

This year marks a decade since Professors Jacqueline Close and Ian Harris led the development of the Australian and New Zealand Hip Fracture Registry – collecting data on the care provided to older people admitted to hospital with a hip fracture, as well as the outcomes of this care. Data is then provided to participating hospitals in real time using a clinical dashboard, and summarised each year in a report. Teams then use the data to identify gaps in care, drive quality improvement and report performance against the national standards. All public hospitals in Australia and New Zealand that operate on hip fracture patients contribute data.

The development of the ANZHFR led to the publication of the Hip Fracture Care Clinical Care Standard by the Australian Commission on Safety and Quality in Health Care in collaboration with the Health Quality and Safety Commission New Zealand. Many hospitals have seen improvements in management of pain, time to surgery, assessment by a geriatrician and early mobilisation.

There are approximately
22,000 new hip fractures
in Australia and 4,000 in
New Zealand each year.



Professor Jacqui Close with patients

International consortium launched for low back pain

Low back pain is the leading cause of disability in low- and middle-income countries. In South Asia, the worst affected region, low back pain imposes a substantial burden on individuals and health systems, and increases health inequities.

This year, researchers from NeuRA's Centre for Pain IMPACT launched the Consortium for Low Back Pain in Low- and Middle-Income Countries – a leadership group that aims to develop the research agenda and identify appropriate care for low back pain in these countries as an urgent priority.

The Consortium consists of researchers, clinicians, and policymakers with expertise in low back pain and people with lived low back pain experience from 30 countries including China, India, Indonesia, Brazil, Ghana, Bangladesh, Mexico and The Philippines.

Originally from Nepal, Postdoctoral Research Fellow and consortium lead Dr Saurab Sharma combines his research, clinical and lived low back pain experience on this project.



"People in every country in the world should have access to culturally appropriate, inexpensive, effective and safe interventions for pain regardless of their circumstances. However, most research on low back pain is derived from high-income countries and its applicability and effectiveness in low- and middle-income countries is uncertain," says Dr Sharma.

"This project will bridge the evidence-practice gap and foster long-term research collaborations to address important research questions relevant in these countries."



Scientia Professor Stephen Lord

**Senior Principal Research Scientist
& NHMRC Leadership Fellow**

"I came to NeuRA in 1994, just after completing my PhD on health and lifestyle factors influencing stability and balance in older people. I defined my research epicentre very early in my career.

At that time, there was virtually nobody studying this area. I sought advice from exercise scientists, vision scientists, experts in sensation, balance and cognition. No one had taken that multi-factorial, multi-dimensional view of falls before. It was a physiological model, not a medical one. Not to fall is the marker of physiological integrity, whereas to fall is a failure of many different systems. Approaching this sequence of events as intricate choreography involving many domains is key.

I secured my first grant in the year after my PhD and began to slowly grow my research group. We have been fortunate to secure continuous funding from the NHMRC since that time.

The advice I would give to the next generation is that first, you must zero in on the important question of your time – the research gap. If your work has clinical application, as ours does, that helps greatly.

I still dream of achieving more for people with multiple sclerosis, Parkinson's, dementia and diabetes. I also dream of accelerating applying the research so that it gets incorporated into care more quickly."

Dr Aidan Cashin

Senior Postdoctoral Research Fellow

"I started out as an exercise physiologist, working with patients on behavioural strategies for a better life. I became disillusioned about how the treatments worked or didn't, and wanted to uncover the mechanisms behind them.

That's what led me into research and I started at NeuRA in 2016 training to qualify for a PhD.

What led me into chronic pain were my inspirational supervisors, particularly Professor James McAuley who has a focus on low back pain. For my PhD, I investigated how low back pain is treated; the evidence for various treatments; the quality of current research and where the knowledge gaps are. For example, I reviewed the use of muscle relaxants because the research was very old. I found that while a common treatment, they are by and large ineffective.

I secured an NHMRC Emerging Leader Investigator Grant shortly after finishing my PhD. This has assured my salary for five years and given me more flexibility to think about the bigger picture. The person in persistent pain is always the most important factor to me. Now I want to explore for which person which treatment works and how we can best match the evidence to the person. The goal that drives me is to improve the outcomes for each individual by improving their care."

REDUCING RISK OF INJURY AND AIDING RECOVERY



Crash test sled at Transurban Road Safety Centre at NeuRA

20 years of driving up safety for Australian road users

Injury is the leading cause of death for children aged one to 14 years and car crashes are the most common cause. Children who are not correctly restrained in the appropriate restraint are up to seven times more likely to be seriously injured or killed.

Since the Impact Injuries Research Laboratory opened in 2002, NeuRA has led reductions in motor vehicle injuries for Australian children and other road users, producing findings which have driven changes in legislation and manufacturing specifications.

In 2010, Professor Lynne Bilston and Associate Professor Julie Brown found more than half of Australian children were in the wrong type of car seat for their size. They tested a shoulder height labelling system to help parents and carers know whether a particular restraint fits their child. These labels fast became standard and continue to be mandatory on all restraints and booster seats in Australia. This research also contributed to new child restraint laws requiring children up to the age of seven to travel in specific car seats.

In 2013, NeuRA launched the National Guidelines for the Safe Restraint of Children Travelling in Motor Vehicles, in partnership with Kidsafe. This was the first time Australian road safety experts had a single comprehensive evidence-based resource to guide advice to parents and carers. This work has reduced child fatalities in motor vehicles in Australia by 45%. The Guidelines were updated again in 2021.

NeuRA partnered with Transurban in 2017 to establish the Transurban Road Safety Centre – Australia's first research-dedicated crash test lab. Today, the Centre's findings are provided to Australian regulatory bodies, motoring associations, industry and the public to improve road safety.

“What we've seen here today is that the research matters and that it saves lives. That's invaluable.”

The Hon Matt Thistlethwaite MP, Deputy Chair
Joint Select Committee on Road Safety

Launching into a new era of trampoline park safety

Trampolines are a ubiquitous part of Australian childhood. But over the past 10 years, their popularity has exploded in the shape of trampoline parks. What hasn't changed is the potential for serious injury from a fall or bounce off the side of a trampoline, with head, neck and spinal cord injuries, even deaths occurring.

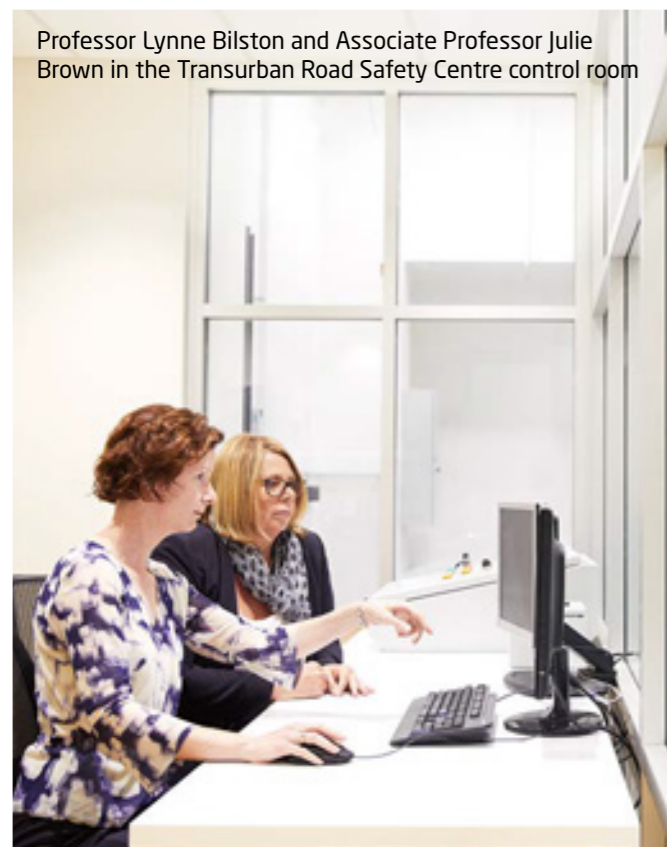
Despite this, commercial parks remain unregulated. A number of voluntary standards and codes of practice exist to promote minimum safety standards, but there had been a lack of evidence about how foam pits – often seen by the public as a key safety feature – should be optimally designed. NeuRA researchers, in collaboration with UTS, UNSW and industry partners, set out to provide this evidence.

After reconstructing a foam pit and designing and building a custom test-rig in NeuRA's basement, researchers dropped an instrumented crash test dummy head-first from a height of up to 1.5m into the pit, testing three different mechanisms to prevent direct contact between the falling 'person' and the floor – a foam slab, trampoline or net bed.



Crash test dummy above the reconstructed foam pit

The results highlight the importance of adequate foam depth in combination with appropriate pit design. They also show the risk of cervical spine injury may not be reduced sufficiently with current foam pit design. New standards are needed to improve safety at trampoline parks and the results are now being used to inform their development.



Professor Lynne Bilston and Associate Professor Julie Brown in the Transurban Road Safety Centre control room

Associate Professor Sylvia Gustin

**Co-Director Centre for Pain IMPACT
and Rebecca Cooper Fellow**

"I grew up in Stuttgart, a beautiful city wrapped in green spaces but also known as the cradle of the automobile. After training as a psychologist, I did my PhD at the University of Tübingen, where I decided to investigate chronic pain using magnetic resonance imaging (MRI).

I was drawn to chronic pain because I was intrigued by the idea that you could manipulate the brain to eradicate all perception of pain. And MRI enables you to see the brain and its mechanisms in all their beauty so you learn how to intervene. I emigrated to Australia with a job offer in 2007 and joined NeuRA in 2015.

As a clinician, I want to develop non-pharmaceutical treatment options. My research revealed the thalamus is particularly implicated in chronic pain, so we have developed a novel brain-computer interface treatment where patients get feedback via a game and EEG and can then neuro-modulate their response to reduce their pain. We're also using virtual reality to modify sensorimotor cortex changes due to chronic pain. And embarking now on a combination of novel brain technologies and electrical stimulation to restore the perception of touch in people with spinal cord injury.

I want to deliver a future without chronic pain. And deliver this to the everyday person in a way that is affordable and accessible for them, wherever they are."

Chiettha Prajnadewie

PhD Student

"My first direct experience with spinal cord injury was during my high school years. My father was diagnosed with a lumbar injury which caused him great pain, suspected to have been sustained as a bus operator.

I gradually became more aware of spinal cord injury and its burden on people. During my time at university studying neuroscience, I developed a particular interest in all things spinal cord-related and the neural signalling pathways that bridge the brain and the periphery.

My PhD study at NeuRA will be the first in the world to identify the specific mechanisms and sites of actions of acute intermittent hypoxia on the respiratory muscles. The function of these muscles is impaired following spinal cord injury, and I will be exploring a protocol for the use of acute intermittent hypoxia as a recovery technique. Similarly, decreased autonomic function is often a consequence of high levels of injury. Abdominal functional electrical stimulation has previously been suggested to alleviate signs of orthostatic hypotension, which my project will incorporate through a world-first controlled pilot study on people with acute spinal cord injury.

I hope that my research will become a stepping stone that will make a lasting positive impact on people's lives, even extending beyond those with spinal cord injury."

IMPROVING MENTAL HEALTH AND WELLBEING

Leading innovation in schizophrenia research

One in every 100 Australians lives with schizophrenia. People with schizophrenia often experience shame, isolation, stigma, loss of social life, limited employment options and more. There is no identified single cause, impeding the ability to develop a cure. Current treatments are designed to suppress symptoms and cannot target the root cause.

Professor Cyndi Shannon Weickert has been on a 30+ year mission to determine the root cause. She has made a number of seminal findings. For example, her discoveries of inflammation and immune cells in the brains of 40-50% of people with schizophrenia upended the long-held belief that immune cells were independent from brain pathology in psychotic illnesses. This opens up whole new avenues for developing targeted anti-inflammatory therapies and has the potential to transform treatment.



Professor Cyndi Shannon Weickert

Professor Weickert's team is now leading the way in defining easily accessible biomarkers for the inflamed state in those with schizophrenia, which may fluctuate at different time points. They have also introduced the concept that clinical trials on the effectiveness of anti-inflammatories should be conducted on those showing signs of neuroinflammation, not on everyone with schizophrenia. These innovations will better define the heterogeneity of schizophrenia and allow for more personalised approaches.

“I’m a big believer in the importance of hope for mental health – for people who are treated successfully and those that aren’t. Research gives hope to people that one day they’ll get better.”

Richard Schweizer



Richard Schweizer was diagnosed with schizophrenia at 22, he's pictured here with his father and NeuRA Director Norbert Schweizer OAM.

Navigating resilience and wellbeing in children

Mental health is on everyone's mind right now. It is increasingly listed amongst the top five issues facing young people in Australia and is on the national agenda as never before.

After more than a decade investigating the neuroscience of wellbeing and resilience in adults, Associate Professor Justine Gatt, leader of the Resilience Lab at NeuRA and UNSW, is now looking to apply this knowledge to understand wellbeing and resilience in children.

The COMPAS-Kids Wellbeing study is a study designed to validate a new mental wellbeing scale for children and adolescents called COMPAS-KIDS. It is the first wellbeing measure of its kind and one that the child can complete independently. It measures the two key components of wellbeing – subjective and psychological – and will ultimately allow researchers to better understand the predictors of wellbeing and resilience throughout development.

Associate Professor Justine Gatt



Once researchers validate the scale, they will be able to use it to create programs and tools for kids that are grounded in the neuroscience of wellbeing and resilience.

“The whole reason why I do this research, which has previously focused on adults, is so we can apply it to children and adolescents, because adolescence is the key period of onset for many mental health problems”, affirms Associate Professor Gatt.





Associate Professor Jan Fullerton

Senior Research Scientist

"I was guided into genetics through different people and supervisors, but also by the fact that your genetic makeup can potentially make or break your life. Mind you, I had two parents who were researchers. My mother was a cardiovascular researcher and my father did a PhD in biochemistry.

When I did my first postdoctoral fellowship in the UK, I was focused on psychiatric genetics: depression, anxiety and neuroticism. I met Professor Schofield while there and he invited me to join him back in Australia where he was working on the genetics of bipolar disorder.

Research today is a completely different ball game to when I started out, both in terms of the challenges of securing grant funding but also the opportunities presented by new technologies. The field of bipolar research is also becoming more elastic, now that we know that the genetic contributors to mental illness overlap.

When people from the bipolar community call me to ask about progress, they are desperate for answers and tools that will help them live more comfortably. That is a huge motivator for me. I want to make a 360 degree difference: to diagnosis, the development of better treatments, improved understanding of co-morbidities, and prevention."

Dr Haeme Park

Senior Postdoctoral Research Fellow

"Human beings are complicated creatures and this has always fascinated me.

After completing my PhD in psychology, I focused on cognitive neuroscience research at Ghent University. When I saw the ad for Associate Professor Justine Gatt's Wellbeing and Resilience Group, I grabbed the chance to do something more translational at NeuRA, and deploy my love of experimental methods to examine what makes each of us different, especially in terms of mental health.

We recently published our findings on the effects of early life stress on the brain-wellbeing relationship. We wanted to see if the brain networks, measured using MRI, differed for highly resilient versus low resilient adults. And whether emotion regulation could have a positive effect on this (and it did!). It's the first study to link brain structural networks to wellbeing and resilience and exposure to early life stress.

I can't imagine a future outside of academia. I would love to have my own lab and also get back into lecturing. The field of social neuroscience - where social psychology and cognitive neuroscience intersect - is my sweet spot.

I'd love to have collaborations across a lot of different fields and develop a more holistic and interdisciplinary approach to see why we are the way we are, how we interact, and how that affects our wellbeing."



World-class facilities underpinning our research

Transurban Road Safety Centre

The Transurban Road Safety Centre was built in 2017 and is Australia's only research-dedicated crash test lab. It combines world-class research with state-of-the-art facilities and equipment to provide ongoing innovation in road safety. Purpose-built at NeuRA, the Transurban Road Safety Centre includes a crash test sled capable of reaching real-life crash speeds of up to 60km/h and cameras that can record up to 1,200 frames per second, allowing researchers to closely examine what occurs in collisions.

Research output

NeuRA researchers recently found people who installed their child car seats using ISOFIX compatible systems were up to three times less likely to make an error, versus those who installed their seats using the vehicle's seatbelt. Crash testing also looked at the protection offered by both ISOFIX and seatbelt-installed restraints in a crash, as well as what happens when car seats secured each way were installed incorrectly. This testing showed that when they are installed correctly (with no errors), both ways of securing the restraint offer the same protection to a child in a crash.

NeuRA Imaging

NeuRA Imaging is a state of the art, open-access 3T MRI research facility. The scanner is 100% available for research for academic, industry and clinical research users. Since the facility opened in 2003, the team has worked with countless researchers from NeuRA, universities and other research institutions, pioneered new cutting edge imaging techniques, published 350 papers and continues to help to drive new knowledge of the human brain and body.

Research output

Combining state-of-the-art Diffusion Tensor Imaging technology with world-leading expertise in the mechanisms of motor impairment, NeuRA researchers are investigating how muscles grow in both typically developing children and children with cerebral palsy. By scanning the lower legs of 320 children aged five to 14 years and infants aged zero to three months, they are looking to build a ready-made database tracking the growth and development of muscles over time – a vital resource for local and international researchers.

The Sydney Brain Bank

For more than 12 years the Sydney Brain Bank has been collecting, characterising, storing and distributing human brain and spinal cord tissue for research into disorders of the brain and mind. It currently holds more than 750 brains, and works with 11 clinical research programs across multiple neurodegenerative disorders. The Sydney Brain Bank is internationally recognised for its excellence in clinicopathological research.

Research output

Researchers examined 636 aged brains from the Sydney Brain Bank for the presence of chronic traumatic encephalopathy (or CTE). The purpose of the study was to understand the frequency of CTE in this population, determine any association with head injury and provide a baseline for studies in more specific groups.

The results showed that of the Sydney Brain Bank's brain donors, only five have evidence of CTE pathology and only three of these cases have a history of single or repetitive head injury. These findings suggest that in the general population, isolated traumatic brain injury is unlikely to cause this neuropathologic change although it may be associated with increased brain ageing.

Gait & Balance labs

NeuRA has three Gait and Balance Analysis Research Laboratories, including state-of-the-art 3D motion capture, in-floor force plates, electromyography, inertial sensors and an instrumented dual-belt perturbation treadmill.

These laboratories facilitate our studies to understand the control of balance and walking (and how these might change with ageing and clinical conditions) including the forces and muscle activity contributing to the movements we see, all measured with high precision. The research team has gained a reputation for extending our knowledge about voluntary and reactive stepping and gait adaptability, including the study of unexpected trips and slips that are induced on a booby-trapped walkway or with the perturbation treadmill.

Research output

People with Parkinson's disease have an inability to regulate and adapt their gait, due to both motor and cognitive deficits. In fact, 67% of people with Parkinson's disease will fall in any given year, and many fall multiple times with serious consequences.

Our current trial involves approximately 50 participants with early to moderate Parkinson's disease using our computerised treadmill coupled with a series of projected light targets which require them to respond by adjusting their stepping. At the same time, a portable scanner system in a skullcap will record cortical brain activity. This test will mimic negotiating hazards in everyday life and elucidate the role of issues such as bradykinesia and freezing of gait in falls.

This study will reveal which brain regions are compromised in people with Parkinson's disease when they need to make quick and accurate steps. In addition, it will assist in identifying training programs and optimal drug regimens for safe mobility.

Spinal Cord Injury Research Centre

The Spinal Cord Injury Research Centre at NeuRA was established in 2020. It conducts research aimed at improving the lives of those with spinal cord injuries, and was built thanks to funding from SpinalCure Australia.

This facility contains state-of-the-art exercise, rehabilitation and neurophysiology equipment, and the

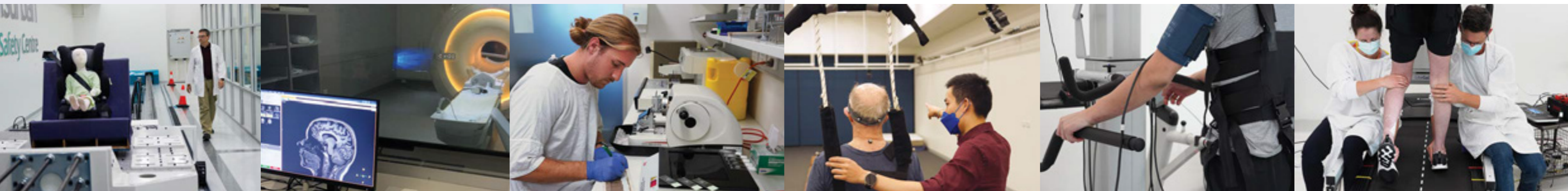
Spinal Cord Injury Research Centre team are currently exploring cutting-edge techniques, such as neurostimulation, acute intermittent hypoxia and inspiratory muscle training, which could help activate muscles in people with spinal cord injuries. Improved activation of muscles is likely to lead to improved bodily functions, such as breathing and walking.

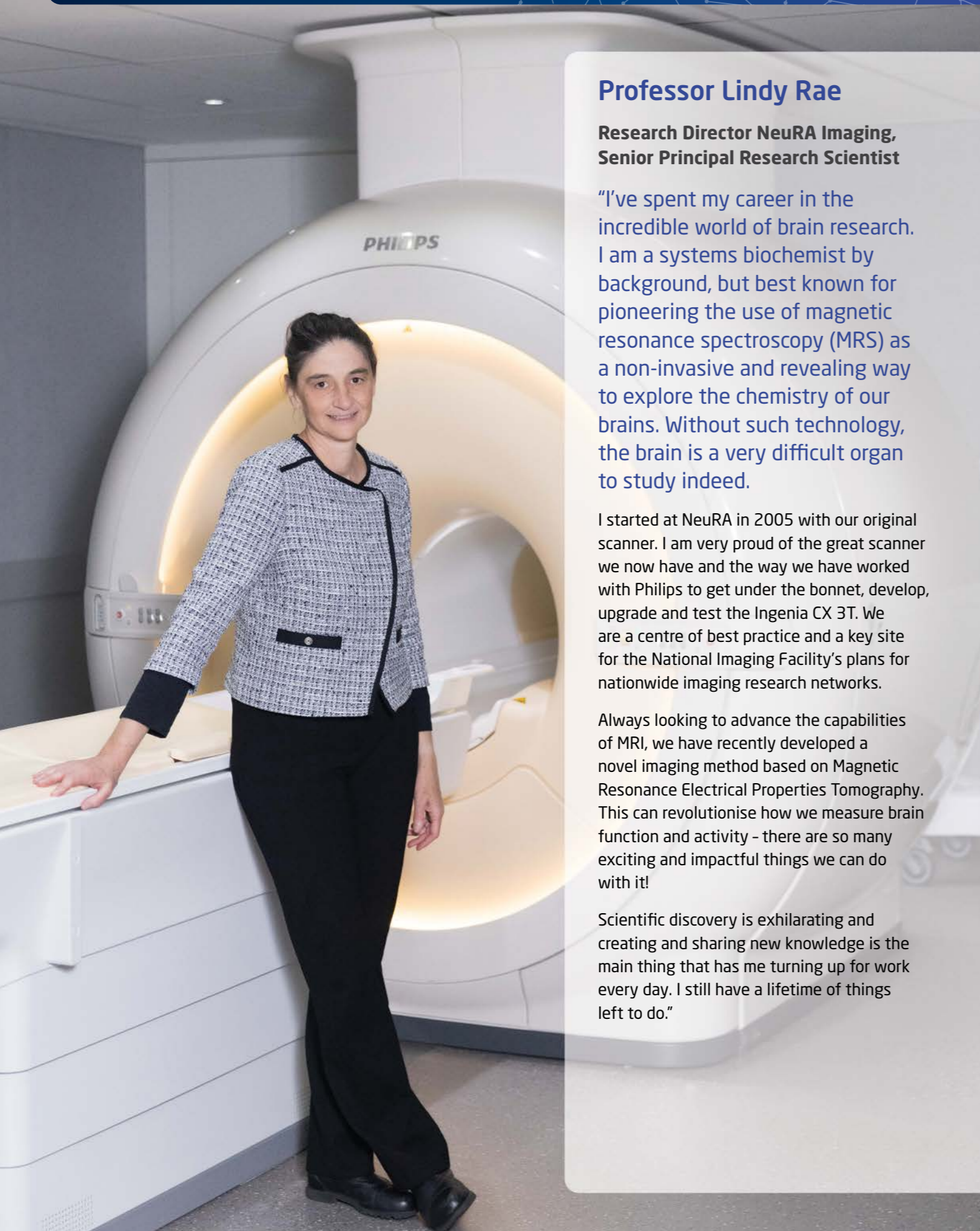
Research output

The eWALK clinical trial is led by NeuRA, with funding support from SpinalCure Australia and the CatWalk Spinal Cord Injury Research Trust. It aims to harness the power of neuroplasticity to restore the function of remaining spinal nerves.

Despite challenges posed by COVID, this landmark trial now has a number of participants enrolled, with active recruitment continuing and more participants undergoing training. In 2022, the trial expanded to Melbourne with a new site, and at least one international site is set to start recruiting participants imminently.

In 2022, the Australian Federal Government announced its early support of Project Spark, a collaboration between NeuRA, SpinalCure Australia and Spinal Cord Injuries Australia, that would see this research taken beyond the lab into community sites around the country.





Professor Lindy Rae

**Research Director NeuRA Imaging,
Senior Principal Research Scientist**

"I've spent my career in the incredible world of brain research. I am a systems biochemist by background, but best known for pioneering the use of magnetic resonance spectroscopy (MRS) as a non-invasive and revealing way to explore the chemistry of our brains. Without such technology, the brain is a very difficult organ to study indeed.

I started at NeuRA in 2005 with our original scanner. I am very proud of the great scanner we now have and the way we have worked with Philips to get under the bonnet, develop, upgrade and test the Ingenia CX 3T. We are a centre of best practice and a key site for the National Imaging Facility's plans for nationwide imaging research networks.

Always looking to advance the capabilities of MRI, we have recently developed a novel imaging method based on Magnetic Resonance Electrical Properties Tomography. This can revolutionise how we measure brain function and activity - there are so many exciting and impactful things we can do with it!

Scientific discovery is exhilarating and creating and sharing new knowledge is the main thing that has me turning up for work every day. I still have a lifetime of things left to do."

Dr Eurwin Suryana

**Postdoctoral Research Fellow,
Sydney Brain Bank**

"After finishing my PhD, I wanted to expand my research skills, so when this role at the Sydney Brain Bank came up, I knew it was perfect for me. I am responsible for facilitating the collection of donated brains by liaising with the various brain donor programs and sometimes next of kin, in order to ensure the donation is completed within a reasonable postmortem window.

I find it really rewarding to facilitate a donor's altruistic wish and also to be involved in characterising this tissue so that it can be utilised in future research projects.

I'm currently funded by the Minderoo Foundation to undertake a research study which aims to visualise plastic chemicals in human brain tissue. At present we are investigating this via mass spectrometry as well as immunostaining of different brain regions with antibodies that are 'specific' to a single plastic chemical. Ultimately, we would like to be able to investigate whether plastic chemicals co-localise with the hallmark pathologies of various neurodegenerative diseases. As plastics are a persistent pollutant we are constantly exposed to, it would be inspiring to think that this research could influence policy and enable future generations to recover from prolonged exposure."



Working with the community

Individuals or groups with direct or indirect lived experience of the conditions NeuRA works on play an important role in our research. NeuRA researchers engage with members of the community in a variety of ways to ensure that studies are informed by their perspective and always conducted with the needs and experience of research beneficiaries in mind.

Co-designed with consumers

Dr Adam Walker leads the Laboratory of ImmunoPsychiatry at NeuRA and UNSW. He’s been working with consumer representatives for the past seven years, particularly in his research into “chemobrain” (cancer-related cognitive impairment), and the influence sleep and circadian rhythm have on cancer-induced inflammation.

Sandie Foreman, a representative of Cancer Voices, has offered the group key insights. Sandie was diagnosed with pleural mesothelioma in 2016 and underwent five rounds of chemotherapy as well as major surgery and radiation therapy.

Before meeting Sandie, the group focused their research efforts on the impact of cancer and chemotherapy on memory and concentration. After working with Sandie, they’ve expanded to investigating components of rule-based learning and the impact of stress on the brain, which has led to new discoveries regarding the cognitive domains vulnerable to cancer. Dr Walker says, “The examination of the impact of stress with cancer and cancer treatment has become an entirely new avenue of research for us. This year we mapped activation of three major cell types throughout stress neurocircuits and discovered what we think is the cellular culprit in cancer-related cognitive impairment and stress disorders.”

It’s an experience that’s been valuable for Sandie too: “It’s fantastic to be involved with something that’s so worthwhile and going to benefit so many people. It’s always interesting to learn about new research and hopefully my input helps in some way.”



Healthy Volunteers Research Registry

Healthy volunteers are vital to many research projects. They provide a verified comparison group to measure changes in individuals affected by diseases of the brain and the nervous system, and a means to investigate healthy brain ageing.

NeuRA’s Healthy Research Volunteer Registry has been operating since 2009 and during its first 10 years received more than 2,500 requests to join. Today, the registry has a database of more than 900 people and hundreds of volunteers participate in research each year.

In 2021, NeuRA signed up as a partner institution with Join Us, a national online research register that matches participants with research studies addressing Australia’s biggest health challenges – enabling us to expand our reach nationally and make more people aware of opportunities to join our trials and play a key role in neuroscience research.

Bringing young and old together for mutual benefit

As part of the Intergenerational Integration Initiative (3i) feasibility study, Associate Professor Ruth Peters and collaborators brought together 10 research participants over the age of 65 and 10 children aged three to four. The 3i project led to the first intergenerational pilot trial designed to assess the mutual health benefits of intergenerational activity, such as reducing frailty and depression.

3i participant Jan Roberts (pictured right) found taking part in the trial was an “absolute joy”.

“I loved the program. I looked forward to Tuesdays with the children and got to know the oldies. I learnt that I am very competitive. I tried hard to win musical chairs but was beaten by the smallest in the group who had the same steely look in her eye as me! The moments I treasured were having fascinating conversations with the four year olds at lunchtime. We have so much to offer each other.”

Jonathan (aged four, pictured below), had an equally enjoyable time. His mother Eva explains: “We’d seen Old People’s Home for 4 Year Olds so we thought it would have mutual benefits. His grandparents live in Adelaide, not close by.



I’m really happy he got the opportunity to do this and Jonathan said he would like to do it again if he could. He particularly liked the lunches together and playing with the ‘old people’.”

Thanks to strong participation from the community, Associate Professor Peters is now set to lead the \$3.7 million NHMRC-funded national INTERgenerational Intervention to Reduce frailTY (INTEGRITY) trial – a world-first clinical trial in community settings.



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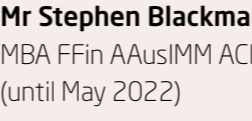


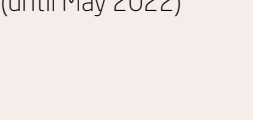

Front row, left to right: Dr Julian Adler, Dr Jennifer Alexander, Colin Tate AM
Back row: Associate Professor Chris White, Kirsten O’Doherty (incoming Deputy Chair), James MacNevin (incoming Chair), Barry Shepherd PSM, Professor Sven Rogge, Norbert Schweizer OAM, the Hon John Watkins AM, Alice Kase, Professor Peter Schofield AO
Not pictured: Dr Debra Graves, Clyde McConaghy


Foundation Board


- 
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Ms Felicity Nicholson
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MBA FFin AAusIMM ACIS AGIA
(until May 2022)

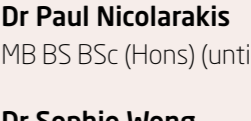

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(from July 2022)


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BA LLB


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Dr Sophie Wong
MBMSc PhD (until February 2022)

Our new Foundation Chair

It was my friend and mentor, David Gonski AC - also Chancellor of the University of New South Wales - who put me forward to take up the position of Foundation Board Chair. I took over from the outgoing Chair, Norbert Schweizer OAM, on 1 January 2022 and would like to express my thanks to Norbert for his six years in the seat.

I have a bold vision for the transformation of Neuroscience Research Australia, over time, into a globally competitive \$100 million organisation where our talented research leaders no longer need to be totally dependent on grant funds. My role as Foundation Chair, working in partnership with Foundation Director Carole Renouf and my Board colleagues, is to bring that vision to life by growing the community of support for NeuRA in quantum leaps. We will achieve this through a clear and focused organisational strategy; a selection of fundraising propositions which sell what the market wants to buy;



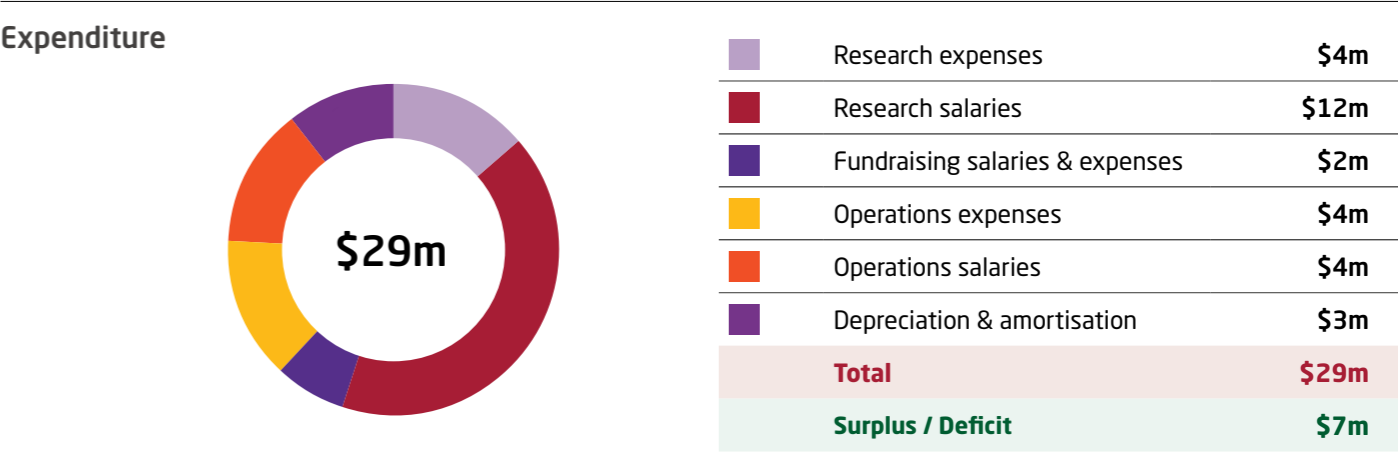
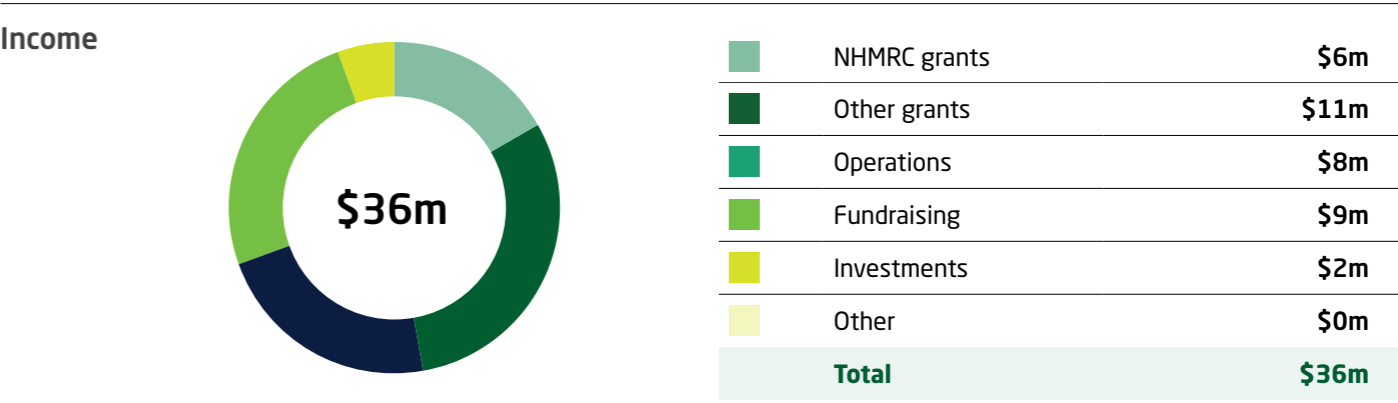
partnerships we will build with government, industry and other not-for-profits; and the networks high calibre Directors will bring to the table. In particular, I would like to see a focus on key areas of community need such as dementia and mental health.

I look forward to working closely with our supporters and research leaders to realise this transformation and a far more expansive future for our organisation.

Colin Tate AM,
Foundation Board Chair

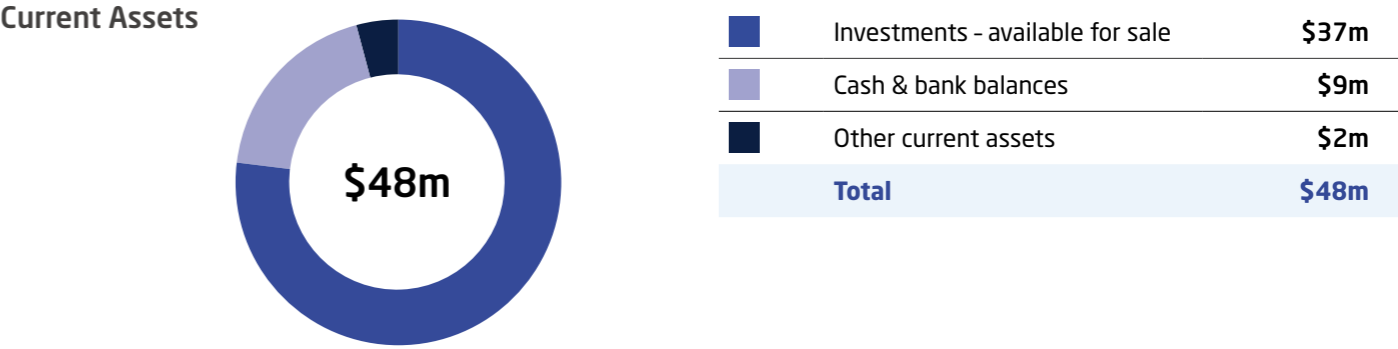
UNSW Chancellor David Gonski AC and NeuRA Foundation Chair Colin Tate AM at NeuRA's 30th Anniversary celebration

2021 financial snapshot



Financial position

Current assets - endowment fund	\$14m
Current assets - cash & others	\$34m
Non-current assets	\$57m
Total assets	\$105m
Liabilities	\$8m
Net assets	\$97m



In gratitude

We are very grateful for the philanthropic gifts of our generous supporters

Key supporters who made gifts of \$10,000 or more in 2021

Margarete Ainsworth	Yvonne Mee
ASX Refinitiv Charity Foundation Limited	Dr Mark Nelson
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2021 Estates

The Estate of Betty Lynch OAM
The Estate of Maureen Brennan
The Estate of Margaret Frank
The Estate of Miriam Goodrick
The Estate of Peter Stroud
The Estate of Reginald Stubbs
The Estate of Ronald White

“It’s my great hope that our next 30 years will be even richer than the last, generating new research outcomes that help the community, that transform health into the future, and make an impact.”

Professor Peter Schofield AO
Chief Executive Officer,
Neuroscience Research Australia

**Neuroscience
Research Australia**





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