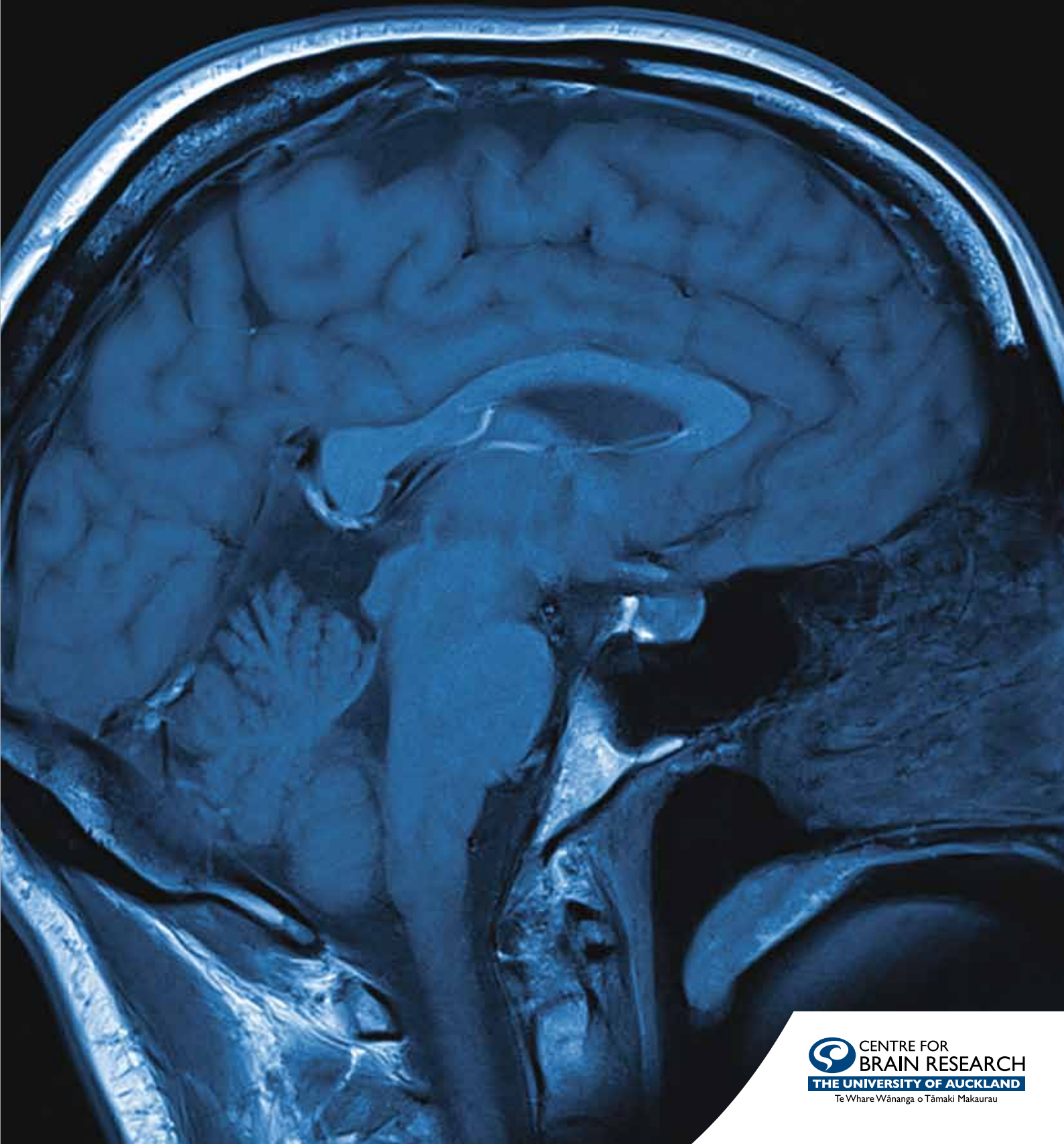


Centre for Brain Research

Working together to improve lives



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Centre for Brain Research

Working together to improve lives



The Centre for Brain Research is a unique partnership between scientists, doctors and the community. Our expert team is committed to identifying and developing new treatments for neurological conditions through our world-class research and international collaborations. Working together in the laboratory, clinic, whānau and community, we will provide a brighter and better future for people and families living with brain disease.



The establishment of the Centre for Brain Research is a tremendously inspiring development and one that promises much for brain research at the University, for clinical care in our hospitals and for enhanced treatment for people affected by brain disease. It is estimated that one in five New Zealanders will suffer from brain disease in their lifetimes. Disorders such as stroke, epilepsy, Alzheimer's, Parkinson's, Huntington's, motor neurone disease, multiple sclerosis and deafness affect hundreds of thousands of New Zealanders every year. Neurological diseases are among the top five most common causes of death and long-term disability. The cost to families and society, both financially and socially, is enormous.

This profile outlines the breadth and scope of the three pillars of the Centre: the world class neuroscience research carried out by the 40 plus research groups in the Faculties of Science and Medical and Health Sciences within The University of Auckland; the leading neurologists, neurosurgeons and physicians in the Auckland region; and community organisations supporting research and people affected by brain disease.

We aim to develop the Centre as a cornerstone of research excellence, to better understand the origins of brain disease and translate this exciting science into improved treatments for the benefit of people and families affected by brain disease. The partnership between the University and hospitals will facilitate unique educational opportunities, with research training for the doctors of tomorrow and promote a clinical focus for our emerging neuroscientists. This collaborative team approach will generate a wealth of knowledge and enable the University and our hospitals to expand their international standing in neuroscience and clinical care.

Understanding the brain is the last frontier of medical research and one of the most challenging areas in medicine. By unlocking the secrets of the brain we learn more about ourselves, who we are and our future.

Professor Richard Faull
Director

Professor Alan Barber
Deputy Director of the Centre for Brain Research

Our goals

Unlock the secrets of the brain

- Build on our world-class research and international collaborations through multidisciplinary studies on the brain, from the gene to the cell to the person.
- Utilise advanced scientific technologies including the invaluable resources of the Neurological Foundation of New Zealand Human Brain Bank.

Develop new therapies

- Translate our research from the laboratory to the clinic to improve the lives of people with brain diseases.
- Expand and develop our ongoing clinical trials for Alzheimer's disease, stroke, epilepsy, multiple sclerosis, Parkinson's disease, Huntington's disease, motor neurone disease and others currently in development.

Improve clinical care

- Advance standards of patient care through improved diagnosis, treatment, rehabilitation and health services.

Train scientists and clinicians

- Create a culture change in training where there is a clinical focus in the laboratory and a research focus in the clinic and community.

Engage with our communities

- Work in partnership with community NGOs to ensure we address the needs of people and their families affected by brain disease.
- Empower the community to share their knowledge and expertise to advance our research and clinical care for the common good.

Educate and inform

- Influence health policy through active local and national engagement.
- Disseminate our findings to the international scientific and clinical communities by publishing in top-ranked journals and addressing international forums.
- Inform the community through the media and active educational programmes.



Our governance

The Centre for Brain Research is an exciting step forward for neuroscience research, for clinical care and the community. Our path will be shaped and guided by our Advisory Boards, featuring leaders and experts in their fields from across New Zealand.

Advisory Board



Chair
Professor Iain Martin
MBChB (Hons), FRCS, MD, MEd(Dist),
FRACS

Professor Iain Martin is Dean of the Faculty of Medical and Health Sciences at The University of Auckland. After an academic career at the University of Leeds, Iain Martin moved to The University of Auckland in 2000 as Professor of Surgery, taking up the role of Head of the School of Medicine in 2004 and being named Dean of the Faculty in 2005. A Fellow of both the Royal College of Surgeons (England) and the Royal Australasian College of Surgeons, Professor Martin's clinical and research interests focussed on gastrointestinal disease, in particular cancer.

Professor Martin: "The Centre for Brain Research brings together outstanding researchers, great clinicians and a community that knows firsthand the impact brain disease can have on individuals, families and friends. The linking of the many individuals and teams that comprise the CBR will facilitate our ability to understand both the normal and the diseased brain, creating new opportunities for the development of treatments for the debilitating diseases at the heart of the Centre's research.

Based in world-class facilities at our Grafton Campus and under the guidance of Professors Faull and Barber, we are confident the Centre for Brain Research will quickly grow into one of the world's leading neurological research centres with clinical, community and research links and collaborations that span the globe. The Centre is a key example of the how academic excellence at The University of Auckland, in partnership with many clinicians and community organisations, is truly leading the way in improving the health and wellbeing of our communities."



Deputy Chair
David Mace
FCANZ, FCIS, FHKSA

David Mace is the Chairman of the Freemasons Roskill Foundation, a major philanthropic organisation in New Zealand. He is a Chartered Accountant and has held numerous Managerial and Directorial positions at the world's largest accountancy firms, including Ernst and Young.



Professor Alan Barber
PhD, MBChB, FRACP

Professor Alan Barber is the Deputy-Director of the Centre for Brain Research and a practising neurologist. He is the head of the Stroke Service at Auckland District Health Board and holds the Neurological Foundation of New Zealand Chair in Clinical Neurology. He is the Secretary-Elect for the Australia and New Zealand Association of Neurologists and the Medical Advisor to the Stroke Foundation (Northern Region).



Jo Brosnahan
QSO, MA Hons, FCILT, FNZIM

Jo Brosnahan is the founding Chair of Leadership NZ, the Chair of Landcare Research and a Director on a number of boards. Prior to this, she was CEO of the Auckland Regional Council for 8 years. She is a Harkness Fellow, with an expertise in leadership and strategy.



Professor Richard Faull
ONZM, MBChB, PhD, DSc,
FRSNZ

Professor Richard Faull is the Director of the Centre for Brain Research and a Professor of Anatomy at the University of Auckland. He is the Patron of the Alzheimer's Foundation (Auckland), Alzheimers New Zealand Charitable Trust and the Huntington's Disease Association (Auckland and Northland), and the Medical Patron of the Motor Neurone Disease Association New Zealand.



Wendy Fleming
RGON

Wendy Fleming is a Registered Nurse and the Chair of Alzheimers New Zealand Charitable Trust, which is responsible for raising funds for research into dementia. She is also the Vice-Chair of Alzheimer’s Disease International as well as the past Chair and Honorary Life Member of Alzheimers New Zealand.



Dr Richard Frith
BSc, MBChB, FRACP

Dr Richard Frith is a neurologist and clinical neurophysiologist at ADHB. He is Chair of the A+ Trust, the Charitable Trust associated with the Auckland District Health Board (ADHB), and Chair of the Julius Brendel Trust. He is President-Elect of the Australian and New Zealand Association of Neurologists.



Professor Grant Guilford
BVSc, PhD, FACVSc

Professor Guilford is the Dean of the Faculty of Science at The University of Auckland. Prior to this role he was Head of Massey University Institute of Natural Sciences and formerly spent ten years as Head of the Institute of Veterinary, Animal and Biomedical Sciences.



Dr Di McCarthy
ONZM, PhD, FRSNZ

Dr Di McCarthy is the Chief Executive of the Royal Society of New Zealand, responsible for fostering science and technology nationally. Prior to taking up her current role, she was a Professor, Pro Vice-Chancellor (Equal Opportunities), and Associate Dean of the Faculty of Science at The University of Auckland.

Rangahau te Roro me te Hinengaro

This name incorporates our vision for the Centre. Although it literally means “Researching the Brain and the Mind”, it can be better interpreted as “Weaving together our collective wisdom and knowledge of the brain.”

Māori Advisory Board

Melanie Cheung

(Ngāti Rangitihī, Te Arawa)

PhD student with Professors Faull and Dragunow and the coordinator of the School of Biological Sciences Tuakana Programme

Dr Hinemoa Elder

(Ngāti Kuri, Te Aupōuri, Te Rarawa, Ngāpuhi)

Child and Adolescent Psychiatrist, Hauora Waikato Group

Professor Richard Faull

(Ngāti Rāhiri, Te Atiawa)

Director of the Centre for Brain Research and Professor of Anatomy at The University of Auckland

Naida Glavish

(Ngāti Hine, Ngāpuhi)

Māori General Manager and Chief Tikanga Advisor for Auckland District Health Board; Chair of Te Rūnanga o Ngāti Whātua

Associate Professor Papaarangi Reid

(Te Rawara)

Tumuaki for the Faculty of Medical and Health Sciences at The University of Auckland

Dr Waiora Port

(Te Aupōuri, Te Rarawa)

Kaiarataki at Northern Genetic Services and cultural advisor to Te Kupenga O Hoturoa

Eru Thompson

(Te Waiohūa, Te Kawerau ā Maki, Ngāti Te Ata, Tainui)

Tikanga Pou Ārahi (Cultural Advisor) to Waitākere City Council

Professor Mike Walker

(Whakatōhea)

Co-director Ngā Pae o te Māramatanga National Institute of Research Excellence for Māori Development and Advancement and a Professor of the School of Biological Sciences at The University of Auckland



Our founding partners

The Centre for Brain Research exists to identify and develop new treatments for brain disease. We comprise over two hundred researchers at the University of Auckland, the leading neurologists, neurosurgeons and physicians from the Auckland regional District Health Boards and community non-governmental organisations.

The University of Auckland

The Centre for Brain Research is an initiative of The University of Auckland, New Zealand's largest provider of medical and biomedical research. It is renowned as one of the top-ranked universities in the world and internationally recognised for its neuroscience research.

The Centre brings together over 40 research groups from across the Faculty of Medical and Health Sciences and the Faculty of Science. Our neuroscientists boast world-class expertise in key areas such as neurodegeneration, neurogenesis, neuroprotection, neuroplasticity, regeneration and recovery.

Led by the Directors Professor Richard Faull and Professor Alan Barber, the Centre's research interests span four broad areas: molecular and cellular neuroscience, clinical neuroscience, cognitive and computational neuroscience and sensory and motor neuroscience. Our expertise extends internationally with links to over 60 groups in major universities and research institutes around the world.

This knowledge is underpinned by the \$16 million redevelopment of the Grafton neuroscience laboratories. This new facility provides a hub for the Centre, as well as a direct connection to the Neurology and Neurosurgery departments at Auckland City Hospital. The state-of-the-art resources include the Neurological Foundation of New Zealand Human Brain Bank, adult human brain cell culture, stem cell technologies, biomedical imaging, modern electrophysiology capabilities, gene therapies, optical science, audiology, cognition testing, drug technologies and therapeutic trials.

Scientific discovery and dissemination are at the heart of everything we do. Senior researchers from the basic neurosciences and clinical specialities meet monthly to discuss research outcomes and direction. The challenges and discoveries in neurological diseases are shared with frontline care workers from community NGOs. This ethos of collective facilities, active intermixing and collaboration promotes a more effective research environment.

Clinical Specialists

Auckland's Neurology and Neurosurgical hospital departments are amongst the largest in Australasia. The doctors at Auckland District Health Board work in partnership with other expert clinicians from the regional District Health Boards to provide care for a third of New Zealand's population. These clinical teams are actively involved with leading national and international research projects and have extensive expertise in clinical trials.

Already underway are over 30 clinical trials for Alzheimer's disease, stroke, brain trauma, epilepsy, multiple sclerosis, Parkinson's disease, Huntington's disease, muscular dystrophy and motor neurone disease. Links to neuroscientists, therapists and community workers in the Centre for Brain Research will see these trials further expand and develop.

The Centre for Brain Research currently has links with:

- Auckland District Health Board
- Counties Manukau District Health Board
- Waitemata District Health Board

Community Partners

New Zealand has a well-established network of charities and support groups helping people living with neurological disease. These non-governmental organisations (NGOs) span the country at both a local, regional and national level. Consisting of experienced professionals and supporters, they provide invaluable assistance to patients and their families.

Each NGO advocates for one type of neurological disease but their ethos is very much the same: that of guiding people through the health and social care systems. Services range from fundraising for research or to support people living with brain disease, lobbying, education, public awareness and health or social support. Senior clinicians and neuroscientists from the Centre play an important role as patrons or advisors on scientific and medical issues.

These long-established alliances have been formalised into strong partnerships with the Centre for Brain Research. Consultation with community NGOs enables our neuroscientists to undertake the privilege of human tissue research. These long-term relationships have facilitated the development of the Neurological Foundation Human Brain Bank as well as tikanga research protocols. Clinical and basic science researchers will work in synergy with community experts to increase understanding of these terrible diseases, and ultimately offer hope to those whose lives have been devastated by them.

Dissemination and education are key aspects of the Centre's mission. Our track record for educational promotion and outreach has already been established through the New Zealand Brain Bee Challenge. This competition for Year 11 secondary school students provides a unique opportunity to involve pupils in science and for the Centre to engage with the educational community.

Drugs and techniques developed in our laboratories can be directly trialled in local hospitals, while medical knowledge will drive forward research. A culture change in training will improve educational opportunities for the doctors and scientists of tomorrow. Patients and families are empowered to share their knowledge and needs. The community as a whole will benefit from dissemination of research and health developments. Working together we will identify and develop new treatments for brain disease.

Our development

- 1920s** First neurosurgical operations are performed in Auckland Hospital by Sir Carrick Robertson
- 1935** Dr. J.E. Caughey ("Jock") practises in Auckland City Hospital as the first neurologist
- 1946** Neurosurgeon Mr. Donald McKenzie helps to establish the first neurosurgical unit at Auckland City Hospital with a 16 bed ward and its own operating theatre
- 1959** First neurological unit in Auckland is established, with ten inpatient beds
- 1975** First PhD degree awarded for neuroscience research in the Medical School
- 1979** Dr Ernie Willoughby is appointed as a Senior Lecturer in the University of Auckland's Department of Medicine, becoming the first academic in neurology
- 1981** Professor Richard Faull receives the University's first human brain donation
- 1993** The Neurological Foundation Human Brain Bank is established
- 2003** The Auckland Neuroscience Network is established at The University of Auckland to foster collaboration between neuroscientists
- 2007** The New Zealand Brain Bee Challenge starts in Auckland
- 2008** Professor Alan Barber is appointed as the first Chair in Clinical Neurology, funded by the Neurological Foundation
- 2009** Centre for Brain Research launches



Neuroscience research group 1990
From left to right: Jocelyn Bullock, Richard Faull, Henry Waldvogel, Louise Nicholson, Karl Jansen, Matthew Williamson, Diane Harcombe, Mike Dragunow





Community Partners

Local and national non-governmental organisations offer a rich network of support groups and services in New Zealand. All our Community Partners are not for profit organisations and rely on public support to carry out their work. These community groups render invaluable assistance to people and their families or whānau living with neurological disease.



Neurological conditions

It's estimated that one in five New Zealanders will suffer from brain disease in their lifetime. Indeed, neurological diseases are among the top five most common causes of death and long-term disability for Kiwis. The cost to families and society, both financially and socially, is enormous. That's why we feel the Community Partners working with the Centre for Brain Research are so invaluable for our combined success.



Stroke



Stroke affects around 8000 New Zealanders every year and is the third biggest killer in New Zealand. Stroke is the major cause of long-term adult disability and for many of the 56,000 stroke survivors in New Zealand, disability can be a fact of life.

A stroke is usually due to a sudden interruption of blood flow to part of the brain, causing the affected part to stop working and eventually die. Basically, it's a brain attack. People of all ages can suffer strokes. While research is underway to prevent strokes and to improve rehabilitation afterwards, the effects can still be devastating. People may be left without the full use of their body, losing the ability to walk or the ability to talk.

The Stroke Foundation of New Zealand works to help survivors of stroke and provides vital support services for patients and carers. They also lobby to raise awareness and funding for better clinical services and research.

Epilepsy



kia titiro ki te tangata - see the person

Epilepsy affects around 2 in every 100 people in New Zealand- that's around 80,000 people. The disorder can affect people of any age, and can also start throughout life. Epilepsy is characterised by seizures during which there are temporary bursts of uncontrolled electrochemical activity within the brain.

The common causes of epilepsy include birth trauma, genetics, brain injury, tumours and infections. Yet for about half of people affected by epilepsy the cause is unknown. Seizures can take different forms depending on where in the brain it arises from. It may present as convulsions, changes in awareness or simply a blank stare. The person may remain fully conscious or be completely unaware of what is happening. For most patients seizures are controlled with lifestyle changes and anti-epileptic medications.

Epilepsy New Zealand works to raise awareness of the disease and reduce the stigma surrounding it. Local field workers help with community education and social support, and ensure patients receive the most suitable health and social care.

Dementia

Dementia is essentially brain failure. Physical changes in the structure of the brain cause alterations to people's memory, thinking, behaviour and emotions. The stark reality is there are over 40,000 people with dementia in New Zealand today.



Alzheimer's disease is the most common form of dementia, accounting for around 60% of all dementias. The disease is progressive, as abnormal proteins build up in the brain forming plaques which interfere with brain function. As the plaques increase, more brain cells die and so more of the brain is affected and symptoms worsen. The causes aren't clear but age, genetics and environmental factors all play a part. Currently there are very few drugs to help improve cognitive function, and those available have only modest effects at best.

Alzheimers New Zealand, Auckland and Counties Manukau help people living with dementia and their carers. Key workers support families as they journey through this progressive disease and ensure patients receive the best healthcare and treatment.

Parkinsonism



One New Zealander in every 1000 is affected by Parkinson's disease. This movement disorder occurs when insufficient quantities of the chemical dopamine are produced in the brain. The key neurological symptoms include tremor, slowing of movement and difficulty walking.

Parkinsonism is an umbrella term for the symptoms caused by a number of different conditions, with 80% of people diagnosed as Parkinson's disease. Much is known about the progression of the disease, which results from the slow degeneration of nerve cells originating movement, called the substantia nigra. Yet little is known about what initiates the deterioration of the neurons at the start of the disease. Treatment usually involves drug replacement for the dopamine. Research continues into both the causes and new therapies.

Parkinson's New Zealand and its branches have established long-standing links with researchers and clinicians in Auckland. The Society helps people to develop the skills to manage the disease and retain a good quality of life.

Multiple Sclerosis

Approximately one New Zealander in every 1000 has Multiple Sclerosis (MS). This disease of the central nervous system occurs when the protective cover surrounding our nerves, called the myelin sheath, becomes scarred in discrete patches called plaques. Message transmission in the brain and spinal cord becomes distorted, resulting in sufferers losing control over parts of their body.



MS is known as a 'prime of life' condition as people tend to be first diagnosed between the ages of 20 and 40. Typical symptoms include loss of balance or coordination, weakness, numbness or pain. The causes of MS are still unknown, however research suggests it may be linked to a reaction to a virus even years after infection, an auto-immune reaction to our own

tissue, and genetic susceptibility. People in cooler climates, women and Caucasians are more likely to suffer from the disease.

MS Auckland Region and MS New Zealand aim to improve the lives of people living with MS. While there is no cure yet, the NGOs aim to encourage patients and their families to manage the condition through a combination of medication, physiotherapy, good nutrition, rest and moderate exercise.

Muscular Dystrophies



It is estimated that 4500 people in New Zealand are affected by a neuromuscular condition. This broad group of conditions all have one terrible symptom in common, that of a disabling loss of muscle strength.

Neuromuscular conditions usually have a genetic origin and lead to underlying problems with nerve tissue. The disability and other effects are always progressive, resulting in problems with mobility, speech, breathing and heart function. Symptoms can become apparent at any age, from soon after birth through to later in life. While there are limited treatments available, there are no cures.

The Muscular Dystrophy Association offers specialised information about over 40 types of neuromuscular conditions, which can often be very rare. Field workers help families to access health care and also offer support groups. The Association actively campaigns for disabled rights and helps people to practically manage their situation.

Huntington's disease



Once a diagnosis of Huntington's disease (HD) is made, the whole family is affected. This incurable neurodegenerative genetic disorder is passed down through the generations, meaning each child has a 50% chance of inheriting it. There are around 300 people living with HD in the Auckland region but many more are at risk of developing it.

Huntington's disease is caused by a mutation on the Huntingtin gene. Extra repeats in the genetic codes mean the gene doesn't function correctly and produces a defective protein. This disrupts normal brain cell activity and causes the movement, mood and behavioural symptoms characteristic of this progressive condition. HD doesn't discriminate and can affect men and women from all races and ethnic groups. Symptoms usually occur between age 35 to 40, meaning multiple generations of one family can be affected at any one time.

The Huntington's Disease Associations of New Zealand work to improve the quality of life for each family affected by HD. Family liaison coordinators help patients seek the right social and health services, and also guide other family members through counselling and genetic testing procedures. While there is no cure, the charity aims to help sufferers reach their maximum potential at each stage of the disease.

Motor Neurone Disease



There are around 250 people living with Motor Neurone Disease (MND) in New Zealand. MND is actually a group of conditions in which nerve cells controlling muscles of movement are destroyed. Without any nervous system stimulation the muscles eventually weaken and waste away.

MND may start with reduced strength or coordination in an arm or leg, or difficulty speaking or swallowing. As the condition progresses the loss of movement increases and other areas, such as breathing, may be affected. MND may affect adults of any age but it's more common after the age of 40. Both men and women are affected, although it is more common in men. MND is a progressive condition and life expectancy varies between 2-4 years; however some people do live longer than this.

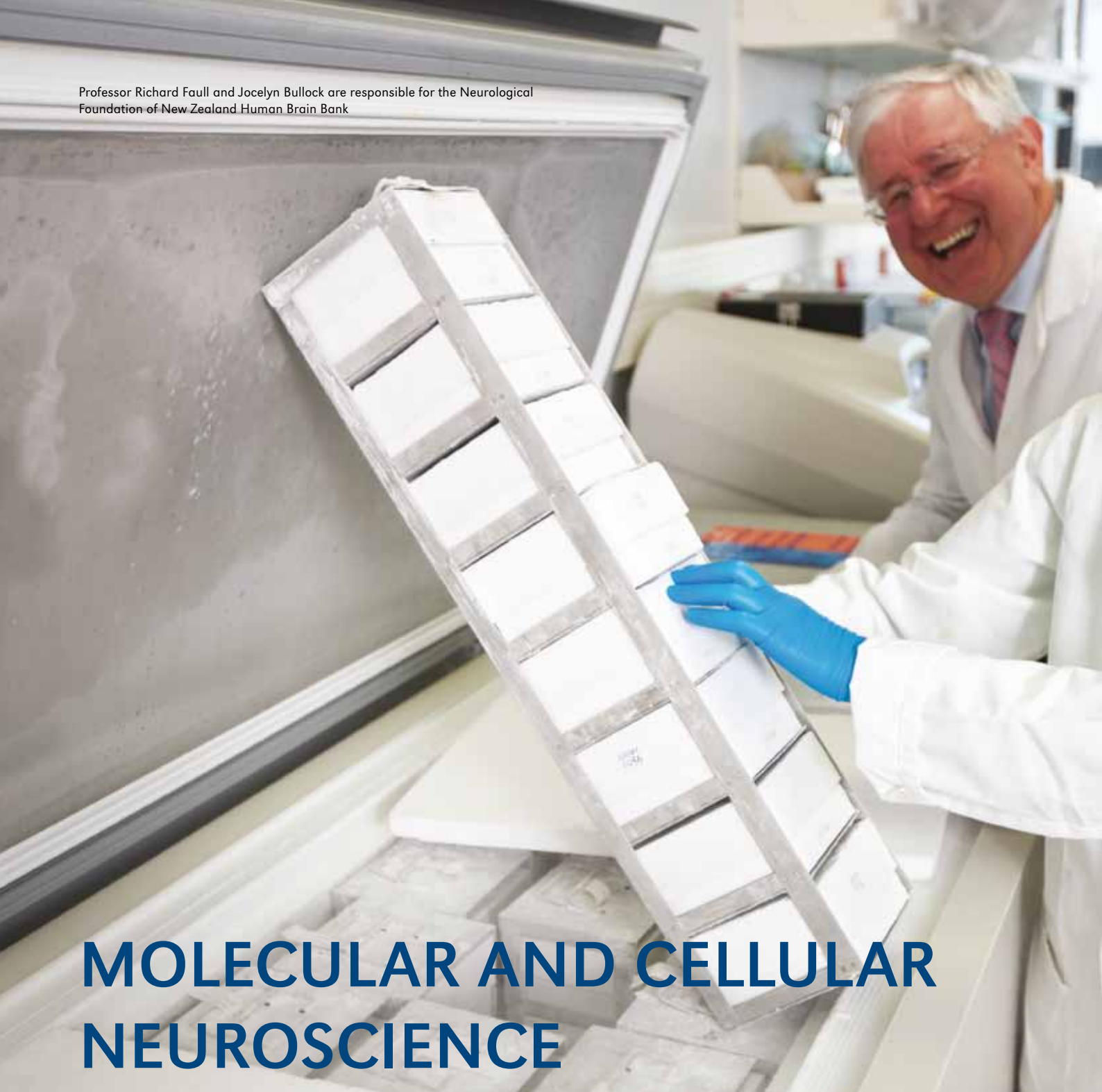
The Motor Neurone Disease Association of New Zealand supports people living with MND and their carers, providing practical advice to manage symptoms as well as social advocacy and liaison with health professionals.



Research

The Centre for Brain Research brings together over 40 different research teams from across The University of Auckland. Bridging the Faculty of Medical and Health Sciences and the Faculty of Science, the Centre has over 200 researchers all working towards the common goal of identifying and developing new treatments for neurological disease.

Professor Richard Faull and Jocelyn Bullock are responsible for the Neurological Foundation of New Zealand Human Brain Bank



MOLECULAR AND CELLULAR NEUROSCIENCE

Neurological Foundation of New Zealand Human Brain Bank

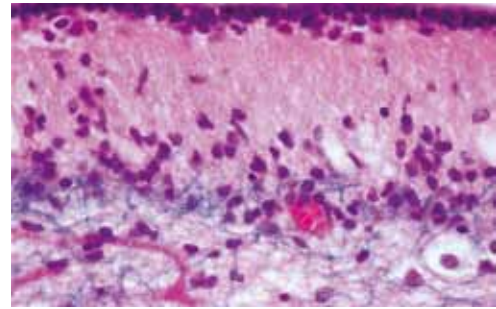
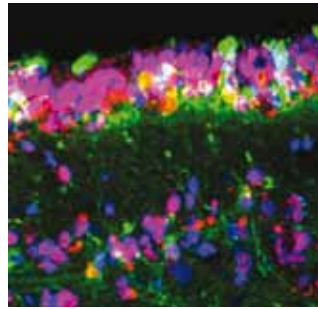
“Our brain bank is so special. We know the history of every brain we research thanks to our close relationships with the families. That’s only possible in a small country like New Zealand, and it means our tissue is in demand all over the world.”

Professor Richard Faull, Department of Anatomy with Radiology and Director of the Centre for Brain Research



The Neurological Foundation of New Zealand Human Brain Bank is a world-class scientific resource unique to the Centre for Brain Research. Established over sixteen years ago, the bank holds tissue from over 400 brains categorised in minute detail. Research on this tissue provides vital clues about neurodegenerative diseases such as Alzheimer's, Huntington's, Parkinson's, motor neurone disease, epilepsy and schizophrenia. Professor Richard Faull is the founder and director of the facility.

"Donating your brain for research is one of the most special gifts you can give. We fully recognise and appreciate that. That's why the Human Brain Bank is kept in one of the most



The Neurological Foundation Human Brain Bank enabled the ground-breaking discovery that the human brain contains stem cells, which multiply and make new brain cells in response to neurodegenerative disease. These images show stem cells in Huntington's disease brains.

high-tech and modern facilities the University can offer and our researchers accord the tissue the respect it deserves."

Patients and family members decide to donate their brain years before death, so when the time comes the bequest process is both swift and sensitive. It's scientifically important that the tissue is collected quickly, so a team of morticians and couriers are coordinated throughout the country. The tissue is then immediately processed in cell cultures for testing, and stored through freezing and chemical preservation processes for future research in New Zealand and overseas.

"This is extremely sensitive and skilled work," says Professor Faull. "We're developing tikanga Māori practices so Māori researchers can join the team. Only by working together can we help find cures for these terrible diseases. That's what our work is all about, and we never forget that."

"I'm the guardian of these precious gifts. The families make such a huge investment in our research, so I make sure we keep them updated on our progress. People think we're unusual in maintaining such long-standing and close relationships with our donors, but I don't see any other way of doing it."

Jocelyn Bullock, Technical Manager of the Human Brain Bank

National and International collaborators:

- University of Otago, New Zealand
- University of Gothenburg, Sweden
- University of Lund, Sweden
- University of Zurich, Switzerland
- Ecole Polytechnic Federale de Lausanne, Switzerland
- Roche Institute, Switzerland
- University of Cambridge, United Kingdom
- University of Wales, United Kingdom
- University of Oxford, United Kingdom
- Kings College London, United Kingdom
- Babraham Institute, United Kingdom
- University of Cardiff, United Kingdom
- University of Southampton, United Kingdom
- Harvard University, United States of America
- University of Washington, United States of America
- University of Leiden, Netherlands

Neurological Foundation of New Zealand

This unique resource is only possible thanks to the continued support of the Neurological Foundation of New Zealand. This national charity tirelessly fundraises to support research into brain diseases. The Foundation has generously supported the Human Brain Bank for sixteen years.



Neurodegeneration

“The statistics are shocking. 8000 people have strokes every year in New Zealand. 40,000 people are living with Alzheimer’s. 80,000 people are living with epilepsy. It’s not hard to see why we’re so passionate about this research when you lay it out like that.”

Professor Richard Faull, ONZM, FRSNZ. Director of the Centre for Brain Research



PhD student Thomas Park and collaborator Dr Hannah Gibbons culture human brain cells

In Parkinson’s disease and other neurodegenerative disorders, brain cells gradually start dying. It’s a slow process, and one the brain fights to survive, but once the disorder starts there’s no stopping it. Yet the cell death is often selective, picking out certain neuronal or support cell types over others. In Parkinson’s disease, cells in the substantia nigra degenerate, creating a shortage of the neurotransmitter dopamine, which is essential for regulating movement. But the big question is why, and how can we stop it?

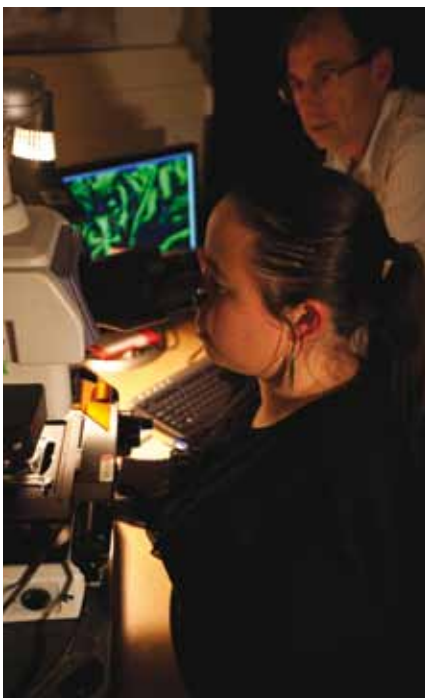
That’s where scientists like Professor Mike Dragunow come in. “We study the basic mechanisms of brain cell injury and repair using adult human cell cultures. We look at the molecular and cellular cascades that trigger nerve cell death, survival and repair. We then use these in-vitro models to test drugs. Cells are essential for this work, and that’s where we’re making ground-breaking progress. Thanks to the Human Brain Bank, we can now grow primary adult brain cells from donated biopsy and autopsy tissue. Only a handful of labs around the world can do that, and we’re one of them.”

Professor Dragunow’s team are capable of examining thousands of cells in a day thanks to a technique called High Content Analysis,

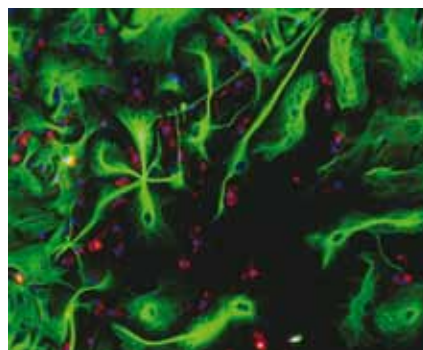
coupling high-tech microscopes and image analysis machines. New hopes for the future are being raised by their latest discovery. “Our work with epilepsy biopsy tissue is really exciting”, says Professor Dragunow. “We think we’ve found adult stem cells growing in the diseased tissue, which we are able to culture and study. Our goal is to discover how to turn these endogenous stem cells into nerve cells and other brain cells, for example using drugs. These drugs could then be used in humans with epilepsy and other neurodegenerative disorders to regenerate and repair the damaged tissue.”

“If you want to study the causes of nerve cell death in the human brain and develop treatments, then you have to look at human tissue. And that’s why the Human Brain Bank is so invaluable for us.”

Professor Mike Dragunow, FRSNZ.
Department of Pharmacology



PhD student Melanie Cheung and collaborator Dr Henry Waldvogel examine cells under fluorescence microscopy



Astrocyte brain cells under fluorescence microscopy





The Huntington's sheep model is studied at the South Australian Research and Development Institute

"These are diseases that systematically strip the family of everything the patient once was, stealing away memory and movement, personality and conscience. It's talking to families that keeps me motivated, and keeps our research on track. And it's why the Centre for Brain Research is so important."

Professor Richard Faull

From surgery table to the lab bench in a matter of minutes

The Centre for Brain Research has developed from a long tradition of clinical and scientific collaborations. For 27 years, neurosurgeon Dr Ed Mee from Auckland District Health Board has been providing tissue for research with patient's enthusiastic consent to The University of Auckland's Medical School.

"The epilepsy programme is such a great example of the progress we can make by working together," he says. "My epilepsy patients come to me for a temporal lobectomy. These are people who are so sick we have to remove the damaged part of their brain so they can get better. This tissue would otherwise be discarded, but now to find out we're getting stem cells from it is just incredible."

A sheep to cure Huntington's

Professor Faull's research group is internationally renowned for their discoveries in Huntington's disease. An expert team of clinicians, pathologists and neuropsychologists have worked together for over twenty five years, pinpointing the exact cause of the motor and mood problems that characterise the disease. But how to stop the symptoms is another matter entirely.

"We had a dream of a large animal model that we could test drugs and treatments on, to help stop the decline of this horrific genetic disease," he says. "But projects like this aren't always successful and don't make attractive prospects for investors. That's where the Freemasons stepped in. I call it dream money, and that support helped us get this idea off the ground and into reality."

The Huntington's sheep is the first large animal model of human brain disease in the world. Sheep were chosen for their large brain similar to humans, and a longer life span to model the slow decline of the disease. Renowned molecular biologist Professor Russell Snell has been a principal driver in this exciting research and has developed the critical gene transfer techniques. His skill enabled the entire human gene for Huntington's disease, including a huge disease-causing extension of 73 repeats, to be incorporated into sheep embryos. Ironically 'Kiwi' and 'Rocket' sheep lines proved the best options, and the group now has around 200 transgenic lambs gambolling around the South Australian farm. The scientists are waiting and watching to observe the cell, molecular and behavioural changes characteristic of Huntington's in middle age. From there, the group has the first realistic chance of finding and testing drugs to help sufferers.

Philanthropy making a difference

None of these projects would be possible without the support of generous individuals and community organisations.

Coker Charitable Trust

Bill and Yvonne Coker both know how terrible motor neurone disease is for families. Bill's father and Yvonne's sister both died of the disease. Now their support is starting the first research programme into this disease in New Zealand.

Gus Fisher Charitable Trust

Businessman Gus Fisher was motivated to help research into Parkinson's disease when he watched his mother struggle with the movement disorder. His support provides vital funding for postdoctoral research studies on Parkinson's disease.

Matthew Oswin Memorial Trust

Matthew tragically died from Huntington's disease at the age of just 37. His family are ensuring his legacy lives on by helping to fund Professor Faull's HD research programme.

Lynette Sullivan Memorial Trust

Auckland businessman Rod Sullivan watched his wife waste away with Huntington's disease. Now his support funds human brain cell culture research in Professor Draganow's lab.

Freemasons New Zealand

This philanthropic community organisation has enabled the creation of the world's first transgenic Huntington's sheep, and has committed over half a million dollars to the brain research programme over the past five years.

Laboratories

Professor Richard Faull and Dr Henry Waldvogel

Neurogenesis and Neurodegenerative Diseases of the Human Brain

Professor Mike Draganow

Human Neurodegeneration Research

Professor Russell Snell

Molecular Genetics

Neuroprotection and therapeutics

Treatments for neurological disorders are fast gathering pace, as researchers and clinicians generate new therapies to protect the brain from injury and disease. Scientists at the Centre for Brain Research are using and developing the latest techniques to ensure patients retain brain tissue and function, and ultimately their quality of life.

Taking tips from bodybuilders

The old saying goes that thinking is hungry work. But research is proving it true; the brain uses a third of our energy resources because neurons have such high energy requirements. Indeed, an energy deficit in the brain is a common feature of neurodegenerative diseases, so even the remaining neurons don't function as well. Could an energy supplement used by body builders provide the answer?

"Creatine is a molecule that maintains energy levels in the brain by promoting energy production in the cell's powerhouse, the mitochondria," explains Associate Professor David Christie. "We're looking at the cell membrane protein which gets creatine into neurons, called the creatine transporter. We want to find out which neurons can take up creatine, and how the transporter works."

In the meantime a clinical trial is underway, led by clinicians from the Centre for Brain Research, looking at how creatine could help patients with Huntington's disease. "Ultimately we're hoping it will help neurons survive and prove a convincing treatment for brain disease," says Associate Professor Christie.



"Creatine is being trialled as a treatment for brain disease in humans across the world. Yet the surprising thing is we don't actually know how it works. That's what we're trying to find out."

Associate Professor David Christie, Associate Dean (Research), School of Biological Sciences, Faculty of Science

Stopping inflammation in its tracks

"Often the biggest problem in brain or spinal cord injury isn't the actual trauma but the body's response to it afterwards. Inflammation is part of the body's healing response, but it actually causes more damage if it happens in a confined space - which is just how the brain and spinal cord are housed."

Associate Professor Louise Nicholson, Associate Dean (Research), Anatomy with Radiology, Faculty of Medical and Health Sciences



Communication is what nerve cells excel at; it is after all their role in the body. But this ability to quickly pass on messages to other cells works against them when hit by stroke or injury. Special channels between cells, called gap junctions, allow neurons to signal they are hurt, which in turn increases inflammation, swelling and scarring in the area of damage. Now Associate Professor Louise Nicholson's team is working with Professor Colin Green from the National Eye Centre to investigate ways they can turn this process off.

"A really exciting idea we're looking at is spinal cord injury and repair", she says. "We think if we can stop these cells communicating through blocking gap junctions, then we may be able to reduce a lot of the swelling. This in turn could help develop treatments to get people walking again. Its early days, but challenges like this are what get me into work each morning."

CatWalk Trust

The ground-breaking research, led by Associate Professor Louise Nicholson and Professor Colin Green, is funded by the CatWalk Trust, a charity funding research into spinal cord repair. They support promising scientist Dr Simon O'Carroll, who is working on a new peptide therapy which can reduce swelling, inflammation, scar formation and promote nerve cell survival when delivered soon after an injury has occurred.



"Funding from the CatWalk Trust has been crucial in allowing this research to progress", says Dr Simon O'Carroll. "Working with a group who are dedicated to finding a cure for spinal cord injury is inspiring and makes you feel that what you're doing will make a real difference to people's lives"



“Gene therapy is a means of using a viral vector to deliver a specific gene into a cell, which alters its behaviour for a therapeutic purpose. It’s harder to do in the brain because of its protective casing - the skull. We’re working on better viral vectors and more sophisticated genetic messenger systems to improve this process, as well as testing new strategies to tackle many of these brain diseases.”

Dr Debbie Young, Department of Pharmacology and Clinical Pharmacology



Protecting the brain

Associate Professors Nigel Birch and Tom Brittain know a thing or two about serendipitous discoveries. Both run a research program around molecules only discovered in the last ten years, and both have made unexpected discoveries about their function! While searching for proteins secreted by nerve cells, researchers stumbled across a protein they called neuroserpine, which is now the focus of Associate Professor Nigel Birch’s team. The protein seems to play an integral role in learning and memory as well as keeping cells alive. Meanwhile, researchers working on data from the Human Genome Project came across a new protein they named neuroglobin, which also seems to play a role in neuroprotection.

“People thought neuroglobin looked like myoglobin, which muscles use to store oxygen”, says Associate Professor Tom Brittain. “But we discovered it has an entirely different role quite by accident! We found it reacts with a cell death protein called cytochrome C, and our research has now proven it helps to stop neurons dying by interfering with the cell suicidal process.”

Both researchers are now investigating the respective proteins to see if they could be used as novel therapeutic agents in brain disease.

Developing gene therapy for brain diseases

In many neurodegenerative diseases, the highly specialised neurons responsible for producing vital neurotransmitters start to die off. No other cells can produce the chemicals, so levels become severely depleted, leading to abnormal function in some brain regions. But what if you could change the behaviour of cells so they can fight off the effects of the disease process themselves, or even help other cells live? That’s what Dr Debbie Young’s team are working towards.

Dr Young’s team is linked to a ground-breaking clinical trial in the USA, where gene therapy will be used alongside brain surgery to help alleviate movement problems in Parkinson’s patients. The team helped produce the viral vector which is used as the delivery method.

“Getting the vector right is all important”, says Dr Young. “We’re taking new approaches to design a gene delivery vehicle that targets the support cells around neurons called astrocytes. These cells are in abundance as the neurons start dying, so we’re seeing whether changing their behaviour might help the neurons stay alive.”

But her research doesn’t stop there. “We’re also getting really complicated, by trying to get vulnerable neurons to help themselves!” Dr Young continues, “As a cell becomes unhealthy it releases suicidal chemicals to die. But we’re designing a gene therapy system that will switch on at that point and protect the cell. We hope to break the apoptosis suicidal cascade and help cells live.”

Laboratories

Associate Professor Nigel Birch
Molecular Neuroscience

Associate Professor Tom Brittain
Metalloprotein Group

Associate Professor David Christie
Nutrient and Neurotransmitter Transporter
Biology

Associate Professor Louise Nicholson
Molecular Neuroanatomy

Dr Debbie Young and Professor Matt During
Molecular Neurotherapeutics



“There’s a reason we don’t yet have a cure for many brain diseases. Our brain is so complicated with many cells interrelating and interacting. We need a greater understanding of these interactions through studies of the fundamental cell biology of nerve cells before we will succeed.”

Associate Professor Nigel Birch, School of Biological Sciences

Neurogenesis

The idea of growing new brain cells is one of the most exciting areas in modern science. The Centre for Brain Research is leading the way in New Zealand to push forward our understanding of stem cells and neurogenesis. Based in the ultra modern laboratories of the Grafton campus, Associate Professor Bronwen Connor and Dr Maurice Curtis are discovering the secrets of these promising cells and the future therapies they may offer.



Dr Maurice Curtis's team examining human brain tissue

“Our team was the first in the world to prove that the adult human brain makes stem cells in response to neurodegenerative diseases. We also found the motorway they travel down to repair the human brain. The challenge now is to direct them to the areas where they’re needed.”

Dr Maurice Curtis, Department of Anatomy with Radiology

The hope of repairing our brain from within

In 2007 Dr Maurice Curtis’s team made a revolutionary finding - the adult human brain contains a stem cell pathway to make and deliver new neurons throughout the brain. Stem cells have the potential to develop into almost any cell type, heralding a miracle-like property of repair and regeneration. It was a startling discovery, and one that hit the headlines around the world, even making the cover of the world’s top science journal, 'Science'.

“People thought that when our brain cells got sick or died we couldn’t ever replace them”, says Dr Curtis. “But we’ve shown that stem cells in the human brain divide and migrate long distances toward areas of cell loss- the brain is trying to repair itself. The problem is it’s too little, too late.” Dr Curtis’s group are now using the resources of the Human Brain Bank to study how stem cells migrate in the human brain.

Complementing this research, Associate Professor Bronwen Connor’s team are using animal models to identify the signals that direct stem cells to divide, move and make new brain cells during disease or injury. Their research has identified for the first time several new signals that direct stem cells to migrate to the area of cell loss and tell the stem cells what brain cell type to make. These signals hold the potential for the development of new drugs that can enhance stem cell repair in the diseased or injured brain.

Brain cell replacement

“In neurodegenerative diseases, the symptoms are caused when brain cells die. So we either need to help the brain repair itself, or provide the brain with new cells to do the old ones’ job. We’re looking at both options.”

Associate Professor Bronwen Connor, Department of Pharmacology and Clinical Pharmacology

It sounds like something from a science fiction movie, but the idea of transplanting new brain cells into the diseased brain is fast gathering pace. Associate Professor Bronwen Connor’s team are the first in the world to show that transplanted adult stem cells can make new

neurons in an animal model of Huntington’s disease. The technique even improved the physical symptoms of the disease. These early results look promising, but more work is needed. Associate Professor Connor explains:

“Only 10% of these cells survived and became new neurons. We’re now looking at novel ways we can promote the survival and generation of new neurons from transplanted stem cells, using a combination of pharmacological and molecular biology techniques. If successful, these techniques will result in even greater clinical improvement. So its early days, but it’s just so exciting.”

Laboratories

Associate Professor Bronwen Connor
Neural Repair and Neurogenesis

Dr Maurice Curtis
Human Neurogenesis and Progenitor Cell Migration



Associate Professor Bronwen Connor and postgraduate student Natasha Naidoo



Plasticity and signalling

“I’m a big believer in use it or lose it. The brain is designed to be used, that’s how it works. Yet so much of its working is a mystery and that’s what I find so exciting- we’re on the cutting edge of science here.”

Dr Johanna Montgomery, Department of Physiology

The nuts and bolts of thinking

In the state of the art laboratories at the Medical School, a team of scientists are hard at work listening to brain cells talk. As unbelievable as it might sound, Dr Johanna Montgomery’s group record the signals neurons send to each other through synapses. These tiny junctions between cells are how cells communicate with each other, and ultimately, the process that enables us to think.

“Neurons are cells designed to talk to each other”, says Dr Montgomery. “Learning, memory, senses- they all rely on cells communicating through synapses. When we learn something, the communication process between two cells gets easier so they talk more. We’re figuring out how that happens, and how synapses can be broken by disease, genetic disorders or drugs.”

As we grow and learn the brain builds new connections continuously, yet only the best ones are kept to form thinking motorways. The team is also studying how this developmental process occurs- information that could prove useful to help new brain cells integrate into the brain as part of stem cell therapies. The research requires painstaking molecular work, but it’s something Dr Montgomery is passionate about.

“People think, ‘why should I care about proteins?’. But they are the source of it all- they are what change our behaviour. When you take a pill, you don’t think about how it works, but that pill works on a protein which you thought you didn’t care about!”

Environmental toxins proving bad news for the brain

We’ve all seen the beauty adverts telling us how free radicals can age our skin. But scientists at the Centre for Brain Research are showing they’re just as bad for the brain. Professor Janusz Lipski explains.

“When brain cells are stressed by toxic agents, they produce more Reactive Oxygen Species-

what we call free radicals. This is meant to be a normal signalling process, whereby cells ask for help. But too much, and it can actually trigger the cell’s own death.”

The team are looking at both acute and chronic ‘oxidative’ stress. In a stroke, brain cells are cut off from the blood supply and starved of oxygen, so undergoing massive production of free radicals which may be what ultimately kills them. But chronic stress can also be a huge problem in neurodegenerative diseases such as Parkinson’s disease.

“Pesticides are known as environmental toxins, but research is proving that older versions may have terrible effects on the brain”, says Professor Lipski. “Rotenone is a pesticide linked to Parkinson’s disease. It’s thought that in more susceptible people, the toxin may trigger the cell death process. We’re looking at how that happens and ultimately, how we could prevent it.”

The brain’s natural cannabinoid system

“We think of cannabis as a recreational drug, but we actually have our own cannabinoid molecules and receptors spread throughout the body. This type of receptor system, known as G-Protein coupled receptors, is so widespread that they’re actually the target for 50% of all therapeutic drugs on the market.”

Associate Professor Michelle Glass, Department of Pharmacology

Just like a human conversation, communication doesn’t just involve talking but also listening. All the cells in our body communicate by releasing molecules that carry messages to other cells. But this process is useless unless the target cell is ready to receive, with the cells producing receptors on their cell membrane. In many neurodegenerative disease processes

this function goes wrong. Either the cells are too ready to listen, with too many receptors, or the messages fall on deaf ears with very few receptors expressed. Associate Professor Michelle Glass explains.

“We know that in Huntington’s disease for instance, the cannabinoid receptors are reduced. We also know the disease process can be delayed if people keep active and stimulated in enriched environments - that’s when we see the number of cannabinoid receptors increase. So we know they’re involved somehow, we just need to work out how.”

Fiery redheads helping scientists to understand obesity

It’s an old cliché, but the idea of fiery redheads may have more than a kernel of truth to it. Melanocortins are the hormones responsible for tanning, but research is proving they also have an impact on our nervous system. For people with a defect in the melanocortin-1 receptor system, it can mean pale skin, an inability to tan, red hair and maybe even a fiery personality! Dr Kathy Mountjoy studies these hormones and their wide impact on the body.

“Five receptor subtypes for these hormones are produced all over the body, so the effects we see depend on where the receptors are located,” she says. “Interestingly, we’re finding this system is widespread throughout the brain, and is also proving critical for regulating appetite and body weight. In fact 4-5% of morbidly obese children have a mutation in the melanocortin receptor MC4R- no other single gene is known to cause obesity at that level.”

Laboratories

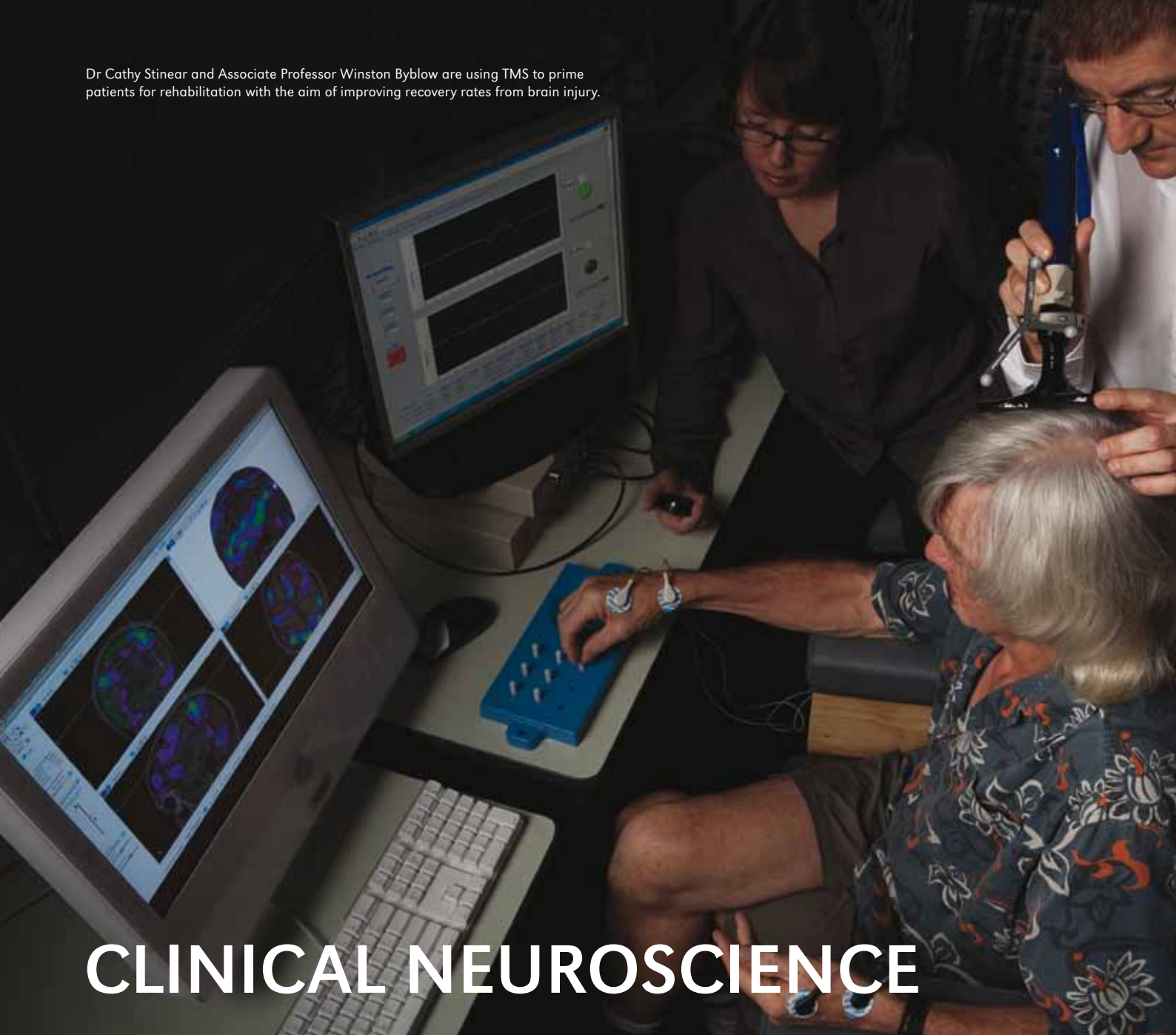
Associate Professor Michelle Glass
Receptor Signalling Group

Professor Janusz Lipski
Molecular Neurophysiology

Dr Johanna Montgomery
Synaptic Function Research

Dr Kathy Mountjoy
Molecular Neuroendocrinology

Dr Cathy Stinear and Associate Professor Winston Byblow are using TMS to prime patients for rehabilitation with the aim of improving recovery rates from brain injury.



CLINICAL NEUROSCIENCE

Neurology Research Unit

“We can now work with people just hours after they’ve had a stroke, in that crucial sub-acute period. Before, we couldn’t research the impacts of stroke until months afterwards. But thanks to our collaborations with health professionals, we can now study the best ways to provide care for patients at the time when it really matters. It’s such a great example of what the Centre for Brain Research can do.”

Dr Cathy Stinear, Department of Medicine



Bringing together the team at the Neurology Research Unit has created some exciting research possibilities. Based at Auckland City Hospital, neurologists and scientists work together on a range of clinical problems, including multiple sclerosis, dystonia, Parkinson's disease and stroke.

Stroke is the third biggest killer of New Zealanders and the greatest cause of long-term disability. Even if people survive the initial brain trauma, loss of mobility or the ability to communicate can mean the difference between working or unemployment, socialising or loneliness. Now this cutting edge team are dedicated to developing new protocols, treatments and therapies for neurology patients.



The Neurology Research Unit team, from left to right: Dr Jennifer Somerfield, Dr Cathy Stinear, Dr Ines Eisner-Janowicz and Professor Alan Barber

"Everybody is different, and everybody responds to treatment differently", says Dr Stinear. "We're working on the idea of personalised medicine, as what works for one person might not work for another".

The clinical neuroscience team are using Magnetic Resonance Imaging (MRI) techniques as well as Transcranial Magnetic Stimulation (TMS) to assess the damage caused by the stroke, and then devising suitable treatment regimes for each patient. Dr Stinear explains.

"Movement involves two parts, planning the move, and then executing it. So in some strokes, you may plan the move, you're good to go, but it's like someone has put a spade through your telecommunications cable and you can't tell the muscles what to do. In other strokes, it's the planning area that's affected, so you can't even prepare the movement. Using imaging techniques we can work out which parts of the brain are affected, and which are most likely to take over from these areas. Then we encourage this process by priming these viable areas with medications, coordinated movement, non-invasive brain stimulation, even practising the movement using your imagination! By targeting these priming techniques we can prepare the brain for a better response to therapy, and a better recovery for the patient."

Laboratory

Dr Cathy Stinear

Professor Alan Barber

Dr Jennifer Somerfield

Dr Ines Eisner-Janowicz

Great minds think alike

The strength of the Centre for Brain Research is the range of expertise and skills on offer. The same problems are looked at by all our experts, each with different training, background and talents, so the whole is greater than the sum of its parts. We hope this will move us forward towards solving these issues; to find and develop more treatments for brain disease. Yet these collaborations wouldn't be possible without the valued support of renowned funding bodies.

Neurological Foundation of New Zealand

The idea of a joint clinical and research position in Neurology was first looked at by Max Ritchie from the Neurological Foundation in 2005. It was clearly a great concept, but finding the right person was a stalling point.

"We knew we wanted someone with an excellent background in Neurology, who was a great clinician. But we also wanted someone with a research bent, someone with a querying mind who wanted to drive research and practice forward. It was a tall order, but we found that in Professor Alan Barber." Max Ritchie, Executive Director of the Neurological Foundation

Professor Barber has been putting these dreams into practice since 2007 and is now the Deputy Director of the Centre for Brain Research.

Stroke Foundation Northern Region

"The more research we can do into the causes and treatment of stroke, the more chance our patients, families and supporters have of resuming a normal life." Rex Paddy, Executive Director

A new Research Fellow position has been created in the Neurology Research Unit thanks to the support of the Stroke Foundation Northern Region.

Fetal physiology and neuroscience



“We’ve become good at keeping babies alive, just not keeping them alive well. As a paediatrician, I know the upset and trauma a family experiences when a baby is born with a brain injury. Our research ranges from the basic science of fetal brain development, to improved therapies on the ward.”

Professor Alistair Gunn, Head of the Department of Physiology

Every year, more babies are born prematurely. The good news is clinical teams have increased survival rates from 15% to 50% over the last twenty years. The bad news is half of these babies are more likely to suffer from cognitive problems, ranging from slight learning difficulties to cerebral palsy. That’s what Professors Alistair Gunn and Laura Bennet are hoping to change.

Cerebral palsy is a disorder caused when brain tissue dies either before or during birth. Four out of five babies with the disorder actually acquire it before birth, caused by infection, alcohol or oxygen starvation during pregnancy. Clinical teams often know there’s a problem during pregnancy, but trialling new drugs on pregnant mothers is fraught with difficulties. That’s where animal models prove useful, as Professor Laura Bennet explains.

“We use a sheep animal model, as the sheep brain is similar to ours in a broad sense,” says Professor Bennet. “Using a large animal like this means we can trial new drugs or intervention methods that are much more likely to gain approval for use in humans. We look at the whole animal though, because while a treatment may help the foetus’ brain development, it’s no good if it stops its kidneys or other organs working.”

Understanding the normal biology for babies is also a key part of the team’s work. “We didn’t even know what the blood pressure for a pre-term baby should be, so how can you decide if it’s too low?” asks Professor Gunn. “By understanding the basic biology first, we can reduce babies’ time in hospital, and ultimately save lives as well as funds.”

Cooling cap invention saves lives

It must be a bizarre sight for any mother, watching as her newborn is strapped into a metal hat strewn with leads and wires. But this strange contraption is proven to save lives. Professors Gunn and Bennet worked with their team to develop the idea that mild hypothermia helps to reduce inflammation in babies born with a brain injury. They designed a cooling cap which helps reduce cognitive problems in full-term babies. The device has now been rolled out across Auckland District Health Board.



Cooling caps may reduce brain injury for infants

Laboratory

Professor Alistair Gunn

Professor Laura Bennet



Speech science

“We have a busy Speech Language Therapy clinic at the Tāmaki campus, where we are constantly learning from our patients and they learn from us. Researching speech and language problems is one of the most varied and interesting areas of science. We work with all age groups, from babies just a few months old to adults in their nineties.”

Associate Professor Suzanne Purdy, Head of Discipline of Speech Science



“I originally trained as an audiologist and came across this interesting group of children who could clearly hear perfectly well when tested using conventional methods, yet teachers and parents said they couldn’t. Much of my research is now focussed on APD. We want to develop early diagnostic methods so we can help these children from a much younger age. With properly targeted interventions we hope that children with APD won’t fall behind and can reach their true potential.”

Associate Professor Purdy’s team have developed a unique method of helping children with APD in the classroom. Teachers wear a microphone that transmits to the child using an individual FM radio transmitter, enabling children to overcome the noise of the classroom. Using Phonak hearing technology, children with APD are able to hear the teacher’s voice without interference from noise and reverberation – like receiving their own private lessons! This successful collaboration between the University and Phonak has led to a new commercial development, SoundSkills, based at Tāmaki Campus.

Laboratories

Associate Professor Suzanne Purdy
Auditory Processing

Dr Clare McCann
Language Processing

Learning to speak again

Saying how we feel is something we all take for granted- that is until it’s taken away from us. Aphasia is a distressing condition where people can’t retrieve or form the words they want to say. It’s a common occurrence after stroke or brain trauma, and one many adults find deeply frustrating. Dr Clare McCann works closely with Aphasia NZ to identify the issues associated with this condition.

“Often people say the most upsetting part of their stroke is losing the ability to speak. We forget how much of communication and socialising relies on language, especially as we age and get less mobile,” says Dr McCann. “We’re working on approaches to help people live more successfully with aphasia and adjust to the psychosocial consequences of this. For example in a left-hemisphere stroke, language abilities are usually damaged, yet emotional words are bizarrely stored on the opposite side of the brain. By triggering these emotional words in the right hemisphere, we could help people to learn to speak again.”

Tolerance is also essential for care givers working with stroke patients. Dr McCann’s team are training health professionals and researchers to communicate more effectively with patients, so the care experience is greatly enriched for everyone.

When the classroom is just too noisy

It’s something we’ve all experienced- in a noisy crowd you just can’t sort the wheat from the chaff to hear what the person next to you is saying. Yet this experience is something many children and adults live with every day. Auditory Processing Disorder (APD) is a condition where hearing may be perfect, but the brain can’t distinguish speech from other noises. If it isn’t diagnosed early enough, children think of themselves as ‘dumb’ or become disruptive as they fall behind their classmates. It’s something Associate Professor Suzanne Purdy is on a mission to change.

Neuropsychology

“We’re working with patients and families at a highly stressful and upsetting time of their lives, as they experience the debilitating effects of neurodegenerative disorders. But our research means so much to people, as we pursue a complete understanding of the impact of disease on the individual and their family. Developing these personal relationships enhances the work of neuroscientists like Professor Faull, and also ensures the legacy of the patient is passed on for all to learn from.”

Dr Lynette Tippett, Department of Psychology



Neurodegenerative disorders like Huntington’s disease, Parkinson’s disease and motor neurone disease are well known for their devastating physical symptoms, but what’s less well known is the impact they can have on cognitive function, including high-level thought like decision-making and emotional processing. Studies at the Centre for Brain Research have proven that brain cell death in these conditions doesn’t just affect movement, but also impacts on emotions, thought and behaviour. Dr Lynette Tippett’s team are heading up this research, in close collaboration with the leading clinicians specialising in these disorders.

“Our work is all about measuring thinking abilities and behaviour. We use cognitive tests, structural and functional MRI scans and sensitive questionnaires to determine exactly how a patient is thinking or feeling. We then use this information to help health professionals improve care for patients, and scientists to correlate their anatomical findings.”

Neurological Foundation of New Zealand Human Brain Bank

Dr Tippett’s team have contributed to the development of the Human Brain Bank as a well-respected scientific resource. Over sixteen years they have developed close relationships with donor families from the Huntington’s disease community, both before and after the death of the patient. This huge body of knowledge is then forever linked with the brain bequest for scientific research.

Dr Tippett expands, “Without knowing the specific symptoms the patient experienced, you can’t really understand what it is you’re seeing

under the microscope. Our systematic record keeping has enabled us, with our collaborators, to investigate the types and regions of cell death in the patient and what that meant. So if you have mood problems in Huntington’s disease, then the mood cortex of your brain has been affected. That’s groundbreaking.”

Memory lapse or Alzheimer’s disease?

Trying to determine whether a simple memory lapse is part of growing older, or something more serious is a question many older adults struggle with. Mild Cognitive Impairment (MCI) is fairly common in later life, but not all people suffering from this go on to develop Alzheimer’s disease. Scientists in the Centre for Brain Research are hoping to define new methods to diagnose Alzheimer’s disease earlier.

“Scientists can’t just work alone if we want to develop effective diagnosis and treatments for patients”, says Dr Tippett. “I spend part of my week in the Memory Clinic, a multidisciplinary outpatient clinic which is part of Waitemata District Health Board. Working with other expert clinicians in the area sharpens our awareness of patient’s symptoms and the need for the development of effective therapies.”

Using new imaging techniques developed in conjunction with the Cognitive Neuroscience group, the team can measure the ability of a patient to learn and form specific types of new memories. Using electroencephalography (EEG) they can identify the circuitry underlying the type of memory loss, and whether there’s been any fundamental change in the plasticity of the brain. It’s hoped this technique will enable clinicians and researchers to identify more serious problems early. It’s a win-win

situation; people with MCI may be relieved of the spectre of severe memory loss, while those progressing towards Alzheimer’s can be treated sooner.

Laboratory

Dr Lynette Tippett
Human Neuropsychology

Clinicians

Dr Richard Roxburgh, Dr Phil Wood, Dr Alison Charleston and Professor Alan Barber



Psychopharmacology and neurodynamics

“Everyone’s brain is individual. We have different genes, different experiences, and different ways of processing information. So it makes sense that we need different medicines to suit each person. We aim to find out more about the pathophysiology, or what’s going on in our brains, during different mental disorders and illnesses and then develop improved treatments.”

Professor Rob Kydd, Head of the Department of Psychological Medicine

Depression, schizophrenia, addiction and other mental illnesses have a huge impact on society. Indeed it’s estimated that at any one time, one in four of us will suffer from depression, with its associated impact on work and relationships. Most patients will receive drug treatments at some time during a mental illness, but these therapies don’t always work quickly enough nor have the desired effect.

Depression and rethinking learning

The Psychopharmacology and Neurodynamics team is challenging traditional thinking about established drug therapies. In a complex study across the Centre for Brain Research, a commonly used class of anti-depressants will be investigated to see if they work more effectively in some people than others, and if they could have other uses outside of depression. Researchers from Vision Science, Motor Science and Neurodegeneration will also collaborate to determine how the drugs impact on their area of expertise. Professor Kydd explains.

“Selective Serotonin Re-uptake Inhibitors, or SSRIs, are a commonly prescribed anti-depressant- they increase the amount of serotonin in our brains, which lifts our mood,” says Professor Kydd. “Yet there’s new research that suggests they could help make our brains more responsive to outside inputs, so we can learn new skills easier. We’re hoping to definitively prove that one way or the other. If it’s true, we’ll have to rethink what other drugs we prescribe alongside SSRIs, and what other situations they can be used in. The implications for clinical treatment and rehabilitation are very important.”

Schizophrenia and Treatment Resistance

Finding the right medication to control schizophrenia symptoms can be a long process. Clinicians often try out a variety of drugs before a suitable one is found, and for some patients that may take years. But what if doctors could predict the response of people to drugs before they even get a prescription? “We aim to find a specific biomarker to predict an individual’s response to treatment,” says Dr Bruce Russell. “A diagnostic tool like that would lead to major advances in the standard of patient care and outcomes for those with schizophrenia.”

Using a novel approach, study participants will undergo an assessment of their response to treatment after taking different antipsychotics. Neurocognitive function, genetic testing, EEG and MRI will all be used to further define structural, biochemical and the cognitive changes implicated in the pathophysiology of schizophrenia.

The impact of recreational drugs

‘P’ is a huge problem for New Zealanders. More commonly known worldwide as ‘crystal meth’, it’s distilled here into a pure form of methamphetamine, giving it the street name of P, or Pure. This highly addictive and damaging drug is widely used in New Zealand; blamed for increased crime and anti-social behaviour, addicts lose control of their own behaviour, and it seems their own addiction. Now pharmacist Dr Bruce Russell hopes to predict the likelihood of someone becoming addicted to P, and how well they respond to withdrawal treatment.

“We think some people are more likely to become addicted to drugs because of their genetic make-up,” says Dr Russell. “Genes affect individual proteins which affects the function of our brain. Using MRI scans, Diffusion Tensor Imaging and proton magnetic resonance spectroscopy, we hope to work out what particular biomarkers or brain regions define an addictive personality.”

Dr Bruce Russell and PhD student Reem Jan examine MRI data



Dr Russell’s team are furthering this research by trialling a pharmacological substitute for P, called methylphenidate. They hope to predict which people will respond well to this treatment, and hopefully improve drug withdrawal programmes.

“New Zealand has a vibrant market of ‘legal highs’ containing compounds such as BZP and TFMPP. They’re all unregulated and un-researched, yet people use them every day. We are the only research team in the world studying the effects of these drugs and their impact on the human brain - our work is critical.”

Dr Bruce Russell, School of Pharmacy

Laboratory

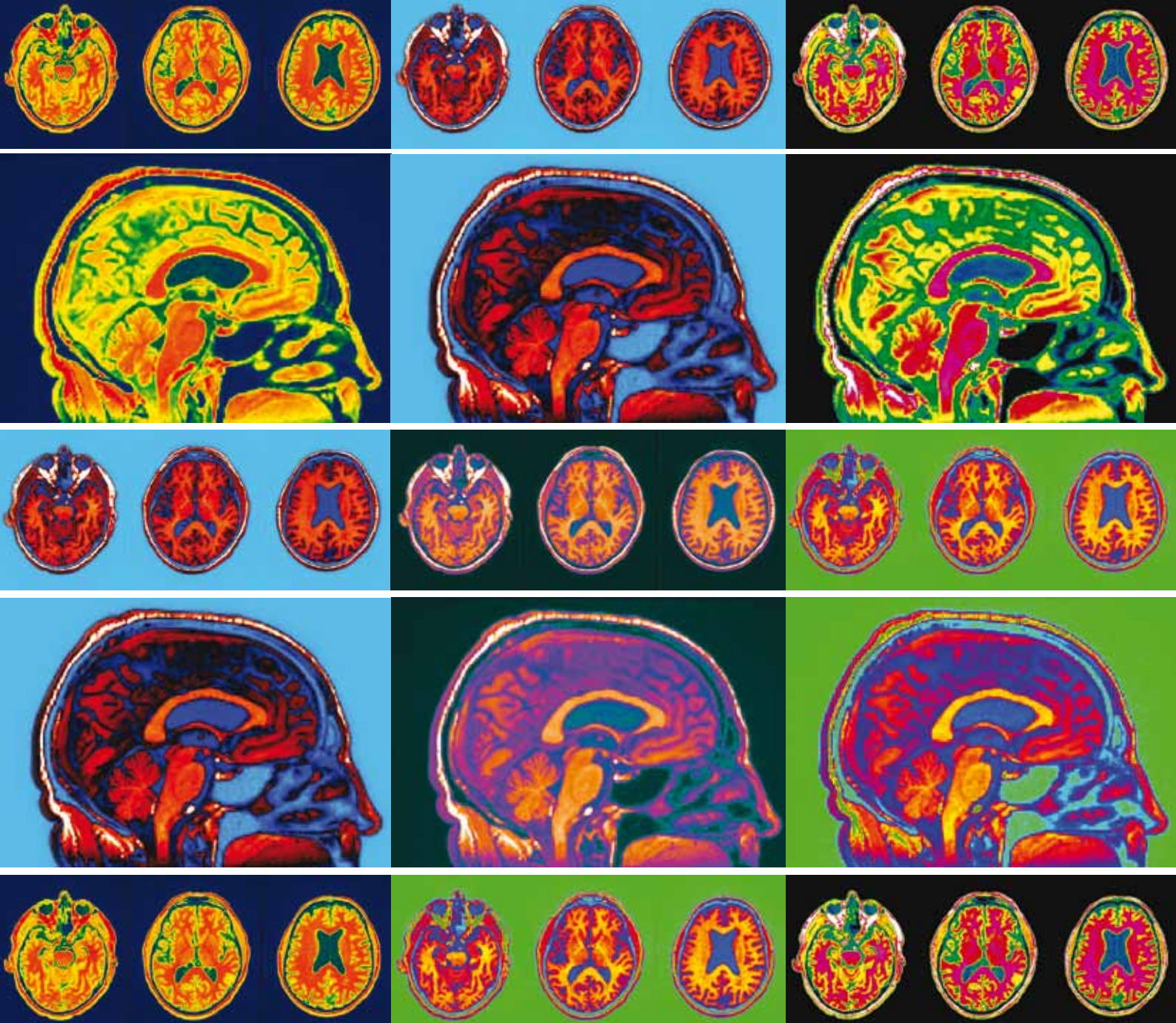
Professor Rob Kydd

Dr Bruce Russell

Dr Malcolm Tingle

Clinical Professor Jim Wright

Honorary Associate Professor Wayne Miles

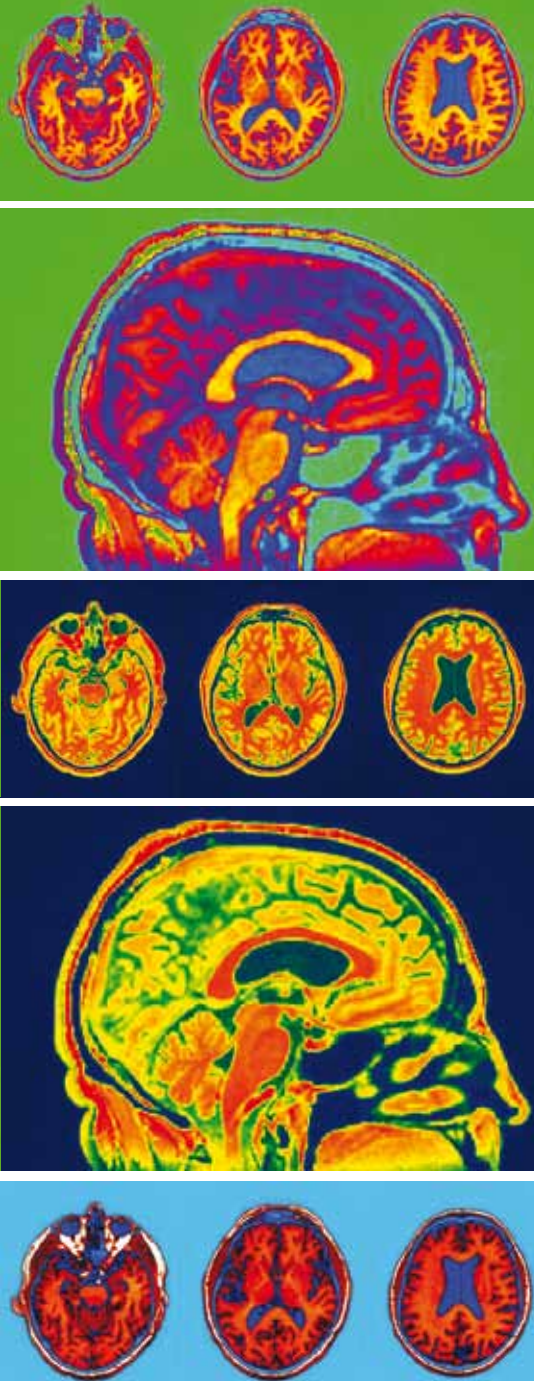


COGNITIVE AND COMPUTATIONAL NEUROSCIENCE

Cognitive neuroscience

“I like to think we can see what people are thinking.”

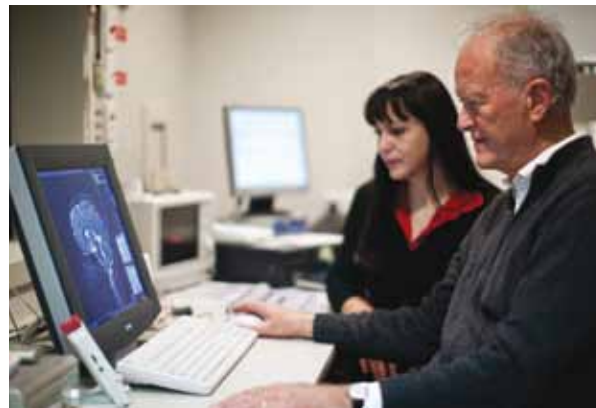
Professor Michael Corballis, ONZM, FRSNZ. Department of Psychology



How left-handed people could improve brain surgery

The old wives' tale used to go that left handed people are more creative and arty. It's a tale that actually has some basis in reality, as the left brain is taken up with our language skills while the right brain takes care of visual and spatial processing. It was thought these functional differences may show up as structural differences in the brain, but researchers in Professor Michael Corballis' group are finding otherwise.

"We're scanning the brains of identical twins who are opposite handed- so one is left-handed and the other is right-handed," says Professor Corballis. "We're finding these so-called 'mirror twins' are not mirrored with respect to language; in most cases both have language represented in the left brain. This suggests our preference for using one hand over the other is probably influenced by the environment,



Professor Michael Corballis and collaborator Dr Gjurjica Badzakova studying functional MRI scans

whereas brain asymmetry for language is probably largely genetic."

'Lateralisation', or brain asymmetry, has important connotations for surgery and brain injury. If an area of the brain is solely responsible for one task, then people are more likely to lose that function in an accident. The team are using this knowledge to start assessing people's recovery prospects. Using functional MRI (fMRI), researchers can see which areas of the brain light up when participants think about or do a task. The coloured areas highlight where the most blood is going in the brain, and therefore which area is doing the most thinking. It's a technique neurosurgeons are now using to improve brain surgery accuracy.

Musical brains

Cognitive Neuroscience researchers are confirming what parents have long known- video gamers have different brains to the rest of us! Research involving musicians indicates that intricate movement of hand muscles may help people to develop more connections across the brain- meaning their brains are less lateralised. The researchers are now developing this study with computer game users to see if their brains are also less lateralised.

Inheriting a good memory

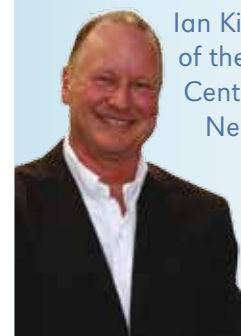
From our first day at school it's obvious that some people have better memories than others. Associate Professor Ian Kirk's team are proving it may be down to variation in just one gene, coding for a protein called Brain Derived Neurotrophic Factor (BDNF). Forming new memories means strengthening the connections between nerve cells so they communicate better, a process known as long-term potentiation. BDNF is thought to be essential for that process.

"We've developed a method to actually view long-term potentiation happening in humans," says Associate Professor Kirk. "By showing visual stimuli, we can measure how well people acquire new information- or make memories. We're now correlating that with genetic information about their levels of BDNF. More BDNF could well mean a better memory."

This information will prove critical for studies into Alzheimer's disease, schizophrenia and depression. Associate Professor Kirk explains; "Depression is thought to result in decreased levels of BDNF, meaning people can't learn as well. We're working with other scientists in the Centre for Brain Research to develop new drug therapies for depression."

"Cognitive neuroscientists study the relationship between mental processes and brain processes and structures. By examining how we think, we can work out which parts of the brain are responsible for each task, and how these parts interact to put it all together."

Associate Professor Ian Kirk, Co-Director of the Research Centre for Cognitive Neuroscience



Remembering the future

Our memories make up a huge part of who we are and our identity. Indeed, our past experiences shape our view of the world and how we interact with people in the future. Yet all that can be taken away from us by horrific illnesses like Alzheimer's disease. Studying how we remember our past and imagine the future is Dr Donna Rose Addis' team.

"If you're planning a party, you need to be able to think back over all the past parties you've been to and extract information from these various memories", says Dr Addis. "You might take the friends from one party, the food from another and the venue from a third. We then have this amazing capability to join all these elements up and imagine what our own party could be like and what might happen. In effect we remember the past to imagine the future."

The idea of 'future thinking' was proposed by Dr Addis's team in 2007, winning the title of one of the Top Ten Breakthroughs that year by Science magazine, the world's top journal. The ability to dice together different scenarios from memory is essential to help us deal with unpredictable futures. Now the team are using this knowledge to learn more about how memory works, and how it can be compromised.

"In patients with damage to the hippocampus, a brain region critical for memory, the ability to imagine the future is also lost", says Dr Addis. "Unfortunately future thinking can also be affected as part of normal aging and even more severely affected in Alzheimer's disease. We're now using fMRI scans to identify the neural networks normally involved in future thinking, so we can learn more about this vital human ability."

Are you watching closely?

Imagine you're watching your favourite basketball team engaged in a critical play-off match. Do you think you would notice if a proverbial 800-pound gorilla walked onto the court, paused in the middle to thump his chest a few times, and then left? Amazingly, researchers have found that about half the individuals viewing this scene failed to notice someone in a gorilla suit doing exactly this! Attention plays a pivotal role in determining what we see – and what we don't see!



Dr Donna Rose Addis and a study participant in the Centre for Advanced Magnetic Resonance Imaging

Studying the neural underpinnings of visual attention is Dr Tony Lambert. "Quite different neural pathways may be engaged when a peripheral visual object triggers an attention shift than when that object is perceived consciously", says Dr Lambert. "In everyday life, shifting attention towards a peripheral object and consciously perceiving that object are so intimately linked that it is difficult to 'see' the distinction."

Dr. Lambert's research uses EEG and fMRI techniques to uncover the network of brain pathways and areas that orchestrate the exquisite dance between attention and perception, governing our ever changing experience of the visual world.

Hands-free not risk free

Dr Tony Lambert, together with concerned scientists from other New Zealand universities, is calling for a complete ban on the use of cell phones while driving. It is now illegal for a driver to use a hand-held phone, but hands-free phones are still permitted. Yet research shows that using a hands-free phone while

driving is just as risky as using a hand-held, because our attention is elsewhere. Dr. Lambert is now trying to raise public awareness to stay safe while driving and avoid using a mobile phone at all.

Laboratories

Dr Donna Addis
Memory Lab

Professor Michael Corballis and Dr Tony Lambert
Cognitive Lab

Dr Jeff Hamm
Mental Chronometry

Associate Professor Ian Kirk
Human Neuroscience Lab

Dr Vanessa Lim
Music and Motor

Dr Karen Waldie
Functional Neuroimaging

Language

“Languages evolve in remarkably similar ways to biological species - they split into new languages, mutate and sometimes go extinct. I use evolutionary methods to work out where languages came from, and implicitly, the origins of human societies.”

Professor Russell Gray, FRSNZ. Department of Psychology



New Caledonian crows manufacture tools

across the Pacific, even reaching South America to give us the kumara in the process.”

Crafty crows design better tools

Professor Gray’s evolutionary skills are also put to good use in a more traditional sense, with work on clever corvids. New Caledonian crows are one of the few bird species that routinely manufacture tools, which is thought to be indicative of higher intelligence. Interestingly, they also seem to pass on to each other the best ideas for tool designs.

“Animals other than humans were presumed to lack the necessary brain power to evolve technologies”, says Professor Gray. “Yet that’s what we seem to be witnessing in these crows. We’re now examining their brains to see what might make them smarter than other birds!”

Laboratory

Professor Russell Gray
Evolution of Cognition and Language

Language Evolution

Most of the South-East Asian islands and Polynesia have the same word for five-something like either ‘lima’ or ‘rima’. The New Zealand dinnertime staple, the kumara, is remarkably similar to a South-American word for sweet potato, ‘kumar’. You’d have thought this would ring a few bells, yet relatively little is known about human lineages and voyaging

routes. Professor Russell Gray is heading up the charge to join the dots.

“By using computational methods adapted from evolutionary biology, we can track the family trees of languages. We then use that to follow the movements of human cultures. For example, this work shows that Polynesians including Māori can be traced back to Taiwan, and have voyaged and traded extensively

Biomedical visualisation

“Computer games are proving vital tools for medical training. We’re developing a video game that helps teach surgical teams. Communication is so important in surgery, so we’d rather they made mistakes in our game than in real life!”

Dr Burkhard Wuensche, Department of Computer Science.

Imaging is an essential part of modern medicine. Thanks to computers, we can now see into people’s brains, watch what they’re thinking and even see the motorways of their thoughts. Complex scanning methods produce the data, but how we represent it on screen is another matter. That’s where Dr Burkhard Wuensche’s team come in.

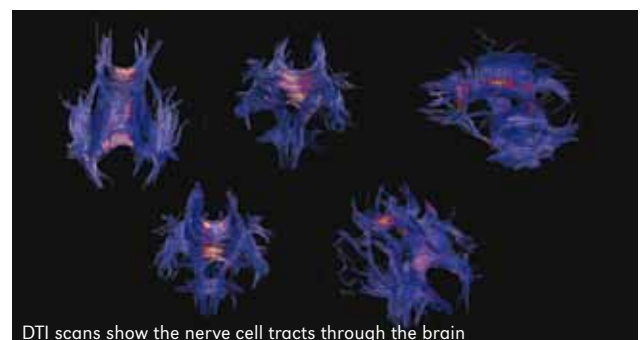
“We analyse data sets from scans like diffusion tensor imaging (DTI), and then we use our graphic programming skills to make them look better”, says Dr Wuensche. “DTI enables researchers to see white matter – that’s the nerve cell bodies that messages travel down. Using 3D representation we can make them

stand out from the background more, and hopefully help doctors to make better diagnoses.”

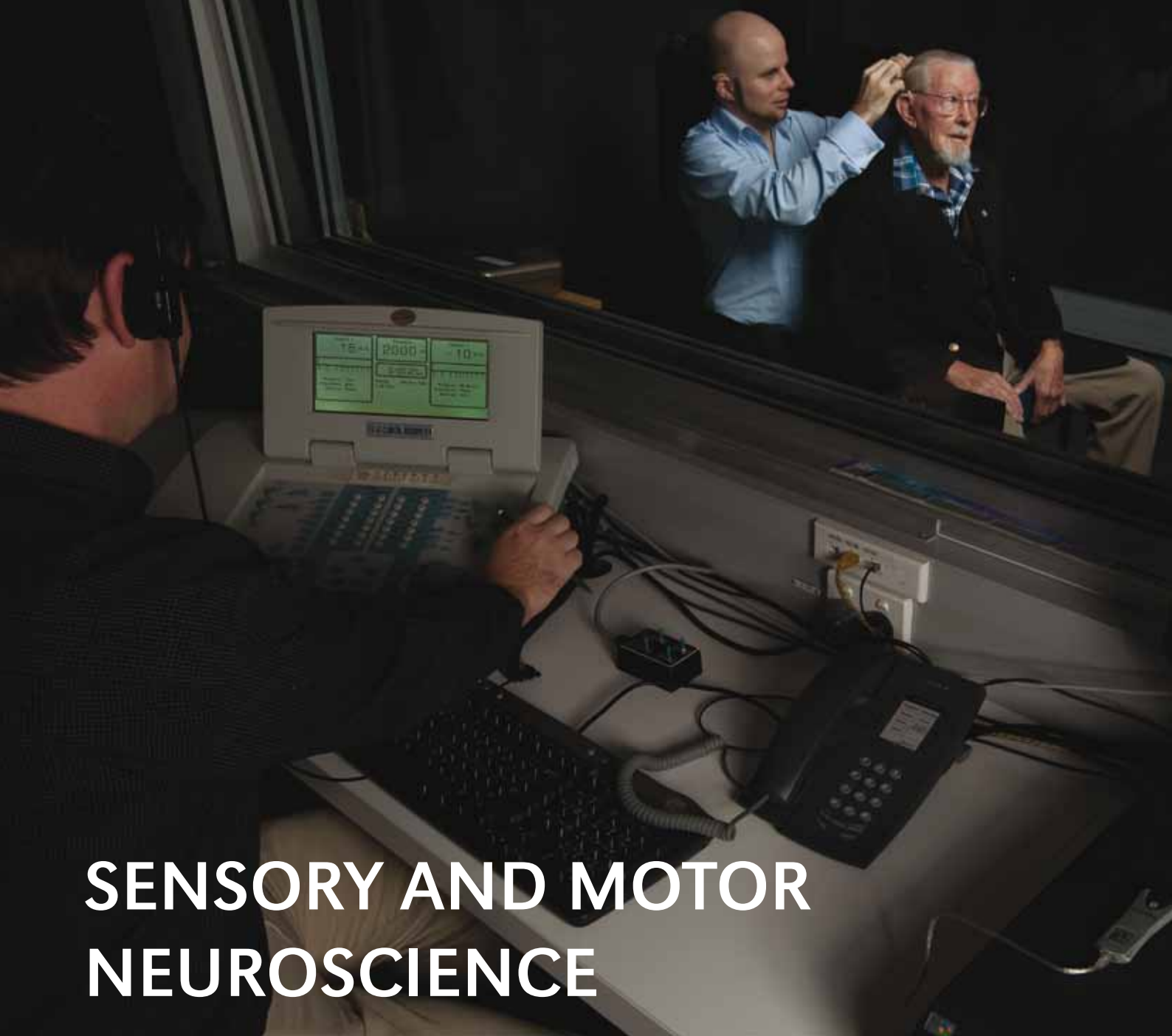
The team were one of the first in the world to do this in live people, helping to develop a tool which is now widely used throughout the world. The team aren’t ready to shake off their computer gamer image yet though; rather they’re putting their video game skills to good use with new training tools!

Laboratory

Dr Burkhard Wuensche
Division for Biomedical Imaging and Visualisation



DTI scans show the nerve cell tracts through the brain



SENSORY AND MOTOR NEUROSCIENCE

Hearing and deafness

“In New Zealand we’re dealing with a potential epidemic of hearing problems. At one end of the spectrum there’s the ‘iPod generation’, showing increasing rates of hearing problems thanks to chronic noise exposure. At the other end, we’re all living longer and age-related hearing loss comes with that. Nearly a third of our population will be severely hearing impaired by 2050. That’s what drives our research forward.”

Professor Peter Thorne CNZM, Professor of Audiology

Head of Audiology Dr Grant Searchfield and Clinical Audiologist Bill Raymond checking a patient's newly fitted cochlea implant at the Tāmaki Hearing and Tinnitus clinic.



The Hearing and Deafness Research Group looks at the normal and abnormal functioning of the ear. Using advanced physiological and imaging techniques, the team correlates basic science research with population data from human studies. Spread across the Faculty of Medical and Health Sciences Grafton Campus and the Hearing and Tinnitus Clinic at Tāmaki, the group are at the cutting edge of auditory neuroscience.

Community work and involvement are central to the success of this research. Professor Thorne is the President of the National Foundation for the Deaf, and has been awarded a Queens' honour for his research and efforts to ameliorate the effects of deafness in childhood. His tireless campaigning enabled the establishment of Project HEIDI; Hearing Impairment, Early Detection and Intervention. Now all New Zealand children are screened for hearing problems at six months of age.

"Biology can't just be about the lab, you have to put the community at the heart of your research", says Professor Thorne. "Our work in clinics and with real people motivates us to keep going. Our research is so rewarding, it's about making a difference to people's lives."

The dream of a pill to cure hearing loss

For soldiers and construction workers, deafness is an occupational hazard. On the battlefield, loud noises and immense pressure changes are par for the course, and soldiers don't get much time to think about protecting their hearing. Currently the only treatment for hearing loss is a hearing aid or cochlea implant. But imagine if they could pop a pill when safe at home, and the hearing damage caused by a loud bomb could be eradicated? That's the dream of Dr Srdjan Vlajkovic.

"People like to be exposed to sound as it enriches our lives, but too much is damaging, just like UV," says Dr Vlajkovic. "Our ears are constantly reacting to external stresses and changes, mopping up toxins and trying to regulate the internal environment. It's called cochlear homeostasis, and that's what we're hoping to ramp up."

Everyone knows about the health benefits of antioxidants in fruit and vegetables, but their

benefits for hearing are less well known. Dr Vlajkovic's team hopes to use the ear's natural antioxidant, called adenosine, to improve hearing repair after noise exposure. The research is proving successful, and the team is now working with drug companies to work out how best to apply the treatment to patients.

"We want to move away from hearing aids towards pharmacological interventions", says Dr Vlajkovic. "My father had Menieres disease, and that's always at the back of my mind- trying to help loved ones and the end-users of our research. If we could develop a treatment that helps prevent or cure deafness, that would be incredible."

Tinnitus: no escape from sound

The Hearing and Tinnitus clinic is home to the North Island adult cochlear implant program as well as an internationally recognized tinnitus clinic. The Audiology team research innovative therapies for tinnitus based on "auditory training", where audiologists attempt to train the brain to reject signals it interprets as tinnitus.

"Tinnitus afflicts many people with hearing loss or brain injury, and there are very few treatments. Since severe tinnitus is believed to be the consequence of how the brain processes and analyses information from damaged ears, studying tinnitus is a window to viewing and understanding the auditory brain as a whole."

Dr Grant Searchfield, Head of Audiology

Laboratories

Professor Peter Thorne
Cochlear Physiology Laboratory

Dr Grant Searchfield
Tinnitus and Hearing Technology

Dr Srdjan Vlajkovic
Auditory Neurobiology

Sound enriches our lives

Human beings are social creatures. Gossip, laughter and deep discussions all help to make our day that bit brighter. Yet thousands of New Zealanders are deprived of a sense we all take for granted. Whether from disease, accident, hereditary disorders or simply age-related decline, hearing problems leave many people in a silent world. Professor Peter Thorne and his team are on a mission to change that.

"Deafness has a huge impact on quality of life. As elderly people become less mobile, socialising becomes a huge thing for them. If they can't hear, communication is very difficult and they are unable to follow or react to what's being said- they become isolated from society", says Professor Thorne. "We live in a world that relies on sound. For children, growing up in a silent bubble means they can't communicate, learning is compromised and they are unable to reach their full potential. To leave them like that is negligent."

Neuroethology

“Neuroethology” is a branch of science that seeks to understand the neural basis of natural animal behaviour. It examines the neural mechanisms for normal behaviour and takes full advantage of the amazing diversity of life.



Professor John Montgomery in his marine laboratory

Fish Ears and Shark Brains

One hundred kilometres away from the University of Auckland, the discipline of neuroscience sits in another world. Set amongst the paradise of Goat Island Marine Reserve is the Leigh Marine Laboratory. There, Professor John Montgomery and his team work on all aspects of marine science and conservation, but critically, how an understanding of fish hearing may lead to better reef conservation. Professor Montgomery explains.

“The term ‘silent sea’ is about as wrong as you can get. We might not be able to hear it but fish certainly can, and the waters around our coasts are teeming with loud and raucous activity. Through our research on fish senses we’ve been able to prove that fish locate their home environment or their feeding grounds through sound. This is critical for reef conservation, because if we can make artificial

reefs sound homely, then we can repopulate entire areas of the marine environment previously ravaged by overfishing.”

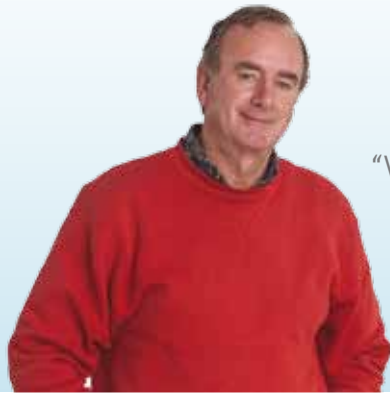
Ultimately, understanding how animal’s brains work may help humans as well. Professor Montgomery’s research into shark brains has led to a new understanding of the cerebellum. This ancient area of the hindbrain first evolved in sharks, and helps to refine and control movement as well as cancel out our own body noise. Ultimately this knowledge could be used in the science of biomimetrics - where scientists reverse engineer animal qualities to help humans.

“People think marine science and neurobiology are a funny mix, but there’s actually a long history of it”, says Professor Montgomery. “Our understanding of nerves and the spinal cord actually came from studying giant squids in the 1950s. We’re just carrying on that long tradition.”

“We specialise in animals that do particular things very well, or even things for which we have no subjective experience! How can fish see in the low light levels of the deep ocean? How can sharks sense electrical activity from other animals? We have the whole diversity of the animal kingdom to work on, which not only gives us a perspective on the evolution of brains and behaviour, but provides numerous examples of skills we’d like to mimic with our own technologies.”

Professor John Montgomery, FRSNZ. Head of the Department of Marine Science





“We mustn’t forget the importance of basic biology. How can you hope to fix the car unless you truly understand the engine? Our work does just that.”

Professor Martin Wild, Head of the Department of Anatomy with Radiology

Clever Kiwi and Modelling the Moa

“Birdsong may sound like beautiful music to everyone else, but to me it’s a highly specialised language,” says Professor Martin Wild. “Songbirds are one of the only other animals apart from humans that have to learn their vocalisations from their parents. Each baby bird has to listen and practice carefully to get their song right. And that can tell us a lot about how we learn to speak and exactly what can go wrong.”

Bird brains and behaviour are a well-known neuronal model for studying how embryos and young animals develop. Yet very little is known about our own national emblem, the kiwi. As an endangered species they can’t be studied in the lab, but Professor Martin Wild and Dr Fabiana Kubke have developed an innovative research programme to study their donated brains after death.

“The kiwi has actually got a huge brain for its size! Its forebrain is hugely enlarged, and that’s something we’d normally associate with intelligence,” says Dr Kubke. “Yet very little is actually known about what behaviours account for that- does the kiwi have an amazing sense of smell, hearing or vocalisations? We’re studying its brain to try to understand more.”

Thanks to a unique partnership with the Department of Conservation, kiwi that are found dead from natural causes in the Northland are provided to scientists at The University of Auckland for research. Their brains are then studied and modelled using advanced imaging techniques including MRI and Computed Tomography scans. The skills learnt during this project have also been put to good use on another New Zealand infamous bird, the moa. More than two hundred years after the bird became extinct, we now know what its brain looked like, and the results are spectacular.

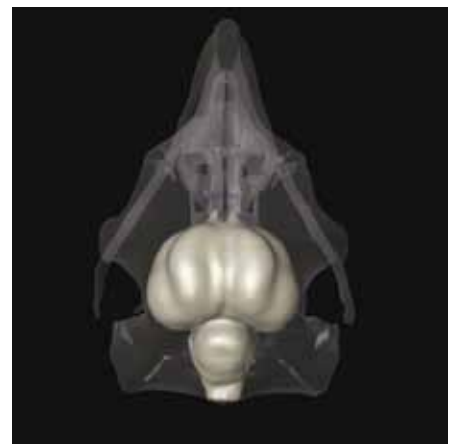
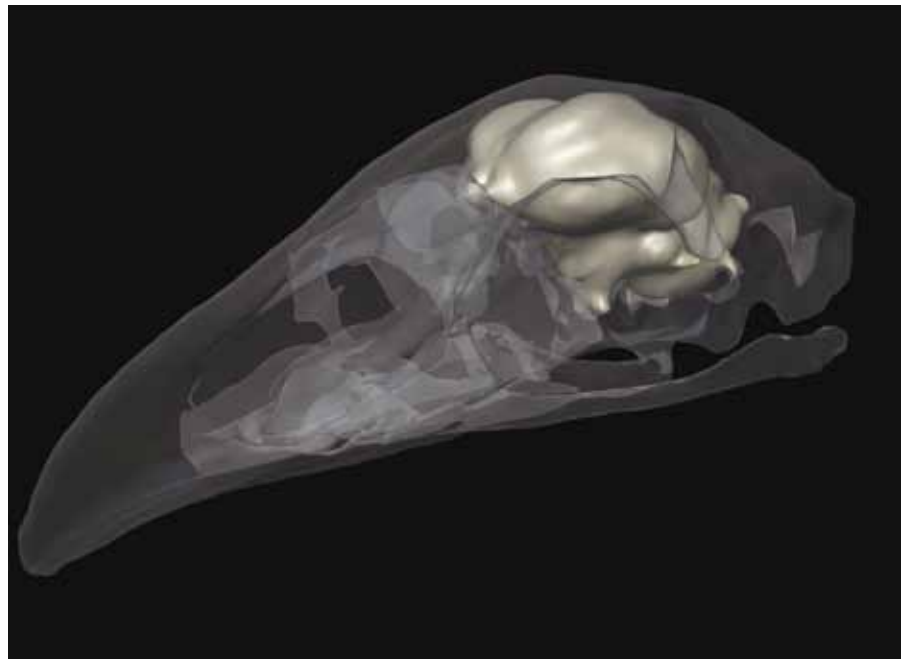
Laboratories

Professor Martin Wild
Comparative Neurobiology and Neuroethology

Dr Mark Hauber
Neuroethology

Professor John Montgomery
Neuroethology

Dr Fabiana Kubke
Neuroethology, Developmental and Evolutionary Neurobiology



These spectacular images illustrating the Moa’s brain were created by modelling the inside of a skull loaned by the Auckland Museum. This project was undertaken by Dr Jeremy Corfield under the supervision of Professor Martin Wild and Dr Fabiana Kubke.

Brain plasticity

“People used to think that when you reached adulthood, then that was it, the brain couldn’t change. Any brain injuries or developmental disorders you acquired, as an adult you were more or less stuck with them. But we’re proving that’s just not true. The brain has enormous plasticity, even in adulthood, and recovery of function is possible. Our research looks at how we can help that along.”

Dr Ben Thompson, Department of Optometry and Vision Science



Dr Thompson running his binocular perceptual training methods to develop treatments for 'lazy eye'

As we age our brains become less able to change. Recovery from trauma, injury or development problems is often less successful in adults than in children. Yet scientists at the Centre for Brain Research are showing the adult brain can adapt and change, presenting new options for rehabilitation and helping to improve people’s daily lives.

Vision Science

Seeing is a remarkably complex process; every image we view involves the brain decoding information from each eye to reconstruct a representation of the object we are viewing. A huge amount of neural circuitry is devoted to this task, and it’s not surprising there’s so many ways it can go wrong. For people with amblyopia, or lazy eye, a developmental problem causes the brain to process information from one eye abnormally, meaning they have reduced vision in that eye and no binocular vision.

“Traditionally the view was that the adult brain didn’t have enough plasticity to correct any problems from childhood, meaning adult amblyopes were considered to be untreatable”, says Dr Ben Thompson. “Our research challenges this. We’ve developed new techniques for treating this disorder, using a kick start from non-invasive brain stimulation combined with some extra brain training.”

Dr Thompson’s lab looks like something from a science fiction movie set when all his equipment is set up. Study participants wear 3D computer goggles and sit under a machine delivering weak electrical stimulation to their brain, all under the watchful eye of the Vision Science team. This unusual treatment uses transcranial Direct Current Stimulation (tDCS), an exciting technology which can amplify the brain’s own neural pathways with non-invasive stimulation. At the same time, Dr Thompson can then promote the use of the weaker eye. He uses binocular perceptual training methods- where each eye watches a different image, forcing the brain to pay attention to both sides. These techniques allow the team to learn how the brain’s visual cortex works, as well as how they can help improve vision for patients with brain-based visual disorders. Ultimately, their work could help people to see again.

Motor Science

Restoring movement ability after brain injury or disease used to be thought of as an impossible dream. When areas of the brain controlling movement are affected, then walking, talking or writing may become just a memory for the patient. Now scientists are finding ways to help the brain rewire itself, proving an old dog can learn new tricks.

“If we can restore movement ability after brain injury, not only does this massively improve people’s quality of life, but it reduces the overwhelming social and financial impacts of their disability. It’s a huge goal that can only be achieved by working with all members of the care team, from the hospital bed to the community.”

Associate Professor Winston Byblow, Associate Dean (Tāmaki), Faculty of Science

Associate Professor Byblow’s team uses novel brain imaging and stimulation techniques to understand how the brain controls movement, and how it changes in response to injury such as stroke. This research has led to new developments including a simple mechanical device which ‘primes’ the areas of the brain controlling the weak hand and arm. By using the device before engaging in therapy, patients are able to make their brains more responsive to therapy and practice, and achieve better outcomes. The novel device is currently being developed by a New Zealand company and will soon be available.

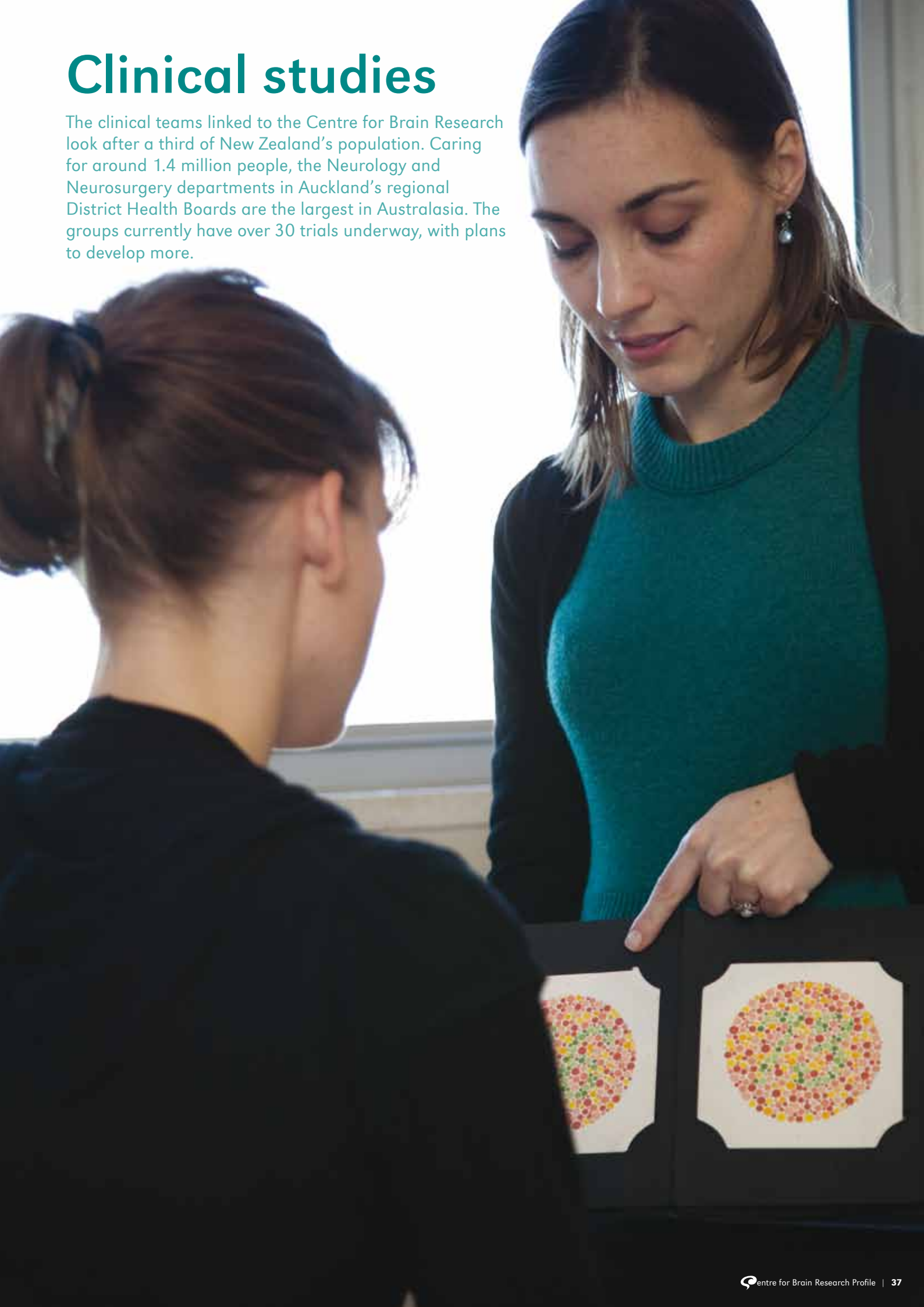
Laboratories

Dr Ben Thompson
Visual Neuroscience

Associate Professor Winston Byblow and
Associate Professor Greg Anson
Movement Neuroscience

Clinical studies

The clinical teams linked to the Centre for Brain Research look after a third of New Zealand's population. Caring for around 1.4 million people, the Neurology and Neurosurgery departments in Auckland's regional District Health Boards are the largest in Australasia. The groups currently have over 30 trials underway, with plans to develop more.



Stroke and brain trauma



Stroke therapy trials

District Health Boards across Auckland are involved in a number of trials testing a range of treatments aimed at treating and preventing stroke, many of which are large multicentre trials funded by pharmaceutical companies. Participation in these studies ensures better care for people with stroke.

Improving outcomes for stroke patients

Accurate diagnosis is essential after a stroke to determine which part of the brain has been affected. Until recently, neurologists simply relied on the external symptoms for diagnosis. Now with the advent of better imaging techniques like Diffusion Weighted Imaging and Diffusion Tensor Imaging, clinicians are investigating how to accurately pinpoint treatment for each patient.

“If we can see exactly which part of the brain is damaged we can make much better decisions about the treatments and therapies to give patients. I am researching better ways to use imaging techniques in diagnosis. We can then refer suitable patients for new rehabilitation and plasticity therapies.”

Professor Alan Barber, Head of Stroke Services at ADHB

Professor Alan Barber is also a co-investigator of two studies led by the National Research Centre for Stroke, Applied Neurosciences and Neurorehabilitation at Auckland University of Technology looking at stroke and traumatic brain injury epidemiology in a New Zealand setting.

Neurosurgery for stroke and brain injury

The ADHB Neurosurgical team are trialling surgery as an option for large-scale strokes and brain trauma. The team is investigating whether removing part of the skull, known as a ‘decompressive craniotomy’, may help to reduce inflammation in the brain. Relieving this pressure build up may help survival and recovery rates for these patients.

Childhood brain injury

“Brain injury is the biggest cause of death and disability in children- it causes more problems than everything else put together. We can treat most other issues, but the brain really is the last frontier of medicine. Apart from basic intensive care we don’t really have a lot of options - that’s why continued research is so important.”

Dr John Beca, Clinical Director of the Paediatric Intensive Care Unit at Starship Children’s Health

The Starship paediatric intensive care and neurology team are currently running a study to predict patient recovery after brain trauma. Using EEG to monitor brain electrical activity, as well as brain oxygen levels and MRI scans, they hope to gain more data about both physiology and outcomes for children with brain injury. The study is being run in collaboration with the Fetal Physiology team at the Centre for Brain Research.

Mild hypothermia becomes a key treatment option

Swelling and inflammation following brain trauma can actually be a greater problem than the original injury. Now the paediatric team at Starship are trialling keeping children cool to prevent further brain damage. The team are coordinating an international study using cooling blankets, where children from babies right up to teenagers, are chilled for three days after brain trauma.

Clinical Team

Neil Anderson	Neurologist ADHB
Alan Barber	Professor of Clinical Neurology
John Beca	Paediatric Intensivist Starship Hospital
Peter Heppner	Neurosurgeon ADHB
Dean Kilfoyle	Neurologist ADHB and WDHB
Andrew Law	Neurosurgeon ADHB
Edward Mee	Neurosurgeon ADHB
Melinda Nolan	Paediatric Neurologist Starship Hospital
Rakesh Patel	Paediatric Neurologist Starship Hospital
Claire Spooner	Paediatric Neurologist Starship Hospital



Surgery

“Heart surgery has revolutionised the lives of millions of people affected by heart disease,” says Professor Barber. “What’s less known is that open heart surgery comes at a cost of brain injury, with stroke occurring in around one in 20 people and memory problems in up to half of people. We’re looking at ways to reduce this injury.”

Professor Alan Barber, Neurological Foundation Clinical Chair in Neurology and Deputy Director of Centre for Brain Research

Stealth bomber technology helps treat vascular disease

Technology first developed in stealth bomber aeroplanes is helping to increase the success of surgery! Using advanced imaging techniques, surgeons are guided into position in the brain by computers, to then perform delicate cerebrovascular surgery. The surgical team are also involved in an international study to trial anti-vasospasm drugs in combination with surgery.

Brain Tumour Analysis

The neurosurgery team are involved in a long-standing collaboration with Professor Bruce Baguley at The University of Auckland Centre for Cancer Research. Brain tumour tissue is sent for histochemical analysis as part of research into tumour biology.

Cognitive problems following heart surgery

In collaboration with the Cardiothoracic Surgery unit at Auckland City Hospital, Professor Alan Barber is trialling a new technique aimed at reducing brain injury following open heart surgery. As a spin-off from this study, the team has shown that brain injury following heart surgery is due in part to clots and air bubbles that fail to be flushed from the heart at the end of surgery.

Hearts and Minds Study

In Starship Paediatric Intensive Care, a similar study is underway. For children born with congenital heart problems, surgery can often be a lifesaver but resulting mild brain development problems are common. The team will now monitor patients to help understand the nature and timing of any brain injuries. “By better understanding brain injury in infants having heart operations, we hope to develop strategies for both prevention and treatment”, says Dr John Beca. The study is being run in collaboration with the Fetal Physiology team at the Centre for Brain Research.

Clinical Team

Neil Anderson	Neurologist ADHB
Rob Aspoas	Neurosurgeon ADHB
Alan Barber	Neurologist ADHB
John Beca	Paediatric Intensivist Starship Hospital
Arnold Bok	Neurosurgeon ADHB
Chris Furneaux	Neurosurgeon ADHB
Peter Heppner	Neurosurgeon ADHB
Ayton Hope	Neuroradiologist ADHB
Andrew Law	Neurosurgeon ADHB
Edward Mee	Neurosurgeon ADHB
Maurice Moriarty	Neuroradiologist ADHB



Epilepsy

“It’s so important that we keep seeking the best treatments for our patients. We want to keep pushing the boundaries and help improve more lives.”

Dr Melinda Nolan, Paediatric Neurologist at Starship Hospital

Auckland Epilepsy Surgery Programme

“Our collaborations with neuroscientists at The University of Auckland have been running for over twenty seven years and it’s been highly productive. Patients are very keen for their brain tissue to be analysed to better understand their condition. The partnership works both ways; our patients make a great recovery, and the tissue we remove is used for research into this complicated disease.”

Dr Edward Mee, Neurosurgeon at Auckland District Health Board

Auckland City Hospital is the national focus of a surgery programme for severe epilepsy. Patients from all over New Zealand with refractory epilepsy proving unresponsive to drugs are referred to the team for assessment, and around 10 to 20 patients per year are suitable for brain surgery. The surgical resection removes the area of brain tissue responsible for causing seizures, and patients often become seizure free. The tissue that would otherwise be disposed of is then sent for research as part of the Neurological Foundation Human Brain Bank. “The whole team is working for the benefit of the patient,” says Dr Peter Begin. “But if we can help research these conditions as well, then of course we are keen to participate and further international knowledge.”

EpiNet - using the internet to further clinical research

Epileptologist Dr Peter Bergin is leading the establishment of an online patient database for epilepsy drug research. By establishing registers for different epilepsy conditions and determining how effective various drugs are in each condition, it’s hoped patients will ultimately benefit. Dr Bergin explains, “We hope that neurologists all over the world will share information about their treatment and its efficacy. We then intend to set up new international clinical trials for the different syndromes. We ultimately hope that we will know right at the outset which is the best drug for each patient with epilepsy.”

Childhood Epilepsy

Childhood epilepsy affects 1% of all children. There are many different syndromes, and each type needs different treatments and drug therapy. The Starship paediatric team is leading the way in New Zealand with clinical research into these conditions.

The team is part of an international study into infantile spasms. This rare form of childhood epilepsy has very poor outcomes if untreated, so steroid hormone therapy is currently the best option. The team is investigating whether steroid therapy is best on its own, or alongside

other drugs. The trial also means the team will follow the babies’ health long-term, so they can monitor the success of each treatment.

Also under investigation are adult medications which could benefit a form of epilepsy found in newborns. Hypoxic ischemic encephalopathy is a type of seizure resulting from brain damage in pregnancy or birth. The trial will investigate the benefits of Levetiracetam against traditional therapies for resetting brain activity.



The Epilepsy Clinical Team

Clinical Team	
Peter Bergin	Neurologist ADHB
Greg Finucane	Psychiatrist ADHB
Richard Frith	Neurologist ADHB
Peter Heppner	Paediatric Neurosurgeon ADHB
Rosamund Hill	Neurologist ADHB
Ayton Hope	Neuroradiologist ADHB ADHB
Hugh Kent	Neuropsychologist
Sanchia Logie	Neuropsychologist ADHB
Edward Mee	Neurosurgeon ADHB
Melinda Nolan	Paediatric Neurologist Starship Hospital
Lynair Roberts	Epilepsy Nurse Specialist
Cynthia Sharpe	Paediatric Neurologist Starship Hospital
Claire Spooner	Paediatric Neurologist Starship Hospital
Elizabeth Walker	Neurologist ADHB
Barbara Woods	Paediatric Neurology Nurse Specialist
Neurophysiology Technician Team	



Movement disorders

“The Centre for Brain Research generates a culture of exploration and excellence. Simply by working alongside so many skilled people, something great has got to happen.”

Clinical Associate Professor Barry Snow, Head of Neurology at Auckland District Health Board

Parkinson's Drug Trials

“Research is such a good discipline for clinicians to be involved with”, says Clinical Associate Professor Snow. “The major focus of our work is of course seeing patients. Yet our involvement in research means a greater degree of precision in diagnosis for patients, and we keep up to date with new developments. Everyone benefits.”

The Movement Disorders team are developing better treatment options for patients with conditions like Parkinson's disease, Tourette's and dystonia. Current drug trials include:

- Rotigotine - a new drug delivery system to provide synthetic dopamine through the skin
- Droxidopa - a drug to treat low blood pressure in Parkinson's
- Sefanaimide - a drug which enhances natural levels of dopamine
- Duodopa - a new drug delivery system to smooth out levels of dopamine in the blood

Deep Brain Stimulation Programme

Auckland District Health Board is the national centre for a new deep brain stimulation programme. Dr David McAuley leads the team performing this innovative cutting edge surgery for Parkinson's, which helps to stimulate the brain's own movement regulation system and relieve symptoms of the disease. Around twelve patients per year from across New Zealand will be specially selected to undergo this highly specialised surgery.

“The patients are awake when we treat them, so we can see the tremor stop on the operating table. To be able to perform this surgery here in Auckland is wonderful for patients and amazing for our international reputation.”

Dr Arnold Bok, Neurosurgeon at Auckland District Health Board

Clinical Team

Arnold Bok	Neurosurgeon ADHB
David McAuley	Neurologist ADHB
Lorraine McDonald	Movement Disorders Nurse ADHB
Barry Snow	Neurologist ADHB



Physiotherapy helps Parkinson's patients keep active and stay well

Neuromuscular disorders

Nerve diseases (neuropathies)

While clinical care for myopathies and neuropathies is of the highest standard, the root cause of these disorders is often not fully understood. These conditions result from disease in the peripheral muscles or nerves, causing pain or loss of control of the limbs. Each condition is very complex and can be acquired or inherited. Close collaboration with neurogeneticists ensures patients receive the best care for their condition, but more research is always needed, as neurologist Dr Dean Kilfoyle explains.

“We can treat conditions like immune mediated peripheral neuropathy with powerful immunosuppressant medications,” says Dr Kilfoyle. “Yet the underlying pathogenesis, or the disease process, remains poorly understood. Advancing our knowledge of pathogenesis at the molecular and basic science level will be crucial to developing more effective treatments.”

Muscle diseases (myopathies)

Dr David Hutchinson specialises in patients with myopathies. He is especially interested in Inclusion Body Myositis (IBM), a condition where patients develop slowly progressive, disabling weakness of throat and limb muscles.

“IBM is an enigma,” says Dr Hutchinson. “It has some features of an autoimmune disorder, including an inflammatory response within muscle, but patients do not respond to immune suppressant treatment. Other features, such as deposition of beta-amyloid protein within muscle fibres, point to a degenerative disorder. To extend my earlier research on IBM by collaboration with neuroscientists in the CBR is an exciting prospect”.

Multiple Sclerosis (MS)



“Our team is working on research to trial special antibodies called monoclonal antibodies, which target a protein or immune reaction and help to switch off a disease process. As we improve this research, we hope it will expand the treatment options for patients with MS.”

Dr Jennifer Somerfield, Neurologist at Auckland District Health Board

Multiple Sclerosis Prevalence Study

The MS Unit, led by Dr Ernest Willoughby, has taken part in organising the recently completed national study of the prevalence of MS in New Zealand, funded by the Health Research Council and the NZ MS Society. The study confirmed a striking correlation between a higher incidence of MS with increased latitude. Almost 3000 people with established MS took part, with the prevalence ranging from 50-60/100,000 in the mid to upper North Island to 120-135/100,000 in the lower South Island- that’s double the prevalence. The study also confirmed substantially higher prevalence in women and low prevalence in Maori and Polynesians. Ongoing research in collaboration with MS Units in Christchurch and

Motor Neurone Disease

“Motor neurone patients want to see more research into their condition. It’s so devastating for families, and yet so little is known. The whole multi-disciplinary team is ready to help the Centre for Brain Research in any way we can.”

Dr Alison Charleston, Neurologist at Auckland District Health Board

Motor Neurone Disease is a devastating progressive condition where patients lose the ability to move their muscles. Yet new research is showing a psychological component to the disease as well. Dr Alison Charleston is linking up with researchers from Cognitive Neuroscience to investigate the level of cognitive impairment in sufferers.

“It’s so important to understand every aspect of the disease process”, says Dr Charleston. “If we can stress to carers that a patient is not just being difficult, it’s simply part of their illness, then it makes a world of difference to their attitude. Research like this makes a patient’s experience of health care so much better.”

Clinical Team	
Alison Charleston	Neurologist Motor Neurone Disease Specialist ADHB
David Hutchinson	Neurologist Muscle Specialist ADHB
Dean Kilfoyle	Neurologist Nerve Specialist ADHB

Australia is focussed on a potential role of genetic and environmental factors contributing to relative deficiency of Vitamin D early in life, becoming a key factor predisposing people to MS.

Clinical trials in MS

For several years the Unit has been taking part in a number of international trials for new treatments in MS. Medications which modify the immune system, such as the monoclonal antibody natalizumab (Tysabri), have proved to be increasingly effective in the inflammatory component of the early stage of the disease. Different treatments are still required for the later, chronic degenerative phase of MS.

Clinical Team	
Fiona D’Young	Study Coordinator/MS Nurse Specialist
Justine Simmons	MS Nurse Specialist
Jennifer Somerfield	Neurologist ADHB
Ernest Willoughby	Neurologist ADHB
Gillian Willoughby	Study Coordinator



Neurogenetic disorders

“One of the ways patients can strike back at the disease is to be involved in research. The Neurogenetic Clinic acts as a pathway for people to get involved with studies right across the Centre for Brain Research.”

Dr Richard Roxburgh, Neurologist at Auckland District Health Board

Longitudinal follow-up study of patients with Huntington’s disease

Research collaboration across the Centre for Brain Research with Professor Richard Faull and Dr Lynette Tippett’s teams has been established now for 5 years. Patients who are keen to be involved in research studies are assessed annually and their physical symptoms and examination findings are combined with long term cognitive studies to complete the picture of how Huntington’s Disease affects each individual differently.

“Working in a multi-disciplinary team is essential to provide the best care for our patients,” says Dr Roxburgh. “People with a neurogenetic condition don’t just have neurological problems; they also have movement, heart, psychiatric and social problems. Our team of professionals is experienced at caring for these rare conditions, so what we learn from one patient we can hand to another.”

Huntington’s disease Creatine Clinical Trial

The neurogenetics team has become the New Zealand accredited site for the international Huntington’s Disease (HD) Study Group. This world-renowned clinical trials team coordinates HD studies on a global scale, so results are more effective. Already underway is a study exploring the effects of creatine in patients with Huntington’s symptoms. This compound is better known as a nutritional supplement, but it’s hoped it will help sustain brain energy. If this happens, motor and cognitive symptoms shown in HD could be reduced and the onset of the condition delayed. The study will investigate this over a three year period in a randomised controlled trial.

Huntington’s and Muscular Dystrophy Database

Dr Richard Roxburgh is in the process of working with community NGOs to develop a database for these conditions. The database will collect information about the diseases, the efficacy of the drugs used to treat them and the frequency of occurrence of the conditions. All the data will be collected in accordance with international standards so that the information can be used globally to help treat these conditions.

Clinical Team	
Salim Aftimos	Geneticist Northern Regional Genetics Service
Lorna Crawford	Occupational Therapist Neurogenetics Rehab Clinic
Jo Dysart	Huntington’s disease Nurse Specialist
Alison Elston	Physiotherapist Neurogenetics Rehab Clinic
Greg Finucane	Neuropsychiatrist ADHB
Mac Gardner	Geneticist Northern Regional Genetics Service
Ian Hayes	Geneticist Northern Regional Genetics Service
Virginia Hogg	Trial Coordinator
Hugh Ken	Clinical Neuropsychologist
Dale Kerr	Genetic Associate Northern Regional Genetics Service
Janka Oberst	Speech & Language Therapist Neurogenetics Rehab Clinic
Richard Roxburgh	Neurologist ADHB
Sarah Smalley	Genetic Associate Northern Regional Genetics Service
Dr Warren Smith	Cardiologist ADHB
Lynette Tippett	Neuropsychologist
Dr Ken Whyte	Respiratory Physician ADHB

Memory diseases

“The number of elderly people in New Zealand is increasing year on year, and the conditions associated with that are steadily climbing. We can’t afford to stop looking for new treatments. More research is our best hope.”

Dr Phil Wood, Geriatrician at The Memory Clinic

Clinical Research

The team at The Memory Clinic on the North Shore treat people with many neurodegenerative conditions, including mild memory impairment, dementia and Parkinson’s disease. Their expertise and specialisation enables the best care for patients from all over the northern half of New Zealand.

Dr Phil Wood heads up the clinical and research teams. “People come here for their own treatment, yet I am constantly amazed by how keen they are to take part in research,” he says. “I think it’s the most altruistic thing someone can do, as it may not help the patient themselves, but it will help those who may be following them.”



Monoclonal antibodies

The team is part of an international groundbreaking trial looking at the efficacy of monoclonal antibodies in Alzheimer’s disease. This research uses an established technology whereby specific proteins are killed with a manufactured immune response. In this trial, ‘Bapineuzumab’ antibodies are targeted towards the amyloid plaques thought to play a role in causing the brain cell death in Alzheimer’s.

“This really is a pivotal trial,” says Dr Wood. “We have 4000 people all over the world taking part in this research, and we hope to prove whether killing the amyloid proteins associated with Alzheimer’s can make a difference to our patients.”

Concert Trial

Antihistamines are more commonly associated with staving off runny noses for hay fever sufferers, but they may soon have a use in dementia. The clinical team is leading a new trial to find out whether a Russian antihistamine called ‘Dimebon’ could help improve brain cell survival. It’s thought the drug may improve mitochondrial function, which are the energy powerhouses of cells. The drug is being given to patients who are already stable on other medication to see if it can further improve their symptoms.

“Alzheimer’s disease is such a difficult diagnosis to give people, as currently there are so few therapies we can offer”, says Dr Wood. “We do have a range of drugs already in use, but they’re clearly not the answer yet. Being part of the Centre for Brain Research means we can widen our research options and hopefully find new treatments for people with brain disease.”

Clinical Team	
Kiri Brickell	Neurologist, WDHB
Sharon Evans	Research Nurse
Virginia Hogg	Clinical psychologist
Sam Ritz	Geriatrician
Alexis Srzich	Geriatrician
Lynette Tippett	Neuropsychologist
Jane Wager	Research Coordinator
Phil Wood	Geriatrician, The Memory Clinic



Working together to improve lives

Our supporters

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- Auckland Medical Research Foundation
- Douglas Charitable Trust
- Foundation for Research, Science & Technology
- Freemasons of New Zealand
- Health Research Council
- Gus Fisher Charitable Trust
- Marsden Fund
- Matthew Oswin Memorial Trust
- Neurological Foundation of New Zealand
- School of Medicine Foundation
- The Coker Charitable Trust
- The Lynette Sullivan Trust



How you can help

Research Volunteer Database

Every day at the Centre for Brain Research our researchers are working hard to find and develop new treatments for brain disease. Alzheimer's, stroke, epilepsy, Parkinson's, multiple sclerosis, Huntington's and other brain diseases are all devastating conditions for both patients and their families. We need to learn more about how our brain works, how these diseases change our biology and how we can halt that process. More research is essential. Yet without human volunteers, many of our health and medical studies simply won't happen.

We need healthy volunteers as well as people with neurological conditions to participate. If you are interested in contributing to current or future research projects at the Centre, you can join the Volunteer Register. The Register is a secure database, which can only be accessed by Centre administrators. From time to time, the administrators search the database for people who might be eligible to take part in ethically approved research projects at the Centre. Information about the study is then sent out to potential volunteers, along with how to get in touch if they are interested in participating.

The information on the Register is only used for this purpose, and will not be made available to any other people or groups. If you decide to join the register, you can change or delete your information at any time, by contacting the Centre.

Supporting the Centre for Brain Research

Partnerships with friends and supporters enable us to significantly enhance our ability to unlock the secrets of the brain. With your support we will continue to develop new therapies, improve clinical care and educate our communities.

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The University of Auckland's School of Medicine Foundation was established in 1994 as a non-profit charitable trust to receive donations and bequests to support research and scholarship within the Faculty of Medical and Health Sciences. Today, funds held by the Foundation are supporting academic and research staff, undergraduate and postgraduate students through scholarships and a variety of exciting and innovative research projects.

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Synaptic Function Research

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Professor Mike Dragunow
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Professor Russell Snell
Associate Professor Louise Nicholson
Dr Kathy Mountjoy
Associate Professor Nigel Birch
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Dr Debbie Young and Professor Matt During
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Associate Professor David Christie
Associate Professor Michelle Glass
Dr Johanna Montgomery

Clinical Neuroscience

Auditory Processing
Fetal Physiology
Language Processing
Human Neuropsychology
Neurology Research Unit
Psychopharmacology and Neurodynamics

Associate Professor Suzanne Purdy
Professor Laura Bennet and Professor Alistair Gunn
Dr Clare McCann
Dr Lynette Tippett
Professor Alan Barber, Dr Cathy Stinear and Dr Jennifer Somerfield
Professor Rob Kydd and Dr Bruce Russell

Sensory and Motor Neuroscience

Auditory Neurobiology
Cochlear Physiology Laboratory
Comparative Neurobiology and Neuroethology
Movement Neuroscience
Neuroethology
Neuroethology
Neuroethology, Developmental and Evolutionary Neurobiology
Tinnitus and Hearing Technology
Visual Neuroscience

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Professor Peter Thorne
Professor Martin Wild
Associate Professor Winston Byblow and Associate Professor Greg Anson
Professor John Montgomery
Dr Mark Hauber
Dr Fabiana Kubke
Dr Grant Searchfield
Dr Ben Thompson

Cognitive and Computational Neuroscience

Cognitive Lab
Division for Biomedical Imaging and Visualisation
Evolution of Cognition and Language
Functional Neuroimaging
Human Neuroscience Lab
Memory Lab
Mental Chronometry
Music and Motor

Professor Michael Corballis and Dr Tony Lambert
Dr Burkhard Wuensche
Professor Russell Gray
Dr Karen Waldie
Associate Professor Ian Kirk
Dr Donna Rose Addis
Dr Jeff Hamm
Dr Vanessa Lim

Clinical Team Leaders

Epilepsy
Memory Diseases
Motor Neurone Disease
Movement Disorders
Multiple Sclerosis
Neurogenetics
Neuromuscular
Neuropathology
Stroke and Brain Injury
Surgery

Dr Peter Bergin, Dr Elizabeth Walker, Dr Claire Spooner and Dr Melinda Nolan
Dr Phil Wood
Dr Alison Charleston
Clinical Associate Professor Barry Snow and Dr David McAuley
Dr Ernie Willoughby and Dr Jennifer Somerfield
Dr Richard Roxburgh
Dr David Hutchinson and Dr Dean Kilfoyle
Dr Beth Synek
Professor Alan Barber, Deputy Director of the Centre for Brain Research,
Dr Neil Anderson and Dr John Beca
Dr Ari Bok, Dr Ed Mee, Dr Chris Furneaux, Dr Andrew Law and Dr Peter Heppner



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