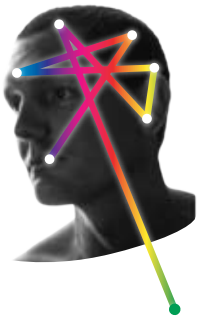
2009 Annual Report

Neuroscience Research Australia

Discover. Conquer. Cure.

Front cover photo: Our research aims to cure diseases and disabilities of the brain and nervous system for the next generation. Professor Tony Broe AM, Senior Principal Research Fellow and Director of the Koori Growing Old Well Study photographed at Neuroscience Research Australia, with his son James.

Our vision is to prevent and cure diseases and disabilities of the brain and nervous system through leadership, excellence and innovation in neuroscience research.



Neuroscience Research Australia

Discover. Conquer. Cure.

Every year, one in five Australians is struck down with a major brain or mind disorder. Since 1993, scientists at the Prince of Wales Medical Research Institute have pursued their passion to discover and cure diseases and disabilities of the brain and nervous system.

It is now appropriate that we embrace a new name that represents our culture and vision.

Neuroscience Research Australia (NeuRA) is more than just a new name. It is a demonstration of our achievements and ambitions, our independence, our collaboration and our internationally recognised leadership in research.

We invite you to discover the incredible work that Neuroscience Research Australia is doing both for Australia and for the world. Share in the excitement of our journey as we continue to understand the secrets of the brain and nervous system to conquer illness and disease.

Disco

"Part of my legacy will be a number of well-trained, equally passionate researchers who will work to **discover** cures for these devastating disorders."

Professor Glenda Halliday

What is the burden of dementia in urban dwelling Indigenous Australians?

The prevalence of dementia in Aboriginal people who live in urban areas in NSW is under the research spotlight. A high rate of early onset dementia has already been identified in remote Aboriginal communities, but those closer to the city have not received the same research attention.

The Koori Growing Old Well Study is examining links between early-life events and mid-life health status in Aboriginal people and their ability to reach a healthy old age in the same way as the non-Aboriginal community.

The research team, including local Aboriginal researchers, is solidifying partnerships with participating Aboriginal communities.

There is a real need to improve care for older Aboriginal people as well as to ensure that they actually reach old age.

Researchers will recruit and interview

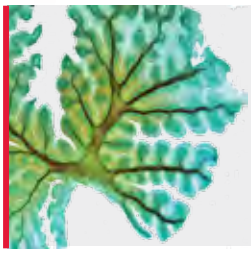
600

Aboriginal people aged 60 and over across NSW in 2010

"Research is collaborative and discoveries arise from work conducted all over the world. My investigations contribute a few pieces to understanding the complex puzzle that is human thinking."

Dr Olivier Piguett
NHMRC Research Fellow

ver.



Researchers rely on the generosity of donors and their loved ones to donate their brain tissue after death. Currently there are over 800 brains in our Brain Bank. This valuable tissue is used to answer vital questions about the causes of disease such as Alzheimer's and Parkinson's.

Kylie Radford
Research Assistant,
Koori Growing Old
Well Study

Managing chronic pain

Tissue damage is neither necessary nor sufficient for pain. The more we learn about pain the more this becomes apparent, most significantly when we consider the 20% of people for whom quality of life is reduced by a chronic pain problem.

We aim to increase our understanding of why things hurt, why things keep hurting and how we can better prevent and manage chronic pain. We are investigating how our brain makes us feel things in our body and how we can change those feelings, how persistent pain can be targeted by treatment and whether or not such treatments actually work in the real world.

Ultimately, we expect to achieve better outcomes for people in pain and fewer people developing chronic pain.

"Every day I am reminded that human beings are fearfully and wonderfully complex individuals. My research can help patients get better tomorrow, not next century."

Dr Lorimer Moseley
NHMRC Senior Research Fellow

There are over

35,000

Australians currently suffering from schizophrenia costing the nation $1.85 billion annually

Con

Diagnosis of Parkinson's disease

Around 100,000 Australians are currently living with Parkinson's disease with one in seven being diagnosed before the age of 50. Parkinson's disease is a progressive, degenerative neurological condition that affects the control of body movements.

While the cause, or more likely, causes of Parkinson's is not known we do know that some factors increase the risk. Although in rare cases Parkinson's can be inherited, the vast majority cases are not.

In Parkinson's disease, a small group of brain cells die early in the disease process.

We are working to understand the reasons why these cells are so vulnerable. This knowledge will assist us to develop new methods to slow or prevent brain cell death and enable an earlier and more accurate diagnosis than currently possible.

Donald Bartho, who has Parkinson's disease and dementia

Understanding mental illness

There has been a rapid realisation that mental illness is responsible for one of the largest disease burdens in Australia with one in five people experiencing a mental illness at some stage in their lives.

A devastating disease like schizophrenia waits silently until a seemingly normal child becomes a teenager or young adult - and then it strikes, derailing a young life.

The exact cause of mental illness is not known but research discoveries have shown that a combination of biological, psychological and environmental factors is the key.

The challenge now for our researchers is to understand these complex interactions and translate their results into innovative treatments We will, one day, conquer this disease.

Professor Cyndi Shannon Weickert
Macquarie Group Foundation Chair of Schizophrenia Research

quer.

"Our single passion is to understand how the brain and nervous system work and discover how to **conquer** disease."

Professor Peter Schofield

"Falls are a major public health problem for older people. Around one in three suffers and falls each year with many suffering multiple falls. We are making major advances in addressing the causes of falls and our findings are now used in clinical practice across the country."

Professor Stephen Lord
NHMRC Senior Principal Research Fellow

Cure.

"Being involved in this research enables me to cope with the progressive nature of the disease. People are so friendly and cheerful. It's not a sad place! It's a pleasure to come here!"

Sonia Wright, who has Motor Neurone Disease

Protecting children in car crashes

Seven years of research by our Injury Prevention Research Centre has underpinned new child restraint legislation throughout Australia.

Our studies in the causes of road trauma injuries in children, and how changes to the types and design of restraints used by children can significantly reduce serious injuries and death, are making a practical difference to the safety of children travelling in cars.

Our research has identified a number of key problems including whether children use restraints correctly and whether they use restraints that are appropriate for their size.

Knowing there are children whose lives have been saved through improving their safety while travelling in cars is extremely rewarding.

Genetic Repositories Australia (GRA) provides advanced facilities for the processing and long-term secure storage of DNA and cell lines from patients and populations. It is a key resource for medical researchers around the nation in assisting to identify genes, improve treatments and cure diseases.

"Neurological disorders are so devastating, and affect so many, we have to find a way to prevent or **cure** them. We never lose sight of why we do this research."

Dr Claire Shepherd

Halting the destruction of Motor Neurone Disease

Motor Neurone Disease (MND) is a degenerative disorder for which there is no cure. Motor neurones control all our movements including speaking, walking, breathing and swallowing. When there is damage, the muscles do not work properly and eventually the patient becomes completely paralysed. More than one Australian dies every day from MND.

Using new diagnostic tests developed at NeuRA, the state of motor neurones can be assessed. The first drug trial for MND initiated in Australia is also underway at NeuRA and new therapies are also being explored that aim to maintain breathing muscle function in patients.

We aim to find the causes, an effective treatment and a cure in the not too distant future.

The prevalence of MND is one in

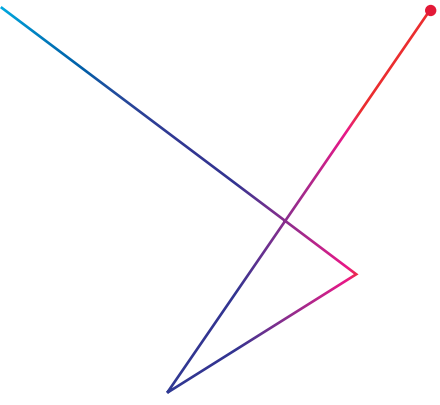
15,000

Australians and the life expectancy of those diagnosed is two to three years

Defining the pathways

"Neuroscience Research Australia is a shared vision. It is underpinned by strength of purpose, a healthy organisational structure, sound leadership and a nurturing environment."

The quest for knowledge, understanding, treatment and cures through neuroscience research – discover, conquer, cure.



Our new name

• The Board and staff of the Prince of Wales Medical Research Institute are proud to announce our new name, Neuroscience Research Australia. The main reasons for the change have been the confusion with the Prince of Wales Hospital and the fact that our previous name gave no indication of what we do or our future direction.

The Board reviewed this matter at length in 2009 and in October, the combined POWMRI and Foundation Boards resolved to adopt the new name Neuroscience Research Australia, a new brand identity to reflect the name and a new acronym, NeuRA. The new name reflects accurately what we do, namely neuroscience research, and that the research is directed to the benefit of all Australians.

This rebranding of our organisation is a momentous occasion for it contributes to the genesis of a new push for scientific endeavour we know today as the neurosciences. Our new name gives us space to grow, and we are confident that we can rise to the challenge.

Opening of the new Prince Henry Wing

• Major building works have continued this year, with the Prince Henry Wing being officially opened in June 2009 by the Hon Jodi McKay MP, Minister for Science and Medical Research. We were also delighted to welcome the Trustees of The Prince Henry Hospital Centenary Research Fund whose generous support allowed this development which has been named to reflect the role of The Prince Henry Hospital in our founding. The additional space helped address our critical need for clinical research laboratories, interview rooms and office accommodation for researchers and students.

The Neuroscience Research Precinct

• As staff numbers continue to rise, space remains at a premium. We submitted the Concept and Planning Application for the Neuroscience Research Precinct to the NSW Department of Planning in May 2009. The Minister approved both the Concept and Project in late January 2010.

The concept approval, which is the long-term master plan for the whole site, envisages a development potential that could provide up to 61,000m^2 of building space and the capacity to house up to 1,500 researchers. The project approval, which is the approval to build the Neuroscience Research Precinct, has been given for a staged development with work on the first of the four stages which would comprise a 25,470m^2 research facility with the capacity for 700 research staff.

Financed by a $30 million Commonwealth Government grant and including $5 million from POWMRI's supporters and benefactors, construction of the first stage of the project commenced in March 2010 with Richard Crookes Construction appointed the building contractor. However, construction of the full project is dependent upon securing additional funding.

Our Board of Directors

• This year, Prof Mike Calford was appointed to NeuRA's Board as the nominee of the National Health and Medical Research Council. Mike is Deputy Vice-Chancellor (Research) at the University of Newcastle. Peter Kemp retired as an Independent Director in August 2009. Peter has made a significant contribution over the last three years and his wise counsel was most appreciated by fellow Directors.

In July 2009, Prime Minister Kevin Rudd appointed Director Mike Quigley as Executive Chairman of the National Broadband Network Company. This is an immense task and one for which Mike is highly qualified. I am especially pleased that Mike will continue as a Director.

NeuRA's Board members are people from all walks of life who accept this position in an honorary capacity. They generously give of their time and acumen. But also, importantly, they give through advocacy and personal financial support. Our Directors believe wholeheartedly in NeuRA's research and NeuRA's researchers and the goals they achieve. And so I extend my personal thanks to my fellow Directors for their continuing and significant enthusiasm and dedication.

Acknowledgements

• I congratulate NeuRA's scientists and clinicians for their outstanding achievements over the last year. In particular, I thank Professors Peter Schofield and Simon Gandevia and the research Group Leaders. These are talented people with creativity, remarkable dedication and a passion for pursuing excellent research. NeuRA is in good hands!

Sincere thanks are also due to those wonderful friends and donors in the wider community who have wholeheartedly supported our research this year. I acknowledge the crucial role played by individuals, trusts and foundations in helping us achieve our mission and look forward to your continuing support.

Neuroscience Research Australia is a shared vision. It is underpinned by strength of purpose, a healthy organisational structure, sound leadership and a nurturing environment.

NeuRA is a place that holds the promise of major scientific advances for Australia.

Paul Brassil
Chairman

Board of Directors

1

1 **Paul Brassil,** BEc LLB ACA FTIA
Director,
Chairman of the Board, 2004 – present
Chairman, Audit Subcommittee
Chairman, Investment Subcommittee
Member, MRI Subcommittee

2

2 **Andrew Bernard,** BSc MPH
Director, September 2008 – present
Nominee of South Eastern Sydney & Illawarra Area Health Service

3 **Professor Peter Schofield,** PhD DSc
Executive Director and Chief Executive Officer, 2004 – present

4

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5

4 **Professor Mike Calford,** BSc(Hons) PhD
Director, August 2009 – present
Nominee of National Health & Medical Research Council

5 **Michael Quigley,** BSc BE
Director, September 2008 – present
Independent Director

6

6 **Barry Shepherd,** PSM, Grad.Dip PSM
Director, 2005 – present
Chairman, Building Subcommittee
Nominee of South Eastern Sydney & Illawarra Area Health Service

7 **Professor Peter Smith,** RFD MD FRACP FRCPA FAICD
Director, 2005 – present
Nominee of University of New South Wales

7

8

8 **David Thomas,**
Director, 1997 – present
Independent Director

9

9 **Gabrielle Upton,** BA LLB MBA FAICD
Director, 2007 – present
Nominee of University of New South Wales

10 **John Walton,** AM
BEc MBA FCPA AASA FAICD FAIM
Director, 1991 – present
Member, Investment Subcommittee,
Member, MRI Subcommittee
Independent Director

10

11 **The Hon Dr Andrew Refshauge,**
MBBS FAICD
Director, 2005 – present
Member, Audit Subcommittee
Member, Building Subcommittee
Member, MRI Subcommittee,
Nominee of NSW Minister for Science & Medical Research

12 **Peter Kemp,** LLB
Director, 2006 – October 2009
Member, Investment Subcommittee
Member, Building Subcommittee,
Chairman, MRI Subcommittee

11

12

Focus on neuroscience

"We now move into another exciting phase as we embrace our new name and the commencement of an impressive redevelopment of the current site."

Our research

• Brain and nervous system disorders pose the largest health, economic and social burden to Australia of any disease group, which is why we have undertaken cutting edge research on these problems since inception. Our scientists and clinicians aspire to find the answers to the burden of brain disorders. We have continued to make major contributions to the advancement of knowledge in neuroscience and its practical translation. A key indicator of this is the number of peer-reviewed publications which, in 2009, totalled over 200 papers– our best year ever.

Our dedication and focus continues to remain on the neurosciences, and our new name, Neuroscience Research Australia, now appropriately reflects this. Not only does it clearly state our purpose, but it also embraces our future potential. The acronym, NeuRA, relates to the key unit of neuroscience, the neuron, and is one that we anticipate will become widely known.

Our dedication and focus continues to remain on the neurosciences, and our new name, Neuroscience Research Australia, now appropriately reflects this.

Our researchers

• Prof George Paxinos AO was one of 16 of Australia's leading scientists honoured by election to the Australian Academy of Science, a most prestigious appointment. This award follows George being one of 12 scientists nationally to be awarded NHMRC Australia Fellowships. Dr Jane Butler was awarded this year's AMGEN Medical Researcher Award as part of ASMR Medical Research Week.

Prof Rhoshel Lenroot, appointed to the Chair of Child and Adolescent Psychiatry at UNSW and Sydney Children's Hospital, commenced in May. Rhoshel relocated from the US where she has worked at the National Institutes of Health in Bethesda and in Arizona, studying the development of the brain in children and adolescents with disorders such as autism and schizophrenia.

Prof Lindy Rae and Assoc Prof Brett Garner were successful in gaining highly competitive NHMRC Senior Research Fellowships, Prof Glenda Halliday was promoted to a NHMRC Senior Principal Research Fellowship and Prof Simon Gandevia had his NHMRC Senior Principal Research Fellowship renewed. Dr Penelope McNulty was awarded an OSMR Career Development Fellowship Award.

Our research programs are supported by competitive research grants and in 2009 we were awarded a NHMRC Partnership Grant on Falls Prevention. Eleven NHMRC Project Grants and two ARC Discovery Grants were successful as was an ARC Linkage, Infrastructure, Equipment and Facilities Grant which will support a major upgrade to the MRI. We also received two out of eight international awards from the US-based Stanley Medical Research Institute and is part of two grants funded by the US National Institutes of Health.

The Appointments & Promotions Committee recommended the promotions of several researchers including Assoc Prof Brett Garner to Principal Research Fellow and Drs Julie Brown, Tim Karl and Penelope McNulty to Research Fellow. The Faculty now comprises 24 Group Leaders based here full-time including nine at Professorial level.

Three of our senior researchers have decided to relocate. After 16 years with us, Prof Elspeth McLachlan retired in October to live in Scotland. Assoc Prof James Brock took up an appointment at The University of Melbourne in early 2010 after 11 years here. After five years with us, Assoc Prof Brett Garner was awarded a Future Fellowship and Professorial position at the University of Wollongong where he had previously worked and will relocate early in 2011. All will be sadly missed as they have been extremely valuable members of staff, and we wish them every success in the future.

Strategic planning

• Our research group leaders met in August to develop our Strategic Plan for 2010-14 which has subsequently been reviewed and endorsed by the Board. The five major areas for strategic development over the next five years are to:

- Develop our research themes in ageing and degeneration; mental illness; brain function and imaging; neural injury; sensation, movement, balance and falls
- Nurture and recruit current and new faculty members and researchers in each of our research themes
- Develop the capacity for enhancing our research through the development of the Neuroscience Research Precinct and developing operational support systems
- Enhance our research funding through increased grant support, commercialisation and philanthropy and establishment of an endowment
- Maintain and strengthen our systems of governance and corporate partnerships and to expand our public profile

The future

• We now move into another exciting phase as we embrace our new name and the commencement of an impressive redevelopment of the current site. We have come on a remarkable journey and are inspired to continue, recognising that traditional barriers between scientific disciplines will be challenged through our future research strategy.

Neuroscience is the final frontier in medical science and the development of the Neuroscience Research Precinct will provide the ideal setting for our researchers, accelerate the pace of discovery and allow them to conquer the burden of brain and nervous system disorders. It will also provide an opportunity to attract 'the best and brightest' neuroscientists to our campus.

Acknowledgements

• I wish to thank the Chairman and my fellow Directors for their support and wise counsel throughout the year. Finally, I want to extend my thanks to our many supporters and generous donors. Your assistance has proved invaluable in achieving our success.

Professor Peter R Schofield *PhD DSc*
Executive Director and Chief Executive Officer

Building our

"Neuroscience is the final frontier in medical science and this building provides the ideal setting for our researchers to pool their brain power and accelerate the pace of discovery."
Professor Peter Schofield

future

Maximising progress in modern neuroscience research requires us to provide facilities that address many concurrent needs.

Excavators and cranes

• In March 2010, we commenced construction of our new research building. This first stage of the new Precinct development will provide six stories and over 8,000 square metres of purpose-built laboratory and clinical research space. But it represents more than just a visually stunning concrete and glass building - it is designed to help researchers collaborate and therefore innovate, which is a key to us conquering and curing neurological diseases.

Early work includes demolition of the old buildings followed by European and Aboriginal archaeology giving way to an eight metre deep hole, our future 'super basement'. Ultimately another six floors will be ready by mid 2011.

Our building will stand out thanks to its beautifully articulated glass façade, proudly announcing our presence and ambitions to the community we serve.

Getting to turning the first sod has been a major process. We have erected new buildings for the decanting of laboratories and for temporary relocation of offices. We also completed construction of a new dock, stores and dedicated freezer storage facility. All this while growing at an astounding rate.

Concrete and glass

• The new building will be the first of four stages. This vision has been made possible by the dedication of a 14,000 square metre portion of the Prince of Wales campus as a 'Neuroscience Research Precinct'. This site is large enough to accommodate NeuRA and other related entities whose collective efforts will accelerate research and treatment in all areas of neuroscience. Other features include an auditorium and a plaza to allow patients, visitors and staff to enjoy outdoor space. Ultimately we will also have two levels of underground parking across the final three stages of the development.

Our new front door and clinical facilities

• We have designed the first stage building to create a friendly visitor experience. The main entrance will be off Barker Street. Patients and visitors can be dropped directly at the front door under a covered entrance, and into a warm, light-filled entry foyer. The main clinical entry point and reception will be located on this level and will provide generous, comfortable waiting areas.

A new MRI facility capable of accommodating two machines will also be housed on the entry level. Direct lift access to a 'super basement' with six metre high celings will allow large format clinical facilities to be developed, such as PET imaging, a crash lab and a large scale gait lab. Levels two and three will provide a seminar room and additional offices for clinical research teams.

Laboratories

• Levels four, five and six will provide laboratory space for a further 150 staff. Our new 'wet' laboratories are designed with flexibility in mind, so we can adapt them to new uses and technologies. Dry laboratories will allow for vital expansion and renewal of critical people focussed neuroscience research.

A sustainable development

• We have incorporated many features aimed at protecting our environment into the building. A number of these also reduce running costs so that our research dollars go further. These include: collection and re-use of storm-water, solar hot water, use of 'Low-E' glass, natural ventilation options for office areas, use of sustainably harvested timbers and use of a highly efficient heating and cooling plant.

Sophisticated building controls will give the building an 'intelligence' to help reduce the environmental impact and running costs. Even the beautifully serrated glass façade has been designed to exclude heat from early morning and late afternoon summer sun.

Future progress

• Maximising our progress in neuroscience research means providing facilities that address many needs. This includes creating an efficient and cost-effective workplace that attracts and keeps the very best staff, provides a welcoming environment for volunteers and patients, encourages staff interaction and serves our community.

We believe we have addressed these issues in our blueprint for the physical growth of our facilities. We look forward to our journey with you as these plans are realised.

Ageing & Neurodegeneration

Neurodegeneration occurs when a part of the brain dies as a result of disease or brain injury.

Common brain diseases in which neurodegeneration occurs include Alzheimer's and other dementias, which affect memory and the ability to think, and Parkinson's and related disorders in which the ability to move is affected.

Alzheimer's disease affects over

250,000

people in Australia

Neurodegenerative diseases cannot be cured or prevented and our ability to treat them is limited. They impose a severe burden, both on quality of life and financially, for those suffering, as well as their families.

The focus of our research at NeuRA is identifying the causes of these diseases. We are also working towards developing better diagnostic methods and improved treatments for patients.

Preventing these diseases, and contributing to the worldwide effort, is our ultimate goal.

Professor Tony Broe AM and Aboriginal Health Worker, Colleen Cawood

Broe Group

We are developing an improved understanding of Aboriginal health in the urban and rural Aboriginal population.

The Koori Growing Old Well Study

- We are working on understanding how Aboriginal people can live healthy and longer lives. We are also investigating the prevalence of dementia and its sub-types in Aboriginal people who live in urban and rural areas. We are currently recruiting Aboriginal people aged 60 and above across NSW, and will eventually assess approximately 600 people for the study.

In 2009, we tested the key survey instruments and built up relationships with Aboriginal communities and organisations in Sydney and the mid north coast of NSW. Importantly, the large collaborative team working on this complex research project includes local Aboriginal researchers.

A pilot test of a modified version of 'KICA' in urban Aboriginal populations

- At the outset of our study, we found that there were no suitable research tools to use with urban, English-speaking communities.

In 2009 we received funding to test an instrument that we modified for urban Aboriginal communities, the Kimberley Indigenous Cognitive Assessment (KICA) tool. We conducted the pilot in late 2009 and are currently finalising the results for a report due to be released in 2010. This research was supported by the Dementia Collaborative Research Centres.

Marj Webb, NeuRA supporter

"My husband Bill and I became passionate about finding a cure for Parkinson's and, even now, two years after losing Bill, I continue to have faith in these wonderful researchers."

Marj Webb

Researchers Veronica Smoothy, Katherine Scarpin and Assoc Professor Kay Double

A pilot test of 'RUDAS' in urban Aboriginal populations

• The Rowland Universal Dementia Assessment Scale (RUDAS) is an Australian-designed cognitive assessment tool designed for research in multicultural and multilingual communities. We developed this tool to accommodate cultural and language factors that are not addressed by other cognitive assessment instruments.

We tested the scale in late 2009 in urban Aboriginal populations and early indications suggest it is a good match for the communities targeted in this project. This research is supported by Alzheimer's Australia Research.

"My key commitment at this stage of my career is to examine and improve Aboriginal health so that Aboriginal people, as well as the non-Indigenous community, can age well."

Professor Tony Broe AM

Double Group

Our work investigates subtle differences between brain cells which may explain why some brain cells die in Parkinson's disease, while other similar cells survive.

The Parkinson's puzzle: Why do specific brain cells die in Parkinson's disease?

• People with Parkinson's disease often have stiff or rigid muscles and find it difficult to move freely. Their symptoms result from the death of cells in a specific area of their brain called the substantia nigra.

Our research is trying to understand why these cells die by looking for differences between these brain cells and cells that survive in other regions of the brain. Together with INSERM in France, we have discovered that the amount of copper in the brains of people with Parkinson's disease is significantly lower. In collaboration with the University of Newcastle, we have found that vulnerable cells differ in the way they produce their chemical messenger, dopamine. With the Halliday Group, we are examining proteins in vulnerable cells. Our next step is to understand how these phenomena are important to brain cell survival, which will hopefully lead to us developing treatments to slow or even halt brain cell death.

Diagnosis of Parkinson's disease

• We are developing a simple and inexpensive blood test that will allow medical professionals to diagnose Parkinson's disease earlier and more accurately than is currently possible. At present, people suspected of having Parkinson's disease are diagnosed based on their symptoms, but this makes an accurate diagnosis difficult, especially for people in the early stages of the disease.

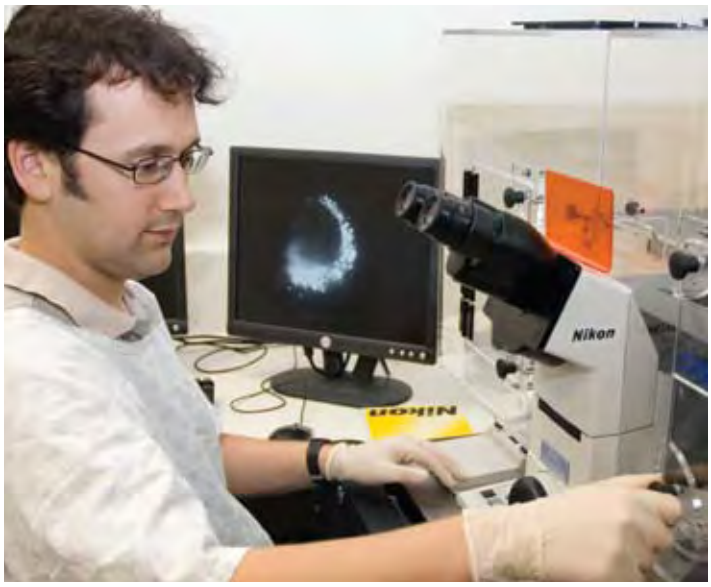
A simple and accurate test would ensure that patients are correctly diagnosed and would enable them to access the most suitable treatment. This work is a commercial collaboration with Queensland-based Anteo Diagnostics.

Ageing and new brain cells

• New neurons are born continuously in the adult brain, a process known as neurogenesis. As we age, fewer neurons are created, and this may play a role in the decline of various functions such as sense of smell and memory. With the Halliday Group and ILP Student Shilpa Enjeti, we have discovered that several factors in the brain thought to regulate neurogenesis decrease with age and we are currently exploring the consequences of these changes.

In a separate project with the Halliday and Shannon Weickert Groups, PhD Student Jie Zhang is investigating how stem cells in the human brain might be employed to replace damaged or dead cells in the diseased brain. This knowledge will be critical for the development of new stem cell treatments for ageing and disease.

Ageing & Neurodegeneration



Elias Glaros, PhD Student

Garner Group

We are working towards understanding how brain lipids, such as cholesterol, may contribute to neurodegenerative diseases including Alzheimer's disease and Parkinson's disease.

Lipids and Alzheimer's disease

- The brain contains more lipids, fat-like substances such as cholesterol, than any other organ in the body.

The transport and metabolism of these lipids in the brain can become dysfunctional in illnesses such as Alzheimer's disease and can play a role in the death of neurons. We are working on finding these abnormalities and understanding how they contribute to disease.

Dr Scott Kim has discovered a form of cholesterol that plays a role in the production of a molecule associated with Alzheimer's disease, the amyloid-beta (Aß) peptide.

We have also found that proteins that transport lipids in the brain, the ABCA7/A1 transporters, regulate the production of Aß in the brain, as revealed by PhD Students Sharon Chan and Surabhi Bhatia.

Dr David Elliot has discovered that the degradation of the lipid-binding apoE protein in the brain is linked to a risk factor for Alzheimer's disease, and Dr Henry Li has screened prototype drugs that stop the production of these lipids and effectively block the production of Aß.

Lipids and Parkinson's disease

- Changes in the transport and metabolism of lipids in the brain may also play a role in Parkinson's disease. PhD student Danni Cheng has discovered that a type of cholesterol in the brain, 24-hydroxy-cholesterol, is involved in the formation of a protein called alpha-synuclein.

The accumulation of this protein in the brain contributes to the neurodegeneration seen in people with Parkinson's disease.

We are currently examining how the formation of this protein is controlled in neurons and other brain cells.

Treating vascular disease

- Vascular disease is an important cause of heart attack, stroke and vascular dementia. PhD student Elias Glaros has shown that a new drug called myriocin can prevent vascular disease by encouraging the production of the protein component of a 'protective' molecule, a high-density lipoprotein.

"The ultimate success would be to relieve human suffering by developing a cure for neurodegenerative diseases. Our immediate successes bring us one step closer to our ultimate goal."

Assoc Professor Brett Garner

Karen Murphy, PhD Student

Halliday Group

Researching comparisons between different neurodegenerative disorders can determine whether any critical independent, or overlapping mechanisms, are associated with degeneration.

Critical proteins in Parkinson's disease

- Certain proteins found in the brain tissue, LRRK2 and alpha-synuclein, are associated with classic Parkinson's disease. We want to identify which cells in the brain use these proteins and whether this usage changes in people with Parkinson's disease. We have also looked at whether common mutations in these proteins play a role in the disease.

Research by Dr Christine Song has revealed that alpha-synuclein accumulates in a type of brain cell called astrocytic glia in Parkinson's disease. PhD student Claire Stevens has started to assess whether increased accumulation of alpha-synuclein is due to age. Research Assistant Annie Yen experimented on neural stem cells from patients and found that mutant LRRK2 protein makes stem cells more vulnerable to cell death.

Dr Yue Huang


Heather McCann, Senior Research Assistant

A prognostic test for Parkinson's disease

• Once a patient is diagnosed with Parkinson's disease, there is currently no way to predict how quickly their disease will progress. Dr Yue Huang has developed a genetic test to predict the rate of disease progression.

In two hundred patients with Parkinson's disease, the test was more than 90% accurate in predicting which patients would have a slow progression, and 75% accurate in predicting which patients would progress quickly.

We are hoping to attract a commercial partner to assist with developing this promising test further.

Inflammatory molecules involved in Alzheimer's disease

• One of the symptoms of Alzheimer's disease is inflammation - a type of immune response - in the brain, and this is linked with the decline in brain function typical of the disease. Finding ways to control this inflammation may offer a way of treating this illness.

Dr Claire Shepherd and her team are working to identify inflammatory molecules involved in the disease. They have identified a protein, monocyte chemoattractant protein-1, involved in inflammation and present at high levels in specific brain cells of people with Alzheimer's disease. We are currently investigating what happens inside cells with high levels of this protein.

Hodges Group

Our clinical research group is dedicated to the study of frontotemporal dementia (FTD) and related disorders, notably Motor Neurone Disease. We investigate cognitive, behavioural, psychological, and brain changes and the impact on patients and their families.

Measuring the severity of frontotemporal dementia

• Once considered rare, frontotemporal dementia is now known to be second only to Alzheimer's disease as a cause of dementia in younger people. Frontotemporal dementia causes progressive changes in personality, behaviour and the ability to perform daily activities.

No standardised instrument currently exists to measure these changes, which makes predicting the course of the condition difficult. Dr Eneida Mioshi and colleagues have developed an instrument to measure these changes, called the frontotemporal dementia functional rating scale. The scale allows professionals to give better advice to families and patients, and helps assess interventions and therapies under development.

We are now exploring how changes measured on the scale relate to alterations in brain function as assessed on MRI imaging.

Progressive aphasia: new assessment methods and therapy

• Many patients with frontotemporal dementia find it increasingly difficult to use and understand language, which can make communication difficult and distressing.

We have developed a method to diagnose this disorder, called progressive aphasia, and to distinguish between its subtypes. Each subtype has a different form of underlying brain pathology: while some people have deposits of a protein called tau in their brain, others have a build-up of a different protein known as TDP-43.

With the Piguet Group and Melbourne's Austin Hospital, we can assess brain function and detect the build-up of abnormal proteins deposited in the brain using a newly developed form of metabolic brain imaging.

Cognitive changes in Motor Neurone Disease

• Motor Neurone Disease has been considered to be purely a motor syndrome which spares aspects of cognition and behaviour, while frontotemporal dementia spares motor abilities. Recent evidence suggests there is considerable overlap between the two conditions.

Working in collaboration with the Kiernan Group, we are identifying the frequency and severity of cognitive changes in people with Motor Neurone Disease. Our preliminary work questioning carers shows that a high proportion of people with Motor Neurone Disease do indeed show changes in motivation as well as other subtle personality changes.

We have also begun work on a simple method using transcranial magnetic stimulation to measure the functioning of the motor system in people with frontotemporal dementia.

Ageing & Neurodegeneration

Dr John Kwok

Kiernan Group

Our 15-strong team of clinicians, scientists, biomedical engineers and research students has a multi-focussed approach to neurological disease.

Treatment trials for Motor Neurone Disease

• We are involved in several trials of treatments for people diagnosed with Motor Neurone Disease (MND). We are testing medications to slow down the rate at which motor neurons are destroyed. If clinical trials are successful, it could slow or perhaps even stop the progressive paralysis experienced by MND patients.

We are also testing new physical therapies, including a respiratory training device designed to maintain the muscles that control breathing. The team members taking part in these studies are PhD Student Ben Cheah, Dr Jennica Winhammar, Dr Steve Vucic and Sr Margie Zoing.

"Our research discoveries have changed the way that the medical world understands the onset of Motor Neurone Disease. This new knowledge promises tangible benefits for patients."

Professor Matthew Kiernan

Development of diagnostic tools

• In collaboration with the Hodges Group, we are investigating the cognitive impairment and memory problems that many people with MND experience.

Dr James Burrell is developing simple diagnostic tools and biomarkers to identify these impairments. Dr Michelle Farrar is adapting our techniques to explore physiological changes in children who develop an early form of the disease, known as spinal muscular atrophy.

As part of our research, we work with the Multidisciplinary Motor Neurone Disease Clinic, supported by the Motor Neurone Disease Association of NSW.

The clinic was recently funded by the Federal Department of Health and Ageing to develop training programs for health care professionals to assist their involvement and care of people with MND.

Kwok Group

We aim to understand the complex interplay between genes, our lifestyle and the physical environment that we live in. All interact to give rise to the common diseases of the brain.

The genetics of dementia and Motor Neurone Disease

• With input from Dr Carol Dobson-Stone and Prof Peter Schofield, we have identified a gene that causes frontotemporal dementia and Motor Neurone Disease by collecting genetic data from a large family that suffered from this disorder.

Our experiments show that the family's version of the gene disrupted molecules important in brain function, and is linked to the onset of disease. Excitingly, we have demonstrated that commercially available drugs are able to interact with this gene.

This project has the potential to revolutionise the diagnosis and treatment of two neurodegenerative disorders, frontotemporal dementia and Motor Neurone Disease.

Role of genes in late onset neurodegeneration

• Two genes, GSK3B and MAPT, control crucial processes in brain cells. We have shown that specific variations in these two genes increase the risk of late onset neurodegenerative diseases including Parkinson's and Alzheimer's disease. We have also shown that these genes are influenced by environmental factors such as diet, smoking and chemical exposure.

Controlling key dementia genes

• We have identified a gene on chromosome 15 that is involved in controlling the biological activity of other genes, a process called alternative splicing.

Because this gene may play a role in controlling key dementia genes, we are currently investigating the genetic and biochemical role of this gene in neurodegeneration.

Dr Carol Dobson-Stone

Marion Rice and Dr Olivier Piguet

"I've just turned 100 and nothing gets me more excited than keeping my brain going and outwitting my opponents playing bridge."

Marion Rice, participant in the Bridge for Brain Research Challenge

Piguet Group

The overarching objective of our research is to characterise the changes in cognition that represent early indicators of progressive neurodegenerative brain disorders.

Hypothalamus in frontotemporal dementia

- Some people with frontotemporal dementia experience changes in their sleep patterns and eating habits. These behaviours are regulated by the hypothalamus, a structure located deep within the brain. Our research is looking at whether the hypothalamus is affected in frontotemporal dementia, a question that has never been investigated.

Bonnie Lam, a UNSW Honours student, has measured the hypothalamus using MRI scans and on postmortem tissues, under the supervision of Dr Olivier Piguet and Prof Glenda Halliday.

She has found that the hypothalamus is smaller in frontotemporal dementia patients compared to healthy adults.

She has also found that this atrophy occurs in specific regions, but that specific neurotransmitters involved in the regulation of eating behaviour are not affected.

Emotion processing in frontotemporal dementia

- Understanding and responding to emotion is commonly impaired in frontotemporal dementia.

How this impairment evolves over the course of the disease, whether all types of emotional information are equally affected and whether all subtypes of the disease are equally affected, are some of the questions that Dr Olivier Piguet and Prof John Hodges are investigating, in collaboration with Dr Laurie Miller, Royal Prince Alfred Hospital, Dr Suncicah Lah, University of Sydney and Assoc Prof Stephen Rose, University of Queensland.

These complex investigations, supported by a National Health and Medical Research Council grant, will contribute to our understanding of the clinical features of frontotemporal dementia and result in improved diagnosis and management of affected patients.

Structural brain imaging in frontotemporal dementia

- Frontotemporal dementia is a progressive neurodegenerative brain condition that predominantly affects the frontal and temporal lobes. Atrophy in these brain regions is an important diagnostic feature for the disease. In collaboration with Assoc Prof Stephen Rose, University of Queensland, Dr Olivier Piguet, Prof John Hodges and Dr Michael Hornberger are using high-definition brain scans to investigate patterns of atrophy and progression of brain changes over the course of the disease in subgroups of patients.

They are also particularly interested in measuring changes in the integrity of nerve fibres connecting brain regions in these patients.

DIAN - an international collaborative study of familial Alzheimer's disease

NeuRA forms one of ten study sites in the US, UK and Australia that make up the Dominantly Inherited Alzheimer Network (DIAN).

In this six year study, funded by the US National Institutes of Health, we are recruiting people at risk of familial Alzheimer's disease to examine the clinical progression of early onset dementia, as well as biomarkers - indicators of disease which are measured in blood, spinal fluid, and by various kinds of brain scan.

The goal of the study is to identify the earliest measurable signs of the onset of Alzheimer's disease for use in both diagnosis and in developing treatments. Dr Bill Brooks, Dr Clement Loy and Prof Peter Schofield lead the Sydney site and enrolled the first study participants in 2009.

Brain Function & Imaging

The brain is a secretive organ. It hides deep within the bony plates of the skull and is so intrinsically bound up with the person to whom it belongs that study of the organ itself can be problematic. Non-invasive imaging technology, such as our 3 Tesla MRI scanner, has made it possible for us to study the brain in situ.

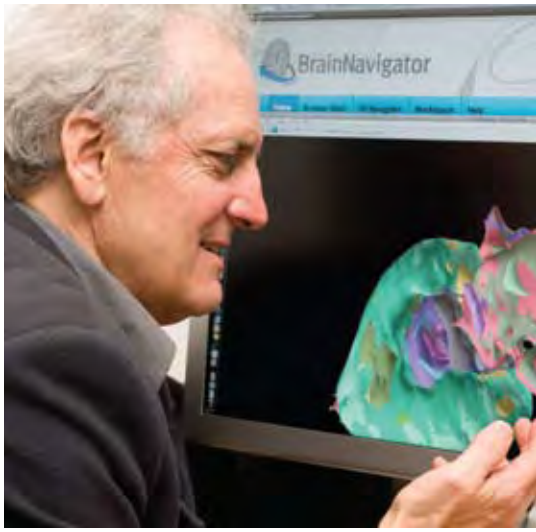
Brain disorders affect

75%

of Australians, either directly or indirectly

Brain researchers, no less than geographers, need maps and coordinate systems to navigate the brain and communicate their observations to each other. On a map of the brain we can superimpose types of neurons, neurotransmitters, enzymes, and connectivity and functional data.

NeuRA is continuing to develop and refine brain atlases of humans and experimental animals which are used internationally as the standard guides for scientific work and are also used by neurosurgeons to target small deep-lying structures in the brain.



Professor George Paxinos AO

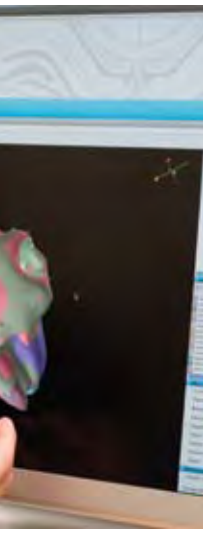
Paxinos Group

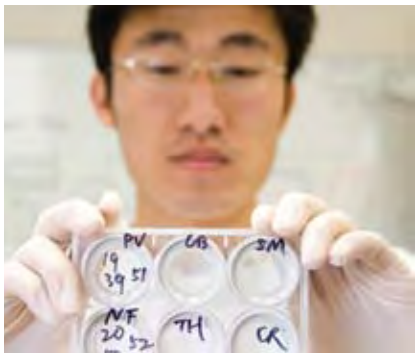
The study of the brain has the allure of discovering the basis of fundamental processes, such as memory, as well as disturbances such as those that occur in mental illness. Our research on the structure of the brain will assist those who try to correlate brain structural abnormalities to neurologic and psychiatric illnesses.

Deciphering the brainstem and spinal cord

- Part of our research is deciphering the organisation of the brainstem, the oldest part of the brain that links the body and the brain. In collaboration with Nobel Prize winner Prof Mario Capecchi at the University of Utah, we are using transgenic mice to reveal details of this structure in the adult brain. With support from the Christopher and Dana Reeve Foundation in the USA and the NHMRC here, we are also working on an atlas of the human spinal cord.

By studying the chemistry of spinal cord tissue, we are identifying which neurons activate muscles or control the autonomic nervous system, important in controlling functions such as heart rate and breathing.





Dr Andy Liang


Dr Michael Green

"Brains are interesting, complex, many-faceted. They are a challenge to study. If they go wrong their owners suffer as do the people around them."

Professor Caroline Rae

Similarities between the human and marmoset brain

• Despite its size, the marmoset brain is similar in many ways to our own brain. With support from the NHMRC and the United States National Institutes of Health, we are constructing an atlas of the marmoset brain. Our preliminary data indicates that the cortex, the outmost layer of the brain important in higher brain function, is similar in marmosets and humans. Our ultimate aim is to construct an atlas of the human cortex.

"The most exciting aspect of my research is identifying a part of the brain that was previously not known to science."

Professor George Paxinos AO

3D atlas of the brain

• Recently brain atlases have begun to be transformed from passive paper guides to something much more dynamic. In collaboration with Elsevier and the Allen Institute, we are reconstructing our two-dimensional atlases into three-dimensions. We are also segmenting magnetic resonance images of mouse brains that have been scanned at the National Imaging Facility in Queensland.

Rae Group

Brain activity is mediated by the brain's chemistry, yet study of brain biochemistry is historically a very recent phenomenon. We study how the brain's biochemistry underlies its functions in both health and disease using magnetic resonance imaging.

Energy levels in the brain during sleep in obstructive sleep apnoea

• Obstructive sleep apnoea affects as many as one in four middle-aged men. During sleep, the upper airway collapses and breathing ceases until the sufferer rouses from their sleep enough to reopen their airway. In severe cases this can happen more than forty times an hour.

In collaboration with the Woolcock Institute of Medical Research, we are investigating the effect of this airway blockage on energy levels in the brain using real-time magnetic resonance spectroscopy.

In contrast to previously held views, we have found that even a moderate lack of oxygen can have significant effects on the brain's energy.

Metabolic response of the brain to GABAergic drugs

• As part of our ongoing studies into the basic neurochemistry of the brain, we are looking at a neurotransmitter called GABA.

This research was boosted in 2009 by Dr Anthony Maher who joined the Institute from Imperial College London, bringing his expertise in 'metabolomics'. Dr Maher is carrying on the work of Dr Fatima Nasrallah, whose PhD on the GABAergic system was awarded earlier in 2009.

We have measured the brain's metabolic responses to a range of drugs that inhibit brain function, and now this is being utilised to determine the sites of action of drugs such as alcohol and gamma-hydroxybutyric acid (GHB).

Mental Illness

There has been a rapid realisation that mental illness is responsible for one of the largest disease burdens in Australia.

The major psychiatric diseases, schizophrenia and bipolar disorder, each affect around 1% of the population, and NeuRA has active research programs in these areas.

Currently over

37,000

Australians suffer from schizophrenia

Schizophrenia alone is a costly illness. The direct and indirect costs of schizophrenia are enormous, with the real financial burden totalling over $1.85 billion per annum.

Unless major inroads are made into finding new treatments for the disease, many people with schizophrenia will continue to live on the edge of Australian society, with only limited opportunities to be healthy and participating members of the community.

Dr Samantha Fung, Professor Cyndi Shannon Weickert and Stu Fillman

Shannon Weickert Group

We believe we will find answers to schizophrenia through a series of steps.

First, understand the biological basis for the disturbing voices and intruding thoughts. Second, understand the biological events underpinning the onset of schizophrenia. Next, develop a partnership with people with schizophrenia who are motivated to try new therapies and who will help us determine which are most effective.

Identification of developmental influences involved in schizophrenia

- We aim to understand how the human brain changes as individuals make the transition from childhood to adulthood.

As many parents know, adolescence is a turbulent time where young people face many challenges of fitting in and growing up. Adolescents also have an increased risk of developing schizophrenia, bipolar disorder and engaging in risk taking behaviour.

We have a unique aim: to understand precisely how the brain cells change and which pathways of maturation are most important for healthy function.

Dr Carlotta Duncan and Dr Samantha Fung have discovered that the ability within our cerebral cortex (the area of the brain responsible for higher brain functions) to inhibit or stop certain responses takes many years to mature and does not reach adult levels until early adolescence.

"In 2002, I was diagnosed with paranoid schizophrenia. I believe in the trials I'm currently taking part in at NeuRA and I'm now looking to the future with optimism and faith."

Peter Kemball, who has schizophrenia

Peter Kemball and Loretta Moore

Shan-Yuan Tsai

"My driving passion is to be able to give people who suffer from schizophrenia the means to communicate, socialise and work, such that their life goals and dreams can be pursued."

Professor Cyndi Shannon Weickert*

Research by PhD student Duncan Sinclair shows that adolescent stress may be detrimental to the prefrontal cortex.

Dr Jenny Wong has determined that an important growth factor is elevated during early childhood and is essential for healthy brain function during adolescence, suggesting that, in addition to adolescence, there are also critical periods for cortical growth during childhood.

The cellular basis of schizophrenia

- Research conducted by Dr Samantha Fung has identified that small inhibitory neurons in the brain are weaker in people with schizophrenia. Dr Jenny Wong has identified that a reduction in growth factor support to these small cells may be the cause of their reduced health. PhD student Duncan Sinclair and Dr Jenny Wong are testing to see if this is caused by too much stress hormone or too little sex hormone action.

In collaboration with a clinical team, we are testing the extent to which stimulation of hormone receptors in the brain can lead to clinical benefits for people with this disorder.

* Prof Shannon Weickert is the Macquarie Group Foundation Chair of Schizophrenia Research, a joint venture between NeuRA, University of New South Wales, Schizophrenia Research Institute and Macquarie Group Foundation. It is supported by NSW Health.

Karl Group

We seek to model schizophrenia using genetic, pharmacological and environmental tools in order to discover the underlying mechanisms responsible for this debilitating disease.

Interaction of genetic and environmental risk factors in schizophrenia

- Neither environmental nor genetic risk factors alone are sufficient to cause schizophrenia. We are investigating whether these risk factors interact to bring about the development of this mental illness.

We are exploring the effect of different compounds from the cannabis plant on animal behaviour, and how a genetic predisposition to schizophrenia can dramatically change the impact of drug use and other environmental risk factors.

Housing conditions of laboratory models

- Enriching the environment of laboratory rodents by including domes, tunnels and tubes provides the animals with sensory, cognitive and motor stimulation, and has been shown to have a beneficial impact on their brain development and behaviour.

Specifically, this enrichment can reduce adverse effects on the brain of ageing, drug treatment, genetic manipulation and early life intervention.

We are establishing new forms of environmental enrichment that can easily be applied to large animal research facilities worldwide, which has the potential to increase the validity of experimental animal research, as well as improving the well being of millions of laboratory animals.

Mental Illness

"Most psychiatric disorders have their onset in childhood and adolescence, making it critical to find ways of identifying those at risk and introducing appropriate early intervention."

Professor Rhoshel Lenroot

Professor Rhoshel Lenroot and Julia Hill

Lenroot Group

Our goal is to use neuroimaging techniques to map how the development of brain networks is different in children and adolescents with psychiatric disorders, specifically those affecting the capacity for positive social interaction such as autism, schizophrenia, and conduct disorder.

Changes in decision-making and the brain in adolescents

- Adolescents are often immature in their decision-making abilities, which can result in risky behaviours that lead to illness and death. Problems with decision-making are also a feature of several neurodevelopmental disorders.

In early 2010, we will begin research in how decision-making and underlying brain networks change during development. Our studies will use MRI to study brain activity during an innovative test of decision-making, developed by colleagues at the Black Dog Institute, in children and young people aged 6 to 18 years of age.

The development of empathy in children with mental disorders

- Social abilities such as the ability to understand and share how other people feel are affected in several neurodevelopmental disorders. Although abnormal empathic ability is seen in autism, schizophrenia, and conduct disorders, the underlying developmental problems and best treatments may be different in each of these syndromes.

Our goal is to use brain imaging to look for differences in how brain structure and function related to empathic abilities develop in children across a broad range of ages and disorders. We are working with collaborators at UNSW, Macquarie University and local community health services and are currently collecting pilot data.

Schofield Group

Many years of research have demonstrated that vulnerability to mental illnesses has a genetic component. Our studies focus on the role of genes and the joint effects of many genes acting together with non genetic factors. This will be a vital key to deciphering what goes wrong in the brain in mental illness.

Genetics of bipolar disorder

- We are studying the genetic component of bipolar disorder in families with several individuals who have been diagnosed with this mental illness. Many different genes seem to contribute to an individual's susceptibility to bipolar disorder. PhD student Erica McAuley has identified one risk gene that plays a role in the development of neurons and the connections between them. With support from the NHMRC, we are now examining how variants of known risk genes increase the risk of developing bipolar disorder. In addition to work on individual genes, we are also looking at combinations of genes that may together present a stronger risk factor for developing bipolar disorder. Dr Jan Fullerton has identified regions on several chromosomes that interact, and is now identifying the specific genes involved.

Genes, ethics and mental illness

- As our knowledge about genes that predispose an individual to mental illness increases, we are examining community understanding and attitudes towards issues surrounding genetics.

"Despite a century of knowledge about mental illness, we still don't have effective treatments or cures. With the advances in technology we have never been at a better time or place to discover just what goes wrong and to use this knowledge to effectively intervene."

Dr Jan Fullerton

Professor Peter Schofield and Professor Laurie Zoloth, Northwestern University, Illinois

Giti Agahi

Working with our collaborators Prof Philip Mitchell, Prof Kay Wilhelm and Assoc Prof Bettina Meiser, PhD student Alex Wilde has evaluated the reasons why people want to know their genetic risk for psychiatric disorders.

Our studies have also looked at public perceptions about the role of genes and mental illness, with a strong focus on the role of stigma and ways in which it can be addressed. This work is of great importance to the general community as well as the research and clinical communities and was featured as a plenary symposium at the World Congress of Psychiatric Genetics held in San Diego.

Genetics of brain function

- In collaboration with the University of Sydney and Brain Resource Ltd, we have looked at how variations within genes can give rise to changes in normal brain functions.

Using cognitive, psychological and neuroimaging data on a large group of normal individuals, we have identified new genes not previously known to affect brain function. We have also investigated several genes known to be involved in disorders such as depression and anxiety. We have found that variants of a brain protein, brain-derived neurotrophic factor, and early life stress can interact and bring about the onset of such disorders. In a collaborative study on post traumatic stress disorder, we have shown that certain variants of the serotonin transporter appear to predict which individuals will have a better response to cognitive behavioural therapy.

Weickert Group

A key focus of our work is determining the thought processes and brain regions that contribute to the impaired thinking, emotions, language, and motivation that are characteristics of schizophrenia in order to find new treatments that will combine with present antipsychotic medications to reverse currently untreatable symptoms.

Clinical trial of a medication for thinking problems in people with schizophrenia

- People with schizophrenia often have problems thinking clearly, socialising with other people, and living independently. These problems do not improve with current treatments.

Our clinical trial of the drug raloxifene aims to test a medication that has been used for other illnesses but may also improve thinking, socialising, and independent living skills in people with schizophrenia.

Brain stimulation to improve feedback learning in people with schizophrenia

- Feedback learning, which guides our behaviour based on reward, can help us to improve our behaviour without our awareness, and contributes to our daily decision making processes. People with schizophrenia often have difficulty with this basic learning process.

Dr Ans Vercammen and members of our team have started brain stimulation trials to improve this type of learning. We have found that some people with schizophrenia do show improvement after treatment and we plan to extend the treatment to more people with schizophrenia over longer treatment intervals.

Brain imaging studies of reward learning and emotion

- Learning and emotion can often be a problem for people with schizophrenia.

Drs Richard Morris and Ans Vercammen in our laboratory are using brain imaging methods such as Magnetic Resonance Imaging to identify brain regions that are impaired in people with schizophrenia during tests of learning and emotions.

We have found that brain regions deep within the brain and along the outer side of the brain are impaired in people in reward learning and emotion.

Neural Injury

Injury is the leading cause of death for people under 45 years of age. Injuries to the nervous system, such as brain and spinal cord injuries, are particularly devastating - often leading to lifelong disability.

Around

460,000

Australians are hospitalised each year due to injury

These injuries affect the remaining undamaged nervous system so that even finding how best to make damaged cells regenerate may not be successful in producing functional recovery. Peripheral nerve injury may also lead to chronic "neuropathic" pain which does not respond to current treatments.

Our research includes a range of studies from basic research into the mechanisms of injury, to developing improved treatments for injured people and to developing strategies to prevent injuries.

Assoc Professor Lynne Bilston

Bilston Group

We are interested in how the soft tissues of the body respond to and are influenced by mechanical loading. Our research spans basic research in tissue mechanics to applied studies in traumatic injury prevention. We study the tissues of the central nervous system - brain and spinal cord, and also other soft organs and muscles.

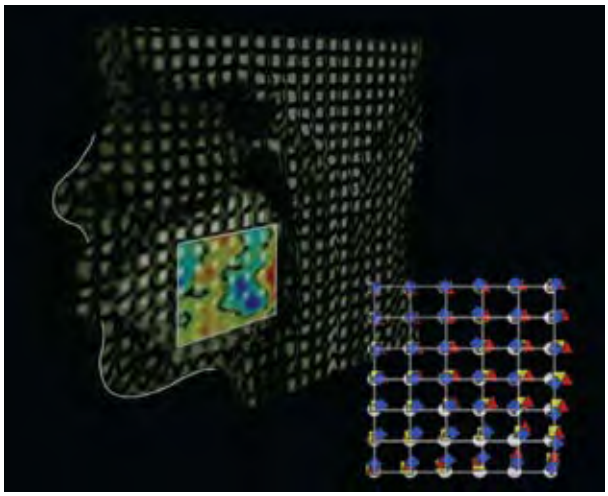
Optimising protection for rear seat occupants of cars

- The rear seats of cars are not subject to the same level of safety standards as the front seats. Our research has demonstrated that the front seat of a car is in fact safer than the rear seat for occupants older than 15 years of age.

PhD student Ben Beck complemented this finding with an analysis illustrating the increased number and sophistication of technologies protecting front seat occupants compared to those in the rear seat. An in-depth crash study drawing patients from six major hospitals, set up by Dr Julie Brown, will define how injuries occur in the rear seat. We will use this information to develop countermeasures to reduce injury among rear seat occupants.

Magnetic Resonance Elastography

- We have developed a novel medical imaging technique, Magnetic Resonance Elastography, to detect changes in tissue stiffness. This non-invasive technique



Journal of Physiology cover image representing muscle movement in Obstructive Sleep Apnoea

"I will apply my research to designing realistic models of children in crash test dummies, providing better testing for restraints used in cars."

Dr Liz Clarke

Dr Liz Clarke

is capable of detecting and quantifying abnormal changes in tissue by applying an external vibration and measuring the displacement caused within the tissue.

We have collaborated with ESPCI in France to make an exciting upgrade to this imaging method by combining our imaging technique with Diffusion Tensor Imaging to study the tissue stiffness along different fibre directions.

For the first time we can quantify the mechanical properties of white matter in the human brain in different loading directions in living subjects. Results from this study could shed new light on the progression of various brain diseases such as Alzheimer's disease and hydrocephalus.

"Knowing the work we do improves the safety of children travelling in cars is extremely rewarding. There are now kids out there whose lives have been saved because of our research."

Assoc Professor Lynne Bilston

Biomechanics and mechanisms of obstructive sleep apnoea

- Obstructive sleep apnoea, characterised by the repetitive collapse of the upper airway during sleep, affects approximately 7% of the population and is a risk factor for cardiovascular disease and fatigue related accidents.

In collaboration with the Gandevia Group, we have studied upper airway mechanics in humans using a novel MRI motion tracking technique and MR elastography to better understand the development of the disorder and to improve therapeutic interventions.

Brock Group

Our laboratory research concentrates on the neural mechanisms that control blood vessels both under normal conditions and in ill health, particularly how nerve injuries modify neural control of blood vessels.

Injury-induced changes in the nervous control of blood vessels

- A major focus of our research is determining how injuries to the nervous system change the way in which nerves control blood vessels. In particular, we are looking at spinal cord injuries that cause episodes of high blood pressure, which greatly increases the risk of stroke or death.

We also investigate nerve injuries that induce changes in blood vessels that supply the skin. Many people who recover from a traumatic injury or who have chronic conditions such as diabetes have poor circulation in their skin, which can impair the healing of wounds and cause cold hands and feet and ongoing pain.

Because these people can become increasingly disabled, we are working to identify drug targets that we can use to improve the control of blood flow and thereby alleviate the symptoms.

Changes in neurovascular function following spinal cord injury

- Research has shown that following injury to the spinal cord, people's veins reduce in size.

This may be an adaptation that contributes to restoring blood pressure control following injury. Dr Nicole Rummery has demonstrated that neural activation of veins increases following spinal cord injury and that this change is associated with a large reduction in the size of the veins.

Our findings suggest that these changes in the size of veins are triggered by the loss of neural control.

Neural Injury

"Using new nerve testing protocols, we have identified patients most at risk of developing severe 'neurotoxic' symptoms following treatment for a range of cancers."

Susanna Park, PhD Student

PhD Student Susanna Park tests a patient

Kiernan Group

Our research explores the mechanisms of neurological disease involving the central and peripheral nervous system.

Nerve damage and cancer therapy

• Nerve damage is a very common side effect of many current cancer treatments. In recent studies investigating nerve function in patients treated with chemotherapy, we have identified a biomarker, or indicator, that will help identify patients at risk of damage to their nerve tissue.

These studies have identified 80% of patients at risk of developing severe nerve damage, providing early identification of susceptible patients. This biomarker was developed from over 1000 studies in cancer patients by PhD student Susanna Park, working with Prof Matthew Kiernan, Dr Cindy Lin and Dr Arun Krishnan.

This information is now being used to provide feedback to cancer specialists monitoring nerve function in their patients, and we have been asked to incorporate our biomarkers into an international clinical trial to commence in 2010.

Spinal cord injury and peripheral nerve injury

• Supported by the award of a program grant from the NSW Office of Science and Medical Research, Dr Rob Boland has investigated nerve function in people after acute spinal cord injury, and has found that this type of injury has significant effects on nerves in the arms and legs.

As a result of this unique finding, in 2010 we will commence a clinical trial applying mild electrical stimulation to participants' paralysed limbs to determine whether we can improve or even prevent acute nerve changes after spinal cord injury.

PhD student Eric Han has developed a template of peripheral nerve injury, specifically at the wrist, to better understand the underlying processes that may affect nerves in people with compression type injuries of nerves. His studies will provide important information about conditions such as carpal tunnel syndrome, a condition that can be associated with significant loss of hand function.

Macefield Group

Our human neurophysiology group uses invasive and non-invasive means to assess how the nervous system operates in health and disease.

The role of sensory information from the finger pads in fine motor control of the hand

• While the brain has exquisite control of the muscles that act on the wrist and fingers, the sensory feedback provided by specialised sensory endings in the skin of the finger pads is critical for fine motor control. We have recorded data from single nerve fibres to determine how individual sensory receptors in the skin encode the compressive and rotational forces associated with manipulation of held objects.

In collaboration with the School of Biomedical Engineering at UNSW, we are using this information to design biologically-inspired sensors for teleoperated robotic surgery.

Functional identification of the sites of the brain involved in blood pressure regulation

• How is blood pressure controlled in healthy people, and what goes wrong in disease? Collaborating with Dr Luke Henderson from the University of Sydney, we have run a set of unique experiments by recording data from the muscle sympathetic nerves that control the diameter of blood vessels while scanning the brain using MRI.

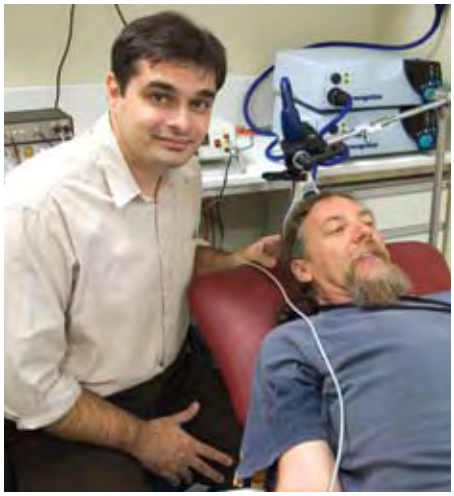
This will improve our understanding of the brain regions involved in the generation of sympathetic nerve activity, and our understanding of the underlying disturbances in sympathetic control that we see in different cardiovascular disorders.

McLachlan Group

Our driving passion is to understand how the nervous system controls the tissues and organs of the body, both normally and when nerve cells are damaged by injury or disease.

Neuroimmune interactions after peripheral nerve injury

• Senior research assistant Ping Hu has examined immune cells (macrophages and T-cells) that invade the stump of a damaged nerve after various types of injury.



Dr Steve Vucic and patient

"My hope for future generations is that there is a cure for MND. I hope that more awareness will mean more support, which means more money, which means more research."

Motor Neurone Disease patient

Stoodley Laboratory

"Success for me will be to have our research findings incorporated into the knowledge base on which clinical care and, in particular, neurological and rehabilitation practice are based."

Professor Elspeth McLachlan

Although macrophage numbers are high while products that degenerate the nerve's axon sheath (myelin) are removed, T-cell invasion is greater if intact axons are present, with numbers increasing as small diameter axons regenerate.

Results from this research implicate sympathetic pathways in T-cell recruitment, possibly triggering abnormal (neuropathic) pain. The T-cell response in a rat strain with susceptibility to autoimmune disease is relatively weak. Overall, these findings suggest that T-cells play beneficial as well as damaging roles in injured nerves.

Retrograde death of sensory neurons following nerve lesions

- Following nerve injuries, small sensory nerve cells in the skin that normally signal painful stimuli progressively degenerate. This may be associated with the accumulation of macrophages and lymphocytes around the nerve cells. Research assistants Ping Hu and Fabricio Amaral have identified damaged cells and quantified the extent of nerve cell death.

Although access to neurotrophins (proteins involved in the survival, development and function of neurons) may also be important, we have found that the survival of these nerve cells varies with the extent and type of injury, and may be linked to the distinct patterns of immune response.

Stoodley Group

Investigators in our neurosurgery laboratory focus on two main clinical problems: syringomyelia (cysts in the spinal cord) and arteriovenous malformations in the brain.

Mechanisms of spinal cord cyst formation

- We are investigating the development of syrinxes, fluid-filled cavities or cysts within the spinal cord and brain stem that develop due to abnormal flow or blockage of cerebrospinal fluid. We are looking at mechanisms of fluid inflow, pathways for fluid outflow, and properties of the spinal cord tissue around the cysts that could influence their development. In collaboration with the Bilston Group, we are examining the effect of Chiari malformations and scarring around the cord on fluid pulse transmission, and the effect this has on fluid flow from the subarachnoid space (the space surrounding the spinal cord) into the spinal cord.

In collaboration with Prof Anne Cunningham, we are examining the effect of syrinxes on surrounding nerve fibres and the feasibility of using stem cells to promote regeneration of damaged nerve fibres.

Enhancing the response of brain arteriovenous malformations to radiation treatment

- We have developed an animal model to investigate the molecular changes brought about by focussed radiation on brain blood vessel abnormalities. We have demonstrated significant success enhancing the effect of radiation by obstructing abnormal vessels by increasing blood clotting within the vessels.

We aim to refine this strategy to determine the longer term thrombosis rates and durability, as well as continue work examining the molecular response to radiation, both in the animal model and in cells cultured from humans.

Sensation, Movement, Balance & Falls

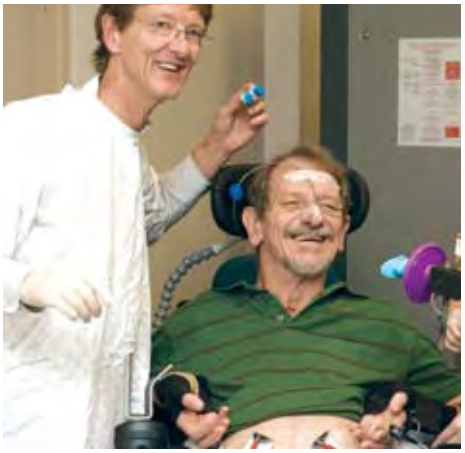
Sensory inputs are crucial to drive all the movements and postural adjustments that we make, whether this be for controlling the forces of the finger and thumb to hold a pen, standing and moving our arms to gesture while talking, or using our breathing muscles to speak or talk.

Falls account for

40%

of injury-related deaths in those aged 85 years and over

Control of balance is vital to everyday life and maintaining our balance is a highly complex and precise process of coordination. Studies are being conducted to explore the effects of vision, sensation and vestibular function on balance while standing and walking in different groups of people.



Professor Simon Gandevia and spinal patient Geoffrey Seaton

Butler Group

The way the respiratory muscles are controlled by the brain and the spinal cord is a focus of our research.

Neural control of hand and breathing muscles

- We have defined a fundamental link between how the brain drives the muscles essential for breathing and the mechanical properties that allow the muscles to produce pressure and airflow. This link allows the neuromuscular system to operate efficiently. We have now determined that this principle operates for limb muscles as well.

Using muscles that move the index finger, PhD student Anna Hudson has demonstrated that, if one of a group of muscles is acutely given a greater mechanical advantage, then the brain uses it more than other muscles for the same task. Our work highlights an important way by which the brain uses muscles and raises novel points about how this control develops and whether it changes in pathological conditions that alter the action of any muscle.

Gandevia Group

Our research field covers the interface between normal sensory and motor function (physiology) and impaired function (pathophysiology).

Proprioception and our sense of limb position

- Proprioception tells us the position of our limbs, and is necessary for us to move properly. While we know that inputs from receptors in muscles and skin can signal joint position, we know little about whether brain signals that command movement

"I am passionate about improving the quality of life and independence of those who have suffered a stroke."
Dr Penelope McNulty


Dr Penelope McNulty


Claire Boswell-Ruys and spinal patient Paul Goode

also contribute. We have examined this by paralysing subjects' arm muscles with curare. When the arm is paralysed but sensory signals preserved, and the subject flexes their wrist, the wrist appears to move in the willed direction. This means that the brain's motor command signals have a novel role in proprioception, which has implications for understanding abnormalities of movement and posture.

"Success in medical research can occur on many different levels. It may be devising a new strategy to help a patient, or exposing new insights into how the brain and muscles are controlled."
Professor Simon Gandevia

Improving stroke rehabilitation

• We have developed a rehabilitation strategy to improve hand and arm use after stroke based on the Nintendo Wii. This brief but intense program significantly improved stroke patients' hand and arm use both in therapy and in everyday activities.

Not only did our therapy work, but patients enjoyed it and continued to show improvements two months later. In addition to tests that demonstrate improved hand and arm function, Dr McNulty's group is making detailed studies of how the brain, nerves and muscles change both after a stroke and with rehabilitation. These studies will provide the key to making rehabilitation work better for all stroke patients, regardless of the severity of their disability.

Taylor Group

The control of muscles by the nervous system underlies all of our actions and muscle fatigue is a prominent symptom in people with many kinds of illnesses.

Timed stimulation alters transmission of motor signals in humans

• While connections in many areas of the brain are now known to change in response to timed activity, little is known about whether similar changes can occur in the spinal cord. Our recent study shows that transmission through the corticospinal pathway in the spinal cord can be altered for up to an hour by a short period of timed stimulation. Transmission can increase or decrease with appropriate stimulation so that the muscle produces more or less force with the same signal from the brain. Our findings suggest that neural connections in the spinal cord could contribute to motor learning. If changes can be prolonged, this technique may help in rehabilitation.

Muscle fatigue in the spinal cord

• When we exercise, we become fatigued. Our muscles become weaker and the nervous system has to drive the muscles harder to perform a task. Postdoctoral researcher, Dr Chris McNeil, has shown that the nerve cells, which convey signals from the spinal cord to the muscles, become more difficult to activate during fatiguing muscle contractions. This means that extra output from the brain is needed to make these nerve cells work to drive the muscles. Thus, changes in the nervous system as well as in the muscles contribute to the impaired performance and increased effort required with fatigue.

Lord Group

Falls are a major public health problem for older people. Approximately one in three suffer falls each year with many suffering multiple falls. By understanding the physiology of balance impairment we can make major advances in addressing the causes of falls.

Dance Dance Revolution: a novel step training system to reduce the risk of falls in older adults

• We believe that using video game technology to engage older adults in balance and stepping exercises offers great potential for preventing falls. Exercises that can reduce the risk of falls often involve repetitively shifting one's weight from one foot to another. Engaging people in repetitive exercise can be difficult if the exercises are boring or unrelated to the goal of reducing fall risk. Instead we propose that interactive video games are a way of circumventing these problems of motivation.

Dr Stuart Smith, Prof Stephen Lord, and research assistants Daniel Schoene and Jamie Lennox have modified an exercise-based video game (Dance Dance Revolution, made for a dance mat), which engages players through foot movement in time

Sensation, Movement, Balance & Falls

"When we look at the association between fear of falling and balance, we often see that they are closely related."

Dr Kim Delbaere

Dr Kim Delbaere and Fay Bernstein, research participant

with stimuli. Preliminary experiments show that older adults enjoy interacting with the game and can play at increasingly difficult levels. The results have been accepted for publication in the British Journal of Sports Medicine.

Impaired stepping as a risk factor for falls

• Stepping is often the last resort against falling when balance is threatened. However, what constitutes an appropriate protective stepping response is unknown.

In this study, conducted by Prof Stephen Lord, Dr Daina Sturnieks, Dr Richard Fitzpatrick, Dr Jasmine Menant, research staff Ria Arnold, Daniel Schoene and Nicole Pongratz and Connie Severino, older people standing with a stiff cord attached to a waist belt were required to maintain their balance as they experienced sudden pulls in the forward, backward and sideways directions. We determined the thresholds of force at which participants stepped, as well as the characteristics of their steps. We then related these data to measurements of physiological function as well as incidence of falls.

This work will allow us to understand which factors contribute to stepping performance and whether impaired stepping can predict falls in older people.

Understanding fear of falling in older people

• Many older people are conscious of the potentially devastating consequences of falling, such as breaking a hip or losing their independence, and they report being afraid of falling. In research by Dr Kim Delbaere, Prof Stephen Lord, Assoc Prof Jacqueline Close, PhD student Jingjing Zheng, and research assistant Stefanie Mikolaizak, we examined the association between fear and falls. We found that high levels of fear are likely to result in falls independent of an actual falls risk due to factors such as depression and that low levels of fear protect against falling through a positive outlook on life. These individuals maintained physical activity and community participation. Therefore the key message is: *Don't worry, be happy!*

"The ultimate measure of achievement will be a significant reduction in fall-related injuries. It is exciting to know that our findings are used in clinical practice and health promotion across the country."

Professor Stephen Lord

The effect on falls of providing single lens distance vision glasses to multifocal wearers

• In this randomised controlled trial, we provided 606 older wearers of multifocal glasses with single-lens distance glasses to determine whether this reduced falls. We recommended that they wear them when walking and doing outdoor activities.

The project team included Prof Stephen Lord, PhD student Marcella Kwan, research assistant Mamta Porwal, as well as colleagues from the University of Sydney. The intervention resulted in an 8% reduction in falls, and was particularly effective in significantly reducing all falls, including outside falls and injurious falls, in people who regularly undertook outdoor activities.

Our findings suggest that, with appropriate counselling, providing single-lens glasses to older multifocal wearers who take part in regular outdoor activities is an effective falls prevention strategy. However, the intervention may be harmful in multifocal wearers with low levels of outdoor activity.

Migliaccio Group

The vestibulo-ocular reflex maintains visual stability during tasks that move the head rapidly and unpredictably.

The role of vestibular nerves in the mammalian vestibulo-ocular reflex

• The vestibulo-ocular reflex (VOR) is a reflex eye movement that stabilises images on the retina during head rotations by counter-rotating the eyes with respect to the head. These head rotations are sensed by the balance organ located in each inner ear. When the balance organs are injured, the subsequent decline in VOR function will result in substantial loss in quality of life.

We do not fully understand the physiological mechanisms of VOR recovery after injury to the balance organs. So our goal is to test the VOR in a genetically altered mouse that does not have a functioning vestibular nervous system. This year, we designed and built a unique

Dr Lorimer Moseley

Dr Americo Migliaccio

state-of-the-art testing system to do this. VOR-evoked eye movements are measured using a high-speed, binocular, three-dimensional video technique, developed by Dr Americo Migliaccio.

Adaptation of smooth pursuit to augment the vestibulo-ocular reflex after injury

- When vestibulo-ocular reflex (VOR) function is reduced due to damage to the balance organs, other eye movement control systems begin to augment the reduced VOR response. We are measuring the timeline of vestibular, saccadic and smooth pursuit function in people with acute injury to the balance organ. To measure eye movements in humans, we assembled a coil system that can precisely measure fast eye movements.

Dr Migliaccio and Kaushik Moro, an electrical engineering student from UNSW, produced the first prototype video goggle system that accurately measures 3D angular eye position in humans. The goal is to use this system in 'dizziness' clinics so that patients can be tested without having to come to the laboratory. For the first time, we will be able to perform large scale VOR/eye movement testing.

Moseley Group

Tissue damage is neither necessary nor sufficient for pain. The more we learn about pain the more this becomes apparent when we consider the 20% of people for whom quality of life is reduced through chronic pain.

Why do some people develop chronic pain after minor injury?

- Most minor injuries recover, but some progress to a very painful chronic condition that is completely debilitating for sufferers. We have been exploring why this happens by undertaking a range of experiments in people who do not have pain or injury and in people who have chronic pain.

In collaboration with researchers at Oxford University, University College London and the University of Milan, we established that the way your body feels affects how it works. These studies caused a stir in the international community because, until then, it was presumed that the way the body feels was purely a consequence of how it works.

However, it is now known that it is a two-way relationship. We also established a method of identifying who will develop chronic pain after a minor hand injury and, on the back of this, we have been awarded NHMRC funding to explore why. This four year project will include brain imaging, blood tests and psychological testing, and stands to make a major contribution to the understanding of chronic pain disorders.

How does the brain determine where something hurts and does this process affect pain intensity?

- The estimated cost of chronic pain in Australia is $35 billion per year.

It is well established that a fresh approach to chronic pain treatment is required, because currently not much can be done to alleviate the problem.

Our team has an international reputation for research into innovative ways to treat people in pain. Currently, we are taking an entirely new approach by investigating whether the way in which the brain localises a sensory input (that is, how you know it is your toe that hurts) changes the intensity of pain.

We are undertaking experiments in people with chronic pain and in healthy volunteers to see whether we can decrease or increase pain by confusing or assisting this localisation process.

Underpinning

Clinical research facilities are critical to attracting and supporting research excellence as we work towards reducing the nation's burden of disease.

Dr Claire Shepherd and Dr Tony Harding

Brain Bank

The objective of the Brain Bank is to provide a research resource facility for the collection, characterisation, storage and distribution of human brain tissue for research purposes. Our primary focus is on various neurodegenerative conditions and also unaffected people.

"My work will help advance our knowledge of neurological diseases so that we can develop new treatments and find cures. Through the expansion of the Brain Bank we can facilitate great research and reach these goals."

Dr Claire Shepherd, Manager, Brain Bank

- Although the concept of a brain bank might seem unusual, it is a vital resource and without it we would be unable to perform essential research required to understand the causes and consequences of human neurodegenerative disorders such as Parkinson's and Alzheimer's disease.

We rely on the generosity of donors and their loved ones to donate their brain tissue after death. We currently have over 800 brains and 450 prospective donors. We are also working with a large number of clinical research groups whose patients are interested in brain donation, so we expect that the number of donors will increase considerably in the coming years.

Researchers use the valuable brain tissue to explore what happens to the brain during disease. For example, we can compare the changes that occur in an individual who has suffered from a neurological disease, versus a person who has aged healthily. By identifying the molecular and cellular processes that are altered in disease, we are able to identify treatment targets.

"The most rewarding aspect of my role is the thought that the genetic samples processed and stored by the facility *today* will be used to improve the health, welfare and lives of so many people *tomorrow* and in the *future*."

Steve Turner, GRA Facility Manager

our discoveries

Genetic Repositories Australia

Genetic Repositories Australia (GRA) is a national genetic repository for DNA and cell lines derived from appropriately consented disease-specific and population-based studies.

- Genetic Repositories Australia (GRA) was established with the support of an NHMRC Enabling Grant in 2006.

We offer a national genetic repository for DNA and cell lines, providing medical researchers with a central facility for the processing, long-term secure storage and distribution of human genetic samples. In 2009, with a fully automated DNA extraction unit, we expanded our processing capacity by providing high throughput support services for a diverse range of research projects and a wide variety of sample types. We supported a total of thirty NHMRC, ARC, NIH and other funded research projects (both internal and external).

The total number of samples received in 2009 surpassed the previous year by almost 50%, with almost 4000 samples processed since operations commenced. Bipolar, schizophrenia, dementia, healthy population, mental illness, ageing and neurodegeneration represent just some of the research projects by GRA.

Our vision is for GRA to become an integral part of research that translates molecular and clinical genetics into improved health.

Imaging Centre

Researchers across Sydney can measure brain structure and function, as well as brain connectibity and chemisty, in a non-invasive way by using the magnetic resonance imaging (MRI) scanner.

- We currently have 60 project groups funded by NHMRC or ARC using the scanner to gather data. Our scientific management board is in place to approve projects based on whether they have funding, ethics clearance and, most importantly, a coherent scientific proposal. Researchers enjoy coming here because they get data that is reliable. In addition to using our optimised protocols, our radiographers are skilled in scanning for research purposes.

Another benefit is that, as the data are stored on a server at the facility, researchers can access data collected by other researchers to use in their study. This year, we received a grant from the Australian Research Council to upgrade the scanner to the latest multi-transmit technology. This upgrade will enable us to image faster, with a better signal-to-noise ratio.

Lauren Curphey, Research Assistant, GRA

The best and brightest

NeuRA's research landscape sustains the potential for future discoveries. Through wise leadership and enthusiastic researchers we are actively cultivating the next generation of exceptional scientists.

Dr Jane Butler

2009 Amgen Award for excellence

• Research aimed at improving breathing control in patients with spinal cord injury has won NeuRA researcher Dr Jane Butler one of Australia's most prestigious medical awards.

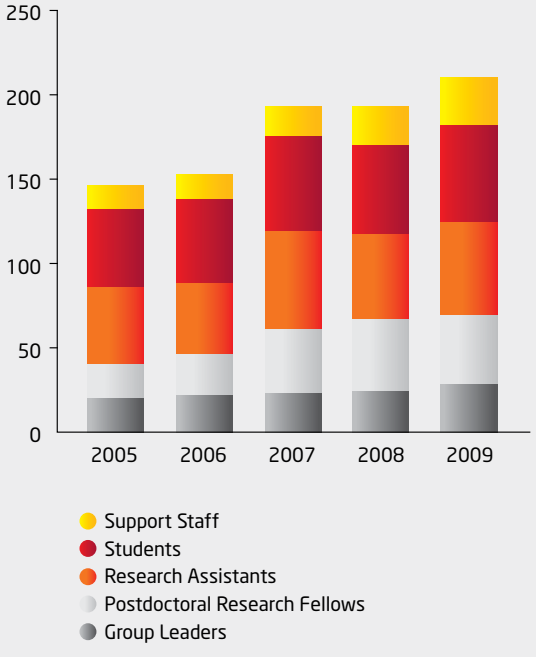
Dr Butler was awarded the 2009 Amgen Medical Researcher Award for excellence in medical research from the Australian Society for Medical Research (ASMR). The Award recognises her significant achievements in discovering a way of allowing spinal injury patients, whose stomach muscles have been weakened or paralysed after spinal cord injury, to activate abdominal muscles and be able to cough and clear their airways, particularly when suffering pneumonia.

Dr Butler said she was delighted with the Award as it recognised the contribution her dedicated team has made to medical research in Australia. She said the Award raises the profile of the type of research they are undertaking into respiratory disorders and the value of their work through the delivery of real treatments.

Dr Butler's research has demonstrated both significance and relevance as the cost burdens on our health system grow on a daily basis and the pressures increase on families to care for their loved ones.

Neuroscience Research Australia is a shared vision. It is underpinned by strength of purpose, a healthy organisational structure, sound leadership and a nurturing environment.

NeuRA staff and students 2005-2009 (FTE)



The future generation

Several young researchers received scholarships to work on PhD projects in 2009. PhD scholarships enable these researchers to pursue postgraduate studies in their chosen field. They also provide a support base for these early career researchers so they can take their place as part of the research community and begin to achieve their goals and fulfill their potential.

Stefanie Reyes, PhD Student

Stefanie Reyes works with the Double Group on Parkinson's disease, and is the recipient of the Michael and Elizabeth Gilbert scholarship.

• Stefanie Reyes: "I first delved into the world of neuroscience at university, where I explored the sensory symptoms present in people with Parkinson's disease.

"A key feature of Parkinson's disease is the death of cells in a region of the brain called the substantia nigra. Interestingly, the disease only affects some cells within this region.

"This specificity of cell death intrigued me, which led to the start of my PhD journey. My approach includes exploring the expression of particular proteins in the cells surviving and those dying in the disease.

"What I find most interesting are all the unanswered questions, including how and why cells die. The brain in its healthy state is such an intricate and complex organ to research. Adding a disease such as Parkinson's into the equation makes it all the more interesting.

"Without the Gilbert PhD scholarship and a top up from Parkinson's NSW, I would have been unable to start my PhD. The financial support has given me the opportunity to focus solely on my research.

"At the completion of my PhD I hope to have contributed some significant findings on the specificity of cell death in Parkinson's disease. Although at this stage I am not entirely sure which path I will take, I am sure that I will continue in neuroscience research."

Duncan Sinclair, PhD Student

Duncan Sinclair works with the Shannon Weickert Group in the Schizophrenia Research Laboratory and began his PhD in 2008.

• Duncan Sinclair: "My interest in understanding schizophrenia developed during my time working for a not-for-profit organisation, assisting people with schizophrenia, bipolar disorder and other psychiatric illnesses to manage the stress of returning to the workforce.

"Now my work delves into the complex ways in which physical and emotional stress contributes on a molecular level to the risk of developing schizophrenia, and how it influences the progression of the illness.

"I am looking at molecules in the brain that turn genes on and off in response to stress. One molecule in particular–the glucocorticoid receptor–seems to be present at varying levels and in different forms in individuals with schizophrenia, which can alter their response to stress and worsen some hallmarks of the illness.

"I'm lucky enough to have a scholarship through NeuRA and UNSW, which enables me to focus full-time on my research project without compromising my family life.

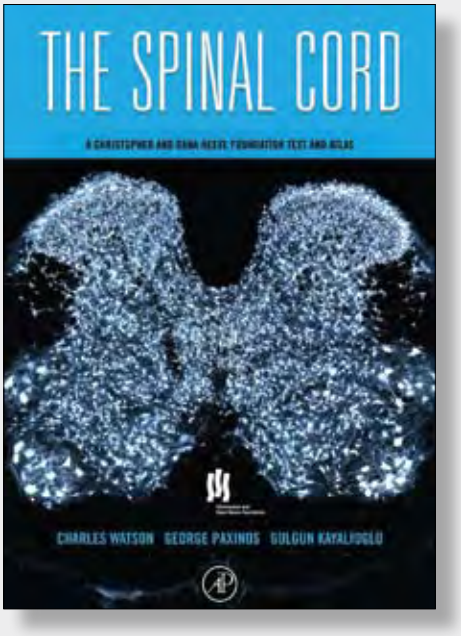
"I'd love to think that my work will help lay the foundation for therapies that minimise the risk of developing schizophrenia. Perhaps we could also prevent the onset of psychosis by developing social and pharmaceutical strategies to help high risk young adults to manage stress."

The importance of publishing

Each year, dozens of papers are published by researchers at NeuRA. Each individual paper takes days, weeks, even months of discussion, writing and revision. We publish our findings in order to share that new knowledge with the world.

Books

1. **Paxinos G, Huang X-F, Petrides M, Toga AW.** The Rhesus Monkey Brain in Stereotaxic Coordinates, 2nd Ed. Academic Press, San Diego, 2009
2. **Paxinos G, Watson C.** The Rat Brain in Stereotaxic Coordinates, Compact 6th Ed. Academic Press, San Diego (Plus CD ROM), 2009
3. **Paxinos G, Watson C, Carrive P, Kirkcaldie M, Ashwell KWS.** Chemoarchitectonic Atlas of the Rat Brain, 2nd Ed. Academic Press, San Diego, 2009
4. **Watson C, Paxinos G, Kayalioglou G.** The Spinal Cord, A Christopher and Dana Reeve Foundation Text and Atlas. Academic Press, San Diego, 2009



Book cover illustration for publication No 4

Journal Publications

5. **Absalom NL, Schofield PR, Lewis TM.** Pore structure of the Cys-loop ligand gated ion channels. Neurochemical Research 34:1805-1816, 2009
6. **Adlam ALR, Patterson K, Hodges JR.** "I remember it as if it were yesterday": Memory for recent events in patients with semantic dementia. Neuropsychologia 47:1344-1351, 2009
7. **Anderson KN, Hatfield C, Kipps C, Hastings M, Hodges JR.** Disrupted sleep and circadian patterns in frontotemporal dementia. European Journal of Neurology. 16:317-323, 2009
8. **Anstey KJ, Wood J, Caldwell H, Kerr G, Lord SR.** Comparison of self-reported crashes, state crash records and an on road driving assessment in a population based sample of drivers aged 69-95 years, Traffic Injury Prevention, 10:84-90, 2009
9. **Anstey KJ, Wood J, Kerr G, Caldwell H, Lord SR.** Different cognitive profiles for single compared to recurrent fallers without dementia. Neuropsychology 23:500-508, 2009
10. **Beck B, Brown J, Bilston LE.** Development of Occupant Protection Systems: Leaving the Rear Seat Behind. Proceedings of the 2009 Australasian Road Safety Researchers, Policing and Education Conference, Sydney, Australia, 2009 (fully peer-reviewed paper)

Assoc Prof Janet Taylor has published over 100 papers in her area of how the brain and nervous system control the way people move.

• Assoc Prof Janet Taylor: "The reason we publish is to share our findings. If you discover something and never share that knowledge, then you might as well never have discovered it.

"Some years ago I heard a colleague talk about a way of making synapses between individual nerve cells grow stronger or weaker, which made me think, could we do a similar thing in the human body?

"I looked up his publications, saw who he'd referenced and was able to follow a network of information about this area.

"Right now is an interesting time for scientific publishing. In the past it used to be difficult to find papers published in lesser known journals, but now because of the internet your work can be found by anyone who is interested."

"Science is about building knowledge. It's about discovering something and telling others so your work can contribute to the wider scientific understanding of the world."

Assoc Professor Janet Taylor

11. **Belmonte C, Brock JA.** Vianna. Converting cold into pain. Experimental Brain Research, 196:13-30, 2009
12. **Bennett H, Broe GA.** The neurobiology of judicial decision-making: Indigenous Australians, native title and the Australian High Court. Public Law Review 20:112-128, 2009
13. **Birznieks I, Macefield VG, Westling G, Johansson RS.** Slowly adapting mechanoreceptors in the borders of the human fingernail encode fingertip forces. Journal of Neuroscience. 29:9370-9379, 2009
14. **Blouin JS, Walsh LD, Nickolls P, Gandevia SC.** High-frequency submaximal stimulation over muscle evokes centrally generated forces in human upper limb skeletal muscles, Journal of Applied Physiology, 106:370-377, 2009
15. **Boland RA, Kiernan MC.** Assessing the accuracy of a combination of clinical tests for identifying carpal tunnel syndrome. Journal of Clinical Neuroscience. 929-933, 2009
16. **Boswell-Ruys CL Sturnieks DL, Harvey LA, Sherrington C, Middleton JW, Lord SR.** Validity and reliability of assessment tools for measuring unsupported sitting in people with spinal cord injuries. Archives of Physical Medicine and Rehabilitation 90:1571-1577, 2009
17. **Brooks D, Halliday GM.** Intralaminar nuclei of the thalamus in Lewy body diseases. Brain Research Bulletin 78:97-104, 2009
18. **Brown AK, Liu-Ambrose TYL, Tate R, Lord SR.** The effect of group-based exercise on cognitive performance and mood in seniors residing in intermediate care and self-care retirement facilities: a randomized controlled trial. British Journal of Sports Medicine 43:608-614, 2009
19. **Brown J, Bilston LE.** Spinal injury in motor vehicle crashes: elevated risk persists up to 12 years of age. Archives of Disease in Childhood 94:546-548, 2009
20. **Brown J, Bilston LE.** Sources of child restraint information utilized by parents in NSW. Proceedings of the 2009 Australasian Road Safety Researchers, Policing and Education Conference, Sydney, Australia, 2009 (fully peer-reviewed paper)
21. **Brown J, Kelly P, Suratno B, Paine M, Griffiths.** The need for enhanced protocols for assessing the dynamic performance of booster seats in frontal impacts. Traffic Injury Prevention. 10:58-69, 2009
22. **Brown J, Wainohu D, Aquilina P, Suratno B, Kelly P, Bilston LE.** Accessory child safety harnesses: Do the risks outweigh the benfits? Accident Analysis and Prevention 42:112-121, 2009
23. **Brown R, Burton AR, Macefield VG.** Input-output relationships of a somatosympathetic reflex in human spinal cord injury. Clinical Autonomic Research 19: 213-220, 2009
24. **Brown R, Stolzenhein G, Engel S, Macefield VG.** Cutaneous vasoconstriction as a measure of incipient autonomic dysreflexia during penile vibratory stimulation in spinal cord injury. Spinal Cord 47:538-544, 2009
25. **Burke D, Howells J, Trevillion L, McNulty PA, Jankelowitz SK, Kiernan MC.** Threshold behaviour of human axons explored using subthreshold perturbations to membrane potential, Journal of Physiology, 587:491-504, 2009
26. **Burton AR, Birznieks I, Bolton PS, Henderson LA, Macefield VG.** Effects of deep and superficial experimentally induced acute pain on muscle sympathetic nerve activity in human subjects, Journal of Physiology, 587:183-193, 2009
27. **Burton AR, Birznieks I, Spaak J, Henderson LA, Macefield VG.** The effects of deep and superficial experimentally-induced acute pain on skin sympathetic nerve activity in human subjects. Experimental Brain Research. 195: 317-324, 2009

The importance of publishing continued

28. **Burton D, Brown J, Bilston LE.** Differences in child restraint related attitudes and behaviours amongst non English speaking background (NESB) and English speaking background (ESB) families. Proceedings of the 2009 Australasian Road Safety Researchers, Policing and Education Conference, Sydney, Australia, 2009 (fully peer-reviewed paper)
29. **Butler AA, Menant JC, Tiedemann AC, Lord SR.** Age and gender differences in seven tests of functional mobility. Journal of Neuroengineering and Rehabilitation 6:31, 2009
30. **Butler CR, Bhaduri A, Acosta-Cabronero J, Nestor PJ, Kapur N, Graham KS, Hodges JR, Zeman AZ.** Transient epileptic amnesia: regional brain atrophy and its relationship to memory deficits. Brain. 132:357-368, 2009
31. **Callisaya ML, Blizzard L, Schmidt MD, McGinley JL, Lord SR, Srikanth VK.** A population-based study of sensorimotor factors affecting gait in older people. Age and Ageing. 38:290-295, 2009
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33. **Cederholm JME, Schofield PR, Lewis TM.** Gating mechanisms in Cys-loop receptors [Review]. European Biophysics Journal 39:37-49, 2009
34. **Chen JS, March LM, Cumming RG, Cameron ID, Simpson JM, Lord SR, Sambrook PN.** Role of quantitative ultrasound to predict fracture among institutionalized older people with a history of fracture, Osteoporosis International, 20:105-112, 2009
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36. **Cheng S, Clarke EC, Bilston LE.** The effects of preconditioning strain on measured tissue properties. Journal of Biomechanics 42:1360-1362, 2009
37. **Choi KH, Zepp ME, Weickert CS, Webster MJ.** Expression profiles of schizophrenia susceptibility genes during human prefrontal cortical development. Journal of Psychiatry and Neuroscience 34:450-458, 2009
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Editorial boards set the standards for communication of research findings

Peer review is the process by which scientists seek to ensure the quality of published research. The peer review process is managed by the editorial boards of scientific journals.

"Peer review is part of the job, it's a scientific duty."

Dr Richard Fitzpatrick

• An expert in neuroscience and physiology, Dr Richard Fitzpatrick has been sought by several noteworthy journals to be a member of their editorial boards, including the highly regarded Journal of Physiology where he serves as a senior editor. He has edited hundreds of papers covering a wide range of medical science and believes that participating in peer review is an essential part of being a researcher.

Dr Richard Fitzpatrick: "A big part of the job is reviewing manuscripts and giving your opinion on the logical and technical quality of the research itself, as well as the broad significance of the science. I review papers in some form or other every day.

"In terms of the impact on my own research, being an editor forces me to read out of my area. For example, I wouldn't have become involved in the area of muscle ultrasound and how it can reveal the actions of the brain if I hadn't been exposed to these ideas while editing outside my comfort zone.

"I also think that, as a scientist, there's a responsibility to participate. If this whole system of scientific inquiry is going to work, building new knowledge, we need to consider carefully what we publish so that we don't spend too long on false paths.

"Although it takes time, editorial work brings new ideas and challenges. By reading about what other people are doing at the cutting edge, you see a breadth of interesting ideas and scientists' approaches to problems."

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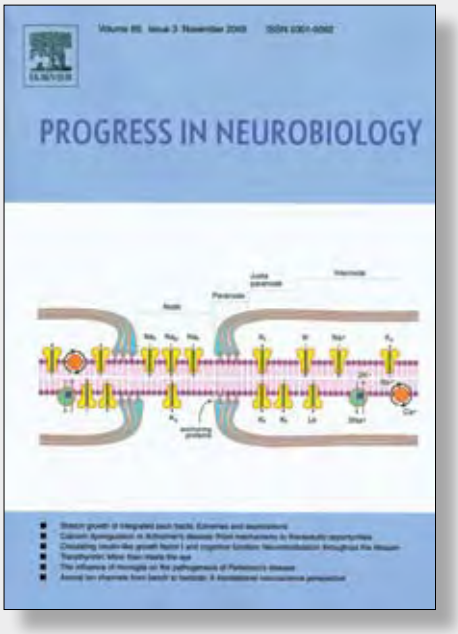

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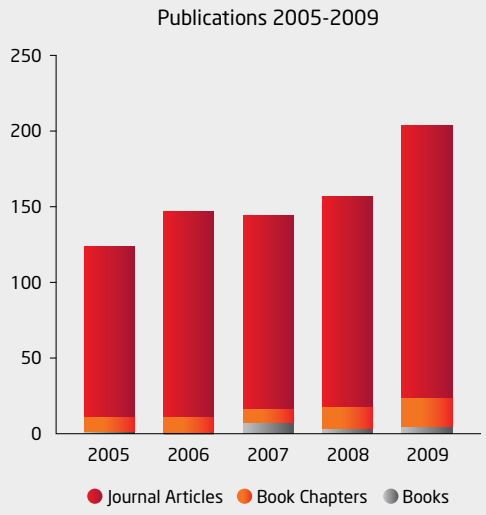

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The Foundation

Making our vis

The vision of NeuRA is to improve the health and wellbeing of our community. The role of the Foundation is to make this vision a reality. It provides financial support for NeuRA's scientific and clinical research programs via a progressive fundraising strategy.

Donations can be made at www.NeuRA.edu.au

Your support is vital

- There's a multitude of ways that you can support our work and you can select a particular disease or area of research.

You can make donations by mail, phone or the internet, hold a fundraising event, become a regular donor, make a bequest, become a corporate partner, celebrate a special event or honour the memory of a loved one who has passed away by making NeuRA a beneficiary in lieu of gifts. We also value the support of a number of community groups and corporate partners.

Please see our website www.NeuRA.edu.au for how you can help us raise our vital funds. Your support helps us increase the extent and impact of our research programs.

We invite you to receive *Brainworks*, our quarterly publication, to keep you abreast of NeuRA's work and its achievements.

The year ahead is exciting with the launch of our $15 million Capital Appeal for NeuRA's new building which will house an expanded number of neuroscientists in a state-of-the-art research environment. With our national focus, we will be providing opportunities for all Australians to support our work and become involved in our national fundraising programs. Every dollar we raise is vital.

ion a reality

Community support is what enables us to remain at the forefront of neuroscience research. An investment in NeuRA, no matter how large or small, is an investment in vital research that will translate to better methods of diagnosis, treatments and ultimately cures.

• The diseases and disorders we focus on touch the lives of almost everyone in some way. We acknowledge and sincerely thank the many generous donors who have shared our vision and supported our research over the past year. Your commitment has enabled the appointment of outstanding Australian researchers, the purchase of new equipment, and the expansion of existing research programs.

The Phyllis Luker Society

Established in 2005, the Phyllis Luker Society is named in honour of a passionate supporter of brain research, Phyllis Luker. Miss Luker made significant donations to NeuRA over a number of years, and left a generous bequest in her Will. The society was set up to recognise people like Miss Luker who have made a bequest, and to thank them for their ongoing generosity and trust.

• John Simmonds was a member of the Society and, in 2009, we received a major bequest from his estate. John sadly passed away from a rare and complex neurodegenerative disorder, a condition that also affects other members of his family.

Familial neurodegenerative disorders are devastating for the families involved, yet research can offer the opportunity to learn more about the genetic and environmental changes that cause these disorders.

John and his family have worked with researchers at NeuRA's Brain Bank to identify the cause of his family's disorder.

John's legacy is reflected in ongoing support for vital work in both diagnosis and understanding of neurodegenerative disorders.

His bequest has already allowed us to embark on more of these complex projects. In 2009 these projects included the investigation of an unusual presentation of frontotemporal dementia, identifying a new gene for frontotemporal dementia, an examination of different pathologies found in familial Alzheimer's disease, and a review of atypical Parkinsonian disorders.

We sincerely thank the Simmonds family for their gift to future generations through supporting our research.

"John's legacy will be ongoing support of vital work in both diagnosis and understanding of neurodegenerative disorders."

John's father, Steve Simmonds, with a photo of his sons, Peter and John

Thank you to our supporters

We acknowledge and thank all our generous donors for their vital financial support.

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Philanthropy in action

Only through the generosity of donors can researchers work towards improving the health of the community. We receive financial assistance from several philanthropic foundations, including the Cowled Foundation. The Cowled Foundation gives an annual scholarship to a female PhD student from country Australia to improve our understanding of the brain.

• Laurie Cowled: "I grew up on a farm near a country village called Bethungra in NSW. As a child I wanted to be a ballerina and an actor but at my school there was no possibility of following those sorts of goals. I would have liked to have had more opportunities.

"Both my husband and I decided that we would both leave our estates to charity and in 2007 I formed the Cowled Foundation. The main thing I wanted to do was help gifted young people from country Australia.

"I first found out about NeuRA through their annual bridge competition, the Bridge for Brain Research Challenge. I was very intrigued by their work, and read in their newsletter, *Brainworks*, that they were looking for people to support PhD students. I was on the phone the very next day to Peter Schofield.

"We set up the Cowled Postgraduate Research Scholarship for Brain Research, which goes to a young woman originally from the country who is studying for her PhD.

Supporter Laurie Cowled and Scholarship recipient Rachel McBain

"The scholarship has gone to two young women so far, Rebecca St George and, most recently, Rachel McBain. Rachel is investigating the control of muscles that regulate breathing in people with spinal cord injury. It's a very worthwhile project and I will be assisting her until she submits her thesis.

"I get a thrill out of knowing that I have been able to assist someone to reach their goal. I believe that education is such a fundamental right.

"NeuRA is such a wonderful institution, and the researchers need all the help they can get. I'm glad that I'm able to do just a small amount to help them on their way."

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Funding our re

NeuRA attracts competitive grant funding from a number of national and international organisations every year.

NeuRA has been successful in securing infrastructure funding of **$1.39 million** for the 2009 calendar year from the NSW Medical Research Support Program. The Institute also received **$1.23 million** in infrastructure funding from UNSW in 2009.

Research Grants

Total peer reviewed grant funding awarded for the 2009 calendar year totalled $12.01 million. During 2009, NeuRA researchers held a total of 146 research grants, fellowships, scholarships and awards.

A significant portion of funding awarded to NeuRA researchers comes from the National Health and Medical Research Council, which totalled $7.87 million in 2009. This includes 60 research support awards (totalling $4.97 million), 22 people support awards (totalling $2.8 million) and 4 scholarships (totalling $88,000).

Professor Matthew Kiernan

Project grants in focus

- Treatment trial for Motor Neurone Disease:

Over half a million dollars in funding over three years has enabled the first drug trial for MND to commence in Australia. Led by Prof Matthew Kiernan, the 44-week, 100 patient study aims to assess whether a novel drug therapy (a sodium channel blocking agent) can slow the rate of disease progression and protect neurons from dying. This study is important as there is no cure for MND.

- Interactive step training: The ability to make timely steps is essential for avoiding trips and falls. This ability is often significantly impaired in older adults, but can be improved with repetitive training of stepping responses. A project grant worth over $300,000 was awarded to Prof Stephen Lord, Dr Stuart Smith and colleagues Dr Catherine Sherrington from Sydney University and Prof Stephanie Studenski from Pittsburgh University. The project aims to develop a home-based step training system to improve the ability of older adults to make well-timed and directed steps for maintaining their postural stability. The system will provide engaging feedback on stepping ability which will promote adherence to the program.

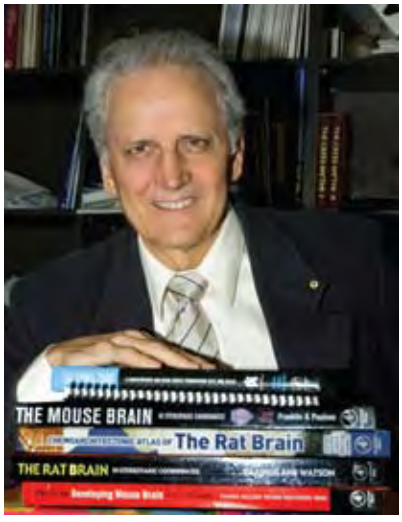
search

Fellowships

• Prof George Paxinos AO, the world's leading expert in the field of brain mapping, was a recipient of a highly prestigious NHMRC Australia Fellowship. This scheme provides $800,000 per annum for five years to outstanding researchers to undertake research that is both of major importance in its field and of benefit to Australian health.

Prof Paxinos is also a co-investigator on a successful NIH grant with Prof Susumu Mori from The Johns Hopkins University, USA. The grant will look at magnetic resonance microimaging of mouse brain development.

• Dr Penelope McNulty was a recipient of a Career Development Fellowship through the NSW Office of Science and Medical Research's Spinal Cord Injury and Related Neurological Conditions Research Program. This award allows Dr McNulty to identify how surviving connections in the nervous system can be targeted to restore hand function in quadriplegia after spinal cord injury.



"With this NHMRC Australia Fellowship, I want to pass on the art of brain mapping to ensure its continuity."

Professor George Paxinos AO

"Securing NHMRC grants is extremely competitive. You have to be at the cutting edge of international science to succeed."

Professor Simon Gandevia

Most funding for health and medical research comes from the Federal Government's National Health and Medical Research Council (NHMRC).

• NeuRA co-founder, Prof Simon Gandevia, says NHMRC funding is nothing less than critical to the success of medical research.

"The NHMRC supports people, from established leaders to junior scientists, and research through broad program grants and smaller, more specific project grants that are critical for the senior scientists to run their research.

"It's an extremely competitive application process - the national success rate for securing a grant is in the order of 20 to 25%. You have to write a highly competitive scientific proposal that deals with an important issue and is at the cutting edge of international science, and you have to show that you can deliver results.

"Your track record is important in building your credibility as a researcher and securing NHMRC grants. Of course, when you don't have a track record it's difficult, so one of the focusses of mentoring here is to try to help early career researchers up that first funding 'step'."

Engaging the co

Our research does not move forward in isolation, but rather with help from, and interaction with, the community. We value our engagement with the community because it means we can share news of our progress, and allow the community to help fund or participate in research that immediately impacts them.

Opening of the Prince Henry Wing, Paul Pearce, Capt Mick Costelloe AM, Pat Williams, Minister Jodi McKay, Professor Peter Schofield, The Hon Bryan Vaughan, John Walton AM

Prince Henry Wing opens

The new $3 million 'Prince Henry Wing' was officially opened by The Hon Jodi McKay MP, Minister for Science and Medical Research on 11 June 2009. The new wing was named in recognition of The Prince Henry Hospital Centenary Research Fund's (PHHCRF) support for medical research, and the historical importance of The Prince Henry Hospital in our establishment.

- Medical research has always relied on philanthropic support and the generosity and foresight of the PHHCRF to continue to support us through its $1 million donation helped make this new wing a reality.

The PHHCRH's Trustees, Capt Mick Costelloe AM (Chairman), John Walton AM, Pat Williams and The Hon Bryan Vaughan joined special guests and scientists to celebrate the naming of the new wing.

The Prince Henry Wing, which is also supported by a grant from the Australian Government, is strategically critical to our work. We urgently needed the space that the new wing provides to manage our growth and laboratory requirements for our current research projects.

mmunity

The ABC'S "Australian Story" profiles our scientist

Professor Cyndi Shannon Weickert with the Australian Story Producer, Catherine Hunter and crew

• NeuRA's Prof Cyndi Shannon Weickert once dreamed of being a famous chef until her twin brother Scott Shannon was diagnosed with schizophrenia in his teens. After witnessing first-hand the devastating symptoms of delusions and hallucinations in the person she loved the most, she embarked on a life mission to find a cure.

Now a world-leading neurobiologist, she relocated from America to Australia when invited to lead a top schizophrenia research program at NeuRA. Prof Shannon Weickert was featured in the ABC's acclaimed Australian Story – an episode viewed by over one million people.

Online dementia management guide

• An online family guide to assist in the care and management of sufferers of younger onset dementia has been released by NeuRA*. The downloadable guide has been developed to help families and carers identify and manage the disorder in everyday life. Prof John Hodges, whose team compiled the guide, said research indicated that an increasing number of Australians in their 40s and 50s are being identified with younger onset dementia.

The guide is a collection of information especially directed to patients and families with younger onset dementia. Before this publication people would have to rely on information gathered from different agencies, which was overwhelming and confusing. It offers practical advice which is not available elsewhere, much of which is specific to the families of younger patients with dementia, such as the impact on teenage children.

Access to this information will empower the families of people with younger onset dementia, reducing levels of stress and increasing the ability to cope better with this condition.

*The guide was commissioned by Alzheimer's Australia and funded by the Australian Government.

Bridge players

Bridge for Brain Research Challenge

• Now in its sixth year, NeuRA's annual Bridge for Brain Research Challenge has around 70 bridge clubs around Australia playing hands during the first week in May. From Palmerston in the Northern Territory to Launceston in Tasmania, over 3000 players keep their minds active by playing bridge while raising funds for Alzheimer's and dementia research.

The Challenge is organised by NeuRA with the support of the Australian Bridge Federation (ABF) and State Bridge Associations. Bridge is a wonderful way to keep your mind alert. It is vital to keep mentally as well as physically active as you get older.

Keith McDonald, President of the Australian Bridge Federation, has been a long time supporter of the Challenge and says that the ABF is delighted with the support from bridge clubs for the research into Alzheimer's disease and they always look forward to raising significant funds for this important work.

Finance

Statement of Financial Performance for the Year Ended 31 December 2009

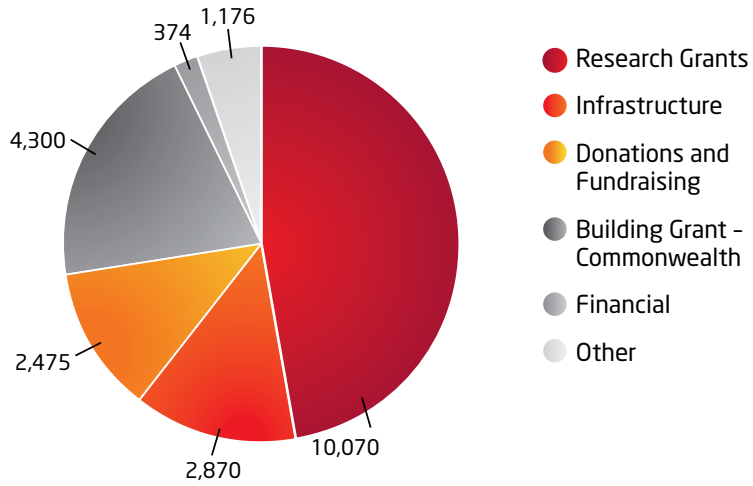
	2009 $'000	2008 $'000	2007 $'000	2006 $'000	2005 $'000
Revenue					
Research Grants	10,070	8,315	6,346	4,903	4,210
Infrastructure	2,870	3,454	4,012	3,283	2,188
Donations and Fundraising	2,475	2,472	2,337	1,439	1,149
Building Grant – Commonwealth	4,300	3,112	605	0	0
Financial	374	477	658	586	358
Other	1,176	869	837	629	406
Total	**21,265**	**18,699**	**14,795**	**10,840**	**8,311**
Expenses					
Salaries and employee benefits	11,080	9,913	8,229	6,683	5,479
Depreciation and amortisation	1,553	742	606	494	461
Research operations	1,892	1,820	1,455	848	454
Fundraising	143	218	223	177	163
Building	324	241	198	162	168
General operations	1,410	1,054	820	607	556
Commercialisation	37	36	0	0	0
Other	444	306	165	252	236
Total	**16,883**	**14,330**	**11,696**	**9,223**	**7,517**
Net Surplus	4,382	4,369	3,099	1,617	794

Statement of Financial Position as at 31 December 2009

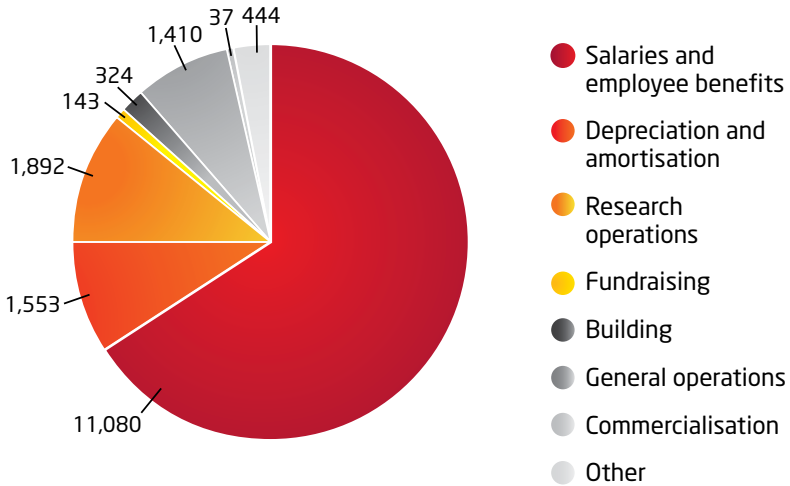
Balance Sheet					
Current Assets	40,372	43,917	45,747	27,889	9,010
Building Development	4,566	1,992	605	0	0
Property, Plant and Equipment	11,097	9,238	7,150	7,009	6,627
Total Assets	56,035	55,147	53,502	34,898	15,637
Current Liabilities	29,858	33,382	36,178	20,780	3,244
Provisions	633	602	530	423	315
Total Liabilities	30,491	33,984	36,708	21,203	3,559
Retained Surplus	25,544	21,163	16,794	13,695	8,428
Reserves*	0	0	0	0	3,650
Total Net Funds	**25,544**	**21,163**	**16,794**	**13,695**	**12,078**

* Reserves transferred to Retained Surplus

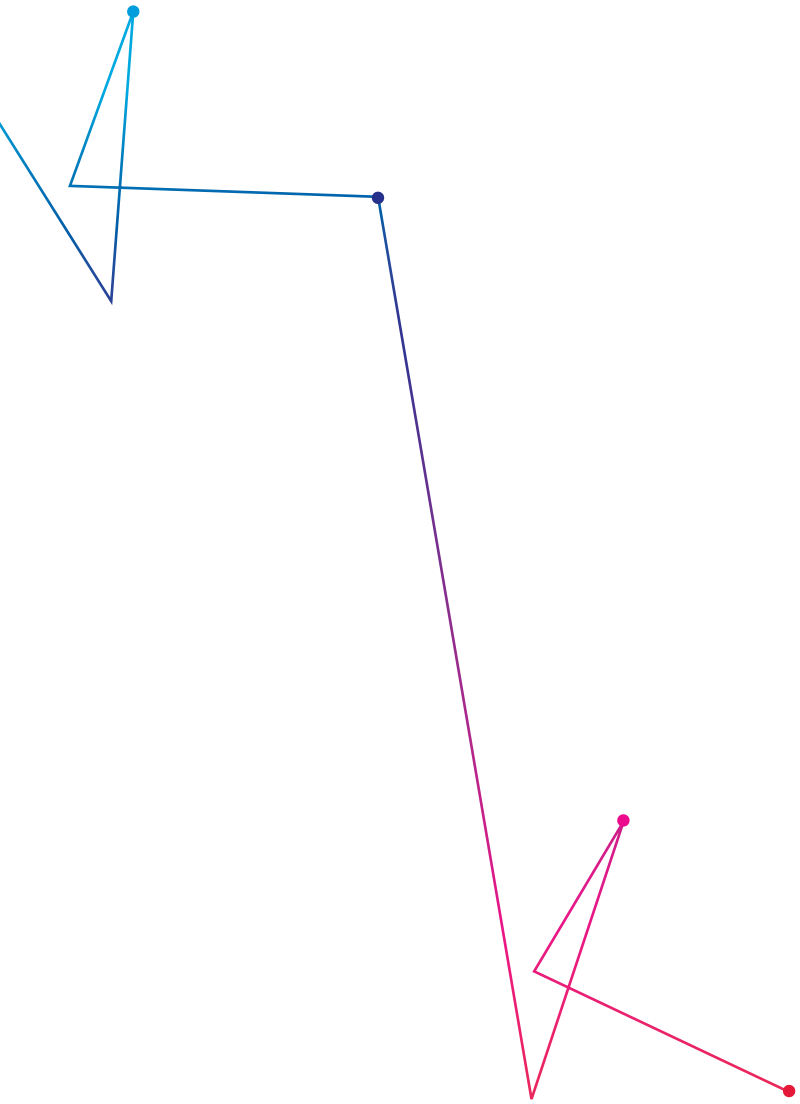
Revenue



Expenses



Due to a change in reporting period from financial year to calendar year, prior year comparatives have been averaged. Financial information was extracted from the audited Financial Statements of POWMRI Limited, the statutory entity of the Prince of Wales Medical Research Institute, for the year ending 31 December 2009 here for information purposes only. A full copy of the audited Financial Statements, including Notes to the Financial Statements and the Audit Opinion, can be obtained free of charge on request to the Finance Manager, Neuroscience Research Australia, Barker Street, Randwick NSW 2031 or online at www.NeuRA.edu.au



Neuroscience Research Australia – a place that holds the promise of major scientific advances for Australia.

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Designed and produced by **walterwakefield.com.au**
Photography by **Anne Graham**
Printed by **Rawson Graphics**

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