MADE IN

Brain Research
NEW ZEALAND
Rangahau Roro Aotearoa

ANNUAL REPORT 2017

The Early Career Researcher Issue

Contents

Brain Research
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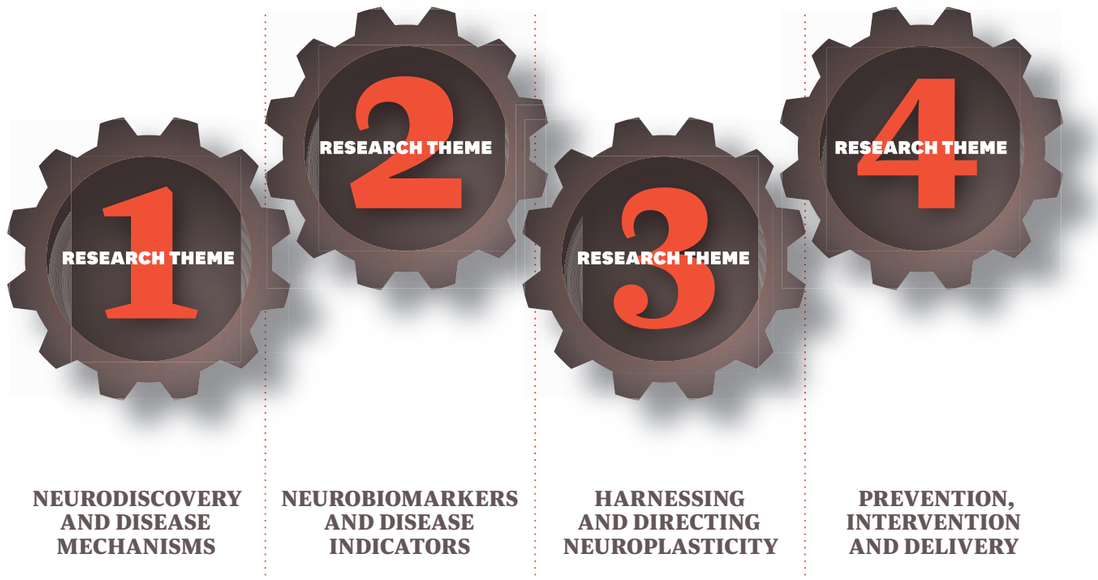
1.

About us

Brain Research New Zealand - Rangahau Roro Aotearoa (BRNZ) is a national Centre of Research Excellence (CoRE) undertaking ground-breaking research on the ageing-brain and ageing-related neurological disorders.
Neurological disorders pose one of the greatest global challenges of our time. By 2036 one in four New Zealanders aged over 65 will be affected by brain disorders like stroke, Alzheimer's, and Parkinson's diseases. These disorders – currently without cure – result in debilitating neurological impairments, loss of independence and a need for significant on-going healthcare. By 2030, dementia alone will cost New Zealanders a staggering $2.7 billion, not to mention untold physical and emotional strain.

By bringing together New Zealand's best neuroscientists and clinicians, and working in partnership with the community, we aim to undertake the translational biomedical research necessary to tackle this challenge head on - to improve people's lives through brain research and, ultimately, the wellbeing of our ageing population.

BRNZ's research programme is devoted to improving our understanding of ageing-related neurological diseases: what causes them, how they progress, and why brain cells are affected and die as a result. Armed with this greater knowledge, we aim to develop better ways of identifying disease at its very earliest stage so we can start treatment earlier, when it will help people most. Beyond early detection, we are also committed to developing new treatments and interventions that can help stave off ageing-related cognitive decline, to keep our brains healthy for longer. BRNZ's research is spread across four Themes of intense research activity. Essential to each of our projects is their excellence and innovation, plus their multidisciplinary, and collaborative nature. Research activity and achievements in these thematic areas are described throughout this report, but especially on pages 42-47, and critical to this effort is our national network of Dementia Prevention Research Clinics, about which you will learn more too.



2.

Our goals for New Zealand

Our vision:

Lifelong Brain health for all New Zealanders.

Our mission:

To unlock the secrets of the ageing brain and develop new therapies and better clinical and community care to enhance life-long brain health for all New Zealanders.

Our goals:

Our goals:

1. **Better health outcomes, improved quality of life and positive ageing for older persons and their families, including reduced physical, emotional, social and financial costs of ageing-related neurological disorders, through public dissemination of the latest research and the creation of partnerships with patients, families, community organisations and NGOs across NZ.**

2. **A Centre of Neuroscience Research Excellence that is nationally and internationally recognised and sought after for its expertise and innovation in the study of the ageing brain.**

3. **Improved strategies for prevention, early detection and slowing of progression of ageing-related neurological disorders, through identification of early biomarkers and an improved understanding of the mechanisms of ageing-related neurological disorders.**

4. **Improved clinical practice by translating scientific knowledge into treatments, strategies and care pathways aimed at delaying or moderating ageing-related neurological disorders.**

5. **Increased scientific, clinical, translational and leadership capability that will improve research output, patient outcomes, productivity and health industry research capacity.**

6. **Improved Māori health and wellbeing during ageing by working with Māori communities to understand their needs and value and build equal relationships, incorporating Mātauranga into innovative research and clinical methods, and by supporting Māori to determine their own pathways to brain health through training of Māori neuroscientists and clinicians.**

3.

2017 in brief

OUR PEOPLE

4 78 research groups from 4 leading New Zealand universities

192 research students and postdoctoral fellows

13% of our members identify as Māori

15 Collaborations with 15 countries worldwide

RESEARCH HIGHLIGHTS

248 peer-reviewed research papers and book chapters

$12M Nearly $12 million in external funding

2 patent applications

1 patent granted

NEW ZEALAND'S FIRST DEMENTIA PREVENTION RESEARCH CLINICS

3 Dementia Prevention Research Clinics in Auckland, Christchurch and Dunedin

129 people assessed through our clinics

5/50 Partnerships with 5 District Health Boards and 50 general practitioners

WORLD CLASS TRAINING ENVIRONMENT

144 graduate students

43 qualification completions

24 Early Career Researchers (ECRs) funded to present their work at prestigious international conferences

48 postdoctoral fellows

OUTSTANDING MĀORI ACHIEVEMENT

3 early career Māori researchers conducting health research with and for their communities

6 Māori specific research projects including studies to help Maori recover after stroke and improve access to hearing services

68 Year 11 Māori secondary school students participating in Brain Bee

COMMUNITY ENGAGEMENT

2000+ people attended our national dementia prevention talk series with Alzheimer's New Zealand

128 schools signed up to use the Being Brainy programme

150+ blood pressure checks at Te Matatini Kapa Haka Competition

BRNZ researchers appeared in the media on average twice a week

$3.25M Over $3.25M in philanthropic funding raised

4.

Co-Directors' Reports

Report from the Co-Directors of Brain Research New Zealand, Distinguished Professor Sir Richard Faull and Professor Cliff Abraham.

Distinguished Professor Sir Richard Faull

"A dream come true"

After almost 10 years of gestation, we launched our CoRE "Brain Research New Zealand – Rangahau Roro Aotearoa" in January 2015 full of excitement and an ambitious mission to establish a true national collaborative research effort on the ageing brain by bringing together the leading neuroscientists and clinicians across the nation to work together for the common good.

I have had the great privilege and pleasure to be a co-director with Professor Cliff Abraham of this exciting national research effort during the first 3 years of development. I believe we can be very proud of seeing our "dream come true". From my perspective here are our leading milestone achievements during the first vital triennium.

We are a success story of national collaboration at every level. Having 78 research groups across 4 universities working together as truly collaborative, inter-institutional, multidisciplinary national teams to advance research on the ageing brain has been transformational and has advanced our research on the national and world stages. Collaborative team research is our byline and this is the secret ingredient of our success.

The establishment of our national network of Dementia Prevention Research Clinics has been innovative and challenging. The clinics will provide the vehicle for our researchers to collaborate with clinicians to take our research directly to the community and trial new novel therapies arising out of our research. The development of the clinics has been risky and courageous, but in the final analysis that is why we have our CoRE, to take our world class collaborative research to the people and to give them hope for the future.

The research clinics enduring success and expansion is very much dependent on long-term financial support. This has been secured by the imaginative establishment of the New Zealand Dementia Prevention Trust led by Sir Eion Edgar and a visionary group of New Zealand's philanthropic leaders.

We are proud of our enhanced engagement with Māori communities led by Dr Hinemoa Elder to understand their needs and values and build equal relationships, incorporating Mātauranga into innovative research, and by supporting the training of Māori neuroscientists and clinicians. Our engagement with Māori is seen as a role model for other CoREs.

Finally, I applaud our very active efforts to provide opportunities for our early career researchers to develop and enhance their careers – they are our future leaders and it is so important that we nurture their development for their future leadership roles.

In conclusion, I must pay a special tribute to the extraordinary leadership and total commitment of Co-Director Cliff Abraham who has been central to cultivating the collaborative success which distinguishes our CoRE. It has been a pleasure and a privilege to work with Cliff. Our future is in good hands with Cliff and Professor Peter Thorne at the helm.

Professor Cliff Abraham

BRNZ Co-Director, Professor Cliff Abraham writes...

As noted above in Sir Richard's recap, during 2017 he made the decision to step down from his role as Co-Director of BRNZ at the end of that year, to dedicate more time to his family and many other responsibilities, as well as to allow for a smooth transition in leadership well in advance of our re-bid in 2019. A look back at the gestation of our CoRE reminds us of what a critical role he has played in not only gaining the funding in the first place, but also moulding our researchers together into a nationally cohesive unit. Clearly, BRNZ has thrived under Sir Richard's leadership, evolving into a nationally and internationally recognised centre. The CoRE has garnered high praises from many of our stakeholders, not least our funder the Tertiary Education Commission, for the early impact of our work.

Perhaps most importantly, Sir Richard has been the visionary behind the Dementia Prevention Research Clinics. These are now established, and projects are getting underway. It is important to recognise that these clinics are receiving a huge amount of additional financial support from the New Zealand Dementia Prevention Trust, chaired by Sir Eion Edgar. Sir Richard played the leading role in encourageing and aiding Sir Eion in getting the Trust up and running. A further notable achievement was Sir Richard's recruitment of Dr Hinemoa Elder as the CoRE's Māori Strategic Leader. Dr Elder has made a massive contribution by providing the leadership for connecting the CoRE with Māori communities and kaumatua. This is now an integral part of BRNZ's activities.

I can't overstate the pleasure that I have had personally in working with Sir Richard in leading this unique CoRE. It is the only CoRE in New Zealand that is co-hosted by two Universities (Auckland and Otago), and this ethos of national cooperation is still the fundamental and most important element of our whole enterprise. We are pleased that Sir Richard will continue as a Principal Investigator in the CoRE, and as a member of the Directorate with oversight of BRNZ's Māori engagement and philanthropic fundraising activities.

To finish, I warmly welcome Professor Peter Thorne as the new Co-Director from the University of Auckland. You will learn more about Professor Thorne later in this report, and it will quickly become evident why he is the perfect choice to succeed Sir Richard. I am very much looking forward to working together with him to continue the CoRE's development and upward trajectory.

A sense of service

Born into a naval family, new BRNZ Co-Director, Professor Peter Thorne spent his childhood living in cities across New Zealand, the UK and Singapore. "I think I attended 11 schools in all, but it was a wonderful way to grow up," he says. His upbringing also left Peter with a strong sense of service and a desire to help others, and that driving force continues to steer his career today. "My parents definitely led by example. If I were to analyse it, I'd say it was their commitment to supporting people, communities and institutions that really laid the foundations of my character."

Professor Peter Thorne

Peter says that he was always interested in science, and that, as a child, had dreamed of studying medicine in order to work with remote communities across Africa. But he was also driven by an innate curiosity, and an ability to ask insightful questions, so he decided to enter the world of scientific research. He started with a BSc in physiology and biochemistry at the University of Otago, before moving to the University of Auckland for a PhD and post-doctoral studies. Peter then joined the prestigious Kresge Hearing Research Institute, at the University of Michigan, before returning to Auckland in 1986.

Since then, Peter's research has focused on sensory neurobiology, particularly inner ear disorders, and the influence of noise exposure and ageing on hearing. Widely acknowledged as New Zealand's strongest advocate for hearing health, Peter was instrumental in the introduction of country-wide hearing screening for new-born babies and, along with his colleagues, established a training programme for clinical audiologists and a dedicated Department of Audiology at the University of Auckland. In 2009 he was named a Companion of the New Zealand Order of Merit (CNZM), for 'services to auditory neuroscience.' Peter is the Chairman of the National Foundation for the Deaf, and is on the Board of the Hearing Research Foundation and the Auckland Medical Research Foundation.

He has also been a central member of the BRNZ family since its inception. "I was part of the group that wrote and presented the original bid to establish the CoRE, so I am honoured to now take on the Co-Director role." Peter speaks very highly of his predecessor, Distinguished Professor Sir Richard Faull, "working alongside Richard, both in the Centre for Brain Research and within BRNZ, continues to be a privilege. I think that under his and Cliff's leadership, the CoRE has been extraordinarily successful."

Key to this success is the focus on collaboration and on investing in researchers at all stages of their careers. According to Peter, "We're doing much more than simply building collaborations within disciplines. We're facilitating cross-discipline research, across NZ universities. And we're connecting clinicians, researchers and communities – I can't think of any other

consortia who have the ability or the skills to operate across all three domains."

It's clear from any conversation with Peter that he is genuinely driven by a need to make a difference – and that extends not only to the lives of those living with neurological disorders but to those of his colleagues too. He says, "I feel it's important to give back. I'll do everything I can to empower people; to create an environment in which they can excel and go on make a difference to the lives of others."

Sitting alongside this need is Peter's unquenchable enthusiasm for his research. He is Director of the Eisdell Moore Centre, a national multidisciplinary research centre, launched in 2017, that's dedicated to research into hearing and balance disorders. For him, the need for such a centre was clear, "Hearing loss affects between 10 and 18% of the population. Similarly, balance disorders affect four out of 10 people, and contribute to falls in older people. These senses play a vital role in maintaining brain health – deficits in either system are increasingly being shown to be risk factors for developing dementia." In recognition of his outstanding contribution to research, Peter was recently awarded the 2017 Gluckman Medal by the Faculty of Medical and Health Sciences at the University of Auckland.

Concern over the impact of hearing loss on individuals, and his desire to provide access to services that can identify and treat hearing deficits, also informs his work with remote Pacific communities, which Peter describes as "genuinely inspiring for me. To work alongside such hugely committed international research groups, and to see the direct output of our work on these remarkable communities – it is a privilege."

For Peter, the need to understand the impact that neurodegenerative conditions have on the lives of everyday people provides a sense of purpose to his work, and to that of BRNZ. "The science we're doing here is really very good – increasing understanding and acquiring new knowledge are the engine room of any research effort. And we're forging strong connections between this country's brightest neuroscience talents. But," he continues, "the key for me is that we now begin to translate those successes into outcomes – to directly improve the lives of New Zealanders living with age-related disorders."

"We're doing much more than simply building collaborations within disciplines. We're facilitating cross-discipline research, across NZ universities. And we're connecting clinicians, researchers and communities – I can't think of any other consortia who have the ability or the skills to operate across all three domains."

PROFESSOR PETER THORNE
Incoming BRNZ Co-Director

5.

Training a world-class workforce

Equipping students

Brain Research New Zealand was built on the talent and tenacity of its researchers – 78 of New Zealand's best neuroscientists and clinicians, committed to combating ageing-related neurological disease and to training the next generation. This year's annual report is about that generation. The emerging leaders of neuroscience preparing to take the baton and run.

As a Centre of Research Excellence funded by the TEC, it is natural that BRNZ should invest heavily in the training and development of its emerging researchers. Each year, we actively promote interdisciplinary and geographical mobility to ensure our early career researchers (ECRs) develop the skills and networks they need to compete on the global stage. With four of New Zealand's best universities collaborating, BRNZ has a unique opportunity to nurture our students in national multidisciplinary teams. Whereas most students are only familiar with single-investigator research, our projects are all collaborative. From 2015-2017, all of our 65 research projects—including 21 PhDs –involved two or more investigators with expertise in different fields. This exposure, to multidisciplinary research from an early stage, not only gives students direct access to a greater breadth of expertise, but ensures that they master a diverse skill set that will propel them into successful careers in healthcare, industry, and academia.

Our research students also benefit from the opportunity to learn in clinical environments, including BRNZ's Dementia Prevention Research Clinics and aligned clinics such as the Stroke Recovery Clinic (Auckland) and the Audiology Clinic (Auckland). Trainee clinicians develop research capabilities through the funding of MB-ChB PhDs and Masters.

In fact, we provide scholarships at every level of a student's career: Summer Scholarships, Masters and PhD scholarships, and Postdoctoral Fellowships, to provide the necessary stepping stones on their paths to success. Equally important on that path is collaboration. With BRNZ funding to travel to leading national and international conferences and symposia, our students have the opportunity to make career-defining connections, and to share knowledge and ideas with peers and mentors both domestically and abroad. We also run training courses in leading-edge translational research techniques, ECR sessions at our annual CoRE-wide wānanga, and a national ECR Workshop to develop their skills and networks even further.

In short, we provide a first-class graduate research education.

To date, BRNZ has directly funded the tuition of 27 emerging researchers, and a further 117 students and Postdocs form the fabric of our research programme. We are immensely proud of the talent rising through our CoRE, and what it represents for the future of neuroscience and the health and well-being of New Zealanders. In the pages that follow we invite you to meet a handful of BRNZ's up-and-coming researchers. Here, we introduce New Zealand's next generation of eminent neuroscientists - each one poised to make their own contribution, in their own remarkable way.

Sophie Barnett

PhD student Sophie Barnett admits that she first caught the 'research bug' during her Honours project. She had excelled in her undergraduate study at Victoria University of Wellington, achieving straight A's throughout the three years, and graduating with a joint degree in biology and psychology, so she had lots of options. Moving to Christchurch came with personal and professional benefits – she'd be close to her family, and could take the opportunity to try something new – neuroscience.

"My long-term goal is to become a leading researcher in restorative neuroscience. With an ageing population, we'll see a growth in disorders like Alzheimer's. We urgently need new therapies, but we'll only get there if we work together. BRNZ has changed the NZ neuroscience landscape, and I am privileged to be a part of it."

SOPHIE BARNETT

"Because of my background, I think my supervisor – BRNZ Principal Investigator Professor John Dalrymple-Alford – thought I knew a whole lot more than I did!" Sophie explains, "But as we discussed his work, I became increasingly determined to get involved in it." Under John's guidance, Sophie looked at how damage to the extended hippocampal system could alter the expression of epigenetic markers throughout the system, as well as investigating some of the epigenetic effects that environmental enrichment had on that same memory circuit. It was an experience that changed Sophie's life.

"The range of things I learned in that year was just incredible. The moment I realised that I had the opportunity to steer my own learning; to answer previously unanswered questions, and share my findings with others, I was absolutely hooked." Sophie had once considered studying medicine because she wanted to improve the quality of life of others. But she realised that she could still have an impact through research, and so, just a few months into her Honours project, she started putting together a proposal for a PhD.

Now funded by BRNZ and supervised by Professor Dalrymple-Alford, Sophie is also being supported by three other senior BRNZ researchers – Dr Louise Parr-Brownlie, Professor Neil McNaughton, and Dr Stephanie Hughes, all at the University of Otago. "My supervisors are all leading experts, and each come from different disciplines," says Sophie. "That's been an invaluable learning experience for me."

Sophie's work focuses on a small but critical circuit in the brain that has been implicated in memory loss in Alzheimer's disease and following thalamic stroke. Through her electrophysiology studies on a series of rat models, she is investigating the effect that damage to two tracts within that circuit has on memory. Sophie is also using a more novel technique – optogenetics – to attempt to improve memory function in the system. She explains, "Optogenetics enables the selective activation of cells with light stimulation, so rather than switching on everything in the region around the electrode tip, this technique allows us to target specific cell types."

For Sophie, being part of the BRNZ family has not only given her an opportunity to meet other like-minded researchers, and to gain a sense of perspective on why her research matters, but it has also fuelled her ambition. "My long-term goal is to become a leading researcher in restorative neuroscience. With an ageing population, we'll see a growth in disorders like Alzheimer's. We urgently need new therapies, but we'll only get there if we work together. BRNZ has changed the NZ neuroscience landscape, and I am privileged to be a part of it." ●

Meg Spriggs

"In school, I wasn't interested in science or maths – I was definitely considered to be an arts kid." So says BRNZ PhD student Meg Spriggs. It was only after she started her Bachelor of Arts in psychology, anthropology and theatre studies at Otago, that she really caught the science bug.

"I feel so privileged to be given this opportunity," Meg says. "The staff in the clinic have been incredibly supportive and have taught me so much, and I've worked with an amazing cross-section of study volunteers."

MEG SPRIGGS

"I went into psychology because I wanted to learn about social and clinical psychology," Meg explains. "And then we had lectures on neuroimaging. I became absolutely fascinated by the idea that we could look at the brain in real time; that there was a way to see the link between biology and behaviour. So, I started down the neuroscience route, and haven't looked back."

Meg worked with Professor Neil McNaughton for her undergraduate project, exploring rodent memory via electrophysiology. It was there that she first came across the work of BRNZ Principal Investigator, Auckland's Professor Ian Kirk, and applied for a summer placement in his lab. That research she did there inspired Meg to stay on in Auckland for her Honours year, and to do a second summer project with Prof Kirk, this time funded by the Neurological Foundation.

"Although that project was relatively small, it's really where I started down my PhD research path," Meg says. She was looking at long-term potentiation (LTP), a process linked to long-term memory formation, using EEG (electroencephalography). The main purpose of this project was to explore how we can measure age-related changes in LTP using visual stimulation, and it gave Meg her first opportunity to recruit and work with elderly people. "We recruited elderly people from the local community. It was fun and interesting research, so I really wanted to take it further."

Meg developed a PhD proposal with the support of Professor Kirk and Associate Professor Lynette Tippett, and was granted BRNZ funding in 2015. Her aim was to use two different techniques – EEG, and MRI-based diffusion imaging – to explore the transition from mild cognitive impairment to Alzheimer's disease. "We know that in dementia, there is an early decline in the brain's ability to adapt and change. In rodents, this has been linked to a blockade in their ability to generate LTP," she explains. "If we can measure this change, it could help us identify which individuals are most likely to develop Alzheimer's."

To that end, Meg has been working with Auckland's Dementia Prevention Research Clinic, of which Associate Professor Tippett is the Director. "I feel so privileged to be given this opportunity," Meg says. "The staff in the clinic have been incredibly supportive and have taught me so much, and I've worked with an amazing cross-section of study volunteers." She's also received additional support from Dr Suresh Muthukumaraswamy.

With multiple techniques and study groups involved, Meg is facing a mountain of data in this final stage of her PhD, but she seems excited by the prospect "I'm using a fairly complex brain function modelling technique in my EEG paradigms. By combining this with diffusion MRI, which looks at brain structure, I'm hoping to explore the connection between function and structure – can we see functional changes before structural ones? Or do they align? I don't yet have all the answers. But ask me again in a few months!"

Jin Ng

University of Auckland PhD student, Jin Ng, is investigating naturally-occurring compounds that could potentially act in the treatment and prevention of neurodegenerative diseases. Rather than focusing on the neurons themselves, Jin is searching for clues in the mitochondria – the so-called 'powerhouse of the cell' – which generate most of the energy that neuronal cells rely on.

"Being a part of the BRNZ family means that I've had a lot of support – I never felt like I was going through this alone. The feeling of being surrounded by other passionate researchers from different fields, all united by a common goal – it's really powerful."

JIN NG

This work is based on a fairly new idea – that dysfunction in the mitochondria could be the initial trigger that leads to the development of Alzheimer's and Parkinson's disease. He explains, "Mitochondria dysfunction is implicated in every major neurodegenerative disease, and we see it happen long before the onset of any cognitive impairment." So, under the guidance of BRNZ Principal Investigator, Associate Professor Nigel Birch, Jin is exploring ways to protect mitochondrial energy supplies – in effect, 'supercharging the powerhouse' – in the hope that this will slow down neuron death and the resulting cognitive decline. "There are a plethora of naturally-occurring bioactive compounds that could offer this functionality, but they have not been tested at physiological concentrations either singularly or as a mixture. So that's what I'm investigating," he reveals.

It's a big goal, but Jin is not short of ambition. Originally from Malaysia, Jin moved to New Zealand at the age of 15, to complete his high school education. "My interest in science initially came from watching TV shows like Bill Nye the Science Guy!" Jin says, "But it was my brilliant Biology teacher at Auckland Grammar School, Ms. Woollard, who really inspired me to pursue biology at a tertiary level." Jin chose his Honours degree – a Bachelor of Technology, majoring in Biotechnology – because it combined molecular biology with business. "I've always been interested in science start-ups, and the process behind growing a company," he says.

Now in the final stages of his PhD, Jin works alongside some of New Zealand's most notable scientists, including Professor Cliff Abraham and Distinguished Professor Margaret Brimble in a cross-disciplinary collaboration. "This project is really exciting. We are also characterizing a variation of a key peptide involved in the manifestation of Alzheimer's disease, amyloid beta, and the effect this has on neuronal mitochondrial function," explains Jin. "We're also working closely with computational modelling experts at Massey University, so that we can further understand the peptide's behavior."

Working as part of a team seems to have been a big draw for Jin, who says that "Being a part of the BRNZ family means that I've had a lot of support – I never felt like I was going through this alone. The feeling of being surrounded by other passionate researchers from different fields, all united by a common goal – it's really powerful." When asked about his hopes for his research, Jin responds "I'm excited that I'm working in a growing field, so I hope that my research answers some questions, while generating more. Anything that gets us closer to the treatment and prevention of neurodegenerative diseases is worth pursuing."

Chris Heinrich

Chris Heinrich has always loved computers. Born in San Francisco to a developer at Apple, his childhood home was full of technology, and he says he was keen to try all of it, "There are so many photos of me mashing at keyboards, or staring at monitors!", no-one was surprised when he decided to study Computer Science.

"Chatting to people living with neurodegenerative conditions is a powerful experience, and I'm very grateful for it. It motivates me to keep going, no matter what technical barriers I meet."

CHRIS HEINRICH

In 2011, Chris's family made a life-changing decision – to pack up and move to New Zealand. So, Chris enrolled in a Software Engineering undergraduate course at the University of Otago, and went on to do an Honours project in data mining. It was during his Master's programme that he had his first foray into brain research. Working with BRNZ Principal Investigator Professor Holger Regenbrecht and Dr Tobias Langlotz, Chris developed an augmented reality tool that lets researchers physically explore huge volumes of brain data, and gives students a way to interact with the brain in 3D.

From there, Chris was encouraged to apply for a BRNZ-funded PhD into the use of mixed reality in stroke therapy, and it was a topic that hit close to home. "When I was younger, both of my grandmothers suffered a stroke," Chris explains. "One in particular really struggled with her rehab exercises and, as a result, never really managed to return to full health. So, when I was offered an opportunity to develop new stroke rehab tools, I jumped on it."

Now working under the guidance of Professor Regenbrecht, Chris is developing a system that allows stroke patients with an upper limb impairment to undertake mirror therapy via a virtual reality (VR)-enabled headset. At the beginning of the project, Chris was given an opportunity to work with a specialist stroke clinician, Nadine Morkisch, who developed a series of exercises to integrate into their virtual rehab system. "By making use of recent advances in VR, we can offer patients a way to carry out clinician recommended rehabilitation exercises in their own home or at community centres."

Their current system stimulates brain recovery by "fooling" a patient into believing that their impaired limb is moving, when, in fact, they're viewing the mirrored movement of their non-impaired limb. But the illusion relies on them recognising the virtual hand as their own, so for that, Chris takes high-resolution images of their hand, and integrates it into the virtual world. "We ran a 48-person study, and found that our approach was significantly better at reproducing a person's own skin features than the current best practice hand visualisations in VR," he says.

Finding novel solutions to technical problems is only one of the things that motivates Chris. "Being part of BRNZ's Early Career Researcher network means that I'm constantly learning. Every year, we meet with other young scientists trying to answer questions on the ageing brain, and get incredible access to leading NZ researchers. But most importantly, we get to meet the people that we're working hard to help." Chris continues. "Chatting to people living with neurodegenerative conditions is a powerful experience, and I'm very grateful for it. It motivates me to keep going, no matter what technical barriers I meet."

ECR Workshop

February 2017

Held in Dunedin on 2-3 February, BRNZ's 2017 Early Career Researcher (ECR) workshop was attended by seventy budding neuroscientists from across the CoRE. The workshop was packed with two days of lectures, panel discussions and presentations from scientists, neurosurgeons, statisticians, public figures and thespians designed to aid students in pursuing their post-PhD careers.

Day One saw University of Otago Vice-Chancellor, Professor Harlene Hayne, deliver a keynote address on "Lessons in Leadership" and what it takes to become a change-maker in society. Dunedin-based actress, screen-writer and director Cindy Diver, teamed up with local GP Suzie Lawless, and the cast of their verbatim play "The Keys are in the Margarine" to demonstrate to our ECRs what it's really like to live with dementia. That message was driven home by former Dunedin Mayor, Peter Chin, whose candid account of his wife's experience with Alzheimer's disease was a poignant reminder of why our research is so important. Whereas Day One focused on the end-users of our research, Day Two focused on translational research – what it takes to turn exceptionally clever lab-based research into a commercial product of practical use. A highlight for everyone was hearing Rob Shepherd's (Professor of Medical Bionics at the University of Melbourne) tales of woe in getting his remarkable bionic ear to market, making it all too clear that commercial challenges can be just as difficult and significant as the technical challenges required to develop technology. Lessons aside, perhaps the most important aspect of 2017's workshop was the opportunity it gave our ECRs to reconnect with their peers and to build the collaborations of tomorrow.

This page:
Professor Rob Shepherd, University of Melbourne
Opposite:
Cindy Diver, Actress and Director, the Keys are in the Margarine

If you build it, they will come...

Keeping up with technological advances can be costly, in both time and money. Nowhere is this truer than in research. So, when BRNZ Postdoc Dr Owen Jones suggested we invite the UCLA creators of the "miniscope" to Dunedin to teach our researchers how to make their own version of the machine for just 2% of the usual cost, BRNZ jumped on board. Miniscopes are essentially microscopes that are small enough and light enough to be used to look into the living brain. This allows researchers to see how certain sets of nerve cells in the brain are activated while animals move around in their normal environment. Over the course of three days in August and under the guidance of the UCLA team, twelve eager BRNZ ECRs built their own miniscopes. In coming years the scopes will be used for a myriad of different projects, from neuroplasticity during learning to sensory responses to the neural drivers of fertility.

Fly me to the moon...

2017 saw BRNZ's Young Ambassadors scheme continue to thrive. Twenty four of our brightest ECRs packed their bags to present at leading conferences, and to train at workshops and in laboratories across the globe. From EMBO's conference on Autophagy in Dubrovnik (Croatia) to the Math and MATLAB for Neuroscientists workshop in the Netherlands, each of our ECR's destinations provided an invaluable opportunity for them to "play among the stars" of neuroscience – to meet international experts, to share ideas, and to gain first-hand experience presenting posters or talks to a critical audience. Otago-based ECR Rose Smither, recently returned from a course on Super Resolution Microscopy in Edinburgh, had this to say of the opportunity "I have learnt some amazing techniques and ideas for the future of the microscopes we have here at Otago. It was incredibly valuable not only for the knowledge I gained but also the contacts I have made in order to obtain help in the future."

***Left:** Miniscope workshop participants, Dunedin, 30 August 2017*

The road to independence

Undertaking a PhD is not for the faint of heart. Invariably it involves countless hours in the lab, surveying the literature, collecting, analysing and presenting data and, then, finally, undertaking a lengthy "write up period" to produce an international quality dissertation that significantly advances the field. It is no wonder then that BRNZ's PhD candidates show so much intelligence and drive. The same can be also said of our Postdoctoral Fellows.

In 2017, BRNZ awarded new Postdoctoral Fellowships to Dr Reece Roberts (University of Auckland), Dr Kyla Horne (University of Otago) and Dr Helen Murray (University of Auckland). As a research centre, you know things are going well when external organisations come forward with substantial donations to support your work. And in 2017, the Health Education Trust did just that, committing $300,000 over three years to fund Helen Murray's postdoctoral research into Alzheimer's disease.

BRNZ's postdocs are all impressive young scientists and the driving force behind many of BRNZ's scientific advances. But what of life after PhD and postdoc? Thanks to a challenging funding environment, the traditional route of setting up your own lab and securing a position at a research university is not as easy as it once was. With funding from the Tertiary Education Commission, comes a responsibility to equip our ECRs with everything they need to be successful. Be it better grant-writing skills, opportunities for leadership, experience with outreach, or a set of skills that transfer easily to other sectors, we are working on all fronts to keep their futures looking bright.

In the pages that follow we ask Professor John Reynolds, BRNZ Directorate member responsible for building capability, to explain how BRNZ is preparing its postdocs and graduate students for rewarding careers, and we introduce three exceptional young scientists who, under BRNZ's umbrella, have successfully travelled the path to independence.

Professor John Reynolds

Q&A

Q Tell us John, what are the challenges these days to gaining independence in a research setting?

A **First and foremost, it depends on the route that a researcher decides to go down.** Most researchers begin their independent career negotiating the research-only route. Getting going is dependent on receiving a significant grant as the principal investigator and being able to negotiate within one's department for some independent space and lab resources to support the research and for the associated team. Thus, it requires a good relationship between the researcher and the host department, and usually a mentor who helps the new researcher get established and may assist with space and resources. For this kind of support, a very strong CV of research delivery and outputs arising from PhD and postdoctoral work is essential (subliminal message: write, write, write!). The other most common career direction, is joining the faculty in a University or Department. An excellent CV demonstrating strong productivity relative to years after PhD is essential. Evidence of good competence, or at least potential, in teaching is important too. Again, solid peer support from research organisations and mentors with whom you have worked, as well as a history of service to organisation and community, is key to success.

Q What are the most important things that BRNZ is doing to help ECRs establish independence?

A **In both of the traditional research pathways to independence, it is becoming increasingly important to demonstrate your ability to work in a team and your willingness to go the extra mile with service to your lab, research centre, department, university and wider community.** This can make the difference between gaining a position over someone with an equally solid research CV. By providing our early career researchers with opportunities: to work with world-class investigators on highly internationally competitive research; to network and build collaborations from an early stage; to assess applications for funding alongside highly experienced panellists; to belong to Theme Leadership Groups and direct our research programme; for exposure to a wide range of skills and viewpoints through the yearly workshops; and for outreach and external engagement, BRNZ provides a substrate for early career researchers to establish a wide skill base to maximise their chances of success in the road to independence.

Q Running your own laboratory isn't for everyone, what role is BRNZ playing in helping students to pursue their careers more generally?

A **Keeping first with research, there are significant opportunities within the PhD, MBChB/PhD and postdoctoral fellowship area for early career researchers to work with PIs and AIs in the CoRE and begin their research journey.** Beyond this, there are of course opportunities to work alongside these investigators on a research project as support staff. In addition, the on-the-job mentoring provided by our investigators and leadership teams in the CoRE can help provide early career researchers with contacts and ideas and statements of support to help in directions outside of research. Our yearly Early Career Researcher (ECR) Workshops also provide experiences beyond the traditional research seminar setting, and encourage ECRs to think outside the box in areas they may wish to pursue. For instance, we have run sessions around engaging in social science, understanding our social development as New Zealanders, seeing the world with fresh eyes through Mātauranga Māori, working in medicine and neuropsychological clinical practice, managing data and IT resources, making statistics your friend, and understanding the challenges of being a person living with or supporting someone with a neurological disorder. All of these encourage the development of skills and interests that are transportable in many directions both within and outside the conventional laboratory environment.

Dr Brigid Ryan:

Searching for clues

As a Post-Doctoral Fellow at the University of Auckland, Dr Brigid Ryan is a rising BRNZ talent. Now working in Associate Professor Maurice Curtis's group, she aims to identify early biomarkers of frontotemporal dementia (FTD) – a neurodegenerative disease that profoundly affects language, behaviour, and cognition. To do this, Brigid is carrying out a unique study. Working with a family that carries a genetic mutation known to result in this form of dementia, she hopes to link minute changes in their blood to the disease's progression, and as a result, develop a blood test for dementia.

"I think it's important that our society is scientifically literate, and that those living with dementia get access to trustworthy advice. BRNZ supports me to help make that happen..."

DR BRIGID RYAN

But Brigid didn't always dream of being a scientist. "In high school, I didn't really know what I wanted to do," she recalls, "My interest in medicine and biology really only appeared in my mid-teens, when my grandma was diagnosed with dementia." Brigid also loved writing, and so enrolled in a double-Honours program – psychology and English literature – at the University of Otago. The launch of a new neuroscience course at Otago saw her change tack, but it was her summer project, carried out under BRNZ Principal Investigator Dr Joanna Williams, that first convinced Brigid that scientific research was for her.

"That project was so interesting that I stayed on in Joanna's lab to do my Honours project. Joanna's support continued into my PhD too – she helped me apply for funding, and was my main supervisor." Brigid's PhD looked at a sub-region of the hippocampus in animal models, to investigate if the formation of memories resulted in detectable changes to microRNAs. This gave her the opportunity to work with BRNZ's Co-Director, Professor Cliff Abraham, whom she describes as "a mentor, who makes me proud to be a scientist." Brigid managed to publish five papers during her PhD, and having enjoyed the experience, she started looking for post-doc opportunities.

Brigid says, "The Human Brain Bank at Auckland was a huge draw because I was keen to work with human tissue." So with the support of Cliff, Maurice and Joanna, Brigid put together a proposal for a BRNZ Fellowship grant, which she was awarded in 2016. Brigid's work now centres on a cohort of 25 people from a single family. She explains, "Some of them carry a mutation with 100% penetrance. In other words, if they are a carrier, they will go on to develop frontotemporal dementia". This gives Brigid a unique opportunity to search for changes to blood biomarkers that could be used to identify the signs of dementia long before an individual displays any symptoms. Working as part of an inter-disciplinary team of neuroscientists and clinicians from Auckland and Otago, Brigid is also searching for other clues, such as changes in cognition and olfaction (sense of smell), that could act as additional biomarkers.

Speaking about the family, Brigid says, "It's a privilege working with, and getting to know them – they're unbelievably generous with their time." Outside the lab too, Brigid is a keen science communicator. "I think it's important that our society is scientifically literate, and that those living with dementia get access to trustworthy advice. BRNZ supports me to help make that happen, and I'm going to keep doing it!


Dr Rita Krishnamurthi

Dr Rita Krishnamurthi:

Stroke prevention is better than cure

"I've been lucky to have some incredible career mentors," says Dr Rita Krishnamurthi, Senior Research Fellow at AUT's National Institute for Stroke and Applied Neurosciences. "From Professor Lorraine Holley and Sir Peter Gluckman, to Professor Dianne McCarthy, Sir Richard Faull, and now BRNZ Principal Investigator, Professor Valery Feigin. They are not only brilliant scientists, but also special people."

Born in Fiji, Rita moved to NZ following her Master's, and started her research career in a cardiology research centre at the University of Auckland – now the Liggins Institute. She soon moved into neurological disorders, and began working towards a PhD in Parkinson's disease. But life got in the way. After two children and a career break to care for her seriously ill parents, Rita submitted her thesis in 2005.

She made the move to AUT in 2009, and has worked in stroke research ever since. Rita says, "My career really took off when I came to AUT. I was able to sink my teeth into a field of work and I learned how to lead rather than follow." She describes the first few years of working in population health as "a huge roller-coaster ride", but Rita quickly established herself in the world of stroke epidemiology. BRNZ funding has been central to that, she says "BRNZ supported us to do a pilot trial on our app, the Stroke Riskometer™, to explore its use as a tool for stroke prevention." Working with Auckland and Canterbury, AUT also carried out a BRNZ-funded national survey on the awareness of stroke and dementia, and they're just about to start working on computational model of dementia prediction.

"Through our work, we've formed some really strong relationships with other NZ universities, and with multiple primary healthcare organisations," Rita explains. "There's still a lot of work to do around stroke awareness, so we're determined to keep going."

Dr Tracy Melzer:

Time will tell

Dr Tracy Melzer is a Research Fellow at the University of Otago, and Research Manager at the New Zealand Brain Research Institute. Originally from the US, and a physicist by training, Tracy moved to Christchurch to study medical physics, and it was there that he first discovered an interest in brain imaging. "I was amazed by just how much we could learn from brain scans," he says. "So when I heard that Professor Tim Anderson was offering an imaging PhD in Parkinson's disease, I jumped at it."

Since completing his PhD, Tracy has continued to work on a major longitudinal study. "We know that the majority of patients with Parkinson's will go on to develop dementia – but we can't say who or when," Tracy explains. "By looking at people with normal cognition, mild cognitive impairment and dementia over time, we can search for clues that could help us track the disease's progression." In the longer-term, Tracy hopes to use this as a tool for prediction – to identify features that are indicative of an individual's risk of developing dementia.

Supported by BRNZ, Tracy also contributed to the 'Hearts & Minds' study led by Professor Donna Addis and Dr Reece Roberts at the University of Auckland. "For years in fMRI, researchers have looked only at the mean signal, but we've started exploring the variability of that signal too." Tracy is currently collaborating with a number of other BRNZ investigators. He describes his work with Dr Catherine Morgan as "really exciting" because they're adding new imaging tools to understand mild cognitive impairment. "Catherine and I will look at blood flow, iron deposition, and the blood-brain barrier."

"Being part of BRNZ is great. The science, potential for collaboration, and opportunities available through BRNZ have been career-changing for me. I'm grateful for their support."

DR TRACY MELZER

Dr Emma Scotter:

Identifying the causes of Motor Neuron Disease

It was an Aotearoa Fellowship at the Centre for Brain Research that brought cell biologist, Dr Emma Scotter, back to Auckland in 2014. She had been working at Kings College London for four years, investigating the role of protein misfolding in motor neuron disease (MND). Since joining the centre, Emma has worked closely with BRNZ's Professors Mike Dragunow and Richard Faull and Associate Professor Maurice Curtis, to extend her cell work into human brain tissue.

While a lot of MND research focuses on the neurons that die in the disease, Emma's work looks at supporting cell types. She says, "Pericytes are of particular interest because they're important to the blood-brain barrier. This structure exists to allow blood to deliver nutrients and oxygen to brain tissue, while keeping the blood cells themselves, and other blood components, within the vessels." Emma's research has shown that this barrier is compromised in MND, suggesting an intrinsic problem with the pericytes that may contribute to the disease's progression. "We're seeing barrier leakage rather strikingly in spinal cord samples, and we are now exploring whether the pericytes could themselves be important to target therapeutically," she explains.

This is where Emma's long-term goal comes in. "Fundamentally, we want to help people. Understanding the disease is obviously important, but really, it's the foundation for doing something about it. It is my hope that our discoveries will be translated into therapies which can slow or halt MND."

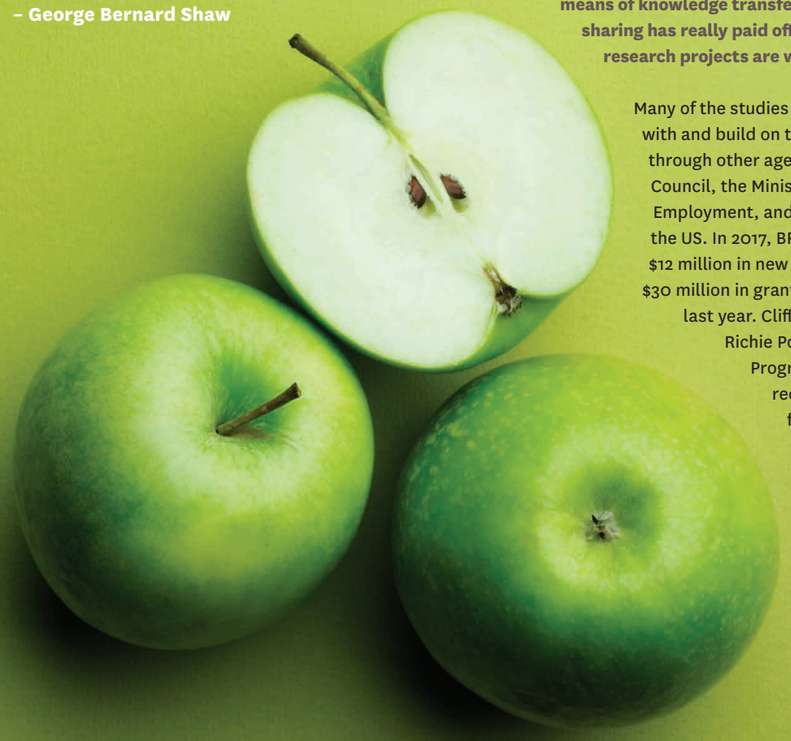
As a member of BRNZ's Neurodiscovery Leadership Group, Emma has met with other emerging researchers across NZ. "Often the limitation to collaboration is just understanding what people in other institutions are doing," she says. "BRNZ opens these doors." It's also provided inspiration for Emma, "Jayne McLean and I recently established the New Zealand Motor Neuron Disease Research Network. In many ways, it's modelled after BRNZ, because I've seen just how valuable that has been in identifying and connecting people."

"Fundamentally, we want to help people. Understanding the disease is obviously important, but really, it's the foundation for doing something about it. It is my hope that our discoveries will be translated into therapies which can slow or halt MND."

DR EMMA SCOTTER

"If you have an apple and I have an apple and we exchange these apples then you and I will still each have one apple. But if you have an idea and I have an idea and we exchange these ideas, then each of us will have two ideas."

– George Bernard Shaw



Sharing nicely

Over the past three years, BRNZ has channelled a significant amount of energy into knowledge exchange. Collaboration with other CoREs, National Science Challenges, research institutions and hospitals brings with it the chance to participate in the joint production of knowledge - to share the results of research and build on it even more. And as luck – or means of knowledge transfer - would have it, our focus on sharing has really paid off. As we mentioned earlier, BRNZ's research projects are wholly collaborative endeavours.

Many of the studies within our programme dovetail with and build on the research capability funded through other agencies, such as the Health Research Council, the Ministry for Business, Innovation and Employment, and National Institutes of Health in the US. In 2017, BRNZ researchers secured nearly $12 million in new research grants, adding to the $30 million in grants our investigators attracted last year. Cliff Abraham, Mike Dragunow and Richie Poulton each lead significant HRC Programme grants, while Richie also receives complementary NIH funding for MR scanning of the Dunedin Longitudinal Study cohort. Through BRNZ's Dementia Prevention Research Clinics and their work with District Health Boards, we have provided greater access to clinical populations and new collaborators. Our Explorer Grants, newly created to bring new groups of researchers together to explore novel ideas, have resulted in a suite of new collaborations with the promise of great things.

From testing the link between hearing loss and dementia using cochlear implants with the Bionics Institute (Melbourne), to developing an implantable light source to combat Parkinson's with the MedTech CoRE, these new partnerships are helping to ensure BRNZ's research advances are applied to develop new treatments for brain disease.

When CoREs collide

When the TEC established the Centres of Research Excellence (CoREs) Fund, it did so to encourage the development of excellent tertiary education-based research that is collaborative, strategically focused and that creates significant knowledge transfer activities. In 2015, the TEC awarded funding to Brain Research New Zealand to develop new therapies and better clinical and community care to enhance life-long brain health for all New Zealanders. At the same time, it also gave funding to the MedTech CoRE, to develop new technologies to improve hospital, community and home-based healthcare, for the benefit of all New Zealanders.

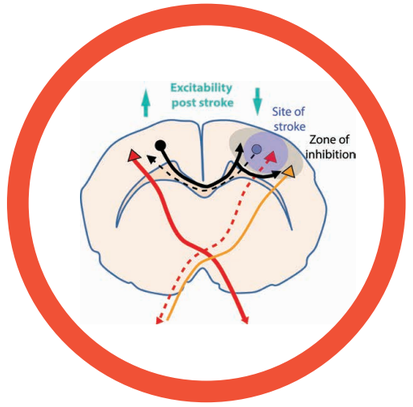
Twenty four months down the line, and it would seem the TEC hit the nail on the head in establishing two Centres of Research Excellence with so much in common. With shared vision, shared expertise, and an unparalleled commitment to improving health outcomes through excellence and innovation, it made good sense that BRNZ and MedTech should put their minds together to see what collaboration could bring. And so, in April 2017 we held a joint symposium "Brain and Technology: A Catalyst for Collaboration" at the University of Auckland, to showcase research from both CoREs as well as developments from overseas. Over two full days, neuroscientists, audiologists, engineers, chemists, and clinicians came together to explore how research into the ageing brain could be advanced by technology. From bionics to virtual reality and neurorehabilitation, it quickly became apparent that if we worked together, the possibilities would be endless. Following the success of the joint symposium, BRNZ and MedTech have agreed to hold the meeting annually, and to offer joint seed funding - in BRNZ's case via new "Explorer Grants"- to back new ideas for technologies related to brain therapies and treatment, stemming from symposium discussions. Significantly, a MedTech/BRNZ collaboration was recently awarded funding for a joint research programme for the development of new optogenetics science and technology by the Ministry of Business, Innovation and Employment. We have also united efforts in the education space, through shared Māori outreach projects and public talks (MedTech Talks).

6.

Research excellence

The end of 2017 marked the mid-way point of BRNZ's first term, giving us an opportunity to reflect on our research achievements thus far, as well as to report on exciting new research we have funded to take us through the next three years. BRNZ's overall research programme is devoted to understanding of the causes, pathology, and sociocultural features of ageing-related neurological diseases, and then using this knowledge to develop new therapies and interventions to attack the disorders and improve quality of life for New Zealand's ageing population. Looking back at the research we have conducted, it is exciting to see our researchers making superb progress in all these areas, with more new projects about to start. Here are just a few examples of the many important discoveries our researchers are making that will ultimately help improve quality of life for all New Zealanders in years to come.

NEURODISCOVERY AND DISEASE MECHANISMS



***Above:** Interhemispheric imbalance model, which predicts dysfunction after unilateral stroke, each side of the brain inhibits the other equally. After a stroke, the inhibition coming from the stroke-affected hemisphere is decreased (interhemispheric dashed line) alongside a decreased excitability in the peri-lesional tissue. The unaffected hemisphere becomes more excitable and exerts a stronger inhibition onto the peri-lesional tissue. Modulating this zone of inhibition in the peri-infarct tissue appears to be a potential target for stroke therapy.*

RESEARCH HIGHLIGHTS | We are working in several important areas to understand disease mechanisms with the aim of finding new therapeutic approaches to tackling them. For example, in Parkinson's disease, one of the key initiating factors is the loss of nerve cells that produce the neurochemical dopamine. Associate Prof Bronwen Conner and her team have been exploring novel methods for directing stem cells and other cell types to become dopamine-producing cells that have the potential for replacing those lost in the disease. While these projects are incubating, she has published important reviews of her work and others that consider the potential and pitfalls of such cell reprogramming approaches to Parkinson's and Huntington's disease (*Stem Cells, Stem Cell Reviews and Research*). Associate Professor Maurice Curtis and Professor Mike Dragunow have discovered a possible mechanism for the spread of Parkinson's disease, whereby the toxic protein alpha-synuclein can transfer between different brain cell types via "tunnelling nanotubes" (*Scientific Reports*). Understanding how these nanotubes work may be one key to developing new treatment strategies for the disease. The encroachment of alpha-synuclein into the main olfactory nucleus may explain the olfactory dysfunction that is common in Parkinson's disease (Curtis, Professor Richard Faull, *Brain*). Dr Jian Guan's group and colleagues have shown that alpha-synuclein accumulation may also account for deterioration of blood vessel cells in Parkinson's disease, leading to impaired flow of blood to the brain (*J Alzheimer's Disease and Parkinsonism*). In the stroke field, we are realising that there is complicated interaction between the two brain hemispheres that may be inhibiting stroke recovery, and targeting this complex interaction has the potential for therapeutic benefit (Professor Winston Byblow, Associate Professor Cathy Stinear, *Clinical Neurophysiology*; Professor John Reynolds, *Brain Stimulation*).

RESEARCH THEME 2

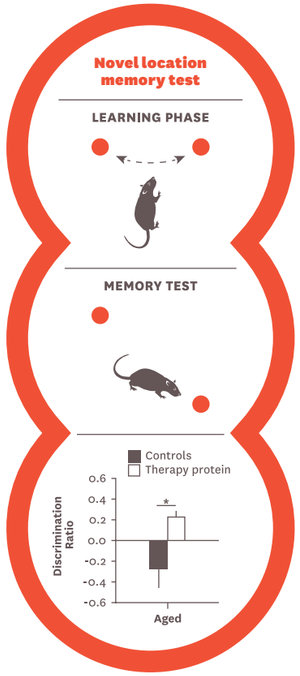
NEUROBIOMARKERS AND DISEASE INDICATORS

RESEARCH HIGHLIGHTS | Understanding neurological disease development, and the molecular indicators that predict disease onset, is a vital element of the attack on neurological disorders. Having predictive "biomarkers" would enable commencement of treatments before significant brain damage occurs. Animal models of human neurological diseases have been very helpful in this regard. BRNZ is proud to be supporting novel sheep models of both Huntington's disease (Faull, Professor Russell Snell), and more recently Alzheimer's disease (Snell). These researchers have shown that the Huntington's sheep, representing the early stage of the disease, show wide-ranging changes in brain gene expression as well as significantly increased brain urea, mimicking the toxic increase in urea and associated ammonia that is seen in human patients (*Proceeding of the National Academy of Sciences, USA*). They have also observed that normal aged sheep show a similar neuropathological profile to that of humans in early stages of Alzheimer's disease (*Neurobiology of Ageing*), which is underpinning their new interests in developing even better sheep models of the disease. The possibility of a biomarker predictive of Parkinson's disease is also being developed by Dr Joanna Williams and Dr Nick Cutfield (*Movement Disorders*).

Another use of biomarkers is to predict how well people will recover from stroke. Being able to predict recovery capability will be important information for the formulation of individualised rehabilitation. Stinear, Byblow and Professor Alan Barber have identified functional and structural biomarkers obtained 3 days after stroke that have a high degree of success in predicting upper limb function 3 months later (*Annals of Clinical Translational Neurology*). This is a significant contribution to the growing field of stroke biomarkers (Stinear, *Lancet Neurology*). Interestingly, in a linkage between stroke and cognition, Professor Ngaire Kerse has shown that stroke risk factors and biomarkers of inflammation can be helpful in predicting cognitive decline, especially in the very old (*J American Geriatrics Society*).

RESEARCH THEME 3

HARNESSING AND DIRECTING NEUROPLASTICITY



***Above:** Rats were allowed to explore two objects. When one object was moved to a new location, aged rats were less able to realise that it had been moved. Treatment with the therapeutic protein (sAPPα) restored memory, as shown by increased exploration of the object in the new location.*

RESEARCH HIGHLIGHTS | Neuroplasticity is fundamental to learning and memory formation, brain development, and recovery from brain disease or injury. Molecules or treatments that enhance brain plasticity are good targets for therapy development. Professor Cliff Abraham, Dr Stephanie Hughes and Professor Warren Tate have been collaborating on the therapeutic potential of a neurotrophic protein termed secreted amyloid precursor protein-alpha (sAPPα). They have shown that administering this protein to the brain can rescue spatial learning and associated synaptic plasticity mechanisms in aged rats (*Neurobiology of Learning and Memory*). More recently, they have shown that a gene therapy approach that elevates the production of this protein in the brain can effectively preserve these same functions in a mouse model of Alzheimer's disease (*Molecular Brain*), protecting against the effects of the toxic proteins that nonetheless still accumulate. As ongoing work is also revealing this protein's ability to increase the genesis of new nerve cells in the brain, there is strong reason to develop a translational pathway for testing this protein in humans (*Experimental Brain Research*).

Sensory loss (visual, auditory, olfactory) is associated with ageing and disease, but hypersensory function can also occur, such as in tinnitus. CoRE researchers are undertaking a range of approaches to tinnitus which is so disabling for many aged individuals, and so difficult to treat (Dr Grant Searchfield *Frontiers of Psychology*). A mixture of broad band "white" noise and nature sounds has been successfully shown to provide some tinnitus relief (Searchfield, *Frontiers in Ageing Neuroscience*). A number of other approaches, including brain stimulation techniques, have been trialled with some success as well (Searchfield, Professor Dirk De Ridder, *Brain Stimulation; Journal of Neural Transmission; Disability and Rehabilitation*), giving hope of finding a long elusive treatment for this very common disorder.

RESEARCH THEME 4

PREVENTION, INTERVENTION AND DELIVERY

RESEARCH HIGHLIGHTS | Globally, neurological disorders ranked as the leading cause group of disability and the second leading cause of deaths in 2015, with Alzheimer's and other dementias being one of the leading contributors (Professor Valery Feigin, *Lancet Neurology*). Thus the development of effective preventive or treatment measures is critical, although enhancing the service delivery to those already with aging-related neurological disorders is equally important. Understanding the needs of health care workers and valuing their work is an important element in quality care, an issue that Professor Leigh Hale has been championing (*Ageing and Society*). She has also been pioneering ways to assess how stroke survivors reintegrate into society (*Edorium J Disability and Rehabilitation*). Of importance, there is a growing awareness of cultural differences between Māori and non-Māori in their links to the home and environment and how this is related to health measures during aging (*Social Science and Medicine*). The types of preferred activities across these groups is also of interest, as their ability to engage in them is likely to be related to health outcomes during aging as well (*J Cross Cultural Gerontology*).

Importantly, BRNZ is funding a number of intervention studies aiming to improve cognitive function and quality of life in those with dementia or its antecedent, mild cognitive impairment (MCI). Such programs include Cognitive Stimulation Therapy (Dr Gary Cheung), Cognition and Exercise training (Kerse), combined physical and mental exercise for Parkinson's disease (Prof John Dalrymple-Alford, Hale), and a lifestyle-change pilot study (Kerse). We eagerly await the outcomes of these trials and programmes. In a novel and intriguing study, the use of home-care robots for improving the quality of life for those with MCI and early dementia has also begun to be explored, with proposals for how to advance this approach having recently been published (Kerse, *J American Medical Directors Association*).

***This page (and inset):** Professor Ngaire Kerse puts BRNZ's members through their paces using the music-based movement therapy Ronnie Gardiner Rhythm and Music (RGRMTM) Method, that is part of her Cognition and Exercise study. The RGRMTM incorporates: music, rhythm, colour, vocals, text, shapes to stimulate balance, coordination, endurance, attention, memory, and social interaction and theoretically promotes neuroplasticity. Participants are taught symbols and words that represent up to 18 body movements, such as clapping hands or stamping feet, which are displayed on a screen and follow different sequences to be performed to music.[3]*

7.

Māori achievement

"He aha te mea nui o te ao?
He tangata! He tangata! He tangata!

What is the most important thing in the world?
It is people, it is people, and it is people

With New Zealand's Māori population living longer, it has never been more important for us to understand Māori needs and values and to carry out culturally responsive research. Looking at dementia alone, a recent Alzheimer's New Zealand report predicts that by 2026, 5.7% of all New Zealanders diagnosed with dementia will be Māori. And with under-reporting an ongoing problem, it's likely that the real situation is significantly worse. In fact, barriers to early detection, such as a lack of culturally appropriate diagnostic tools and effective community education, have led researchers to believe that as few as 60% of all cases of dementia are actually diagnosed. And for Māori individuals who are diagnosed, cultural issues surrounding the delivery of health care continue to mean the gap in health between Māori and non-Māori is far from closed.

From the beginning, increasing Māori capability and improving Māori health outcomes have been fundamental goals of our CoRE, and our ever-increasing Māori workforce is one of our greatest strengths. In 2017 BRNZ awarded PhD Scholarships to two exceptional Māori researchers - Justine Camp (Te Rūnanga o Moeraki) and Sophie Mathieson (Ngāpuhi) who, in 2018, will join audiologist Alehandrea Manuel (Ngāti Porou) in undertaking research that will ultimately promote Māori brain health. 2017 also saw BRNZ award its prestigious Eru Thompson Postdoctoral Fellowship to talented clinical psychologist, Dr Julie Wharewera-Mika (Ngāti Awa, Ngāi Tuhoe). Like our Māori PhD scholars, Julie's research stands to benefit Māori specifically by exploring clinical practices and therapeutic pathways for Māori living with neurological disease. We also welcomed Otago-based lecturer Dr Anne-Marie Jackson to the fold, who joins a team of 11 other Māori investigators, all passionate about improving health outcomes for Māori through their work.

***Left:** BRNZ Māori community partner Puketeraki Marae, Dunedin*

Te Kura Kaupapa Māori o Hoani Waititi

Alongside the need for more Māori neuroscientists and clinicians, BRNZ has been conscious of the pressing need for increased numbers of Māori students in STEM [science, technology, engineering and mathematics] subjects.

Under the leadership of Dr Hinemoa Elder, BRNZ has spent these past few years forging a partnership with Te Kura Kaupapa Māori o Hoani Waititi. Founded in 1985 and boasting a role of 178 Māori students, Hoani Waititi is a total immersion school with an outstanding reputation for excellence in kapa haka and Te Reo Māori. Having held annual Wānanga with the Kura for two years now, our relationship has enabled us to show its tamariki what we do, and the opportunities on offer if you get involved in STEM subjects. In fact, we are already beginning to see students from the Kura develop an interest in careers in health and science, one we hope will last a lifetime.

Left inset: BRNZ's North Island Māori community partner Hoani Waititi Marae, Auckland

Brain Bee competition

When it comes to attracting Māori students into STEM, Te Kura Kaupapa Māori o Hoani Waititi isn't the only school on our radar. Just as exciting, Associate Professor Debbie Young has been leading the "Brain Bee" charge, introducing scores of Māori high school students from rural New Zealand to the world of neuroscience. The NZ Brain Bee Challenge is national competition targeted at Year 11 high school students. Each year, students take part in Round 1 of the competition in the form of a multi-choice test at their school under exam conditions. The top-scoring students from each island then go forward to either the North Island or South Island Brain Bee Challenge final. After thrashing it out at the finals, the overall NZ Brain Bee champion goes on to represent New Zealand in the International Brain Bee competition.

In 2017, BRNZ investigators Professor Louise Nicholson (North Island Brain Bee coordinator up until 2016) and Associate Professor Maurice Curtis (NZ Brain Bee Coordinator) teamed up with the MOKO Foundation, piloting a new initiative to boost the number of Māori students entering the competition. As part of the pilot, two Māori university students from the Far North (Conor O'Sullivan, a health science student from the University of Auckland, and Kapowairua Stephens, a medical student from the University of Otago) travelled home to recruit Year 11 Māori students into the competition from high schools in their area. A few months later, and under the guidance of MOKO Foundation Chief Executive, Deirdre Otene, they returned to the Far North again, to run teaching wānanga and tutorials to train pupils for the upcoming contest. Flash-forward to competition time and 15 Māori students from the Far North flew through Round 1, and took up places in the final of the 2017 North Island Brain Bee Challenge at The University of Auckland. (A total of 173 Year 11 students from North Island high schools took part in the final).

With the pilot proving so successful, Assoc Prof Debbie Young (North Island coordinator from 2017) suggested BRNZ fund 2 Māori Summer Studentships in 2017/2018 to take the initiative further. And so, with Debbie and Deidre Otene at helm, BRNZ supported two exceptional Māori scholars to fly the Brain Bee flag in the Far North again. This time they recruited and trained 68 Māori students from a catchment of 5 high schools, who will compete in Round 1 of the competition in March 2018.

Funding Māori-focused research

Research for Māori is best done by and with Māori, and for that we not only need a thriving Māori workforce, but meaningful Māori-focused research into the ageing brain. For BRNZ, "meaningful" means assessing how well research findings could be rolled out in Māori communities, and the practical implications of that research for Māori, and Māori health outcomes. It also means finding better ways to engage with Māori communities.

In 2017, BRNZ continued to dedicate funding to Māori research, funding two new studies that directly address questions of particular relevance to Māori. These two new projects will start next year, adding to the three Māori research projects currently underway. In Otago, Dr Louise-Parr Brownlie (Ngāti Maniapoto me Ngāti Pikiao) will lead a team of four Māori researchers examining Māori perspectives on neurosurgery, and brain and spinal cord stimulation techniques used to treat neurological disorders. Louise and her team will be working with BRNZ's partner Māori communities – Hoani Waititi Marae in Tāmaki Makaurau and Puketeraki marae in Otepoti to explore if and when neurosurgery or neurostimulation is acceptable to Māori communities and to understand what adjuvant treatments are needed for Māori neurology patients to get and stay well. In Auckland, Associate Professor Nicola Kayes, has teamed up with Dr Hinemoa Elder (Te Aupouri, Ngati Kuri) to learn what matters most to Māori in the neurorehabilitation setting. Through this study Nicola and Hinemoa hope to work with Māori communities to develop a culturally appropriate measure of therapeutic relationship that will lead to improvements in culturally competent practice underpinned by principles of whānaungatanga.

Left: BRNZ's Maori Strategic Leader, Dr Hinemoa Elder

Mātauranga platform

2017 also saw BRNZ invest in a Mātauranga research platform, the first of its kind among CoREs, which will be led by Dr Hinemoa Elder and Associate Professor Nicola Kayes (AUT). By setting out a clear Mātauranga agenda BRNZ aims to ensure Māori communities have ongoing and comprehensive opportunities to communicate their Mātauranga with us and to engage on their own terms with our researchers. Our Mātauranga platform will also give our researchers the opportunity to improve their cultural competency and confidence and thereby improve the ways in which they can utilise Mātauranga in their research. This is crucial for strengthening the Māori workforce and wider workforce cultural competency within our group. In funding this platform, we hope to provide a roadmap that other CoREs can use in establishing their own approaches to responding to Māori needs and aspirations.

Left: Dr Louise Parr-Brownlie, University of Otago
Top: Associate Professor Nicola Kayes, Auckland University of Technology

Julie Wharewera-Mika:

A ‘whole whānau’ approach to living with neurodegenerative disease

In 2014, New Zealand lost one of its leading kaumātua, Eru Thompson. Eru played a pioneering role at the University of Auckland, advising on cultural considerations for the use of human tissue in teaching and research. In 2016, with his family’s blessing, BRNZ established the Eru Thompson Māori Postdoctoral Fellowship in his honour. Clinical psychologist Dr Julie Wharewera-Mika (Ngāti Awa, Ngāi Tuhoe, Te Whānau a Apanui) is the first recipient of the fellowship, which she describes it as “a huge honour, and one that comes with responsibility – to use this opportunity to make a difference.”

That need to contribute to improving the lives of others has been with Julie since she was young. She grew up in Whakatāne, amongst her whānau and hapū, which she says was “an incredibly nurturing environment, grounded in Te Ao Māori”, which provided her with a strong sense of identity. Julie moved to Auckland to attend university in 1996, but, she says, “When things get too busy, I return home. It’s where I feel grounded and enriched.”

Julie’s interest in wellbeing and her strong community connection led her to study Psychology and Māori Studies, and then Honours part-time, while working in mental health services. “I met my husband at that time too, and became hapū with our first child, so there was a lot to balance! I work best when my whānau is flourishing”” she says. Julie returned to the University of Auckland to do her clinical training, while continuing her work in mental health, and expanding her whānau with two more children. Her doctoral thesis looked at Māori experiences of inpatient mental health services, and it was there that Julie started thinking about the ageing brain.

“I interviewed Māori service users and their whānau, and found that we had the best recovery outcomes with a complementary approach – one that integrated western practice with culturally informed practises grounded in Te Ao Māori,” she explains. “And I wondered if that would also be true for neurodegenerative diseases.”

In her fellowship, Julie will take this idea further, exploring clinical practices and therapeutic pathways for Māori living with Huntington’s disease. It will involve engagement with other Māori clinicians and healers, along with whānau, in order to refine and pilot culturally-specific supports for these conditions. Julie says, “Our approach can be described as ‘collective healing’. We know that a single diagnosis of Huntington’s disease has an impact on the wellbeing of the entire whānau, so we believe that if we take a whole whānau approach – one that combines Māori healing kaupapa Māori approaches and Western therapies – we stand the best chance of enhancing wellbeing for all.”

Julie will work alongside Dr Melanie Cheung, an Associate Investigator of Brain Research New Zealand. “Mel was actually the person who first encouraged me to apply for the fellowship,” says Julie. “We did our doctoral studies at the same time, and grew up in the same rohe, so we’ve always followed each other’s work. Now we will have the opportunity to build on each other’s expertise.” Another key member of the research team is BRNZ Principal Investigator, Dr Margaret Dudley, a leading expert on dementia assessment and screening, and its impact on Māori communities. “It is a real privilege to have two remarkable researchers – both Māori women – to collaborate with,” says Julie. “We hope that our findings will not only benefit the Māori living with neurodegenerative diseases, but also contribute to a wider understanding of culturally-relevant interventions for these – and other – conditions.”

Anne-Marie Jackson:

Working with Māori communities to support flourishing health

University of Otago senior lecturer Dr Anne-Marie Jackson, recently joined BRNZ as an Associate Investigator. An expert in the area of Māori physical education and health, Anne-Marie brings with her years of experience of working with communities across New Zealand, to better understand how one's place is associated with mauri ora, or flourishing health.

A Southlander by birth, with whakapapa to Te Taitokerau (Northland), Anne-Marie comes from a sheep-shearing background, which she believes instilled the strong work ethic she carries with her today. "My parents always emphasised the importance of education to my younger sister and I, and perhaps more importantly, the value of doing things properly. I think they'd have been happy and proud no matter what field we went into, as long as we gave it our all!"

Working in science wasn't always a goal for Anne-Marie. She spent her formative years in Invercargill at boarding school, where she says she was "a bit of a blend, really. I did thoroughly enjoy science at high school, but I also loved languages, and I played a lot of sport." Those interests led Anne-Marie to undergraduate study in Physical Education at Otago, where she met Associate Professor Tania Cassidy. "Tania was a real mentor – she met me as this little 17-year old, but took me through my Honours, a Masters and part of my PhD". Anne-Marie majored in exercise sports science, with a focus on motor control. But she says that at the end of her degree, she found herself "looking for a way to challenge my own thinking, and I got that by shifting into the humanities." Anne-Marie's Masters explored education policy in New Zealand, and in her PhD, she focused on the importance of environmental health, especially for Māori communities.

Since then, Anne-Marie has established herself as an important voice in national conversations on Māori health research. To that end, she has worked closely with BRNZ's Māori Strategy Leader, Dr Hinemoa Elder, for two years. According to Anne-Marie, "Hinemoa has been instrumental in highlighting the importance of Māori knowledge to BRNZ. It's easy to be aspirational and not see it translate, but here, we're seeing aspirations turn into actions. Not only with me coming on as an Associate Investigator, but we have plans for several PhD students who will work with Māori communities."

Building a stronger, Māori-led workforce is a key priority for Anne-Marie, and she has shown herself to be an exceptional mentor for young Māori scholars. With her colleague Dr Hauiti Hakopa, she runs Te Koronga, a research group, which started five years ago with a single student. These days, they supervise 15-20 students, people Anne-Marie describes as being "very comfortable within their discipline knowledge, but also in their Māori knowledge."

"These things don't change by accident," she says "You have to be intentional in what you do. And that's why I'm so excited to be a part of BRNZ. We, as Māori, are overrepresented in many negative health stats, including in neurodegenerative conditions. By taking a grounded approach, and working with our communities, we can comfortably ask difficult questions. And ultimately, help people to build a healthier future in tune with their environment."

***Top:** A group of Dr Jackon's Maori research students*

8.

A CoRE without borders

In 2017, The Global Burden of Disease Study (GBD) published evidence to suggest neurological disorders pose one of the greatest threats to public health. By 2050 Alzheimer's disease (AD) alone is predicted to affect between one-third and one-half of people over 85 years worldwide, approximately 135 million. The increasing frequency of neurodegenerative disorders like stroke, Parkinson's disease (PD) and AD – currently without cure - poses one of the greatest global problems of our time, a problem that will take a global effort to solve.

Over the past twelve months, BRNZ has witnessed a significant increase in our international exposure and CoRE-funded international research collaborations, with more BRNZ-funded international collaborative research, increasing participation in global strategies around neurodegenerative diseases and, for the first time, collaborations between the CoRE, as an entity, and overseas institutions. In the pages that follow, we share experiences from select research collaborations to highlight principles that we have found key in building long-term relationships with collaborators and in meeting the aim to address scientific questions important not only to New Zealand but to strategic health initiatives across the globe.

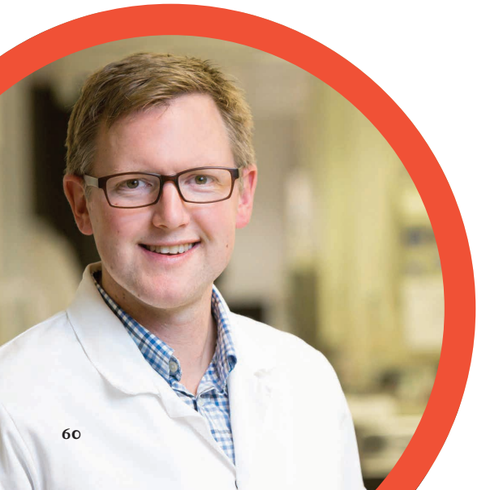
International collaborative research projects

Dr Joanna Williams from the University of Otago, along with Prof Cliff Abraham, received BRNZ funding for a project with Professor Ralph Martins at Macquarie University in Sydney. The Otago group have found that specific microRNAs, non-coding genetic material which regulates many different metabolic pathways in the brain, are changed in the blood of people with AD, as well as in a mouse model of the disease. This exciting finding may indicate a specific blood biomarker that could herald the onset of this disease. Teaming up with Professor Martins's group, which has a cohort of people who are cognitively normal or who are at an early stage of the disease, is an ideal opportunity to test the hypothesis that this molecular signature could be used to predict the development of AD before clinical symptoms appear. In this collaboration they will test whether these microRNAs are expressed early in the development of AD by accessing blood samples from this cohort of elderly individuals and who have had brain scans already to assess the presence of a disease-associated protein. This study will allow determination of miRNA biomarkers/predictors of future dementia.

In another exciting collaboration with peers across the Tasman, Professor Russell Snell at the University of Auckland has been funded for a collaboration with the South Australian Research and Development Institute (SARDI) to characterise a sheep model of AD. Through the Auckland and SARDI partnership the team has developed a transgenic sheep that has a mutation in a gene (Presenilin1 gene) that is implicated in human AD. They will use the funding to characterise the brains of this newly developed sheep model of AD, which can then be used in BRNZ-funded investigations for the discovery and testing of biomarkers, investigations of disease mechanisms, and for therapeutic testing. This is an exciting and novel development with enormous potential in investigations into AD.

Institutional partnerships and global strategies

A major focus has been on building collaborations with neuroscience institutions in China. This has involved reciprocal visits between Chinese and New Zealand neuroscientists and clinicians leading to the signing of a Memorandum of Understanding (MOU) between BRNZ and the Huashan Hospital of Fudan University in Shanghai, and between BRNZ and the Shanghai Mental Health Centre.

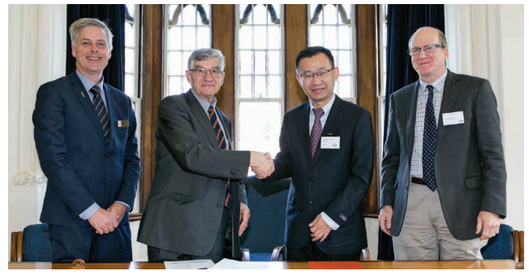


In May 2017, Brain Research New Zealand was part of a delegation supported by the New Zealand-China Research Collaboration Centre (CRCC) that visited Shanghai to explore the collaborative opportunities with Chinese scientists and institutions across a number of research areas including neuroscience. The BRNZ delegates, Professor Peter Thorne (UoA), Professor John Reynolds (UoO) and Associate Professor Maurice Curtis (UoA) visited the Chinese Academy of Science Key Laboratories Institute of Neuroscience (ION), the Brain Research Institute of Fudan University, the Neurology department of Ruijin and Huashan Hospitals. The discussions were high level and exploratory but rapidly identified a large number of synergies and areas where BRNZ scientists and clinician researchers could develop research collaborations, particularly with respect to establishing a Brain Bank and use of human tissue for research, neuroplasticity and neurodegenerative diseases, such as Parkinson's disease.

This visit led to a Chinese delegation visiting BRNZ members at the University of Auckland and University of Otago in October, during which a workplan was developed centred around the MoUs. This has led to the establishment of a Joint Research Laboratory at Huashan Hospital, with funding from the Chinese government to support joint initiatives over the next three years. We also mapped out specific visits in 2018 around the establishment of Brain Bank at the hospital, building on the expertise and experience from the NZ Neurological Foundation Brain Bank at the University of Auckland (Distinguished Professor Sir Richard Faull and Associate Professor Maurice Curtis), and a further visit to explore other areas of joint research interest. We are excited about the potential for this collaborative initiative, which has been built on genuine engagement and is an acknowledgment of the breadth, depth and international standing of research within the CoRE.

Professors Thorne, Reynolds and Abraham also attended a collaboration meeting in Beijing organised jointly by the Health Research Council and the National Science Foundation of China, and there was a reciprocal visit in Wellington in December to build a formal relationship between these two agencies to support China-New Zealand collaborative research initiatives.

On another front, BRNZ has been invited to send delegates to attend a meeting in October 2018 of the leaders of the world's major national and international brain initiatives. This meeting, to be held in Japan following the IEEE conference on Brain Machine Interfaces, will bring together representatives from other global Brain Initiatives (Japan, China, US, Israel, Korea, Australia, and Europe). The purpose of this meeting is to promote creation of an International Brain Initiative and to continue the engagement of all stakeholders to ensure the success of such an endeavour.



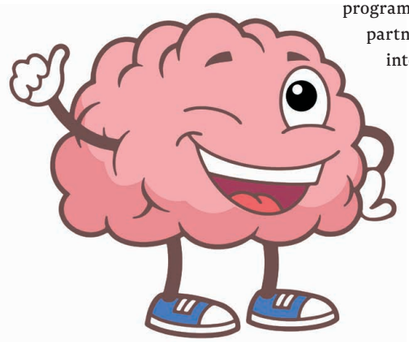
***Above:** Present at the signing of BRNZ's MoU with Huashan Hospital were (from left) Professor Richard Blaikie (Deputy Vice-Chancellor, University of Otago), Professor Jim Mann (Director, NZ-China NCD Research Collaboration Centre), Xiangjun Chen (Huashan Hospital, Fudan University), and Professor Cliff Abraham (Co-Director, Brain Research NZ, University of Otago).*
***Left:** Associate Professor Maurice Curtis*

The Australasian Neuroscience Society Presidency

The ANS is the major research neuroscience society representing scientists from Australia and New Zealand. We are delighted that our co-Director Professor Cliff Abraham has been elected as the President-elect for this Society, with the formal position of President to commence in 2019. This is a prestigious position that acknowledges his standing as researcher and leader in neuroscience. Professor Abraham will be the first New Zealand-based representative to be President of ANS and it represents an opportunity to foster stronger relationships between the neuroscience communities of Australia and New Zealand.

Being Brainy comes to Australia

We are delighted that the Australian Neuroscience Society is looking at picking up the Being Brainy educational programme for primary school children and introducing it in Australian schools in partnership with BRNZ. This innovative education programme, developed by Associate Professor Bronwen Connor at the University of Auckland, provides an engaging introduction to the brain for young children. Being Brainy has been incredibly popular with teachers, with nearly 130 New Zealand schools now registered to use it. From humble beginnings, it is fair to say that this innovative education programme is taking on a life of its own, complementing the Brain Bee programme for secondary schoolchildren. This partnership with ANS signals an educational international collaboration for BRNZ.



Global collaborations in 15 countries

1. AUSTRALIA
2. GERMANY
3. CANADA
4. CHINA
5. GREAT BRITAIN
6. UNITED STATES OF AMERICA
7. JAPAN
8. SPAIN
9. BELGIUM
10. SWITZERLAND
11. FRANCE
12. ITALY
13. ARGENTINA
14. NETHERLANDS
15. SLOVAKIA

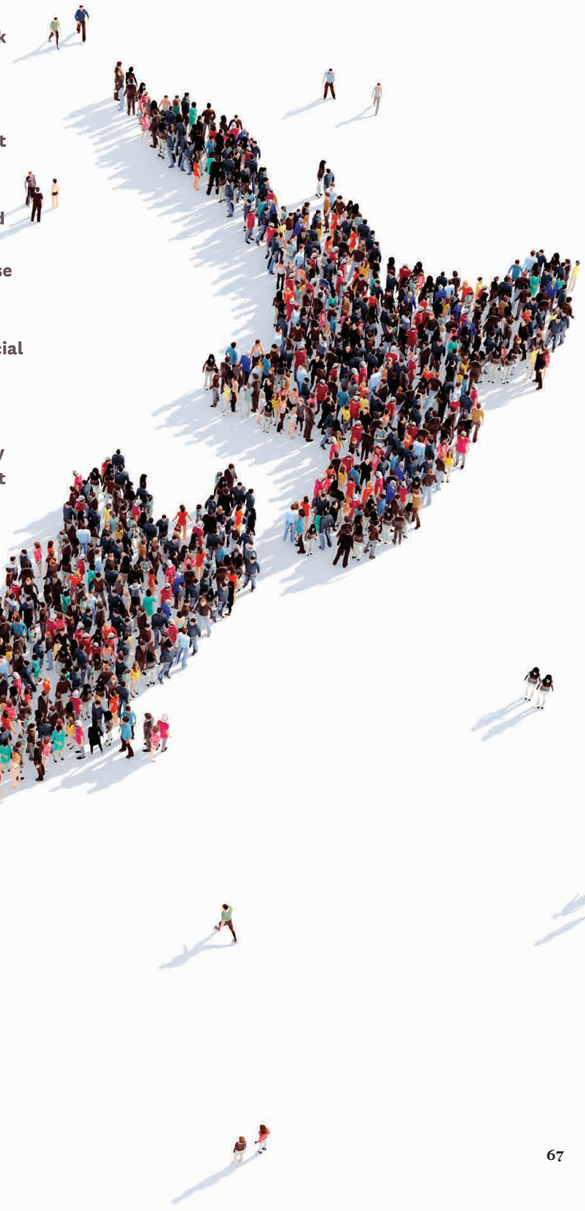
9.

National engagement

We want New Zealanders to enjoy lifelong brain health, and to achieve that goal, we need to demystify brain disease, translate research into benefits, and share with our stakeholders everything we know. BRNZ knows the importance of involving the community in the research we do, whether by contributing to Brain Week, leading dementia awareness campaigns, or developing new diagnostic tools with Māori.

There is probably no better manifestation of BRNZ's commitment to the community, than our national network of Dementia Prevention Research Clinics (DPRCs). Over the next few years, and across our clinics in Auckland, Christchurch and Dunedin, we will be examining both healthy adults and people with Mild Cognitive Impairment or early signs of Alzheimer's using a range of tests - from blood and DNA analyses to MRI brain scans and memory assessments. This large group of people will be monitored over time to see if they develop Alzheimer's disease. As the study progresses, BRNZ researchers will be able to use study data to look for biomarkers, or tell-tale signs that could signify early disease. They will also look at lifestyle factors such as diet, exercise, mental stimulation and social interactions, with the ultimate aim of identifying factors that influence the development of Alzheimer's disease.

Setting up a national network of research clinics certainly is not easy, nor is it without cost. To meet our recruitment targets, our clinic teams have engaged with DHBs, specialists, GPs and professional bodies the length of New Zealand to educate and recruit potential study volunteers. On the pages that follow, BRNZ's National DPRC Director, Associate Professor Lynette Tippett, fills us in on the past 12 months. ››



Associate Professor Lynette Tippett
National Director, Dementia Prevention Research Clinics

The DPRC network has had an exciting 2017. The Auckland DPRC moved into its first full year, and at a national level, 2017 saw the start of the Dunedin DPRC (launching formally in February 2018), and towards the end of the year, the start of the Christchurch DPRC. The recruitment of individuals with mild cognitive impairment (MCI) or the earliest stages of Alzheimer's disease (AD), is now being undertaken at a national level through our clinics and we are delighted that this presents opportunities for a wider range of New Zealanders to be part of the studies. We aim to study ~400 people over a period of years to determine which biomarkers, cognitive characteristics, and health and lifestyle factors influence, or delay the development and progression of AD. People who attend the clinics may also be invited to participate in a range of other studies that further our understanding of these conditions, as well as preliminary clinical trials, with the goal of identifying treatments and interventions that might prevent, delay or ameliorate AD and other related dementias.

The wonderful benefits of having multiple clinics across the country are accompanied by challenges to ensure consistent practices and processes across the sites, including clinical assessment, neuropsychological assessment, MRI scanning of the brain, and collection and pre-processing and storage of the blood samples that are part of the study. We are fortunate to having a dedicated team of clinicians and researchers who are working at this very important level of quality control for the clinics.

Staffing

The DPRCs now have a national network of highly skilled clinical staff, who met for an afternoon workshop at BRNZ's Annual research wananga on 1-2 September. There was an eager exchange of ideas and experiences that was much enjoyed and useful for all who attended.
We plan to ensure regular ongoing interactions.

In Auckland the clinic is organised by the clinical research nurse, Christine Brennan. She has been joined by Research Co-ordinator Jane Govender, who works as a research nurse in the Auckland clinic, but whose role also extends to managing research and clinical quality control. We are lucky to have neuropsychologist Dr Christina Ilse, and the part-time involvement of Dr Kiri Brickell, a neurologist with a special interest

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"The most important part of the DPRCs are the people who volunteer to be part of this research journey, a joint endeavour between these individuals, clinicians and researchers of BRNZ."

ASSOCIATE PROFESSOR LYNETTE TIPPETT

and expertise in dementia and Dr April Clugston, a consultant older age psychiatrist (from Counties Manukau District Health Board). April is currently on maternity leave and we have a locum older age psychiatrist, Dr Joanna Wang who has slotted smoothly into the team. Dr Andrew Smith, a neuroradiologist, reads the clinical MRI scans. Our Bloodbank Fellow, Dr Erin Cawston, has worked tirelessly to ensure our bloodbank processes, and those of the other DPRCs, are of the highest international calibre. Our multi-disciplinary clinical team also comprises myself, Dr Gary Cheung (Older age psychiatrist), and Dr Phil Wood (geriatrician and current Health of Older Persons Chief Advisor in the Ministry of Health), all of whom bring clinical and research expertise to the DPRC.

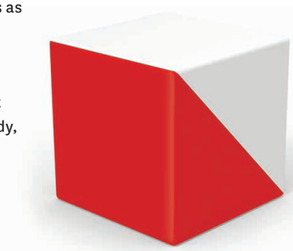
The Dunedin DPRC is led by neurologist Dr Cutfield, with a part-time research nurse, Debra McNamara, as well as a part-time neuropsychologist, Annabel Dawson and an experienced research technician Christina Edgar who pre-processes the bloods and works alongside Dr Joanna Williams.

Last but not least, the Christchurch DPRC has recruited staff and is beginning to see participants. Led by neurologist Professor Tim Anderson, and psychologist Professor John Dalrymple-Alford, the staff also includes part-time research nurse Marie Goulden and part-time neuropsychologist Karelia Levin. Dr Toni Pitcher has helped co-ordinate blood processing, with the help of Dr Erin Cawston, and these will be processed and stored by the Cancer Tissue Bank.

In addition to the clinical teams, we have been fortunate to have the input of the "Travelling Heads", who are a group of 5 people organised by MR physicists Dr Catherine Morgan and Dr Tracy Melzer, who at regular intervals have scans at all three MRI scanners. This enables them to monitor quality control, stability, and comparability of the MR images across the country.

GPs and specialists

The DPRCs rely also heavily on the support of GPs and specialists working in the DHBs and privately, who share information about our clinics with people affected by memory problems. Currently we are working with Medical Specialists and Memory Clinics in five DHBs (Waitemata, Auckland, Counties-Manukau, Canterbury and Southern DHBs), as well as private specialists and more than 50 GPs. We have a steady flow of enquiries from individuals about participating in the DPRC studies as a result. Across the three DPRCs 129 people have either begun, or completed, their first year of assessments. Of these, 105 meet all criteria to continue in the study, and the first year reassessments of 25 participants have been completed. We look forward to involving many more individuals with memory difficulties in 2018.



The People

The most important part of the DPRCs are the people who volunteer to be part of this research journey, a joint endeavour between these individuals, clinicians and researchers of BRNZ. We are grateful for the enthusiasm and willingness of the participants who will always be central to our research, who offer so much of themselves, and from whom we can learn so much.

On the 13th November, 2017, the Auckland DPRC held its first DPRC event for all participants and family members. It was an information and question-and-answer evening, focusing upon up-to-date information regarding factors that reduce the risk of dementia, and the current status of medications for dementia, as well as very important time for socialisation. We have gathered feedback on the evening and plan to hold such events on a regular basis.

***Below:** Dunedin Dementia Prevention Research Clinic participant Mr Bill Thompson and his sister Jill.*

The New Zealand Dementia Prevention Trust

TEN MILLION DOLLARS. Reaching the fundraising goal of the New Zealand Dementia Prevention Trust might seem a formidable challenge, but to founding benefactor and Chair of the Trust Sir Eion Edgar, it's all in a day's work. A seasoned philanthropist, Sir Eion is familiar with fundraising for a good cause. Named Senior New Zealander of the Year in 2010, he has been the driving force behind many successful New Zealand organisations, including the Sports Foundation, the Sir Peter Blake Trust, the New Zealand Olympic Committee, the Arts Foundation, the Edgar Diabetes and Obesity Research Centre and, most recently, the New Zealand Dementia Prevention Trust. And while he swears that the old maxim "the harder you work the luckier you get" is true, it's BRNZ and our nation's ageing population who are truly the lucky ones in the equation.

According to latest estimates, dementia affects over 60,000 New Zealanders today, and this figure is predicted to triple in the next 30 years. Year after year, the costs of dementia—both economic and social—continue to climb. In 2016, dementia cost New Zealand $1.7 billion, and by 2030 this could be more than $2.7 billion. Yet despite the prevalence and costs of dementia, dementia research in New Zealand is significantly underfunded, making philanthropic funding vital to support the research we do.

In 2015, Sir Eion set up the Trust to support the operation of BRNZ's network of Dementia Prevention Research Clinics, inviting fellow Trustees Mr David Mace, Sir Don McKinnon, Lady Barbara Stewart, Sir Ralph Norris and Mr Bill Moran to join the fundraising effort. Two years in, the Trust has received more than $3.2million in gifts and pledges – nearly a third of the way to reaching its target. And while it may be easy to tally the value of pledges received, for BRNZ the true value of the Trust's support is incalculable. The Trustees - Sir Eion, Mr David Mace, Sir Don McKinnon, Lady Barbara Stewart, Sir Ralph Norris and Mr Bill Moran - are all nationally acclaimed New Zealanders, renowned for their excellence in business and politics and for their unwavering commitment to doing good. By giving their time to bolster BRNZ's dementia research, they are not only helping to attract donations and attention to the cause, but directly supporting BRNZ in our efforts to improve the diagnosis, treatment and prevention of dementia, and one day, to find a cure.

Sir Eion Edgar, Chair of the New Zealand Dementia Prevention Trust

In 2017, over $800,000 in donations from the NZDPT helped us purchase vital research equipment and employ outstanding research staff including neuropsychologists, research nurses, and blood technicians who will work with study volunteers on a daily basis to carry out detailed diagnostic evaluations. BRNZ is immensely grateful to have the support of the New Zealand Dementia Prevention Trust and all those who have generously committed their own money to support our cause. With the Trust's support, we can increase the scale and scope of our research, extend our impact, and ultimately help ageing New Zealanders enjoy a life lived to the full.

Combating dementia across New Zealand

Community partnerships are at the heart of our efforts to improve the brain health of New Zealanders, so we were thrilled this year to team up with Alzheimer's New Zealand to deliver a national dementia awareness campaign. ANZ is New Zealand's leading dementia support organisation. Each year, it supports tens of thousands of New Zealanders affected by dementia through advocacy, raising awareness, and the promotion of research about prevention, treatment, and care of people with Alzheimer's disease. From September to November 2017, Brain Research New Zealand and ANZ joined forces to deliver a dementia talk series, reaching over 2000 people across New Zealand. We were welcome in 22 retirement homes from Whangarei to Invercargill, to talk about dementia and how our research is helping to fight the condition - fielding scores of questions in the process. What is the difference between healthy and unhealthy ageing? When is dementia likely to strike? What can I do to keep it at bay? Through partnering with ANZ, we hope to help New Zealanders improve their own brain health, and improve access to and uptake of treatments currently available.

Brain Awareness Week

The mainstay of BRNZ's community outreach programme is Brain Awareness Week (BAW), a global campaign to increase public awareness of the progress and benefits of brain research. A Neurological Foundation of New Zealand (NFNZ) initiative for the past twelve years, BRNZ has been proud to do our part to support and extend the NFNZ's Brain Week events since we were established. In 2017, BRNZ was again proud to support BAW events in Auckland and Otago, reaching thousands of Kiwis keen to learn about the brain. In Auckland, Professor Janusz Lipski contributed to a panel discussion about advances in research for patients with movement disorders.

BRNZ PhD student Kristina Zawaly led the public through an energetic display of the Ronnie Gardner Method, a type of dance that incorporates: music, rhythm, colour recognition, and memory. In Dunedin, BRNZ PIs again teamed up with the Brain Health Research Centre and the Otago Museum to run a full week of educational activities, including a fascinating talk by Dr Andrew Clarkson about reprogramming the brain following stroke.

Increasing awareness of dementia and supporting skills in dementia care

A recent Alzheimer's NZ report estimated that there were over 62,000 people living with dementia in New Zealand and that by 2050, that number would increase threefold. Despite the drive for better dementia care across New Zealand, education and training for healthcare professionals has been largely inconsistent.

In one of BRNZ's most targeted education initiatives so far, Prof Ngaire Kerse has partnered with the National Dementia Cooperative, Alzheimer's NZ, Alzheimer's Auckland and the Northern Region DHBs Cognitive Impairment Pathway to increase awareness of dementia and dementia care, and to standardise dementia resources and tools across New Zealand. Over the past twelve months, Ngaire's team has been developing a comprehensive suite of dementia education resources for New Zealanders affected by dementia, including caregivers and healthcare professionals.

On October 4th 2017, Ngaire and her team launched the resources, including resources specifically for Māori and Pacific peoples, at a Dementia Educator Forum in Auckland, making them available to workers in the health sector, including DHBs, hospices and palliative care, residential care, and community support, via the NZ Dementia Cooperative's online portal.

Ngaire's aim in hosting the forum, attended by 35 dementia educators from all over the North Island, was to stimulate open cross-sector discussion about how dementia education is working in New Zealand, and what we could do to improve it. Throughout the course of the day, participants covered a range of topics, from the pressure points within each sector to the tools/experience/knowledge/resources needed to help dementia educators do the best job they can. The forum concluded with the group agreeing on set of recommendations for change, to be presented to the DHBs and the Ministry of Health in coming months.

"*The inbetweeners*" - living well with Mild Cognitive Impairment

Many New Zealanders over the age of 65 will experience some changes to their memory and thinking as they get older. To a certain extent this is all a normal part of ageing. When those changes go beyond what you would normally expect for people of that age, they enter a kind of grey-zone between 'normal' age-related decline and 'dementia', a grey-zone that we call 'mild cognitive impairment' (MCI). Some people with MCI will go on to develop dementia, but this isn't true for everyone. In fact, research suggests that one in five people diagnosed with MCI will return to normal cognitive functioning within a few years. Many others will remain stable for several years or more without progressing to dementia. It is thus an ambiguous diagnosis, since it can be temporary, permanent, or transitional for any individual.

In 2015, BRNZ funded a two year study into the ways that people with MCI live with and respond to changes in their memory and thinking. Two years on, and after interviewing many New Zealanders living with the condition, lead investigator Associate Professor Nicola Kayes and her team have found some interesting results.

There were a number of challenges, priorities, and barriers to care which were concerning for individuals with MCI and their families. Nicola discovered one concern which overshadowed most others: profound uncertainty. The diagnosis of MCI left people unsure about what to expect for the future. Would they get better? Would they continue to get worse? What part of their experience was normal ageing, and what was the diagnosable problem? Caught in a kind of cognitive 'no man's land', people can find it tremendously difficult to navigate life with MCI.

Their resilience in the face of that uncertainty has been remarkable. Despite very limited external support, people with MCI and their families have shown themselves to be tremendously adaptable, developing home-grown strategies for dealing with the day-to-day challenges of MCI. In order to help share those strategies with the broader MCI community, Nicola has been working with people with MCI, and their families, to develop a new interactive website. The website, to be launched by BRNZ in 2018, will provide a space for people experiencing changes to their memory and thinking to share their stories, tips and tricks with one another.

Cognitive Stimulation Therapy

Above: BRNZ clinician, Dr Gary Cheung (University of Auckland).

In 2013, the Ministry of Health published the Dementia Care Framework to provide guidance for DHBs to plan their dementia services and develop care pathways for a better coordination of dementia services within each DHB. In that framework, Cognitive Stimulation Therapy (CST) was one of two specific treatments recommended as good practice for dementia. CST is a structured and manualised group treatment specifically developed for people with mild to moderate dementia. It has been shown to improve cognition, quality of life and communication; and costs relatively the same to deliver as anti-dementia medication.

Over the past two years, BRNZ clinician Dr Gary Cheung and colleague Dr Kathy Peri ran a series of one-day training workshops for healthcare professionals in Auckland, Wellington and Christchurch, to enable them to deliver CST in the community. To date, Gary and Kathy have trained 150 health professionals including nurses, occupational therapists, speech language therapists and psychologists to provide CST. They have also trained over 50 non-regulated workers such as Dementia Auckland volunteers, diversional therapists and caregivers. Gary and Kathy's workshops have been a significant success, with large numbers of people with dementia in New Zealand now benefiting from CST. The impact on the lives of people who undertake such programmes is considerable, with many reportedly becoming more expressive, alert, and able to remember things they once could not. But it's not just individuals with dementia who stand to benefit. Recent research suggests that CST can have a positive effect on the caregiving relationship and well-being of care-givers too. With so much potential for this therapy, BRNZ has recently funded Gary to take CST to the regional and rural areas of New Zealand next year, sharing the benefits even further.

Valuing our unsung heroes

Every day, increasing numbers of New Zealanders are called upon to care for a parent, grandparent, spouse, or friend living with cognitive decline. Caregivers are, of course, generally unpaid, but informal care is far from free. Quite aside from the economic costs – estimated by Deloitte to be $68.6 million in 2016 – caregivers also experience high levels of mental and physical ill-health, financial stress and social isolation; factors that likely diminish their ability to care for those they support. In the paid sector, the current workforce is ageing and there is a predicted decline in the number of middle-aged female support workers in these roles. Recruiting and retaining support workers is thus an ongoing challenge, and this will only rise as the demand for care increases.

People with cognitive decline rely heavily on the people that support them. Without carers, people with dementia would need institutional care more quickly, and experience a poorer quality of life, and reduced access to services and interventions. Despite this, we know relatively little about caregivers' needs and what makes their role harder or easier. To fill this gap, Professor Leigh Hale and Associate Professor Nicola Kayes have spent the past 24 months interviewing over 40 paid and unpaid caregivers, to find out what skills and attributes they draw on in their caregiving roles, and the enablers and barriers to providing quality care. As the project draws to a close, Leigh's team hopes the information they have gained will help researchers to better understand the common skills and attributes of carers and how these skills might be enhanced or expanded to support them better. They also hope to identify measures that will help others to design interventions aimed at reducing cognitive decline – interventions that can be realistically implemented or supported by those who provide care for individuals with dementia.

PREP2:

A biomarker-based algorithm helping clinician predict recovery after stroke

Stroke affects around 8,000 New Zealanders every year with many left dependent on others for simple daily activities, such as walking, washing, dressing, and feeding. Weakness is common after stroke and prevents many people from returning to normal life. Recovery is essential for regaining independence and accurately predicting recovery is important for planning rehabilitation. However, recovery after stroke is highly variable, and it is difficult for doctors and therapists to predict how quickly and to what extent someone is likely to recover.

BRNZ PI Associate Professor Cathy Stinear has led the development of a novel algorithm to predict recovery of hand and arm function after stroke. The algorithm combines clinical assessment and a biomarker of a key brain pathway that controls movement. This algorithm is called PREP2, and it allows therapists to tailor rehabilitation for individual patients. Dr Stinear's research has shown that using PREP2 information in clinical practice improves rehabilitation efficiency and helps patients leave hospital a week earlier. The algorithm is now in routine clinical practice at Auckland District Health Board, and the team are supporting its implementation at four other DHBs, with more expected to follow. This research has been published in Brain, Stroke and Annals of Clinical and Translational Neurology. Dr Stinear has also published two invited reviews on the use of biomarkers in predicting motor recovery after stroke for Lancet Neurology. This research was funded by the Health Research Council of New Zealand, the Neurological Foundation of New Zealand, and the Julius Brendel Trust.

10.

Outreach

Scientific knowledge in its pure form is a classic public good, but the value is only realised when that knowledge is shared. As a Centre of Research Excellence committed to improving the brain health of New Zealanders, BRNZ takes public outreach seriously. Each year, our researchers and students continually work to share their knowledge not just with the scientific community through publications, conference presentations and symposia, but also with the media, community groups, healthcare professionals, and schools the length of New Zealand. To date, BRNZ has demonstrated its direct contribution to the economy through hundreds of research outputs, numerous patent applications, millions of dollars in external funding, and the direct involvement of dozens of researchers, clinicians, and students in the community, sharing what they know with the public.

IN THE MEDIA

For BRNZ, the media is undoubtedly one of the most effective channels through which our researchers communicate their work. Be it to policymakers, businesses, not-for-profits or the general public, appearances in the media help us capture people's attention, and stimulate and contribute to public debate. In 2017 our researchers appeared in national print media on average more than twice a week. Internationally, well over five hundred articles featured our researchers or their work, potentially reaching tens of millions of people and appearing in papers and online outlets in China, Turkey, the USA, the United Kingdom, Russia and India to name a few. Examples include:

- Professor Donna Rose Addis featured numerous times in the media in 2017, most notably in a New York Times article titled "We aren't built to live in the moment" (19 May 2017) and with BRNZ Postdoctoral Fellow Dr Reece Roberts in a Radio Live Afternoon Talk titled "Why do We Lose Things".

- Distinguished Professor Sir Richard Faull featured in the media numerous times, with a string of TV and radio interviews by popular TV personalities such as Kim Hill, Mark Sainsbury, Jim Mora and Hillary Barry. He also featured in the NZ Listener (28 January – 3 February) in an article by Clare De Lore about Professor Anne Young, Chair of the CBR Scientific Advisory Board, a longtime collaborator of Sir Richard's on Huntington's disease.

- In August, Associate Professor Lynette Tippett was the focus of an article on stuff.co.nz, highlighting the need for home-grown research into the prevalence of dementia in New Zealand, following a public debate about dementia at Parliament.

- Dr Toni Pitcher appeared on TV One News and Radio New to talk about the predicted increase in the prevalence of Parkinson's in New Zealand

- Dr Moana Theodore was interviewed by Donna Chisholm of North & South Magazine, for a feature article in February 2017 called "What's Your Real Age? World-famous Dunedin Study Unlocks the Secrets of Successful Ageing".

- Dr Louise Parr-Brownlie featured in the Otago Daily Times (ODT) in March, in an article highlighting her $1.2million HRC award for research into a brain implant that could treat Parkinson's disease. Louise appeared in the ODT again in September for work on chronic pain.

- In May, Dr Andrea Kwakowsky participated in Jim Mora's highly-popular Radio New Zealand programme "The Panel", where the panel discussed issues related to ageing, sex hormones and hair growth.

- Neurological Foundation Professor of Clinical Neurology, Alan Barber, appeared on TVNZ One News, TV3 Newshub, Newstalk ZB, and Radio 531 P.I (Pacific Breakfast Show) to talk about clot retrieval, the remarkable new technique that is revolutionising stroke treatment.

- In December, Professor Russell Snell featured heavily in the national and international news for his groundbreaking research into Huntington's disease, identifying the first signs of when Huntington's disease affects a brain.

INVITED LECTURES

In 2017 BRNZ members were invited to give lectures to a range or educational and professional organisations in New Zealand and around the world. Here are just a few examples of BRNZ researchers at work:

- Professor Donna Rose Addis was invited to give ten lectures in 2017 in New Zealand, America and Canada, including a very well-attended public lecture at the Dunedin Public Art Gallery titled "The Imaginative Brain".

- Distinguished Professor Margaret Brimble was invited to give a public lecture at Macquarie University titled "The Nature of Chemistry - Saving Lives and Creating Jobs "in August 2017.

- Associate Professor Cathy Stinear gave seven invited research presentations on PREP2, a biomarker-base algorithm that helps to predict motor recovery after stroke, featuring at scientific meetings in Baltimore, Calgary, Chicago, Hong Kong and Australia.

- In March, Associate Professor Nicola Kayes was invited to speak to the NZ Society of Physiotherapy Synapse Meeting about person-centred practice, and what it looks like in Neurorehabilitation. Nicola gave a public lecture at the University of Brighton in September on "Embedding person-centredness: Building trust, connectivity and capability in rehabilitation"

- Dr Margaret Dudley was invited to speak at the 10th Health Services and Policy Research Conference in Queensland in November, and was also the Keynote speaker at the Royal Australian and New Zealand College of Psychiatrists' Faculty of Psychiatry of Old Age Conference in Queenstown in 2017.

- Neurological Foundation Chair in Neurosurgery, Professor Dirk De Ridder was invited to give over twenty public and keynote lectures in 2017, including "Tinnitus: the neurosurgeon's perspective: invasive neuromodulation (DBS, VNS, epidural Stimulation)" in 100 years of Otorhinolaryngology at University of Zurich, in August,

- In July, Professor Richie Poulton gave a keynote presentation at the Cook Islands Health Conference on "How combining datasets can provide insights for policy-making" Cook Islands Health Conference.

WORKING WITH SCHOOLS

As mentioned earlier in this report, BRNZ researchers continued their partnership with the Australasian Neuroscience Society and the Queensland Brain Institute, to organise the national secondary schools' Brain Bee Challenge (www.abbc.edu.au/abbc/index.html). In the North Island, 169 students from 27 schools competed in the Round 2 final. In the South Island, 264 students competed in the first round of the competition, with 100 taking a place in the round 2 final, held at the University of Otago. The South Island students came from 18 schools from Nelson and Motueka, to Dunedin and Roxburgh in Central Otago and Buller High School on the West Coast. In other activities aimed at educating teachers and inspiring future generations of scientists and clinicians, Dr Tracy Melzer led field trips for high school physics students from Rangi Ruru Girls School, Riccarton High School, and Papanui High School, where secondary school students visited the New Zealand Brain Institute and Pacific Radiology and learned about brain imaging research including how the MRI scanner works and the scanning environment. And then of course there's Being Brainy - BRNZ's Brain Education Programme for primary and intermediate school students, developed by Associate Professor Bronwen Connor from the University of Auckland. In 2017 BRNZ was thrilled to officially launch the Being Brainy website and resources and offer the programme to schools across New Zealand, with 128 schools nationwide now registered to use the 8-week lesson pack.

AWARDS AND ACCOLADES

- Professor Richie Poulton (Department of Psychology lecturer, and Dunedin Multidisciplinary Health and Development Study director at the University of Otago) became a Companion of the New Zealand order of Merit (CNZM) for his services to science and health research. Best known for his role as director of "The Dunedin Study" Prof Poulton has also served on many government, public and academic statutory bodies, and as a consultant internationally.

- In July 2017, Fulbright Scholarship recipient Professor Ruth Empson, travelled to the United States to work with Professor Jennifer Raymond, a world leader in cerebellar learning at the Department of Neurobiology at Stanford University. Prof Empson was part of a team investigating how brain activity controls movement. Professor Empson says the collaboration, which also involves colleagues at Imperial College London, has the potential to change the way scientists think about how the brain controls movement. "In the future our results could also have far reaching implications for improving movement control and rehabilitation strategies in a variety of neurological disorder.

- In recognition of his outstanding contribution to research, Professor Peter Thorne was recently awarded the 2017 Gluckman Medal by the Faculty of Medical and Health Science at the University of Auckland.

- In 2017, Dr Hinemoa Elder was awarded Fairfax and Westpac's Women of Influence Award for Innovation and Science. The distinguished award is one of just ten across the country and recognises Hinemoa's success in driving innovations in science, particularly in her work with Māori communities.

- In October 2017, the Australasian Neuroscience Society's Council announced BRNZ Co-Director, Professor Cliff Abraham, as the next President-Elect of ANS. Cliff will assume his role as President of ANS in 2019, one in a long string of leadership appointments that recognise his significant research expertise, and outstanding ability as a strong and unifying force in the field of neuroscience.

SERVICE

Brain Research New Zealand's researchers are dedicated members of the local and international science community and hold leadership and research advisory positions in many professional bodies, Non-Government Organisations and New Zealand-based charities. In 2017 our researchers continued to dedicate their time and considerable expertise to the following national and international entities:

National

- Age Concern Otago
- Alzheimer's Foundation (Auckland)
- Alzheimer's Otago
- Alzheimer's Auckland Charitable Trust
- Alzheimer's New Zealand Charitable Trust
- Community Care Trust Otago
- Deafness Research Foundation
- Huntington's Disease Association (Auckland)
- Health Research Council, Biomedical Research Committee
- High Performance Sport New Zealand
- Motor Neurone Disease Association of New Zealand (Inc.)
- Ministry of Health National Stroke Network Leadership Group
- Multiple Sclerosis Otago
- National Foundation for the Deaf
- Neurological Foundation of New Zealand
- Neuromuscular Research Foundation Trust
- Neurology Association of New Zealand
- New Zealand Rehabilitation Association
- Parkinson's Association Otago
- Stroke Foundation Otago
- Stroke Foundation of New Zealand

International

- Alzheimer's Disease International medical and scientific Advisory Panel
- American Academy of Neurology
- Australasian Neuroscience Society
- Australian and New Zealand Association of Neurologists
- European Federation of Neurological Societie
- Human Frontiers Science Programme Organisation
- International Society of Vestibular Physiologists
- Society for Neuroscience (North America)
- American Tinnitus Association
- National Stroke Foundation of Australia
- Stroke Society of Australasia
- Neurosurgical Society of Australasia
- UK Stroke Association
- World Federation for Neurorehabilitation
- World Stroke Organization
- World Health Organisation Global Burden of Disease (GBD) 2013 TBI Panel
- World Health Organisation - Integrated Care for Older People

EDITORIAL BOARDS

BRNZ researchers serve on numerous journal editorial boards. Some examples include:

Professor Ngaire Kerse
- Australasian Journal on Ageing
- BMC Family Medicine

Professor Valery Feigin
- Neuroepidemiology (Editor-in-Chief)

Dr Grant Searchfield
- Scientific Reports
- International Journal of Audiology
- Journal American Academy of Audiology

Neurological Foundation of New Zealand Professor of Clinical Neurology Alan Barber
- Neuroepidemiology
- Journal of Clinical Neuroscience

Professor Suzanne Barker-Collo
- Neuroepidemiology

Dr Yiwen Zheng
- Frontiers of Neuro-Otology

Professor Paul Smith
- Frontiers of Neuro-Otology

Professor Cliff Abraham
- Brain and Neurosciences Advances
- Hippocampus
- Neurobiology of Learning and Memory
- Experimental Brain Research

Dr Rita Krishnamurthi
- World Journal of Clinical Cases, Annals of Neurology and European Medical Journal – Neurology

Associate Professor Srdjan Vlajkovic
- Journal of Neurology and Therapeutics

Associate Professor Johanna Montgomery
- American Journal of Physiology
- Scientific Reports – Nature

Neurological Foundation Chair in Neurosurgery, Professor Dirk De Ridder
- Thalamus and Related Systems
- Neuromodulation
- Neuroscience and Biobehavioural Reviews
- The Open Neurosurgery Journal
- The Open Translational Medicine Journal
- Journal of Speech, Language and Hearing Research

11.

The engine room

GOVERNANCE BOARD

BRNZ is privileged to have the support of prominent New Zealanders and academic leaders who are committed to helping us achieve our goals. In 2017, BRNZ welcomed Professor Richard Barker to the board, following his appointment to the role of Pro-Vice-Chancellor (Sciences), at the University of Otago.

Our Governance Board members in 2017:

SIR DON MCKINNON

Chair of Brain Research New Zealand.

MRS WENDY FLEMING

Chair of Alzheimer's New Zealand Charitable Trust, Honorary Vice-President of Alzheimer's Disease International and Past-Chair Alzheimer's New Zealand.

MR TONY OFFEN

Dunedin accountant, entrepreneur and member of the Council of the Neurological Foundation of NZ.

THE VENERABLE LLOYD NAU PŌPATA

Archdeacon of Tāmaki Makaurau, Pou Tikanga - of Ngāti Kahu of Northland.

PROFESSOR RICHARD BLAIKIE

Deputy Vice Chancellor (Research and Enterprise) at the University of Otago and Professor in Physics.

PROFESSOR MAX ABBOTT

Pro Vice Chancellor and Dean of the Faculty of Health and Environmental Sciences at AUT, and the Director of the National Institute for Public Health and Mental Health Research.

PROFESSOR JOHN FRASER

Dean of the Faculty of Medical and Health Sciences at the University of Auckland.

PROFESSOR JIM METSON

Deputy-Vice-Chancellor (Research) at the University of Auckland.

PROFESSOR RICHARD BARKER

Pro-Vice-Chancellor (Sciences) at the University of Otago.

PROFESSOR IAN WRIGHT

Deputy-Vice-Chancellor at the University of Canterbury.

SCIENCE ADVISORY BOARD

BRNZ's Science Advisory Board is made up of five internationally recognised experts in the neurosciences and neurology. The Board is chaired by Professor Stephen Davis (*right*), Professor of Medicine at the University of Melbourne, and President of the Australian and New Zealand Association of Neurologists.

Joining Professor Davis on the Scientific Advisory Board are:

PROFESSOR JOHN ROSTAS

(Emeritus Professor, Faculty of Health and Medicine, University of Newcastle, past-President of the Australasian Neuroscience Society).

PROFESSOR MARK BEAR

(Professor of Neuroscience of the Picower Institute for Learning and Memory, Massachusetts Institute of Technology, and Howard Hughes Medical Institute).

PROFESSOR JOHN ROTHWELL

Institute of Neurology, University College London.

PROFESSOR A. DAVID SMITH

(Emeritus Professor, University of Oxford, Founding Director of Oxford Project to Investigate Memory and Ageing).

DIRECTORATE

DISTINGUISHED PROFESSOR SIR RICHARD FAULL

- Co-Director
- MBChB, PhD, DSc; KNZM FRSNZ
- Neurodegenerative diseases of the human brain

PROFESSOR WICKLIFFE ABRAHAM

- Co-Director
- BA with highest distinction, PhD; FRSNZ
- Synaptic plasticity, metaplasticity and the neural mechanisms of memory and Alzheimer's disease

PROFESSOR PETER THORNE

- Strategic development
- BSc, DipSci, PhD; CNZM
- Diseases of the inner ear and the effects of noise and consequences of ageing on the auditory system

PROFESSOR JOHN REYNOLDS

- Leadership development and capability building
- MBChB, PhD
- The role of neuromodulation and synaptic plasticity mechanisms in brain areas affected by Parkinson's disease and stroke

PROFESSOR ALAN BARBER

Neurological Foundation of New Zealand Chair of Clinical Neurology

- Clinical engagement
- MBChB, FRACP. PhD
- Neurology with special interest in stroke

ASSOCIATE PROFESSOR LYNETTE TIPPETT

- Dementia Prevention Research Clinics
- MSc (1st), DipClinPsych, PhD
- The clinical and neuropsychological effects of neurological disorders

DR HINEMOA ELDER

- Māori engagement and strategic development
- MBChB, FRANZCP, PhD
- Psychiatrist with a special interest in working with Māori whānau with traumatic brain injury

MĀORI ADVISORY BOARD

BRNZ is privileged to be able to call on the expertise of our Māori Advisory Board to provide guidance on the funding of neuroscience research that will have a positive impact on Māori health outcomes.

DR WAIORA PORT

BA, MA, PhD *(Te Aupouri [Ngāti Pinaki], Te Rarawa [Ngāti Maroki])*, a respected Kuia with long-standing community knowledge of Māori health issues.

PROFESSOR PAPAARANGI REID

DipComH, BSc, MBChB, DipObst, FNZCPHM *(Te Rarawa)*, Tumuaki and Head of Department of Māori Health at the Faculty of Medical and Health Sciences, University of Auckland.

TE KAANGA SKIPPER

(Tainui), Te Roopu Taurima o Manukau within the Kaupapa Māori Disability Support Service (Korowai Aroha)

DR EMMA WYETH

BSc (Hons) PhD. Director of Te Rōpū Rangahau Hauora Māori o Ngāi Tahu (Ngāi Tahu Māori Health Research Unit) and a Lecturer in Māori Health, both in the Department of Preventive and Social Medicine at the University of Otago.

PROFESSOR MICHAEL WALKER

(Te Whakatōhea) BSc, MSc, PhD, Fellow of the Royal Society of New Zealand and the Royal Institute of Navigation in London.

DR LOUISE PARR-BROWNLIE

BSc, PhD, *(Ngāti Maniapoto and Ngāti Pikiao)*, neurophysiologist and Kaiārahi at the Otago School of Medical Sciences, University of Otago.

RESEARCHERS

In 2017 BRNZ were delighted to welcome nine new researchers into the fold including Dr Monica Acosta (University of Auckland, PI), Dr Sarah Cullum (University of Auckland, PI), Associate Professor Phil Sheard (University of Otago, AI), Professor Denise Taylor (Auckland University of Technology, PI), Dr Ailsa McGregor (University of Otago, AI), Dr Andrea Kwakowsky (University of Auckland, AI), Dr Erin Cawston, (University of Auckland, AI), Dr Toni Pitcher (University of Otago, AI) and Dr Simon O'Carroll (University of Auckland, AI).

Associate Professor Srdjan Vlakjovic and Dr Gary Cheung, both from the University of Auckland, were also promoted to Principal Investigators, in recognition of their significant expertise and contribution to BRNZ's research programme. BRNZ is extremely proud to have such an outstanding level of expertise across a wide range of scientific fields within our research centre.

NAME	POSITION TITLE	INSTITUTION	BRNZ STATUS
Richard Faull	Distinguished Professor	University of Auckland	Co-Director, PI
Wickliffe Abraham	Professor	University of Otago	Co-Director, PI
Alan Barber	Professor	University of Auckland	Directorate member, PI
Peter Thorne	Professor	University of Auckland	Directorate member, PI
Lynette Tippett	Associate Professor	University of Auckland	Directorate member, DPRC Leader, PI
John Reynolds	Professor	University of Otago	Directorate member, PI
Brian Hyland	Professor	University of Otago	Theme Leader and PI
Tim Anderson	Professor	University of Otago	Theme Leader and PI
Ngaire Kerse	Professor	University of Auckland	Theme Leader and PI
Monica Acosta	Dr	University of Auckland	Principal Investigator
Donna Rose Addis	Professor	University of Auckland	Principal Investigator
Nigel Birch	Associate Professor	University of Auckland	Principal Investigator
Margaret Brimble	Distinguished Professor	University of Auckland	Principal Investigator
Winston Byblow	Professor	University of Auckland	Principal Investigator
Bronwen Connor	Associate Professor	University of Auckland	Principal Investigator
Garth Cooper	Professor	University of Auckland	Principal Investigator
Sarah Cullum	Dr	University of Auckland	Principal Investigator
Maurice Curtis	Associate Professor	University of Auckland	Principal Investigator
Mike Dragunow	Professor	University of Auckland	Principal Investigator
Margaret Dudley	Dr	University of Auckland	Principal Investigator
Jian Guan	Associate Professor	University of Auckland	Principal Investigator
Ian Kirk	Professor	University of Auckland	Principal Investigator
Janusz Lipski	Professor	University of Auckland	Principal Investigator
Johanna Montgomery	Associate Professor	University of Auckland	Principal Investigator

NAME	POSITION TITLE	INSTITUTION	BRNZ STATUS
Suzanne Purdy	Professor	University of Auckland	Principal Investigator
Grant Searchfield	Associate Professor	University of Auckland	Principal Investigator
Russell Snell	Professor	University of Auckland	Principal Investigator
Cathy Stinear	Associate Professor	University of Auckland	Principal Investigator
Srdjan Vlajkovic	Associate Professor	University of Auckland	Principal Investigator
Debbie Young	Associate Professor	University of Auckland	Principal Investigator
Valery Feigin	Professor	Auckland University of Technology	Principal Investigator
Nicola Kayes	Associate Professor	Auckland University of Technology	Principal Investigator
Denise Taylor	Professor	Auckland University of Technology	Principal Investigator
Andrew Clarkson	Dr	University of Otago	Principal Investigator
Nick Cutfield	Dr	University of Otago	Principal Investigator
Dirk De Ridder	Professor	University of Otago	Principal Investigator
Ruth Empson	Associate Professor	University of Otago	Principal Investigator
Leigh Hale	Professor	University of Otago	Principal Investigator
Stephanie Hughes	Dr	University of Otago	Principal Investigator
Steve Kerr	Associate Professor	University of Otago	Principal Investigator
Ping Liu	Associate Professor	University of Otago	Principal Investigator
Liana Machado	Dr	University of Otago	Principal Investigator
Tracy Melzer	Dr	University of Otago	Principal Investigator
Pauline Norris	Professor	University of Otago	Principal Investigator
Louise Parr-Brownlie	Dr	University of Otago	Principal Investigator
Richie Poulton	Professor	University of Otago	Principal Investigator
Holger Regenbrecht	Associate Professor	University of Otago	Principal Investigator
Ted Ruffman	Professor	University of Otago	Principal Investigator
Phil Sheard	Associate Professor	University of Otago	Principal Investigator
Paul Smith	Professor	University of Otago	Principal Investigator
Warren Tate	Professor	University of Otago	Principal Investigator
Ian Tucker	Professor	University of Otago	Principal Investigator
Joanna Williams	Dr	University of Otago	Principal Investigator
Yiwen Zheng	Dr	University of Otago	Principal Investigator
John Dalrymple-Alford	Professor	University of Canterbury	Principal Investigator
Tim David	Professor	University of Canterbury	Principal Investigator
Gary Cheung	Dr	Auckland District Health Board	Principal Investigator
Richard Roxburgh	Dr	Auckland District Health Board	Principal Investigator
Suzanne Barker-Collo	Associate Professor	University of Auckland	Associate Investigator
Erin Cawston	Dr	University of Auckland	Associate Investigator
Melanie Cheung	Dr	University of Auckland	Associate Investigator
Michelle Glass	Associate Professor	University of Auckland	Associate Investigator
Andrea Kwakowsky	Dr	University of Auckland	Associate Investigator
Simon O'Carroll	Dr	University of Auckland	Associate Investigator
Cris Print	Associate Professor	University of Auckland	Associate Investigator
Arjan Scheepens	Dr	University of Auckland	Associate Investigator

NAME	POSITION TITLE	INSTITUTION	BRNZ STATUS
Ben Thompson	Associate Professor	University of Auckland	Associate Investigator
Henry Waldvogel	Associate Professor	University of Auckland	Associate Investigator
Rita Krishnamurthi	Dr	Auckland University of Technology	Associate Investigator
Michael Black	Associate Professor	University of Otago	Associate Investigator
Ailsa McGregor	Dr	University of Otago	Associate Investigator
Toni Pitcher	Dr	University of Otago	Associate Investigator
Jon Shemmell	Dr	University of Otago	Associate Investigator
Reremoana Theodore	Dr	University of Otago	Associate Investigator
Ed Mee	Dr	Auckland District Health Board	Associate Investigator
Barry Snow	Associate Professor	Auckland District Health Board	Associate Investigator
Phil Wood	Dr	Auckland District Health Board	Associate Investigator
Ari Bok	Dr	Auckland District Health Board	Associate Investigator

OUR STUDENTS

STUDENT NAME	LEVEL OF STUDY	UNIVERSITY	GRADUATE DESTINATION
Yassar Alamri	Doctoral Degree	University of Otago	Continuing Study
Gemma Alder	Doctoral Degree	Auckland University of Technology	Continuing Study
Mustafa Almuqbel	Doctoral Degree	University of Otago	Continuing Study
Wojceich Ambroziak	Doctoral Degree	University of Auckland	Continuing Study
Christine Arasaratnam	Doctoral Degree	University of Auckland	Continuing Study
Ashleigh Baker**	Doctoral Degree	University of Auckland	Continuing Study
Sophie Barnett**	Doctoral Degree	University of Canterbury	Continuing Study
Deanna Barwick	Doctoral Degree	University of Otago	Continuing Study
Beth Elias	Other	University of Canterbury	Continuing Study
Brittney Black	Doctoral Degree	University of Auckland	Continuing Study
Allyson Calder	Doctoral Degree	University of Otago	Continuing Study
Beatriz Calvo-Flores Guzman**	Doctoral Degree	University of Auckland	Continuing Study
Stella Cameron	Doctoral Degree	University of Otago	Continuing Study
Niamh Cameron	Other	University of Otago	Unknown
Sergio Castro	Other	University of Otago	Continuing Study
Polly Chen	Doctoral Degree	University of Otago	Continuing Study
Siyi (Robert) Chen	Doctoral Degree	University of Otago	Completed qualification Employed Overseas
Benjamin Chong	Doctoral Degree	University of Auckland	Continuing Study
Aimee Chu**	Doctoral Degree	University of Otago	Continuing Study
Jodi Cicolini	Doctoral Degree	University of Otago	Continuing Study
Guy Collier	Doctoral Degree	Auckland University of Technology	Continuing Study
Karol Czuba	Doctoral Degree	Auckland University of Technology	Continuing Study
Fawzan Dinnunhan	Other	University of Otago	Completed qualification Employed in NZ other

STUDENT NAME	LEVEL OF STUDY	UNIVERSITY	GRADUATE DESTINATION
Fraser Doake	Other	University of Canterbury	Continuing Study
Samuel Dodd	Other	University of Auckland	Further study in NZ
Stewart Dowding**	Doctoral Degree	University of Canterbury	Continuing Study
Megan Elder	Doctoral Degree	University of Otago	Completed qualification Employed overseas
Beth Elias	Other	University of Canterbury	Continuing Study
Dawei Fan	Doctoral Degree	University of Auckland	Continuing Study
Simon Feng	Doctoral Degree	University of Otago	Continuing Study
Mathew Fields	Other	University of Auckland	Completed Qualification Further study in NZ
Timothy Galt**	Other	University of Otago	Continuing Study
Nethra Ganesh**	Doctoral Degree	University of Auckland	Continuing Study
Tina Gao	Doctoral Degree	University of Auckland	Completed qualification Employed in NZ, other
Anthony Garvey	Other	University of Otago	Continuing Study
Manju Gayarathny	Doctoral Degree	University of Otago	Continuing Study
Ann George**	Doctoral Degree	Auckland University of Technology	Continuing Study
Usman Ghani**	Doctoral Degree	Auckland University of Technology	Continuing Study
Vania Glyn	Doctoral Degree	University of Auckland	Completed qualification
Jeremy Goh	Doctoral Degree	University of Canterbury	Continuing Study
Michelle Goodman	Doctoral Degree	University of Canterbury	Continuing Study
Karan Govindpani	Doctoral Degree	University of Auckland	Continuing Study
Matthew Grant**	Other	University of Auckland	Completed qualification Further study in NZ
Pippa Grierson	Other	University of Auckland	Completed qualification
Hayley Guiney**	Doctoral Degree	University of Otago	Continuing Study
Smitri Gupta	Other	University of Auckland	Continuing Study
Shwetha Haldankar	Other	University of Auckland	Continuing Study
Matthew Hall	Doctoral Degree	University of Otago	Continuing Study
Jenny Hamilton	Doctoral Degree	University of Canterbury	Continuing Study
Ashwini Hariharan	Doctoral Degree	University of Otago	Continuing Study
Regina Hegemann	Doctoral Degree	University of Otago	Continuing Study
Chris Heinrich**	Doctoral Degree	University of Otago	Continuing Study
Kyla Horne (nee Wood)**	Doctoral Degree	University of Canterbury	Completed qualification Employed in NZ, other
Joshua Houlton	Doctoral Degree	University of Otago	Continuing Study
Mandana Hunter	Doctoral Degree	University of Auckland	Continuing Study
Roanne Hurley	Doctoral Degree	University of Otago	Continuing Study
Soo Hyun Kim	Doctoral Degree	University of Auckland	Continuing Study
Mohamed Fasil Ibrahim	Doctoral Degree	University of Otago	Continuing Study
Sharon Jay**	Other	University of Otago	Completed qualification Employed in NZ, other

STUDENT NAME	LEVEL OF STUDY	UNIVERSITY	GRADUATE DESTINATION
Javier Martin	Doctoral Degree	University of Otago	Continuing Study
Jin Chan	Other	University of Auckland	Continuing Study
Kate Riegle Van West	Doctoral Degree	University of Auckland	Continuing Study
Allanah Kenny**	Doctoral Degree	University of Canterbury	Continuing Study
Soo Hyun Kim	Doctoral Degree	University of Auckland	Continuing Study
Joseph (donghyo) Kim	Doctoral Degree	University of Auckland	Completed qualification Employed in NZ, other
Kiri Barr-Glintborg	Other	University of Canterbury	Did not complete qualification
Kaushalya Kumarasinge	Doctoral Degree	Auckland University of Technology	Continuing Study
Nitika Kumari	Doctoral Degree	Auckland University of Technology	Continuing Study
Madeleine Kryke-Smith	Doctoral Degree	University of Otago	Completed Qualification, Employed Overses
Louisa 'Joyce' Luann Fang Lim	Other	University of Otago	Did not complete qualification
Fengzhe Liu	Other	University of Auckland	Completed qualification, Further study in NZ
Rhys Livingston	Doctoral Degree	University of Otago	Continuing Study
Jordan Lloyd	Other	University of Auckland	Continuing Study
Siobhan Lockie	Other	University of Canterbury	Continuing Study
Shaun London	Other	University of Canterbury	Continuing Study
Natalie Matheson	Doctoral Degree	University of Otago	Completed qualification, Employed in NZ, other
Elshin Mathias	Doctoral Degree	University of Canterbury	Completed qualification, Employed in NZ, other
Sophie Mathiesen**	Other	University of Otago	Completed qualification, Further study in NZ
Laurel McArthur	Doctoral Degree	University of Auckland	Continuing Study
Amy McCaughey-Chapman	Doctoral Degree	University of Auckland	Continuing Study
Alice McDouall	Other	University of Auckland	Continuing Study
Natasha McKean**	Doctoral Degree	University of Auckland	Continuing Study
Emily Mears	Doctoral Degree	University of Auckland	Continuing Study
Rosie Melchers**	Other	University of Otago	Continuing Study
Stephanie Mercer	Doctoral Degree	University of Otago	Continuing Study
Normala Mesbah	Doctoral Degree	University of Otago	Continuing Study
Jason Michael	Doctoral Degree	University of Auckland	Continuing Study
Vyoma Mistry	Other	University of Auckland	Continuing Study
Soheila Mohammadyari	Doctoral Degree	Auckland University of Technology	Continuing Study
Clarrence Molinyawe	Other	University of Auckland	Completed qualification, Employed in NZ, other
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Ronan Mooney	Doctoral Degree	University of Auckland	Continuing Study
Jodi Morrisey	Doctoral Degree	University of Otago	Continuing Study

STUDENT NAME	LEVEL OF STUDY	UNIVERSITY	GRADUATE DESTINATION
Helen Murray**	Doctoral Degree	University of Auckland	Completed qualification, Employed in NZ, other
Hala Musa	Other	University of Auckland	Completed qualification
Seray Naidoo	Other	University of Auckland	Completed qualification, Further study in NZ
Jin Ng**	Doctoral Degree	University of Auckland	Continuing Study
Sharon Olsen	Doctoral Degree	Auckland University of Technology	Continuing Study
Thulani Palpagama	Doctoral Degree	University of Auckland	Continuing Study
Madhavi Pandya	Other	University of Auckland	Completed qualification, Further study overseas
Tyson Perez	Other	University of Otago	Further study in NZ
Brook Perry	Doctoral Degree	University of Canterbury	Completed qualification, Employed overseas
Emma Peterson	Doctoral Degree	University of Canterbury	Continuing Study
Rebecca Playne	Doctoral Degree	University of Auckland	Completed qualification, Employed in NZ, other
Susan Rapley	Doctoral Degree	University of Canterbury	Continuing Study
Usman Rashid	Doctoral Degree	Auckland University of Technology	Continuing Study
Samantha Ross	Doctoral Degree	University of Otago	Completed qualification, Employed in NZ, other
Joyeeta Roy	Doctoral Degree	University of Otago	Continuing Study
Keith Runnalls	Doctoral Degree	University of Auckland	Completed qualification, Employed overseas
Natalia Samorow	Doctoral Degree	University of Auckland	Continuing Study
Phil Sanders**	Doctoral Degree	University of Auckland	Continuing Study
Pooja Shekar	Other	University of Auckland	Completed qualification, unknown
Hanwant Shekhawat	Other	University of Auckland	Completed qualification, unknown
Yamit Sigred	Other	University of Canterbury	Completed qualification, Employed in NZ, other
Anurag Singh	Doctoral Degree	University of Otago	Continuing Study
Tina Tasananukorn	Other	University of Canterbury	Completed qualification, further study in NZ
Jamie Small	Other	University of Canterbury	Completed qualification, Employed in NZ, other
Marie-Claire Smith	Doctoral Degree	University of Auckland	Completed qualification, Employed in NZ, other
Jennifer Song	Doctoral Degree	University of Auckland	Continuing Study
Meg Spriggs**	Doctoral Degree	University of Auckland	Continuing Study
Megan Stark	Doctoral Degree	University of Otago	Continuing Study
Lucy Stiles	Doctoral Degree	University of Otago	Continuing Study
Caroline Stretton	Doctoral Degree	Auckland University of Technology	Continuing Study
Ryan Sutcliffe**	Doctoral Degree	University of Otago	Continuing Study

STUDENT NAME	LEVEL OF STUDY	UNIVERSITY	GRADUATE DESTINATION
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Matthew Sykes	Doctoral Degree	University of Otago	Completed qualification
Mildred Tan	Other	University of Canterbury	Continuing Study
Huey Tan	Other	University of Otago	Continuing Study
Sierra Tane	Other	University of Auckland	Completed qualification, Further study in NZ
Kathryn Todd**	Doctoral Degree	University of Auckland	Continuing Study
Anita Trudgen	Other	University of Auckland	Continuing Study
Pranav Vemula	Doctoral Degree	University of Otago	Continuing Study
Chitra Vinnakota	Other	University of Auckland	Continuing Study
Simon Walker	Doctoral Degree	University of Auckland	Completed qualification
Sarah Waters	Other	University of Auckland	Completed qualification, Further study in NZ
Kristina Wiebels	Doctoral Degree	University of Auckland	Continuing Study
Kaitlin Wolfe	Doctoral Degree	University of Otago	Continuing Study
Jane Wu	Doctoral Degree	University of Auckland	Completed qualification, Employed in NZ, other
Jiani Xu	Other	University of Auckland	Completed qualification, Employed in NZ, other
Panzao Yang	Doctoral Degree	University of Auckland	Completed qualification, Employed in NZ, other
David Yates	Other	University of Auckland	Completed qualification, Employed in NZ, other
Jason Yeung	Other	University of Auckland	Further Study in NZ
Jiaxin Zhang	Doctoral Degree	University of Otago	Continuing Study
Lisa Zhou	Doctoral Degree	University of Otago	Continuing Study

*** denotes students whose tuition has been directly funded by Brain Research New Zealand*

12.

Research outputs

One of the important ways BRNZ contributes to the economy is through research publications, where we share research findings with other researchers, policymakers, and communities globally.

PATENTS FILED

1. E. T. Williams, P. W. R. Harris, M. A. Jamaluddin, K. M. Loomes, D. L. Hay, C. Walker and M. A. Brimble "Peptide Conjugate CGRP Receptor Antagonists and Methods of Preparation and Uses Thereof" NZ Patent Application 736960, 2017, filed 6 November 2017
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PATENT COOPERATION TREATY

3. J. N. J. Reynolds, E. W. Tan, B.I. Hyland, G. N. L Jameson, M. M. A Myint, S. M. Mackay, J. R. Wickens "Acoustic driven drug delivery systems" Publication no. WO2017/034418 A1

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BOOK

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13.

Partners & collaborators

PARTNERS:

THE UNIVERSITY OF AUCKLAND
Te Whare Wānanga o Tāmaki Makaurau
NEW ZEALAND

UC UNIVERSITY OF CANTERBURY

UNIVERSITY of OTAGO
Te Whare Wānanga o Otāgo
NEW ZEALAND
SAPERE AUDE

AUT UNIVERSITY
AUCKLAND, NEW ZEALAND

COLLABORATORS:

- Alzheimer's New Zealand
- Auckland District Health Board
- Australian Neuroscience Society
- Brain Health Research Centre
- Canterbury District Health Board
- Centre for Brain Research
- Counties Manukau District Health Board
- Fudan University and Huashan Hospital, Shanghai
- Health Education Trust
- Medical Technologies Centre of Research Excellence
- Mercy Hospital, Auckland
- Neurological Foundation of New Zealand
- Neurology Department of Ruijin Hospital
- National Institute for Stroke and Applied Neurosciences
- New Zealand Dementia Prevention Trust
- New Zealand Brain Research Institute
- Plant and Food Research
- Pacific Radiology
- Puketeraki marae
- Ralph Martins, Macquarie University, Sydney
- Shanghai Mental Health Centre
- Southern District Health Board
- Te Kura Kaupapa Māori o Hoani Waititi
- The New Zealand - China Non-Communicable Diseases Research Collaboration Centre
- University of Otago, Cancer Society Tissue Bank
- Waitemata District Health Board

14.

Financials

FUNDING SUMMARY FOR THE YEAR ENDED 31 DECEMBER 2017

	2017
Funding Received	$000
Tertiary Education Commission grant	4,972
Surplus/Deficit carried forward	858
Total Funding received	**5,829**
Expenditure[2]	
Salaries	1,456
Overheads	1,526
Project costs	646
Postgraduate students	592
Travel	254
Extraordinary Expenditure[3]	36
Subcontractors[4]	174
Total Expenses	**4,684**
Net surplus/(Deficit) 5	**1,145**

*All amounts are shown exclusive of Goods and Service tax (GST)

NOTES

1. This financial report is for the period 1st January to 31st December 2017. This report only contains details of funding and expenditure relating to the CoRE grant that the Centre receives from the Tertiary Education Commission. It does not contain details of philanthropic funding, or operating funding to Centre investigators from other funding agencies.
2. This funding summary details funding received and funds distributed to collaborative partners of the CoRE.
3. The extraordinary expenditure budget is for board and science meeting expenses.
4. 2017 costs include funding paid for clinical tenths.
5. In 2016 BRNZ carried forward a net surplus of 858. This surplus has been added to BRNZ's 2017 income to fund the CoRE's research programme in 2017. BRNZ therefore has a net surplus of 1,145 that will be carried forward into 2018 to fund future expenditure of the CoRE.

15.

Table of statistics

BROAD CATEGORY	DETAILED CATEGORY	YR 3
Value of CoRE funding from TEC ($M)		**$4.972**
FTEs by category	Principal investigators	2.93
	Associate investigators	1.74
	Postdoctoral fellows	3.71
	Research technicians	5.1
	Administrative/support	5.7
	Research students	136.4
	Total	**155.58**
Headcounts by category	Principal investigators	52
	Associate investigators	32
	Postdoctoral fellows	48
	Research technicians	38
	Administrative/support	15
	Research students	144
	Total	**329**
Peer reviewed research outputs by type	Books	1
	Book chapters	15
	Journal articles	232
	Conference papers	139
	Other	2
	Total	**389**
Value of external research contracts awarded by source ($000)	Vote Science and Innovation contestable funds	$1,987
	Other NZ Government	$27
	Domestic – private sector funding	$349
	Overseas	$870
	Other	$124
	Total	**$3,357**
Commercial activities	Number of licenses	0
	Income from licenses	0
	Patent applications	2
	Patents granted	1
	Invention disclosures	0
	Number of new spinouts	0
	Capitalisation value of spinouts	0
Students studying at CoRE by level	Doctoral degree	99
	Other	45
	Total	**144**
Number of students completing qualifications by level	Doctoral degree	20
	Other	23
	Total	**43**
Immediate post-study graduate destinations	Further study in NZ	11
	Further study overseas	1
	Employed in NZ	18
	Employed overseas	6
	Unknown	6
	Other	1
	Total	**43**

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Brain Research
NEW ZEALAND
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