# neuroscience



Prince of Wales Medical Research Institute Annual Report / 2007

# the way forward

#### Neuroscience, the study of the brain and nervous system,

presents the greatest challenge known to man. Our brain is the most complex mechanism we have ever encountered and understanding its intricacies requires a profound research commitment. When disrupted, disorders of the brain and nervous system pose the largest health, economic and social capital burden to Australia of any disease group. The significant investment the Prince of Wales Medical Research Institute is making into neuroscience research will mean that its research base has a secure footing for many years to come, bringing more discoveries, exciting science and eventually new treatments.



# contents

# e chairman's report

в енесиtive director's report

# 12 board of directors

### 15 research

Ageing and Neurodegeneration Brain Function and Imaging Mental Illness Neural Injury Sensation, Movement, Falls and Balance Research Facilities

# 37 our profile

Prizes and Awards 2007 Publications Professional Service Our People

# чэ finance

Financial Summary and Funding Our Supporters

## 60 fundraising and communications

Raising Funds, Raising Awareness How You Can Support the Institute

# chairman's report 2007

On behalf of the Board of Directors, I am delighted to report that 2007 was another successful year for the Prince of Wales Medical Research Institute. We are one of the largest institutes in the country, dedicated to neuroscience and directed to understanding the integrative actions of the brain and nervous system in health and disease.

As I reflect on the significant achievements of our scientists, detailed in the Executive Director's report and also later in this report, it is evident that we are keeping faith with the Institute's mission to investigate, diagnose and treat neurological diseases and conditions.

The biggest challenge currently facing the Institute is increasing our laboratory space. Therefore, I am pleased to be able to report that the Treasurer, in the Federal Government's 2007 Budget, awarded a \$30 million capital grant to the Institute. This funding has enabled us to begin a major building program on the Institute's current site. The development will form the first stage of a world-class Neuroscience Research Precinct, which is estimated to cost in excess of \$70 million. The Institute's partners in the Neuroscience Research Precinct are South Eastern Sydney & Illawarra Area Health Service and the Randwick Campus Hospitals, the University of NSW and the Black Dog Institute.

The Board Ms Gabrielle Upton, Deputy Chancellor of the University of NSW, was appointed to the Board in April as a nominee of the University. With her legal and banking background and experience in a broad range of areas, Gabrielle's advice and expertise are greatly appreciated.

The Board established several new sub-committees in 2007, including the Investment Committee and the Building Committee. The latter was set up to oversee the Neuroscience Research Precinct building project and keep the Board informed of the project status; also to develop criteria and select appropriate staff, consultants and contractors to deliver the project. I thank those members who are serving on these new committees, and on the Audit Committee.

**Constitution** In August 2007, the Board formally adopted a new Constitution for POWMRI Ltd (the entity under which the Prince of Wales Medical Research Institute operates). The Directors felt that this was a necessary step to better reflect changes to Corporations law and surrounding circumstances which have occurred since POWMRI's original Memorandum and Articles of Association were first adopted in 1993. I would specifically like to acknowledge the personal interest shown to us by Professor Fred Hilmer, Vice-Chancellor of the University of NSW and Professor Deb Picone and Mr Terry Clout, former and current Chief Executive Officers of the South Eastern Sydney & Illawarra Area Health Service.

The Constitution is the basis for the close affiliation with the Institute's founding stakeholders, the University of NSW and South Eastern Sydney & Illawarra Area Health Service. Although the Institute is proud to maintain its status as an independent medical research institute, our close ties with both the University and Area Health Service have proved successful during the Institute's rapid growth in the last 14 years. The Board is conscious of these relationships and wishes to enhance, not diminish, them in any way. Foundation Significant progress was made in 2007 to establish a Foundation for the Institute, to be called "The Brains Trust". The Board is especially grateful to Henry Davis York, Solicitors, for their pro bono support in establishing the Constitution and Charitable Trust Deed of this important new venture. The registered company ("The Brains Trustee Ltd") will hold and manage the Institute's endowments and bequests from members of the Phyllis Luker Society, as well as philanthropic, corporate and wider community donations. This will significantly enhance the ability of the Institute to conduct its ongoing research. Inaugural Directors of the company are Professor Peter Schofield, Mr Graeme Bradshaw, Mr James Williams and myself.

State Funding I am honoured to continue serving as a member of the Chairmen's Advisory Group, representing the State's leading medical research institutes. The group, led by Mr Bill Ferris AC, was formed to advocate increased funding for health and medical research via the NSW Government's Medical Research Support Program. This program provides the infrastructure funding that is vital to enable our institutes to flourish and our scientists to continue their important work to improve the health and wellbeing of the Australian community.

Acknowledgement The Board expresses thanks to all members of the Institute's staff for their significant contributions to research outcomes and the overall development of the Institute in 2007. In particular, Professor Peter Schofield, Executive Director and CEO, and Professor Simon Gandevia, Deputy Director, are to be congratulated on providing outstanding leadership and a rich environment that enables our team of dedicated and talented scientists to achieve optimal results in their neuroscience research programs.

The Board is also most grateful to the Institute's friends and donors in the broader community who have supported our research projects and activities. We acknowledge the crucial role played by these individuals, trusts and foundations in helping the Institute achieve its mission.

Finally, I would like to express my personal thanks to my fellow Directors for their enthusiastic support and wise counsel in 2007.

Paul Bram

Paul Brassil Chairman



# paul brassil Chairman

"We are one of the largest institutes in the country, dedicated to neuroscience"

# neuroscience the way forward

The Institute's continued growth In last year's Annual Report, I noted that the Institute has quadrupled in size over the past 13 years, and was already at full capacity. In 2007, we exceeded 200 staff and students and continued on our rapid growth trajectory. To substantially expand our laboratories and facilities, we have developed plans for a new \$70 million building with Cox Richardson Architects & Planners. The new building will double the space of our existing research facility. Importantly, we propose that the Institute's building developments will lead the establishment of the Neuroscience Research Precinct. This will create opportunities for cooperation across the neurosciences and for translation of our research activities to improved health outcomes.

The Federal Government had put substantial recurrent support into health and medical research and with this growing investment, we put our case for funds to the Minister for Health, the Hon Tony Abbott and to the Prime Minister, the Hon John Howard. In the May budget, the Federal Treasurer announced a \$30 million capital grant to the Institute and we featured as the budget issue cover photo in the Higher Education Supplement of The Australian newspaper. Together with \$5 million of our own funds, this major grant will enable Stages 1 and 2 of the planned \$70 million building to commence and will establish the Neuroscience Research Precinct. The grant is an outstanding endorsement of the Institute's research programs and plans for the future, and I owe a great debt of gratitude to those key individuals who assisted in putting forward our case.

With a need for action, the Institute submitted and received approval for a Development Application for Stage 1 building works by Randwick Council in October. These initial building additions will add extra research and office space and also provide space for decanting which will be needed when Stage 2 works commence. These works are now underway for completion in 2008 and include a two level temporary building of 300m<sup>2</sup> to be erected at the rear lane of the Institute and a two level building of 450m<sup>2</sup> adjoining the north-eastern side of the Institute.

Our architects, Cox Richardson are progressing with advanced masterplanning for Stages 2 and beyond. We have appointed Dr Jeff Freeman as our Facility Development Manager to assist the Institute in managing the building brief. We completed the year by appointing a leading firm of Project Management Consultants, Winton & Associates, to oversee and manage all aspects of the new building project.

There is significant support for the Neuroscience Research Precinct project from the Institute's key stakeholders, the University of New South Wales and the South Eastern Sydney & Illawarra Area Health Service and from our other Precinct partners. 2008 will see major advances in planning and integration of the Neuroscience Research Precinct.

With the Federal Government's provision of the \$30 million capital grant, we are now seeking matching funds from the NSW State Government to support the physical development of the Institute.

#### A new Minister for Science and Medical Research

Following the State election in March, Verity Firth was appointed as the new Minister for Science and Medical Research. I had an opportunity to brief the Minister and Members of the NSW Parliament as she introduced her first piece of legislation, the Human Cloning and Other Prohibited Practices Amendment Bill, 2007. Minister Firth visited the Institute in June and toured our research facilities, seeing clear examples of the scope and relevance of our research to improving health. She also had a chance to converse with many of our researchers while visiting their laboratories. The Minister expressed her strong support of our research and the initiative of the Neuroscience Research Precinct.

In May, the Premier, Morris lemma and Minister Verity Firth visited the Institute as the location for their media announcement about the forthcoming NSW State budget. Against a background of our research into falls and balance and into spinal injury and rehabilitation, the Premier announced that one of the central themes of the budget was to continue supporting the innovative Spinal Injuries Research Grants Program. A further \$13 million will be invested in the Program over the period 2007-11 so as to support research projects leading to discoveries that will have a positive impact on the lives of the 9,000 Australians with spinal cord injuries and other neurological conditions.

In August, I visited the then Federal Opposition spokesperson for Health, Nicola Roxon, where I highlighted the willingness of our staff to assist in providing expert advice. Later in the year, we hosted a visit by the NSW Minister for Health, Reba Meagher, in which we showcased some of our research activities and again highlighted our request for NSW Government support for our building program.

#### Opening of the Schizophrenia Research Laboratory

To coincide with the launch of Mental Health Week in October, the Premier and Minister for Science and Medical Research visited the Institute to officially open the newly renovated Schizophrenia Research Laboratory. The opening attracted significant media coverage and was hosted by Anne Deveson, writer, broadcaster, filmmaker, former head of the Australian Film Television and Radio School, and staunch advocate of research into schizophrenia.

In addition to the opening of our state-of-the-art schizophrenia research laboratory, the Premier acknowledged the support of the Macquarie Group Foundation in expanding the funding base for our Chair of Schizophrenia Research, held by Professor Cyndi Shannon Weickert, with a major philanthropic boost and recognition by renaming this crucial position as the Macquarie Group Foundation Chair of Schizophrenia Research.

New research programs and staff 2007 saw two worldrenowned neuroscientists join the Institute to establish new research programs.

Professor John Hodges, a behavioural neurologist and world expert in dementia research, was recruited from Cambridge University in the UK. John, who is a long time collaborator with staff at the Institute, was awarded a prestigious

# professor peter schofield Executive Director and CEO

"To substantially expand our laboratories and facilities, we have developed plans for a new \$70 million building"

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Federation Fellowship by the Australian Research Council as well as a State Government Life Sciences Research Award. He took up a UNSW appointment as Professor of Cognitive Neurology, based at POWMRI, in November. John and his team are undertaking fundamental research on long-term memory systems and the human brain and applying this to better diagnosis and treatment of frontotemporal dementia.

Professor Charles Watson, a long-standing collaborator with the Institute's Professor George Paxinos, was appointed a part-time POWMRI Senior Principal Research Fellow, as he returns to a full-time research career spent at both the Institute and at Curtin University in Perth. Charles has been active in producing atlases to navigate the brain of humans and animals and understanding the sequence of events that occurs during brain development.

A Strategic Planning Day was held in March for our senior scientists to forward plan the Institute's science and operations. We reaffirmed the key role of our five major research themes, namely ageing and neurodegeneration; brain function and imaging; neural injury; mental illness; sensation, movement, falls and balance. These broad research themes provide a means by which we can maximise our impact through collaborative endeavour. We also endorsed the role of our research centres and facilities, including the Spinal Injuries Research Centre, Symbion Clinical Research Imaging Centre, Tissue Resource Centre (Brain Bank), and Genetic Repositories Australia. The senior scientists also commenced planning for an external review to be conducted by national and international experts in 2008. The Scientific Review will consider our current and long-term plans and how best to enhance our research performance.

Staff promotions, awards and recognition The Institute has an outstanding cadre of researchers, including the appointment of an ARC Federation Fellow in 2007 and nine NHMRC Research Fellows. Our rich environment for neuroscience research and excellent track record of career development has allowed us to host four NHMRC Career Development Awardees. We also have a significant program to mentor our postdoctoral fellows and graduate research students.

Of particular note are promotions awarded to Institute researchers in 2007, to take effect from 2008. Dr Jane Butler was awarded a highly competitive NHMRC Senior Research Fellowship, and Drs Brett Garner and Richard Fitzpatrick were promoted to POWMRI Senior Research Fellows. Richard was also awarded a senior level NHMRC Career Development Award. Two of the Institute's stars of the future, Drs Olivier Piguet and Stuart Smith, were awarded NHMRC Career Development Awards for commencement in 2008.

Professor George Paxinos is to be congratulated as the 2007 recipient of the Australian Psychological Society's Distinguished Scientific Contribution award. Recipients of other significant awards and prizes include Dr Steve Vucic who won both the James Lance Young Investigator Award by the Australian & New Zealand Association of Neurologists and the Golseth Young Investigator Award of the American Association of Neuromuscular & Electrodiagnostic Medicine; Lolita Warden for the Bill Evans Memorial Prize of the Australian & New Zealand Neuropathological Society; and Sharon Savage for the Macquarie University Master of Clinical Neuropsychology Prize for Academic Excellence.

Congratulations are also due to the seven students whose PhD degrees were conferred in 2007: Cindy Kersaitis, Shaokoon Cheng, Peter Martin, Kingsley Storer, Anne Tiedemann, Connie Vogler and Vanessa Young.

**Competitive grant success** Our scientists are to be congratulated on the high success rate of their competitive grant submissions in 2007. Institute researchers achieved a 43% success rate in this year's round of NHMRC project grants, considerably above the average national success rate of 27%. NHMRC is Australia's major scientific funding body. We work closely with our partner, UNSW, who provide grant management services. Of the grant outcomes announced, the Institute contributed one-quarter of all UNSW's NHMRC project grant success and half of their NHMRC Career Development Awards. Our researchers also received many research grants from other funding bodies in Australia and overseas.

**Excellent publication record** Scientific publications provide a measure of our scientific output as they are a key way of communicating our discoveries. POWMRI researchers produced 143 scientific publications in 2007, an excellent performance and one that outperforms many larger research institutes.

Major international conference Many of our researchers attended the International Brain Research Organisation (IBRO) meeting in Melbourne and various satellite meetings





around the country. Professor George Paxinos as Congress Chair, Professor Elspeth McLachlan as Chair of the Scientific Program Committee, and Professor Glenda Halliday as Australian Neuroscience Society President, all played substantial roles in organising the IBRO meeting. In addition, Dr Kay Double, Professor Simon Gandevia, Drs Jane Butler, Janet Taylor and Richard Fitzpatrick organised satellite meetings.

Prior to IBRO, the Institute hosted visits by two eminent neuroscientists. Professor Herta Flor, a plenary speaker at IBRO, visited us from Germany and presented a seminar. Professor Peter Agre, Nobel Laureate from USA and also an IBRO plenary speaker, visited the Institute prior to his public lecture at Parliament House and engaged in an informal meeting with our postgraduate students.

Supporters and donors The Institute's fundraising events in the 2006/07 financial year raised \$1.6 million for our research. Key support included outstandingly generous support from several personal benefactors, those who established scholarships for talented, young researchers, our ongoing participation in the ASX-Reuters Charity Foundation, the many participants in our "Bridge for Brain Research" Challenge, and our "Food for Thought" gala dinner. The theme, "Café de Paris", showcased a degustation menu from some of Sydney's most notable French chefs. Our guest speaker was Sue Pieters-Hawke, daughter of Hazel Hawke who has Alzheimer's disease, and our guest of honour was the Consul General of France. Proceeds of the event supported our research into Alzheimer's disease and dementia. The Phyllis Luker Society has continued to flourish in 2007 under the stewardship of Leonie Harle who was appointed in mid-2007 following the resignation of our original Bequest Manager, Robyn Maher. During 2007, a number of Institute friends indicated their intention to leave a bequest to support our ground-breaking research in the neurosciences. Of particular note are those new members of the Phyllis Luker Society who have committed to make living wills through one-off or regular donations. Just as the membership of the Phyllis Luker Society allows us to recognise these farsighted individuals, applying a living will allows our generous benefactors to see the impact of their gifts on the work of our research programs.

Finally, I wish to acknowledge the many people, not least our Board Chairman and Board of Directors, who have contributed so much to the work of the Institute over the past year. I would also like to express my personal thanks to my scientific colleagues and our operations staff for helping to achieve the successes of 2007. I am extremely grateful for this support.

The field

**Professor Peter R Schofield** Executive Director and CEO

# board of directors



Mr Paul Brassil BEc LLB ACA FTIA Director, POWMRI Limited, 1997 – present Chairman of the Board, POWMRI Limited, 2004 – present Chairman of the Audit Committee, POWMRI Limited, 2003 – present

Partner of PricewaterhouseCoopers, Chartered Accountant and a Fellow of the Taxation Institute of Australia, specialising in advising local and international clients on income tax and related matters.



Professor Roger Dampney BSc PhD DSc Director, POWMRI Limited, 1995 – present

Professor of Cardiovascular Neuroscience at the University of Sydney and an Honorary Consultant Physiologist at Royal North Shore Hospital. He is also a member of a number of Societies and Advisory Committees and has served on a number of NHMRC Grant Review Panels.



Ms Judi Hausmann MPRIA Director, POWMRI Limited, 2003 – present

Principal of Hausmann Communications in Sydney and a Member of the Public Relations Institute of Australia.



Professor Peter Smith RFD MD FRACP FRCPA Director, POWMRI Limited, November 2005 – present

Dean, Faculty of Medicine, UNSW. He has served on a number of Commonwealth and State Government committees and advisory boards, and is recognised as a leading clinician, researcher and educator.



Ms Gabrielle Upton BA LLB MBA GAICD Director, POWMRI Limited, April 2007 – present

Deputy Chancellor, UNSW. A lawyer and banker, currently Legal Counsel at the Australian Institute of Company Directors and a member of the Corporations and Markets Advisory Committee, the Federal Government's advisory committee on corporations and securities law. She serves on the Australian Defence Force Academy Consultative Committee and the General Sir John Monash Foundation NSW Awards Committee.



Mr David Thomas Director, POWMRI Limited, 1997 – present

David's business is in the hospitality industry.



Mr Peter Kemp LLB Director, POWMRI Limited, October 2006 – present

Principal of Peter Kemp Solicitors, a specialist commercial law firm in Sydney. Peter has been involved in commercial legal practice for over 30 years, mainly in his role as one of the founding partners of Kemp Strang Lawyers. He is also a member of the Business Law Section of the Australian Law Council and a founding member of its Insolvency Section.



Dr Andrew Refshauge MBBS GAICD Director, POWMRI Limited, October 2005 – present

Member, Audit Committee, POWMRI Limited,

June 2006 – present Former Deputy Premier of NSW (1995-2005), former Treasurer and Minister for Health, and a medical practitioner with extensive skills and experience in the political, financial and health sectors.



Mr Barry Shepherd PSM Director, POWMRI Limited, July 2005 – present

Former Director of Corporate Services, SESIAHS and Deputy CEO, South Eastern Sydney and Eastern Sydney AHS. He served as POWMRI Director during the Institute's formative years and was renominated to the Board by the Area Health Service. He has extensive expertise in the health and medical research sector and the delivery of major projects.



Mr John Walton AM MBA BEC FCPA FAIM Director, POWMRI Limited, 1991 – present

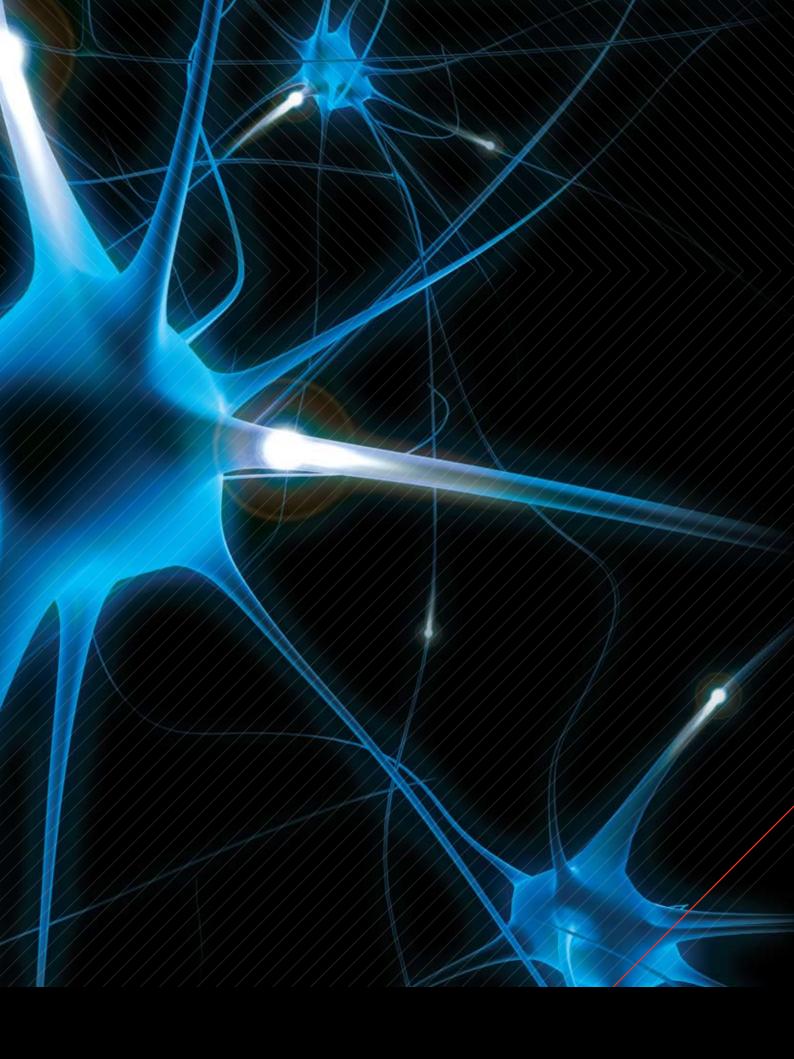
An inaugural Director of POWMRI, he was Chairman of Eastern Sydney Area Health Service 1991-1996, having been a Director since 1976. He is Chairman of Walton Enterprises Pty Ltd, Deputy Chairman of the Australian Institute of Management, and a Director of Young & Rubicam Australia Pty Ltd, Capital Investments Pty Ltd, and Sydney Children's Hospital Foundation. He has also served as Chairman or Director of many corporate and community boards.



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



Mr Andrew Dermott BEc CA Company Secretary and Finance Manager, POWMRI



# research

The Prince of Wales Medical Research Institute

is dedicated to fundamental and clinical neuroscience research. The outstanding medical research initiatives undertaken by scientists at the Institute are founded upon excellence in research leadership. By accelerating discovery, they will redefine neurological and psychiatric research globally. Their research continues to make substantial contributions to the health and wellbeing of the Australian community.

## dr kay double NHMRC Senior Research Fellow

Kay heads a research group investigating the neurochemistry of Parkinson's disease with an extended interest in the development of new diagnostic methods for neurodegenerative diseases and stem cell biology

# ageing and neurodegeneration

Neurodegeneration is the process by which a part, or parts, of the brain die as a result of trauma, such as a brain injury, or as a result of a disease process. Common brain diseases in which neurodegeneration occurs include Alzheimer's disease and frontotemporal dementia, which affect memory and the ability to think, and Parkinson's disease and related disorders in which the ability to move is affected.

Neurodegenerative diseases cannot be cured or prevented and the ability to treat these conditions is limited. These disorders impose a severe burden on the quality of life for persons suffering these conditions, as well as their families. The financial costs to affected families and the Australian health system are also significant. Research into neurodegenerative diseases at the Institute is identifying the causes of these disorders and is working to develop better diagnostic methods and improved treatments. The ultimate goal of this research is to contribute to the worldwide effort to prevent these disorders.

**ARC/NHMRC Network on Ageing Well** Professor Tony Broe and his team are examining cognition dementia and ageing in Aboriginal and Torres Strait Islander peoples. Their project is assessing current knowledge about risk factors and protective factors for cognitive growth and cognitive impairment and for cognitive decline in the older Aboriginal population and has provided an extensive Literature Review of the area. This has led to a successful NHMRC Grant Application, the aims of which are to examine the burden of dementia in Aboriginal people 45 years and over in urban and rural communities, their needs within the communities and current systems of care and support.

#### A clinical, fMRI and transcranial ultrasound study

of age-related motor slowing This study by Professor Broe and colleagues examines the function of the presupplementary motor area of the brain in age-related motor slowing in "normal" subjects with, and without, hyperechogenicity of the substantia nigra and in subjects with clinical Parkinson's disease to differentiate "normal" brain ageing from abnormal (pathological) brain ageing.

#### The aetiology of brain cell death and new methods

of diagnosis in Parkinson's disease Dr Kay Double and colleagues are investigating changes in a group of lipids called isoprenoids in Parkinson's disease. Consistent with their previous findings in the brains of persons who died with Parkinson's disease, they found decreased cholesterol in the blood of Parkinson's patients, compared with age-matched healthy controls. This finding agrees with epidemiological studies of a decreased risk of Parkinson's disease in persons with lower levels of cholesterol. The team is now investigating changes in cholesterol production and breakdown pathways in different types of Parkinson's disease.

#### Use of the Synchrotron microscope in identifying changes

in the midbrain In a collaborative study, Dr Double and her team have used the highly sensitive synchrotron microscope based at the European Synchrotron Radiation Facility in Grenoble, France to identify age and disease-related changes in a variety of elements of interest within the human midbrain. These data help understand functional changes in brain cells with development and ageing. Further, they are relevant for the team's work developing a new diagnostic method for Parkinson's disease using ultrasound imaging. Using the synchrotron they will investigate changes in relevant elements, such as iron, in Parkinson's disease and the implications of these changes for cell protection and damage.

#### Regulation of dopamine synthesis by tyrosine hydroxylase

Another project by Dr Double's team is investigating how the enzyme tyrosine hydroxylase controls the synthesis of dopamine in the brain and how differences in dopamine production increase cell vulnerability. This research aims to identify novel points for the development of therapeutic approaches and assist in the development of better methods for diagnosis of Parkinson's disease.

Neuronal lipids and Alzheimer's disease Research in Dr Brett Garner's group has shown that cellular lipids such as cholesterol and specialised lipids called sphingolipids can regulate the production of a neurotoxic peptide known as amyloid-beta (A $\beta$ ). This peptide accumulates in the brains of people with Alzheimer's disease and it is widely believed that strategies aimed at reducing the production of A $\beta$  could offer a new therapeutic approach to treat this common cause of dementia. With key contributions from Dr Scott Kim and PhD student Sharon Chan, the team has shown that specific neuronal proteins called ATP-binding cassette (ABC) transporters can regulate Aβ production and that this is associated with altered lipid transport in neuronal membranes. Using a different approach, the team is investigating the use of drugs that can reduce the concentration of cholesterol and sphingolipids in specialised regions of neuronal membranes called lipid rafts. They have discovered that certain drugs can almost completely shut down Aβ production in isolated neurons grown in culture dishes. The challenge now is to test these drugs in animal models of Alzheimer's disease such as genetically engineered mice that produce human A $\beta$  and these studies are currently underway.

#### Understanding the function of apoE in neurobiology and

neurodegeneration Other research in Dr Garner's group involving PhD student David Elliott has shown that a protein called apoE plays an important role in brain lipid transport and neurodegenerative disease. In this project the team discovered that apoE levels are increased in neurons undergoing a special type of cell death known as apoptosis. They have also shown that apoE is cut into smaller fragments in the human brain. This project is providing a detailed analysis of human brain apoE modifications and the focus now is to understand how these modifications relate to neuron death and Alzheimer's disease. Current objectives are to characterise the intracellular trafficking pathways of apoE and define the pathways that result in apoE fragmentation in the human brain. Regulation of neuronal alpha-synuclein expression Lewy bodies are neuropathological inclusions found in Parkinson's disease brain and are composed of aggregated proteins including alpha-synuclein and other components including lipids. While its exact function is unknown, alpha-synuclein binds lipids which has raised the question as to whether alpha-synuclein can be considered as a specialised apolipoprotein. Previous work has shown that increased cellular alpha-synuclein level predisposes towards neuron death in Parkinson's disease. However, very little is known regarding the regulation of alpha-synuclein levels in the brain. A study by PhD student Danni Cheng in Dr Garner's group has shown that certain oxidised forms of cholesterol that are present in the brain can regulate the expression of the alphasynuclein gene in neurons. The studies are now focused on understanding the mechanisms controlling alpha-synuclein production in neurons and other brain cells.

#### Targeting the sphingolipid biosynthetic pathway to treat

atherosclerosis Atherosclerosis is a major contributor to heart attack, stroke and vascular dementia and accounts for 50% of all deaths in developed countries. Research in Dr Garner's group with key contributions from PhD student Elias Glaros has shown that certain sphingolipids may promote atherosclerosis. In this project they are testing novel therapeutic approaches (inhibiting synthesis of specific sphingolipids) to prevent atherosclerosis in apoE gene knockout mice that develop atherosclerosis similar to humans. They have already identified potential therapeutic targets in the sphingolipid biosynthetic pathway and recently published data indicate they have inhibitor compounds and approaches that will selectively inhibit the synthesis of the sphingolipids of interest. The team has shown that a broad spectrum sphingolipid inhibitor (myriocin) inhibits both the early development of atherosclerosis and also the progression of established atherosclerotic lesions. Current studies are therefore focused on understanding the antiatherogenic mechanisms of action for myriocin.

Genetic influences on Parkinson's disease Several different approaches are being used by Professor Glenda Halliday's team to understand how differences in genetic makeup either cause or influence the onset, progression and pathology of Parkinson's disease.

They have been identifying families which have many members, or who suffer Parkinson's disease at a very young age, to determine any differences in the clinical course of the disease, determine associated gene abnormalities from donated DNA, determine any cell abnormalities from donated cell biopsies, and over time assess the brain changes from donated tissue in comparison to non-familial cases and people without Parkinson's disease. The research team has already identified several families in Sydney with novel mutations in known Parkinson's-associated genes.

A second research theme has been to identify normal gene variations that associate with an earlier onset or a more rapid progression of Parkinson's disease (risk genes for Parkinson's disease) in donated DNA samples from patients followed and measured longitudinally. This will assist in determining important cell pathways involved.

They are also working to determine how genetic differences impact on the disease by assessing brain changes in the patient groups identified above.

Problem symptoms in Parkinson's disease Professor Halliday and colleagues have been concentrating on understanding the cellular causes for falls, some types of pain, visual hallucinations and dementia. Longitudinal neuropsychological assessment over 20 years has been completed to determine the prevalence and different types of dementia that occur in Parkinson's disease. A key focus of this research has been conducting a drug trial to determine if cholinesterase inhibitors can successfully treat visual hallucinations in Parkinson's disease.

#### Progressive supranuclear palsy and multiple system

atrophy A series of different studies to determine cellular changes over time and early objective measures to predict these changes during life for the future development of therapeutic interventions have been conducted by Professor Halliday's group. New studies will assess proteins identified as genetically involved in Parkinson's disease to determine any role in progressive supranuclear palsy or multiple system atrophy.

Dementia with Lewy bodies The new diagnostic criteria in a large number of longitudinally followed patients, and cellular changes in the brain unique to cases with pure dementia with Lewy bodies are being assessed by researchers in Professor Halliday's laboratory. Identification of families with pure autopsy-proven dementia with Lewy bodies is also being assessed to determine major genetic influences and causes. A comparison is made of brain changes in families clinically diagnosed with dementia with Lewy bodies, Alzheimer's disease, and Parkinson's disease without dementia.

#### Dominant genetic influences on Alzheimer's disease

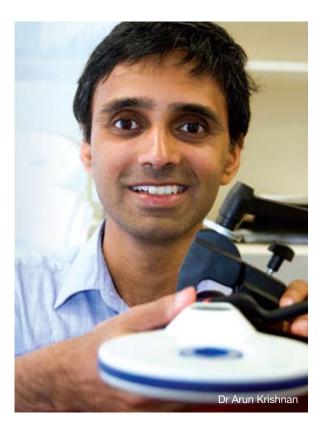
A study is being conducted in the Halliday laboratory to determine whether the genes currently used to model Alzheimer's disease cause the same brain changes as those observed in non-familial cases with Alzheimer's disease.

Genetics of early onset Alzheimer's disease Dementia is usually thought of as a disease of ageing. However, the burden of young onset dementia, with symptoms occurring before age 65, has recently been identified as an important area not well supported by the health care system. Dr Bill Brooks has continued his development of information and support systems for use by families that have early onset hereditary dementias.

Spastic paraparesis, a form of lower limb paralysis, has frequently been associated with early onset Alzheimer's disease. However, in those individuals with spastic paraparesis, the onset of dementia is significantly delayed. Dr John Kwok and Professor Peter Schofield have shown that none of the genes that are known to cause spastic paraparesis are associated with this variant presentation of Alzheimer's disease. They are now using genetic linkage approaches to attempt to identify these modifier genes, which may provide therapeutic targets for the treatment of Alzheimer's disease.

Professor Schofield has continued his support for the genetic analysis of two epidemiological studies led by campus colleagues, Professors Perminder Sachdev and Henry Brodaty. The Memory and Ageing study has recruited 1,000 individuals from the south-eastern region of Sydney while the Older Australian Twin Study is recruiting twins and their siblings from the eastern seaboard.

**Frontotemporal dementia syndromes** A series of studies using a variety of techniques is aimed at identifying cellular changes over time in the different forms of frontotemporal dementia. These different pathological forms of the disease cannot be differentiated clinically and new studies by Professor Halliday and colleagues will develop objective biological measures to differentiate these patients in the clinic. Cellular and animal models will be used to further understand how the pathological changes are caused at a cellular level.



#### Frontotemporal dementia: A multidisciplinary research

approach Professor John Hodges is focusing his research on frontotemporal dementia (FTD). FTD, also known as Pick's Disease, is the second most common cause of dementia in younger people (less than 65 years old) and may be more frequent in older adults than is currently recognised. Professor Hodges has established a new research group through funding by the ARC, UNSW, NSW Life Sciences Research Award and the NHMRC. This group collaborates closely with the Institute's neuropathology and genetics groups.

#### Advancing knowledge on FTD by using a range of

research methods FTD is varied in the way it presents. Some patients have changes in behaviour and personality while others have progressive loss of language ability (aphasia). The underlying brain pathology is also heterogeneous. Some show tau-positive inclusion pathology in neurones while others deposit a newly discovered protein (TDP-43). In a third of cases, genetic factors play a major role and, to date, tau gene mutations have been discovered. Compared to Alzheimer's disease, much less is known about the clinical course, impact, and cellular changes. Professor Hodges and his team of researchers aim to advance knowledge on a broad front by using a range of research methods (neuropsychology, behavioural measures, brain imaging, etc) and to improve the care, management, and, ultimately, the treatment of this disease.

Deficits in emotion processing and autobiographical memory and their impact on carers How is the processing of emotion impaired in FTD? How does it affect the ability to remember meaningful and important information from one's life? How does it affect interpersonal relationships? How do these deficits evolve with time? These are some of the questions Professor Hodges and his team are trying to answer in this research project. This project will follow patients with FTD who will undergo tests of memory, language and thinking abilities and will receive a brain MRI scan at yearly intervals. They will also interview family members of patients to understand the impact of the disease on interpersonal relationships.

Brain imaging Frontotemporal dementia predominantly affects two regions of the brain: the frontal and temporal lobes. Presence of progressive change to these brain structures is an important feature of the disease and helps towards an accurate diagnosis. Professor Hodges' group will study the extent and severity of changes taking place in the frontal and temporal lobes as the disease progresses using structural MRI with diffusion tensor imaging (DTI). This project will contribute to their understanding of the progression of the disease and improve diagnostic accuracy.

Severity rating scales and everyday life impact As time passes, FTD can create progressive difficulties in patients. For instance, behaviours, the ability to perform some cognitive tests, and the ability to do activities can change. To date, there is not a standardised way to measure change over time in FTD. This creates difficulties in predicting the course of the condition, and can cause anxiety in families because of the lack of knowledge of disease progression. Professor Hodges is developing an instrument which will help measure such changes. This rating scale will allow professionals to give better advice to families and patients, and will permit patients and families to make adjustments to their living arrangements.

Identifying biomarkers In order to develop treatments and effective interventions for patients with FTD, the underlying process of brain degeneration needs to be identified early in the disease course. FTD patients may have one of several different underlying brain pathologies which cannot at present be predicted by either the type of symptoms exhibited, or by a genetic profile. Cellular studies of the brain have shown that there are two types of protein ("tau" and the more recently discovered "Tar DNA binding protein 43") which accumulate in neurons in FTD. Professor Hodges' research group has shown that these pathologies are associated with different inflammatory responses, and so may require very different approaches to treatment. The goal is to develop an easily identifiable biological marker for the type of cellular changes occurring in each patient with FTD through screening blood and cerebrospinal fluid in FTD patients and using advanced brain technology to examine the distribution of inflammatory changes.

Genetics of frontotemporal dementia Dr John Kwok and Professor Peter Schofield have been studying familial dementias and, together with PhD student Agnes Luty, have characterised a large South Australian family that has frontotemporal dementia and motor neurone disease. Genetic linkage studies have led to the identification of linkage to chromosome 9p, a well-established locus for this disease. Neuropathological investigation of donated brain tissue has identified the role of the recently described protein TDP-43 as a key marker of the brain pathology, confirming the clinical diagnosis of frontotemporal dementia and motor neurone disease. Positional cloning studies are well advanced for the identification and characterisation of the gene responsible for this inherited disorder.

Other studies examining inherited forms of frontotemporal dementia are continuing and this team contributed samples and data to a major international collaborative study examining the phenotypic variability associated with a common mutation in the frontotemporal dementia gene progranulin.

Motor neurone disease (MND) MND, a universally fatal condition that kills one Australian every day, continues to be a priority for Assoc Professor Matthew Kiernan's research group. The cause of MND is unknown in the majority of cases and there is debate as to where the disease begins. The group has been investigating the origin of MND through studies directed at different levels of the neural axis from the brain, through to the peripheral nerve, with longitudinal studies in pre-symptomatic carriers of a genetic mutation linked to the development of MND. They have developed a clinical trials consortium, and commenced two investigator driven studies, one focusing on a novel neuroprotective medication, the other trialing respiratory muscle training devices, attempting to maintain function in MND patients. These studies are being driven by PhD students Jennica Winhammar and Ben Cheah, with supportive coordination by Sr Margie Zoing. In addition, the successful collaboration that established the Australian Motor Neurone Disease Registry is now filtering through clinical information from the 659 MND patients that have registered from sites across Australia. In other projects, Dr Cindy Lin has completed collaborative studies with the University of Taiwan, that established the mechanism of nerve failure in a metabolic neuropathy linked to the development of Porphyria; Dr Arun Krishnan has returned from postdoctoral training in the UK, having been awarded the UNSW Dean's Foundation Fellowship to investigate mechanisms of action of anticonvulsant therapies used in the treatment of epilepsy.

# Positional cloning of a splicing factor on chromosome 15 that modulates splicing of key dementia genes

Alzheimer's disease and Parkinson's disease are the two common causes of dementia and neurodegeneration. Through positional cloning, Dr John Kwok's team has identified a gene on chromosome 15 as a modulator of alternative splicing, a process that controls the biological activity of the majority of genes. They are now studying the genetic and biochemical role of the gene in neurodegeneration in terms of its effect in splicing.

The role of genes in neurodegeneration The role of the glycogen synthase kinase- $3\beta$  and microtubule associated protein tau genes in neurodegeneration has been investigated. Both genes control crucial processes in the cell. Dr Kwok has shown that genetic polymorphisms in these two genes interact to increase risk for late-onset, idiopathic neurodegeneration. His group aims to discover whether the two genes will have an effect in other diseases and to determine how the biological mechanisms in the genes act to increase risk.

The life cycle of soft drusen A clinicopathological study by Dr Shirley Sarks and colleagues is documenting the hallmark lesions of early Age-related Macular Degeneration (AMD), from their genesis to their regression. Data from this study will allow better disease categorisation and assessment of disease progression in epidemiological studies and clinical trials.

#### The resident macrophage population in normal human

choroid Resident choroidal macrophages have recently been shown to influence the development of AMD-like lesions in mice. However, little is known about the normal macrophages that reside in human choroid. This immunophenotyping project aims to provide baseline data so that pathological changes to the resident choroidal macrophage population can be assessed.

#### Serum anti-retinal autoantibodies in macular

telangiectasia Macular telangiectasia is a disease of the retinal vasculature affecting individuals from the fourth decade onwards. Little is known about its aetiology or pathogenesis. This study by Dr Sarks and her team examines how the serum autoantibody profile in macular telangiectasia differs from normal individuals, to provide clues to pathogenesis and a possible marker of disease progression.

# brain function and imaging

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## professor charles watson am Senior Principal Research Fellow

Charles has medical and doctoral degrees and a specialist qualification in public health medicine. He collaborates with Professor George Paxinos on brain mapping 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 a new 3 Tesla MRI scanner, has made it possible for Institute researchers to study the brain in situ. They can see live changes in brain activity and blood flow, determine brain chemistry and structure. 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, Institute researchers can superimpose types of neurons, neurotransmitters, enzymes, and connectivity and functional data. They are continuing to develop and refine brain atlases of humans and animals models.

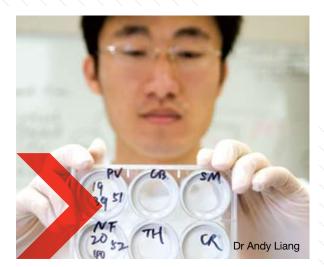
**Brain mapping** Professor George Paxinos is producing the major brain maps that are used by neuroscientists internationally. Maps of the brain and spinal cord are needed by virtually everyone who studies the relationship between the nervous system and its disorders such as depression, schizophrenia, Parkinson's disease, Alzheimer's disease and Motor Neurone Disease. Scientists also need to know the relationships between the brain and spinal cord of humans and other species so that they can test hypotheses inspired by human considerations and relate their observations to humans.

Professor Paxinos published four major atlases in 2007, three of which were in collaboration with his colleague Professor Charles Watson. Paxinos and Watson have been collaborating for 30 years and published the most cited book in all of neuroscience and the most cited Australian publication of all times: The Rat Brain in Stereotaxic Coordinates, 6th Edition, 2007. They also published the most significant anatomical work ever on the chick brain: The Chick Brain in Stereotaxic Coordinates, 2007. They were joined by Professor Glenda Halliday to construct Atlas of the Developing Mouse Brain, 2007, the first major developmental brain atlas for the mouse. They and their colleagues are continuing to develop and refine brain atlases of humans and other species which are used internationally as the standard guides for scientific work. These atlases are also used by neurosurgeons to target small deep-lying structures in the brain. Until publication of their atlases, brain research was hampered by the lack of accurate stereotaxic coordinates to study animal models of human neurologic and psychiatric disease. Their atlases created a path for a new wave of studies on Alzheimer's disease, Parkinsonism, mental illness, and stroke.

With financial support from the Christopher Reeve Foundation, Professor Paxinos, Professor Watson, Dr Gulgun Kayalioglu and Dr Claire Heise have nearly completed work on a mouse and rat spinal cord atlas.

Brain energy changes during obstructed breathing in obstructive sleep apnoea In collaboration with Assoc

Professor Ron Grunstein from Sydney's Woolcock Institute, Professor Caroline Rae has obtained measures of live bioenergetic changes from the brains of persons suffering from Obstructive Sleep Apnoea (OSA). This disorder is characterised by repetitive periods of sleep-disordered breathing, with subsequent arousal from sleep, resulting in excessive daytime sleepiness and cognitive dysfunction. The researchers are investigating how the repetitive hypoxia experienced impacts brain energy levels. They have obtained live measures from the brains of persons with OSA who were undergoing magnetic resonance imaging and compared measures obtained whilst apnoeic with those obtained during normal oxygenation.



Neural basis of reading Learning to read is a complex task and one that has come relatively late in evolution to the human brain. As part of their investigations of reading disability (dyslexia) Professor Rae, in collaboration with Professor Max Coltheart and Dr Genevieve Macarthur of the Macquarie Centre for Cognitive Science, have been using functional magnetic resonance imaging (fMRI) to see how people read. The researchers theorise that words that sound like words but are not real words (such as RANE) can be read correctly only via the phonological (letter to sound) route, while words that are real words but not possible to sound out ("irregular words") such as YACHT, can only be read by the dictionary look-up route (lexical route). This is the dual route hypothesis and they are currently searching for the neuroanatomical substrate of these routes using fMRI. The researchers have completed a study using adults with no reading disability and are currently obtaining data from children who are learning to read. They will investigate whether training the individual reading routes has any impact on how the brain reads.

Understanding your inhibitions Any work the brain does requires energy and that energy comes from metabolism of glucose. Understanding how the brain works therefore requires understanding how brain metabolism relates to brain function. Fatima Nasrallah, PhD student with Professor Rae, has been working on understanding how inhibition of brain activity impacts on brain metabolism, using a targeted neuropharmacological approach coupled with use of datacrunching technology available in the field of metabolomics. In 2007, Fatima identified separate inhibitory and excitatory components to GABAergic activity at the GABA<sub>B</sub> receptor, the first time the metabolic consequences of activity at this receptor had been systematically identified. This work will aid in interpretation of functional experiments involving GABAergic input and also shed light on the workings of the GABAergic system itself. This system is involved in important functions such as sleep, motor control and in balancing excitatory activity in the brain.

Amino acid transport in the brain Amino acids are the basic building blocks for making much of the brain. Understanding how they can get in and out of cells in the brain is therefore important. In collaboration with Professor Stefan Bröer of the Australian National University, researchers at the Institute have been studying how the intermediary metabolite alanine gets in and out of cells in the brain. This research, published in the *Journal of Neurochemistry*, is basic science which shows how alanine moves between cells, which transporters it uses to do this, and what impact blocking these transporters has on metabolism.

# 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 disorders schizophrenia and bipolar disorder each affect around 1% of the population, and the Institute now has active programs in each of these areas. Other mental health conditions, such as depression, will affect up to 20% of the community. Individual and family costs of these disorders are substantial and this is further reinforced by the major financial costs to the Australian health system.

Ultra high-risk, prodromal, and early intervention studies of cognitive and genetic predictors of the development of schizophrenia Dr Tom Weickert's group is undertaking a study of children and young adults who are at an 'ultra high-risk' to develop schizophrenia (during late childhood through late adolescence) and may be in the prodromal (pre-symptomatic) phases of illness. This will open up the possibility for medical intervention before illness onset and would improve on current treatments and the prognosis of people likely to develop schizophrenia. The goal of this research is to establish accurate early detection measures and discover new and effective early treatments that are tailored to the individual on the basis of their genetic constitution. Australian Schizophrenia Research Bank (ASRB) The aim of the ASRB is to collect and link genetic, neuroanatomical, cognitive and clinical information from 2000 healthy adults and 2000 people with schizophrenia nationwide. The information stored by the ASRB will be used in genetic research with the aim of developing better diagnosis, treatments and preventative strategies for people with schizophrenia. Dr Weickert and his team are the Sydney-based data collection team for the ASRB.

# Brain stimulation studies to assess cortical role in category learning and reverse deficits in schizophrenia

The unique contribution of different brain regions to category learning remains unclear and represents a critical gap in the current knowledge base. Knowledge of the contribution of these brain regions is beneficial to the development of therapy to treat this and other cognitive impairments in schizophrenia. Reversal of this impairment may also lead to improvement of daily function and independent living in these patients thus reducing the burden to society.

Clinical trial of selective estrogen receptor modulator in schizophrenia Of all the various systems associated with schizophrenia, impairments to cognition function are



### carlotta duncan PhD Student

Carlotta was awarded an Australian Postgraduate Award through UNSW and commenced her PhD at the Institute examining the molecular biology of schizophrenia treatment

generally resistant to full remission and are the most lasting and debilitating as they interfere with the ability to function independently. A study conducted by Dr Tom Weickert and Professor Cyndi Shannon Weickert aims to determine if the estrogen receptor type 1 genotype can be linked to specific cognitive deficits in patients with schizophrenia and attempts to reverse cognitive deficits in these patients. This research project will be in partnership with the Kiloh Centre at Sydney's Prince of Wales Hospital and future work with the clinical population is planned to enhance translational work. This research is significant because it will clarify the role of hormones and genes in relation to cognitive deficits in schizophrenia and it may help patients improve their level of functioning.

Enhancing neurogenesis in the primate brain Since brain disease often involves neuronal death, research into strategies to restore neuronal numbers could lead to improved function and recovery in patients. The proposed research by Professor Shannon Weickert and colleagues is significant because it aims to determine whether increasing the number of new neurons generated *in vivo* is feasible. The benefit of this new knowledge is that it will show that new cell production is not fixed but is modifiable during the adult life of primates.

#### Neuregulin dependent neuronal migration and

schizophrenia Genetic and environmental factors combine to increase risk for developing schizophrenia. The key neurobiological events in which risk genes participate during development are not understood. Without this important information, Professor Shannon Weickert and her team do not know which pathological events are primary to the disease, nor do they know where to aim therapy. The path to developing therapies to prevent schizophrenia involves research on how risk genes influence brain development and structure.

# The effects of sex hormones during puberty on neurocognition in an animal model of schizophrenia

The aim of this project is to determine the role of pubertal testosterone in the development of cortical volume and cognitive function during adolescence. Removal of the effect of testosterone on pubertal development was the independent variable used to examine the effect. Reversal learning and prepulse inhibition tests (PPI) were administered during puberty and 16 months later (PPI only). The data will tell Professor Shannon Weickert and colleagues whether removing testosterone affects these important measures of orbitofrontal cortex functioning and dopaminergic



transmission, both of which are implicated in the pathology of schizophrenia. The researchers are also analysing data from 3T MRI scans of the brain taken across the pubertal period to identify and correlate changes in cognitive function with reductions in cortical volume. One of the major developmental changes they have found to date is an overall reduction in brain size during adolescence. Manual tracing methods will determine if grey matter, white matter or ventricular decreases are the source of this reduction. This project will also validate the method used to obtain volumetric estimates from the MRI scans, by comparing and correlating the volume measurements for a previously determined region of interest (the amygdala) with histological stains of the same region.

Genetics of bipolar disorder Both genetic and environmental factors are involved in the development of bipolar disorder, a severe mood disorder characterised by oscillations from normal mood to periods of elevated mood (mania) or low mood (depression). Dr Jan Fullerton and Professor Peter Schofield are investigating the genetic contributors to bipolar disorder using Australian families with multiple individuals who have been diagnosed with the disorder. Together with PhD student Erica McAuley, the group has recently identified a bipolar susceptibility locus located on chromosome 15 in a pooled analysis of 35 families. Further, more detailed analysis of this region using a newly acquired campus Illumina beadstation facility for the analysis of SNP markers has identified a single gene, which confers an increased susceptibility to bipolar disorder. They are now aiming to understand how these alterations translate into an increased genetic susceptibility by characterising the biological pathways involved.

Because of the complex pattern of genetic transmission, they expect that multiple genes will contribute to susceptibility

to bipolar disorder. It is possible that combinations of genes will be stronger risk factors for developing bipolar disorder than individual genes, so they are examining gene-gene interactions (genetic epistasis) throughout the genome to identify genes which, in concert, may increase susceptibility. This analysis has led to the identification of multiple such interacting regions, and they are now seeking to identify the specific genes involved in these interactions.

Quantitative trait analysis of bipolar disorder Genetic research into bipolar disorder traditionally uses strict categorical criteria to define a clinical diagnosis. However, it is common for relatives of individuals with bipolar to exhibit some evidence of mood disturbance, but not sufficient to meet the strict clinical criteria for a positive diagnosis. These individuals are correctly considered clinically unaffected, although they likely share some of the susceptibility genes underlying the disorder. Dr Jan Fullerton has been examining the use of subclinical traits to identify individuals who share susceptibility genes in order to follow the pattern of genetic transmission of bipolar disorder through families more accurately.

Genes, environment and depression In a collaborative study with Professors Kay Wilhelm and Phil Mitchell from the UNSW School of Psychiatry, Professor Peter Schofield and his team examined the genetic variation in the transporter protein that is involved in the reuptake of the neurotransmitter serotonin. There is an association between low serotonin transporter levels, stress and depression. The group has further shown that there is an association between the serotonin transporter genotypes and the way an individual copes with stress. This has led to further clinical studies correlating how individuals can use different methods to handle stress. Their research has significant implications for reducing the likelihood of

there has been a rapid realisation that mental illness is responsible for one of the largest disease burdens in australia

developing depression and a planned future study will be to evaluate whether specific training in stress management, matched to an individual's genotype, may lead to a reduction in the incidence of depression.

Genes, ethics and mental illness Work on genes involved in predisposing an individual to mental illness has allowed Professor Schofield's research group to undertake a range of collaborative studies examining community and patient understanding and attitudes to modern issues surrounding genetics. This has included studies with Professors Mitchell and Wilhelm. Assoc Professor Bettina Meiser and PhD student Alex Wilde in which they have evaluated who wants to know their risk, and perhaps more importantly, why. They have examined attitudes to genetic testing in families with multiple cases of bipolar disorder as well as attitudes towards childbearing, causal attributions for bipolar disorder and psychological stress. Current studies are examining media reporting and 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.

Animal models of mental illness While animals do not suffer from schizophrenia or bipolar disorder, animal studies undertaken by Dr Albert Chetcuti and PhD student Carlotta Duncan have investigated how the administration of antimanic drugs such as lithium or antipsychotic drugs can led to changes in the gene expression profiles in the brain. The treatment of mice with antipsychotic drugs has identified the role of potassium channels and their regulators as an unexpected target for understanding the way in which schizophrenia may develop and possibly be treated.

Neurotransmitter receptors Over many years, Professor Schofield and his colleagues at UNSW, Professor Peter Barry and Dr Trevor Lewis, have been investigating the detailed biology of a key class of neurotransmitter receptors, the ligand gated ion channels, through studies on the prototypical glycine receptor. This work has continued with studies examining the role of the receptor in the mechanism of neurotransmitter induced activation and in determining how ions permeate the receptor channel. Mouse models with inherited deficits in their glycine receptors have been studied in collaboration with Professor Robert Callister at Newcastle University and have shown the role of reduced glycine receptor function on the excitability of neurons that effect movement and balance.

Genetics of normal brain function In a collaborative study with Professor Lea Williams from the University of Sydney at Westmead Hospital and Assoc Professor Evian Gordon from the Brain Resource Company, Dr Carol Dobson-Stone and Professor Peter Schofield have investigated how polymorphisms within genes may give rise to variations in normal brain functions. Using cognitive, psychological and neuroimaging data on a large collection of normal individuals, they have investigated the role of several genes known to be involved in brain disorders. This included the genes for brain derived neurotrophic factor, monoamine oxidase A, apolipoprotein E, catechol-O-methyltransferase. They have shown, for example, the contribution of an individual set of genetic variants such as the apolipoprotein E alleles on cognitive performance and dynamic neural activity over six decades of normal life. And they have demonstrated how genetic polymorphisms in brain derived neurotrophic factor can impact brain function and memory and how this correlates with depressive features in a normal population. Finally, these collaborative studies have demonstrated an association between monoamine oxidase A polymorphisms with emotional and behavioural brain markers and their relationship to antisocial and psychopathic personality traits.

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. 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. The Institute's 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.

Spinal Injuries Research Centre The Spinal Injuries Research Centre (SIRC) incorporates work on spinal cord injury by more than ten laboratories in the Institute. The research ranges from experimental studies of the effects of spinal transection on the responsiveness of blood vessels and on inflammation (possibly leading to spinal hyperexcitability and neurone death) to better understanding of how spinal cysts develop in the long term after spinal injuries and even the design of improved child restraints in motor cars. Projects on people with spinal cord injury included measurements of the excitability of motor and sensory axons, the evaluation of nerve-muscle units in atrophied muscles and the development of stimulation techniques for generating more effective muscle force to assist coughing and coordinated walking during rehabilitation.

SIRC members were particularly successful in the second round of the NSW Ministry of Health and Medical Research Program for Spinal Cord Injury and Related Neurological Conditions. A Program Grant worth \$1.5 million was awarded to Professors Elspeth McLachlan and Vaughan Macefield and Assoc Professors James Brock and Matthew Kiernan for studies of the changes in nerve and muscle excitability below a spinal cord injury. Project grants were also awarded to Assoc Professor Kiernan for a study of motor neurone disease and Professor George Paxinos to prepare a spinal cord atlas.

Changes in neurovascular function following spinal cord injury Bladder distension or minor unheeded injuries in people with spinal cord injury often lead to episodes of high blood pressure (autonomic dysreflexia) that may cause stroke or death. These events require emergency hospitalisation and are expensive as well as dangerous. The development of high blood pressure depends on activation of the sympathetic

# dr ingvars birznieks

#### Senior Research Officer

Ingvars' research is aimed at understanding how tactile receptor signals contribute to sophisticated motor control of hand actions

nerves that supply small arteries. Assoc Professor James Brock and Professor Elspeth McLachlan have demonstrated that nerve-mediated activation of arteries is markedly enhanced following spinal cord injury, contributing to the exaggerated increase in blood pressure. Dr Nicole Rummery, who joined the group in 2007, has investigated changes in arteries located above and below a spinal cord injury. She has demonstrated that nerve-mediated activation of arteries is only enhanced below the level of the spinal cord injury, where their nerve connections with the brain have been severed. These findings confirm that it is loss of brain-derived nerve activity that leads to the enhanced nerve-mediated responses of arteries. The work suggests that restoring activity in the nerves supplying arteries will prevent or reverse the changes of neurovascular function following spinal cord injury.

#### Atrophic changes in disused sensory axons below

a spinal cord injury Dr Sabine Krofczik has recorded from single unmyelinated axons (<0.002 mm thick) in leg nerves that supply the skin below transection of the upper thoracic cord. The conduction velocity of the impulses travelling along the sensory axons was significantly reduced by two months after the injury. In collaboration with Dr Susan Luff at Monash University, Research Assistant Rathi Ramasamy has found, using the electron microscope, that the axons shrink by about 20% over this period. The changes in conduction velocity can be explained by the change in dimensions, suggesting the membrane channels responsible for electrical signalling are not defective. The atrophy may be related to decreases in neurotrophin receptors in the epidermis after spinal cord injury.

**Tracking neural function in spinal patients** As part of the Program Grant awarded by the NSW Office for Science and Medical Research (OSMR) to Assoc Professor Matthew

Kiernan's research team, Dr Rob Boland has been tracking neural function in spinal patients from the time of their acute injury in the intensive care unit, through their period of inpatient rehabilitation and, in some cases, recovery. Preliminary data suggest that decentralisation and consequent inactivity underlie the complex changes in nerve failure that occurs in spinal patients.

Neuroinflammation Work on the long-term effects of inflammation in peripheral nerve and spinal cord injuries in animal models is continuing in Professor Elspeth McLachlan's laboratory. Researcher Ping Hu has examined the subtypes of macrophage and lymphocyte that invade the stump of a damaged peripheral nerve using specific staining for protein antigens. By examining the inflammatory changes in the parts of a damaged nerve a long way below the lesion, he has found that, if there is no regeneration, the macrophage and T-cell populations differ from those present when the damaged axons regenerate into the stump. If some unmyelinated axons survive the injury, as after compression, the population is similar to that during regeneration. The findings point to a new type of interaction between growing axons and the immune system and have implications for the regeneration of nerves over very long distances in human limbs.

Ping Hu and Professor McLachlan are also studying the contribution of inflammation to the slow retrograde loss of neurones damaged by nerve and spinal cord injuries. As well as the loss of growth factors important for maintenance of neurones, glial activation seems to play a role in triggering this type of neuronal death. These studies may explain the progressive nervous degeneration that prevents recovery after some severe injuries.

recent findings include that rates of misuse of child restraints are high, and much of this misuse is serious enough to compromise the effectiveness of the restraints in crashes

Ascending projections from the lumbosacral spinal cord

Dr Lauren Staples, with assistance from Rathi Ramasamy, spent the year developing methods for preparing maps of the major projection pathways from the lumbosacral spinal cord to some important centres in the brain involved with pain processing, hindlimb movement and control of the bladder and bowel. After injecting a fluorescent dye near the terminals of ascending projection neurones at sites in the hypothalamus and periaqueductal grey, the distribution of neurones in the spinal cord segments with these particular functions can be mapped in three dimensions using computer assisted reconstruction techniques. This project forms the essential basis of a study of the degeneration of these neurones after spinal cord injury.

Mechanisms of spinal cord cyst formation Current projects in Assoc Professor Marcus Stoodley's group are investigating the role of aquaporins and the blood brain barrier in syrinx development. In addition, these researchers are collaborating with Assoc Professor Lynne Bilston on projects examining the effect of Chiari malformations on pulse transmission from the head to the spine, and the effect this has on fluid flow from the subarachnoid space into the spinal cord. A further collaboration with the University of Adelaide is focussing on outflow pathways from syrinxes. A new project, in collaboration with Professor Anne Cunningham, is examining the effect of syrinxes on surrounding nerve fibres and the feasibility of stem cells to promote remyelination of damaged axons.

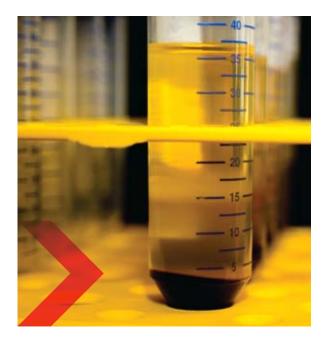
Enhancing the response of arteriovenous malformations to radiation treatment After developing an animal model that can be used to investigate the effects of radiosurgery on arteriovenous malformations, Assoc Professor Stoodley and colleagues have studied the molecular changes in this model and proposed various strategies to enhance the thrombotic effect of radiation. Their recent work has demonstrated a significant increase in thrombosis rates using a vascular targeting strategy. Their current projects are aiming to refine this strategy to determine the longer term thrombosis rates and durability of the vascular occlusion. They are also continuing work to examine the molecular response of endothelial and smooth muscle cells to radiation, both in the animal model and in cells cultured from the animal model.

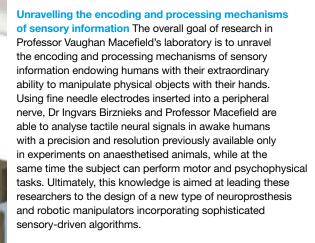
**Neurotoxicity** Studies from a NHMRC project grant investigating nerve function in patients treated with chemotherapy, to determine the pathophysiology of nerve dysfunction and development of neuropathy, are now well advanced through research conducted by Assoc Professor Kiernan and colleagues. Prospective clinical and neurophysiological studies have been completed in 35 patients to date, encompassing more than 120 cycles of chemotherapy. These studies implicate involvement of voltage-gated Na+ channels in the development of oxaliplatin-induced neurotoxicity. In addition to the ongoing clinical studies, research focus groups have been developed with the NSW Cancer Institute Psycho-Oncology Unit. These latter studies have delineated the functional impact of chemotherapy-induced neurotoxicity. Assoc Professor Kiernan's team is also now able to provide feedback to oncologists regarding nerve function in their treated patients – attempting to preserve nerve function and thereby reduce the incidence of neuropathy.

#### Effects of nerve injury on blood vessel function

Many people who recover from traumatic injury or who have chronic conditions such as diabetes suffer from peripheral vascular disorders leading to poor circulation in the extremities. Impaired wound healing, cold hands and feet and ongoing pain characterise these conditions. These people must face a long life with progressively increasing disability. Assoc Professor James Brock and Professor Elspeth McLachlan are investigating the changes that occur in nerve-mediated regulation of blood vessels supplying skin in these disorders. In 2007, they demonstrated in reinnervated arteries that adaptations are able to produce elevated levels of nerve-mediate activation despite a depleted perivascular nerve plexus. These modifications are due primarily to changes in nerve function rather than changes in the behaviour of the vascular muscle. The primary goal of this work is to identify drug targets that can be used to improve control of skin blood flow and thereby alleviate the symptoms.

Understanding how pain is initiated Assoc Professor Brock uses a unique approach that allows electrical activity to be recorded from the very fine nerve endings of nerves whose activation results in painful sensations. Using this technique, the mechanisms by which substances released in damaged and inflamed tissues lead to discharge of action potentials and the sensation of pain is being investigated. Presently he is exploring the sites at which action potentials are initiated in the nerve terminals.





#### Child injury - road trauma is a leading cause of death

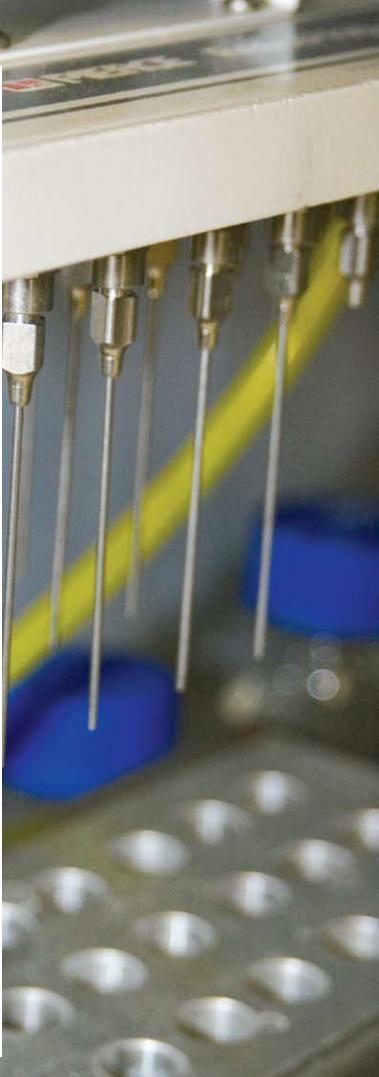
and disabling injury for children Assoc Professor Lynne Bilston's group is studying how road trauma injuries occur in children, and how changes to the types and design of restraints used by children can reduce serious injuries and death. Key problems include whether children use restraints correctly and whether they use restraints that are appropriate for their size. Recent findings include that rates of misuse of child restraints are high, and much of this misuse is serious enough to compromise the effectiveness of the restraints in crashes. This is consistent with the team's findings in real crashes, where appropriately restrained children who sustained serious injury were all misusing their restraints. Crash testing of these types of restraint misuse is showing how this incorrect use of restraints allow the child to move around inside the car more during a crash, thus increasing the risk of impact with the vehicle interior or other occupants during a crash, resulting in injury.

Magnetic resonance elastography A new Magnetic Resonance Imaging (MRI) technique to measure the stiffness of the brain, muscles and other tissues is being used by Assoc Professor Bilston and colleagues. This method uses an external vibration in the tissue, the propagation of which is measured with the MRI scanner to estimate the stiffness and viscosity of the tissue. The stiffness changes with age and in some diseases, so this research may help these researchers develop better methods of diagnosis of diseases of the brain and muscle, such as hydrocephalus, sleep apnoea, and muscle injury.

#### Effects of mechanical loads on the nervous system

A study of how mechanical forces affect the tissues of the human nervous system is being undertaken by Assoc Professor Bilston's team. This research ranges from spinal cord and peripheral nerve injury to chronic conditions such as syringomyelia and hydrocephalus. Recent work on the mechanical factors in spinal cord injury has shown that the differences in spinal cord injury incidence and severity between adults and children are influenced both by fundamental differences in the spinal column flexibility and stiffness and differences in intrinsic spinal cord tissue responses to mechanical loading.

Upper airway biomechanics The mechanical properties and motion of muscles that surround the upper airway and how these change in sleep apnoea patients are being investigated in Assoc Professor Bilston's laboratory. The researchers are using MRI methods and computational modelling to understand how the muscles around the upper airway differ between healthy adults and those with obstructive sleep apnoea.



# sensation, movement, falls and balance

Sensory receptors reside in virtually every part of the body. They are responsive to different stimuli and provide the brain and spinal cord with information about our internal environment and about the world around us. Institute scientists are using a range of techniques to understand how the sensory system works, how it affects the motor output from the brain, and how it gives an accurate "sensory" map of the external world. Sensory nerves and their connections in the central nervous system can be damaged in a range of pathologies.

Breathing is our most important movement. It requires co-ordinated contractions of many muscles and special control systems in the brain to ensure that it can be maintained. Our research examines the way that the brain controls the output to the breathing muscles in health and in diseases such as chronic obstructive pulmonary disease, spinal cord injury and obstructive apnoea.

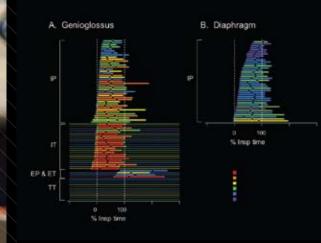
**Control of the human thumb** The thumb provides a unique mechanism to manipulate objects for eating, writing and communication. Many muscles control the thumb, but a unique one is flexor pollicis longus. This muscle is the only one which bends the tip of the thumb. In recent studies

published in the Journal of Physiology, Dr Wei Shin Yu, Dr Richard Fitzpatrick, Assoc Professor Sharon Kilbreath and Professor Simon Gandevia have investigated the operation of this muscle. Its performance is unique. Even when it generates very small forces, they are judged with surprising accuracy. Dr Yu and colleagues have described a major neural basis for this. The single motor units which generate the voluntary forces at the thumb are unusually small, and this allows the brain very fine control of the thumb's overall force. They also examined how force produced by this muscle may be transmitted not only to the thumb tip, but also to the adjacent fingers. Using spike-triggered averaging, they found only small levels of spill-over to the index finger of forces generated by the thumb. This result is important in understanding the biomechanics of human muscles. The current work shows some of the fundamental mechanisms that underpin the way in which the brain controls human manual performance.

Muscle fatigue Muscle fatigue occurs when exercise decreases the ability to produce force with a muscle. It is a complex phenomenon which involves processes in the nervous system, including the brain and spinal cord, as well as in the muscle itself. The contribution of the nervous

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Jane studies motor control particularly the control of breathing and the control of movement after spinal cord injury



system to fatigue (central fatigue) has been thought less important than muscle mechanisms. Investigations by Dr Peter Martin, Professor Simon Gandevia and Dr Janet Taylor and colleagues, and published in the *Journal of Applied Physiology,* examined fatigue during very weak voluntary contractions, maintained for more than an hour. They showed that subjects' ability to produce force dropped by 30%, and that central fatigue accounted for two-thirds of this fatigue. That is, fatigue in the nervous system was greater than fatigue in the muscle. Because muscles are often continuously active at low levels to maintain posture in sitting and standing, central fatigue may figure prominently in everyday tasks.

Obstructive sleep apnoea (OSA) Obstructive sleep apnoea (OSA) affects about 4% of adult males. In OSA, the upper airway collapses repeatedly during sleep (sometimes more than 50 times/hour) which prevents normal breathing and can cause snoring. One postulated reason for the nocturnal airway collapse is that there is insufficient drive to the upper-airway muscles. During wakefulness there is believed to be a compensatory increase in drive. Institute researchers Julian Saboisky, Dr Jane Butler, Professor David McKenzie, Dr Robert Gorman, Professor Simon Gandevia and colleagues published a study in the Journal of Physiology which looked at the electromyographic activity in the upper airway in people with severe OSA while they were awake. To look at the neural drive to the upper airway, they recorded single motor unit activity from genioglossus (in the tongue), an important muscle that acts to keep the upper airway open. The combined changes based on all types of motor unit activity were not consistent with a generalised increase in drive to the genioglossus in OSA. However, a consistent finding was that the mean size of the motor unit action potentials was larger and their duration increased in OSA. Their results provide a new explanation for the increased activity of upper airway muscles measured in OSA, previously thought to represent a simple compensatory neural mechanism to keep the upper airway open. They provide direct evidence that the increased electromyographic signal measured in OSA is due in large part to peripheral neurogenic changes in the motor units rather than a change in the neural drive to the muscles.

Human Sensory Function Many sensory systems provide the brain with the information it needs for orientation, maintaining

balance and to make successful movements of the limbs. Sensations from joints, muscle and skin, signals from the vestibular organs of the inner ear, vision and sound, are merged together so automatically that we are hardly aware of it - until something goes wrong. The aim of this research being undertaken by Dr Daina Sturnieks, Dr Richard Fitzpatrick and colleagues is to understand how the brain combines these different senses to form a single perceptual image of the body and its orientation and how, when things go wrong, it leads to debilitating problems such as vertigo, motion sickness and falls. To plan and execute successful movements, whether voluntary or automatic, the brain also needs to know about the load it has to move. Loads are constantly changing during ordinary activities and the brain must create an internal image of how they are changing and adapt to them. Not being able to adapt and scale the reflex and voluntary commands sent to muscles results in devastating movement disorders. Published in the Journal of Physiology, this research is investigating the sensory, neural and muscular processes that provide for this adaption of motor responses to load and sensory conditions and why it goes wrong in different clinical conditions and with ageing.

Motor function after stroke There are over 50,000 new strokes in Australia each year. Most people who survive a stroke have weakness on one side of the body and half will be severely disabled, affecting their ability to live independently. After the initial injury to the brain causing cell death, secondary changes in the motor pathway can have consequences as profound as those of the original stroke. The aim of Dr Penelope McNulty's work is to understand the effect of these changes in the brain, spinal cord, nerve and muscle and use the knowledge gained to make rehabilitation work better. Her approach is to combine highly specialised techniques to examine different elements of the motor pathway and compare these data to functional ability. Many activities of daily living require a steady, low-level force to be generated during a voluntary contraction. She is able to measure how stable the force is, and how well the brain can control the signal to sustain the required muscle activity. By adding a distraction task and removing any available feedback, she can determine how the sensory systems interact with the motor system to produce functional muscle control. Her work not only investigates changes after stroke but also how normal ageing affects the motor pathway.

Control of balance is vital to everyday life. Maintaining balance involves highly complex processing of peripheral sensory information and precise coordination of motor responses. Research aims of the Falls and Balance group is to enhance understanding of human balance and involves investigations of sensory and motor contributions, particularly those from the vestibular system. Current studies are designed to investigate the physiology and biomechanics of standing, walking, stepping reactions, trips and slips. Falls risk factors and strategies for prevention of falls in different populations are being examined in large-scale studies.

#### Prediction of falls and disability during and after

rehabilitation ward stays This study, being undertaken by Dr Cathie Sherrington, Professor Stephen Lord, Dr Jacqui Close, Dr Anne Tiedemann, Elizabeth Barraclough, Morag Taylor and colleagues, aims to develop screening and assessment tools for prediction of falls and disability during and after rehabilitation ward stays. Data collection has recently finished in a prospective cohort study involving 435 older people. This involved assessment of patients and medical records reviews, falls outcome data collection. The research team will use the data to test the ability of existing falls screening tools to predict falls and develop new screening tools, if necessary. They will also develop a tool which can predict disability three months after hospital discharge.

The potential impact of this study is significant. Health professional have been asking for a valid in-hospital screening tool which includes objective measurement of physical ability to enable identification of very high-risk individuals. Such a tool will help guide intervention strategies. Development of a pre-discharge screening tool for falls and disability in the month following discharge will help in referral to appropriate rehabilitation and community services after hospital discharge.

Development of safe footwear By altering somatosensory feedback to the foot and ankle and modifying frictional conditions at the shoe-sole/floor interface, footwear influences postural stability and the subsequent risk of slips, trips and falls in older people. However, little is known about what constitutes safe footwear for older people when undertaking activities in and around the home. Because footwear appears to be an easily modifiable falls risk factor, it is imperative to identify the specific shoe features that might facilitate or impair balance in older people so as to design targeted falls prevention interventions and provide evidencebased recommendations. As part of her PhD project, Jasmine Menant has been conducting a series of studies which examined the effects of common shoe features on functional tests of balance as well as on walking and stopping on various surfaces in young and healthy older communitydwelling people.

**Protective stepping** Protective stepping is crucial for balance control and recovery. A step made to restore balance must have the right timing, direction and size for it to succeed. Initial studies have shown that inappropriate step responses are significantly more prevalent in older compared to younger people. Impaired stepping is even more common in older people at risk of falls and those with balance impairments, suggesting that appropriate stepping responses are crucial for falls prevention. However, no studies have comprehensively examined stepping performance as a risk factor for falls in a prospective study.

Dr Daina Sturnieks, Professor Stephen Lord and Dr Richard Fitzpatrick have begun work to systematically investigate



sensory, motor, neural, mechanical and psychological determinants of appropriate and impaired responses to postural perturbations and determine the role that impaired stepping plays in falls. Much of this work will be addressed in a large prospective cohort study, with two targeted experimental studies undertaken to identify the effects of fatigue and divided attention on stepping performance and balance control. The final study will comprise a randomised controlled trial to evaluate the effects of a training intervention to improve balance and stepping performance in older adults.

#### Visual intervention strategy incorporating bifocal and

**long-distance eyewear** Presbyopia is a visual condition in which the crystalline lens of the eye loses its flexibility, making focusing on close objects difficult. To correct for presbyopia, older people are either prescribed separate single lens glasses for distant and near vision or, for convenience, a single pair of multifocal (bifocal, trifocal or progressive lens) glasses. Multifocal glasses have benefits for tasks that require changes in focal length, (e.g. driving, shopping and cooking). However, multifocals also have disadvantages. Many anecdotal reports have recorded that multifocals constitute a 'danger' for older people, particularly when walking on stairs, and in those with disabilities that affect gait. Bifocal glasses have optical defects, such as prismatic jump at the top of the reading segment that causes an apparent displacement of fixed objects. The lower lenses of all types of multifocal glasses blur distant objects in the lower visual field and this factor, in particular, may represent a significant problem for older people. Professor Lord and his team are conducting a randomised controlled trial in 600 older people to determine whether the provision of single-lens distance glasses to elderly multifocal glasses wearers, together with recommendations for wearing them for standing and outdoor activities, can reduce falling rates over a 12 month period. The study is in follow-up stage and will be finishing end of June 2008. The team anticipates that the study results will be implemented into clinical practice and public health falls prevention strategies, and will translate into tangible benefits for the community in terms of reduced falls-related morbidity and reduced demand for acute, sub-acute and non-acute health services.

Falls in cognitively impaired older adults Over the past decade, a number of controlled trials have been published which show it is possible to prevent falls in older people. However, a major disappointing outcome of research in this field is that trials that have included or specifically focused on older people with cognitive impairment have been unsuccessful in preventing falls. As a result, Professor Lord, Dr Jacqui Close and the research team are conducting a study which aims to develop our understanding of the important factors that contribute to risk of falling in older people with cognitive impairment and dementia. They anticipate that they will be able to identify which risk factors and underlying mechanisms are most strongly associated with falling in cognitively impaired older people and then hope to use the information to design targeted and tailored intervention strategies to reduce falls and fractures in this high risk population.

Fear of falling and risk taking behaviours Falls are prevalent in older people, and often result in injuries that impose limitations upon daily activities and threaten autonomy. Older people are often aware of these potentially devastating consequences, and report to be afraid of falling. Although fear of the consequences of falling is often thought necessary to raise awareness and to encourage people towards participation in falls prevention programs, there is a growing consensus that fear of falling may be maladaptive and can lead to the avoidance of fall-related activities. The resulting reduction in activity leads to physical deconditioning, poor quality of life, and increased falls risk. Few studies of falls, fear of falling, anxiety, and depression have been able to unravel the 'chicken and egg' question regarding the interrelationships among these measures, since most studies are cross-sectional. Furthermore, the problem of inappropriate fear, either too much or too little, has been neglected in the current literature. The current study being conducted by Professor Lord, Dr Close and Dr Kim Delbaere aims to investigate prevalence and associated factors of fear of falling in older people. They are currently conducting a longitudinal cohort study with a one-year follow-up period in approximately 500 community-dwelling older people aged over 70.

Falls risk assessments for ambulance officers and emergency departments The Ambulance Service of NSW attends to many older people who have suffered a fall and, around 10-25% of these people, are not subsequently conveyed to the hospital Emergency Department. A study from the UK has reported that those not conveyed are a high



risk group for not only falls, but also other health outcomes, yet existing support and onward referral services are limited for this particular group. On the other hand, conveying all older people treated for falls would have a significant impact on the function of Emergency departments with little evidence to support that, in the absence of a significant physical injury, this is the right place for assessing these individuals. The development of a screening tool would allow for safe non-conveyance and the means for identifying people requiring more detailed assessment and follow-up. Dr Anne Tiedemann and Professor Lord are conducting a cohort study with a six-month follow-up period. They plan to develop this screening tool to identify older people at high risk of future falls who have been treated by the Ambulance Service as a result of a fall, but are not conveyed to hospital - possible participants will be those aged 70 years and over. Phase 1 of the study will involve the recruitment of 250 participants, which will allow for the assessment tool components to be selected from a larger pool of possible predictor variables. The developed tool will then be applied to a further 250 participants for external validation.

# research Facilities



## tissue resource centre

# Donated brain tissue for national research distribution

The Institute became part of the Australian Brain Bank Network in July 2004, a facility funded by a five year NHMRC Enabling Grant and established to coordinate the collection of human brain tissue by a number of research facilities across Australia. The Institute's Tissue Resource Centre (TRC) provides human tissue from both healthy and diseased brains for histological, genetic and biochemical analysis. The number of donors allowing their tissue to be provided to third parties for research purposes has increased steadily with 689 brains currently stored at the Institute.

Under Professor Glenda Halliday and Managers Karen Murphy and Heather McCann, the TRC team developed DNA extraction techniques for both fresh and fixed brain tissue to be able to provide autopsy confirmed DNA material for research purposes on cases consented for such studies. This year, they implemented these techniques as part of standard procedures and processed all incoming specimens. Currently the TRC has a total of 159 DNA samples from autopsy confirmed brain samples. In addition to brain tissue, the TRC now holds 180 DNA samples with consent for national distribution to researchers.

The focus in 2008 will be to update diagnostic and database systems, and integrate new clinical donor programmes to link in with the TRC. In particular, there have been many recent changes to the diagnostic criteria of a number of different neurodegenerative diseases, and the TRC team needs to revise the neuropathological criteria applied to their brain holdings to ensure their diagnoses reflect the most current criteria.

#### Australian Parkinson's Project

This three year NHMRC funded project commenced in 2006 and, this year, the clinical collection procedures in NSW, Qld and WA were standardised and a national database developed. For samples from NSW, the Genetic Repositories Australia facility at the Institute processed all 2007 donated blood samples for this project, with 124 samples processed for DNA extraction. In addition, lymphocytes were separated from 47 familial samples and 10 cell lines have been generated to date.

## genetic repositories australia

With the support of a \$2 million National Health and Medical Research Council (NHMRC) Enabling Grant, Genetic Repositories Australia (GRA) has been established in newly renovated laboratories at the Institute. GRA is a national genetic biorepository for DNA and cell lines, providing researchers with a central facility for processing, distributing and the secure storage of human genetic samples derived from appropriately consented diseasespecific and population-based studies.

In 2007, the facility officially opened for general use by the research community under the direction of the Facility Manager, Steve Turner. Samples were received from nine different research groups and a total of 875 samples were processed. A significant number of NHMRC and Australian Research Council (ARC) funded grants and research projects have already been supported by GRA, including projects in Memory and Ageing, Mild Cognitive Impairment, Parkinson's disease, Bipolar, Dementia, First Episode Psychosis, Mental Illness and Depression.

GRA fills a key 'missing link' in Australia's health and medical research infrastructure. It interfaces between the needs of individual researchers and research teams to develop population cohorts or tissue banks, by providing a critical core service. The operations of GRA will underpin significant biomedical and public health discoveries.



## symbion clinical research imaging centre

The Symbion Clinical Research Imaging Centre (SCRIC), a joint facility between the Institute and Symbion Health, houses a 3 Tesla magnetic resonance imaging (MRI) scanner. This scanner allows researchers to measure brain structure and function, as well as connectivities and chemistry in a non-invasive manner. In April 2007, the original Philips scanner was replaced with the latest model, the "Achiever", having larger field gradients and a second radiofrequency channel. This enables researchers to undertake a more extensive range of exciting new experiments, including 31P (brain bioenergetics) and 13C (brain metabolism) experiments, and to obtain higher angular resolution in their images.

During 2007, research using the scanner was expanded, with more than 30 projects. A grant from the NSW Cancer Council allowed SCRIC to purchase additional equipment to image smaller items. In addition, the facility joined the Australian National Imaging Facility, becoming part of a nationwide network that includes imaging facilities in Adelaide, Melbourne, Sydney and Brisbane. From this National Collaborative Research Infrastructure Strategy (NCRIS) scheme, SCRIC expects to be able to employ a facilitation fellow from 2008 to assist researchers who wish to access the facility under NCRIS.

## information technology

The IT Department at the Institute is focussed on providing world-class IT and telecommunications support to researchers and laboratories throughout the organisation. The aim is to ensure that the research progress is visibly enhanced at every level of endeavour – from high quality desktop computer support through to advanced security and networking, along with the development of new computer based tools and software.

To meet this end, several important upgrades have been made in the IT realm in 2007. These include the provision of new servers and an expansion in staff to better support the existing operations of the Institute and to plan for the imminent explosion in computing requirements as the Institute prepares to take its next great leap forward. Some of the improvements include unlimited storage space for files and data along with enterprise grade email and collaboration services, improving efficiency and enabling laboratories to work together by methods previously unavailable.

There is a wide range of research interests within the Institute and, with the continued nature of the expansion, the challenge for IT is to ensure that all laboratories are properly supported at their individual level, whilst maintaining a cohesive framework to enable co-operation and dialogue between laboratories. The IT group feel confident that IT within the Institute is now at this level and can continue to further support and foster our ongoing research excellence.

## electronic and mechanical workshops

The Institute's workshops provide essential infrastructure support to scientists and students and were the first infrastructure module to be established shortly after the Institute opened in 1993. The unique nature of research carried out at the Institute means that the equipment needed for the experiments cannot be bought "off the shelf" – instead it has to be constructed to individual specifications.

Workshop staff, Lajos Weisz in the Electronic Workshop and Hilary Carter and Dave Menardo in the Mechanical Workshop, collaborate with scientists to design, prototype, and manufacture the equipment – either in house or by CAD drawings – which are then turned into parts by subcontractors. The workshop team is also on call to repair breakdowns or calibrate equipment during experiments involving volunteer subjects with spinal injuries or respiratory illness.

The equipment manufactured in the Mechanical Workshop ranges from large-scale frames which can support an entire person which assists investigation into human movement and balance, to small tissue baths which can record electrical signals from individual nerve cells. In the Electronic Workshop, the equipment required ranges from simple strain gauge amplifiers to Hi DC voltage stimulators and from position measurement to data acquisition for accurate analysis.

Equipment designed and manufactured by the workshops is used in other Institutions such as The Black Dog Institute, University of Sydney, UNSW, Cumberland College and University of Western Sydney. Various components for Professor Stephen Lord's "Falls Kit", prototyped in the workshops, have been distributed world-wide.



## our profile

#### dr sinthuja sivagnanasundaram Senior Research Officer

Sinthuja's key research focus is on abnormal neuronal migration in schizophrenia pathogenesis

## prizes and awards

#### **Alex Burton**

TOW Poster Prize, Coast Association TOW Research Committee

Merck Sharpe Dohme Poster Prize, UNSW Faculty of Medicine Research Day

#### Danni Cheng

Young Investigator Prize, IBRO Parkinson's Disease Satellite Meeting

#### **Jan Fullerton**

Postdoctoral Poster Prize, Brain Sciences UNSW Symposium

#### **Erica McAuley**

Best Student Oral Presentation, GeneMappers Congress, Brisbane

#### Susanna Park

TOW Prize, Open Junior Division, Coast Association TOW Research Committee

#### **George Paxinos**

2007 Distinguished Scientific Contribution Award, Australian Psychological Society

#### **Sharon Savage**

Macquarie University, Master of Clinical Neuropsychology Prize for academic excellence

#### **Rebecca St George**

Merck Sharpe Dohme Poster Prize, UNSW Faculty of Medicine Research Day

#### **Steve Vucic**

James Lance Young Investigator Award, Australian and New Zealand Association of Neurologists

2007 Golseth Young Investigator Award, American Association of Neuromuscular and Electrodiagnostic Medicine

#### Lolita Warden

Bill Evans Memorial Prize, Australian and New Zealand Neuropathological Society

Merck Sharpe Dohme Poster Prize, UNSW Faculty of Medicine Research Day

#### **Gunnar Wasner**

Best Poster Prize, Clinical Studies, International Congress on Neuropathic Pain



#### postgraduate degrees conferred in 2007

Student	Degree	Project Title	Supervisor(s)
Cindy Kersaitis	PhD	The pathogenesis of sporadic frontotemporal dementia	G Halliday / J Kril
Shaokoon Cheng	PhD	Biomechanics of hydrocephalus	L Bilston / E Jacobson
Peter Martin	PhD	Central fatigue in human subjects	J Taylor / S Gandevia
Kingsley Storer	PhD	Cerebral arteriovenous malformations: the role of radiosurgery and gene therapy in their treatment	M Stoodley / J Tu
Anne Tiedemann	PhD	The development of a validated falls risk assessment for use in clinical practice	S Lord / R Salgado
Connie Vogler	PhD	Comparing the effectiveness of seated and weight bearing exercises on falls risk	S Lord / C Sherrington
Vanessa Young	PhD	The neuropathology of white matter hyperintensities	J Kril / G Halliday

### 2007 publications

#### **Books**

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#### **Journal Publications**

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Behnke S, **Double KL, Duma S, Broe GA**, Guenther V, Becker G, **Halliday GM**, Substantia nigra echomorphology in the healthy very old: correlation with motor slowing, NeuroImage, 34:1054-1059, 2007

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#### **Book Chapters**

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## professional service

#### to the scientific community and related organisations

#### Lynne Bilston

- Member, Engineers Australia National Panel on the Biomechanics of Injury, 1995 - present
- Board Member, College of Biomedical Engineers, Engineers Australia
- Member, Kidsafe NSW
- Member, Australian Standards Committee for Child Restraints in Motor Vehicles (CS-085) (incl drafting panel)
- Editorial Board Computational Methods in Biomechanics and Biomedical Engineering
- Member, NSW Products Safety Committee, 2007-

#### Ingvars Birznieks

Member, Latvian Scientific Council (Human biology, Medicine), international popular science iournal Ilustreta Zinatne

#### James Brock

- Chair, Grant Review Panel 4D, Autonomic, Peripheral and Sensory Nervous Systems, **NHMRC 2007**
- President (2003-2005) Australian and New Zealand Microcirculation Society
- Treasurer (2005-2007) Australian and New Zealand Microcirculation Society
- Member, NHMRC Grant Advisory Group 4 (2002, 2004, 2005)
- Member, Animal Care and Ethics Committee, UNSW 2004-
- Teacher, International Brain Research Organization Neuroscience Schools 2001-
- Editorial Board Autonomic Neuroscience: Basic and Clinical

#### **Jane Butler**

- Member, Local Organising Committee, 2010 meeting of the Australian Neuroscience Society
- Editorial Board Journal of Applied Physiology

#### Kay Double

- Member, Management Council, Parkinson's NSW Inc and Scientific Editor of newsletter
- NSW Representative: Australian Association of Alexander von Humboldt Fellows
- Secretary, National Association of Research Fellows of the National health and Medical Research Council of Australia
- · Founding member, Forum for European-Australian Science and Technology (FEAST)-Germany.
- Editorial Board, Journal of Neural Transmission; Parkinson's Disease and Allied Conditions.
- Principal Organiser, Seventh International Brain Research Organization World Congress of Neuroscience Satellite Meeting 'New Frontiers in Basic and Clinical Research in Parkinson's disease and other synucleinopathies' Prince of Wales Medical Research Institute, 8th-9th July 2007
- Organiser, Seventh International Brain Research Organization World Congress of Neuroscience Workshop "Parkinson's disease", Melbourne, 13th June, 2007

#### **Richard Fitzpatrick**

Editorial Board – Journal of Physiology

- Editorial Board Journal of Applied Physiology
- Editorial Board Gait and Posture

#### Paul Folev

- Books Editor Journal of the History of the Neurosciences
- Member, Organising Committee, 2007-2009 Meetings of the International Society for the History of the Neurosciences

#### Brett Garner

- Member, Regional Grants Interview Committee, National Heart Foundation
- Editorial Adviser Biochemical Journal
- Editorial Adviser Clinical Science

#### Simon Gandevia

- Co-Convenor of Exercise Group, Australian Physiological and Pharmacological Society, 1999-
- Associate Editor Journal of Applied Physiology, 2005-
- Chair, NHMRC Career Awards Panel (2007)
- Editorial Board Encyclopedic Reference in Neuroscience
- Editorial Board Acta Physiologica
- Editorial Board Journal of NeuroEngineering and Rehabilitation
- Editorial Board Australian Journal of Physiotherapy
- Faculty of 1000 Section Head for Muscle and Connective tissue

#### **Glenda Halliday**

- Director, Tissue Resource Centre, POWMRI, 2005-2009
- President/Past President, National Association of Research Fellows of NHMRC, 2004-2007
- President/President Elect/Past President, Australian Neuroscience Society, 2005-2009
- Member, Scientific Advisory Board, Victorian Movement Disorders Collaborative Research Group, 1998-2008
- Member, Tow Research Committee, Coast Medical Association, 1999-
- Member, Membership Committee, International Brain Research Organization, 2001-2008
- Member, ad hoc professional appointment committees, POWMRI & UNSW Faculty of Medicine, 2003-
- Member, Network for Australian Parkinson's Project, 2003-2008
- Member, Network of Australian Brain Banks, 2005-2009
- Member, Organising Committee, the International Brain Research Organization 7th World Congress of Neuroscience, 2005-2007
- Member, Organising Committee, 17th International Congress on Parkinson's Disease and Related Disorders, World Federation of Neurology, 2005-2007
- Co-convenor, 3rd Australian Dementia, Ageing and Neurodegenerative DISeases group meeting, 2006
- Member, NHMRC project grant committee, 2007-2008

- NHMRC grants co-ordinator for Neuroscience Discipline, 2007
- Member, Scientific Board, 6th International Conference on Frontotemporal Dementia, 2007-2008
- Member, Scientific Committee, 18th International Congress on Parkinson's Disease and Related Disorders, World Federation of Neurology, 2007-2009
- Member, Advisory Committee, Centre for Brain and Mental Health Research. University of Newcastle, 2007-
- Member, Scientific Advisory Committee, Kolling Institute, Royal North Shore Hospital, 2008
- Convenor, Grant Selection Committee, Sir Zelman Cowen Universities Fund. University of Sydney, 2008
- Editorial Board Acta Neuropathologica
- Editorial Board Journal of Neural Transmission
- Editorial Advisory Board Brain
- Editorial board Movement Disorders

#### John Hodges

- Associate Editor Brain (Cognitive Neurology Section)
- Editorial Board Cognitive Neuropsychiatry
- Editorial Board Cognitive Neuropsychology
- Editorial Board Nature Clinical Practice Neurology

#### Matthew Kiernan

- Chair, Specialist Advisory Committee in Neurology, Royal Australian College of Physicians
- Chair, Neurology Curriculum Writing Group, Royal Australian College of Physicians
- Member, Committee for Physician Training, Royal Australian College of Physicians
- Member, Conioint Committee, Memorandum of Understanding between Specialty Societies and the Royal Australian College of Physicians
- Honorary Secretary, Australian and New Zealand Association of Neurologists
- Council Member, Australian and New Zealand Association of Neurologists
- Postgraduate Coordinator, Prince of Wales Clinical School, UNSW
- Member, Higher Degree Committee, UNSW
- Member, Examination Committees, Medicine, UNSW
- Member, Human Research Ethics Committee, Prince of Wales Hospital
- Board Member, Australian Brain Foundation **NSW Committee**
- Editorial Board Journal of Neurology, Neurosurgery and Psychiatry
- Editorial Board Journal of Clinical Neuroscience
- Editorial Board Clinical Neurophysiology

#### Stephen Lord

 President, Australia and New Zealand Falls Prevention Society (establishment committee)



- Vice President, International Society for Posture and Gait Research, 2001-5
- Chair, Research Advisory Committee, NSW
  Injury Risk Management Research Centre, 2004-
- Member, Osteoporosis Australia Medical and Scientific Committee
- Founding member and scientific advisor, New South Wales Falls Prevention Network
- Member, National Association of Research Fellows of NH&MRC
- Associate Member, Prevention of Falls Network, Europe (ProFaNE), 2004-
- Host, International Society for Postural and Gait Research, 16th biannual conference, Sydney, March, 2003
- Host, Australian Falls Prevention Conference, Inaugural meeting, Manly, Sydney, November, 2004
- Member, Scientific Program and Organising Committees, Second biennial Australian Falls Prevention Conference, Brisbane, November, 2006
- Member, Scientific Program Committee, International Society for Postural and Gait Research, 17th biannual conference, July, 2007, Vermont, USA
- Member, Scientific Program Committee, Third Biennial Australian Falls Prevention Conference, Melbourne, October, 2008
- Convenor, National Falls Investment Round Table (a meeting of falls prevention researchers, clinicians and Federal and State policy makers), March, 2006
- Convenor, Falls Research into Practice Forum (second meeting of falls prevention researchers, clinicians and Federal and State policy makers), March, 2007
- External Reviewer, New Zealand Accident Compensation Corporation (ACC) Operational Plan on Preventing Falls in Older People, May, 2007
- External Reviewer, Queensland Stay on Your Feet Community Good Practice Guidelines.
   Preventing falls, harm from falls and promoting healthy active ageing in older Queenslanders, November, 2007
- Invited Presentation Evidenced-based fall prevention strategies for older people. NSW Area Health Services Health Promotion Directors Meeting, November, 2007
- Chair, Expert Advisory Group, Australian
   Commission on Safety and Quality in Healthcare
   National Falls Prevention Guidelines, 2008
- External Reviewer, Victorian Department of Health Service's Review of Falls Prevention Projects 2000-2007

#### Vaughan Macefield

- NSW Organiser, Australian Brain Bee Challenge
- Chair of Local Organizing Committee, International Society for Autonomic Neuroscience, Sydney 2009

#### Elspeth McLachlan

- Chair, International Program Committee, 7th IBRO Congress on Neuroscience, Melbourne, 2004-2007
- Regional Coordinator, IBRO Public Awareness Committee, 2004-2007
- Convenor, NSW Regional Group, Australian Academy of Science, 2004-
- Member, Nuffield Foundation Medical Fellowship
   Committee, 1999-
- Universities Australia Representative, ARC/UA/ NHMRC Joint Working Group to prepare the Australian Code for the Responsible Conduct of Research

- Editorial Board Clinical and Experimental Pharmacology and Physiology, 1998-
- Editorial Board Clinical Autonomic Research, 2001-

#### George Paxinos

- President, 7th International Brain Research Organisation World Congress of Neuroscience (Melbourne 2007)
- Editorial Board Neuroscience and Biobehavioural Reviews
- Editorial Board Journal of Chemical Neuroanatomy
- Editorial Board Brain Structure and Function

#### **Olivier Piguet**

Member, Publication Board – Brain Impairment

#### Caroline Rae

- Company Secretary, Australian and New Zealand Society for Magnetic Resonance (ANZMAG), 2005-
- NSW State representative to Council of the Australian Society for Biochemistry and Molecular Biology
- Member, Australian Academy of Science National Committee for Brain and Mind
- UNSW Node Director, Australian National Imaging Facility
- Executive Committee, Brain Sciences
  Institute, UNSW
- Chair, NMR Reference Group, UNSW

#### **Peter Schofield**

- Public Officer, (Lorne) Genome Conference, Incorporated, 1992-2007
- Co-Convenor, The Neuroscience Panel & Member of Scientific Steering Committee, NISAD, Neuroscience Institute for Schizophrenia & Allied Disorders, 1998-2007
- Member, Scientific Advisory Board, Mental Health & Addiction Research Centre, University of Otago, Christchurch, New Zealand, 2003-
- Member, Inaugural Course Management Committee, Australian Course in Advanced Neuroscience, 2004-
- Member, Scientific Advisory Board, Apollo Life Sciences Pty Ltd, 2004-
- Member, Selection Committee, Young Tall Poppies Campaign, Australian Institute of Policy & Science, 2006-
- Member, Research Council, Schizophrenia Research Institute Australia (formerly NISAD), 2007-
- Expert Witness, Administrative Appeals Tribunal, Appeal by Sydney IVF vs NHMRC, 2007
- Expert Witness, US PTO examination of CSIRO patent application, 2007
- Panel Chair, NHMRC Grant Review Panel Molecular Neuroscience, 2007
- Member, Editorial Board, Psychiatric Genetics, 2002-
- Advisor to the Tasmanian Minister for Health and presentation to Tasmanian Legislative Council on the 'Human Cloning & Other Prohibited Practices Amendment Bill', 2007

#### **Claire Shepherd**

- Member, Organising committee, 2006 Australian Neuroscience Conference
- Media liaison officer, 2006 Australian Neuroscience Society Conference
- Scientific judge, 2006 Australian Neuroscience Society Conference

- Scientific Judge, 2006 TOW Awards
- Co-convenor and chair, 3rd Australian Dementia, Ageing and Neurodegenerative DISeases group meeting, 2006
- Organiser, Neuroinflammation Symposium, International Brain Research Organization 7th World Congress of Neuroscience, 2007

#### Marcus Stoodley

- Member, Scientific Advisory Board, Cure for Life Foundation
- Member, RACS Board of Surgical Research
- Member, Brain Foundation NSW Committee
- Board Member, Australian Brain Foundation
- Editorial Board Pediatric Neurosurgery
- Member, SESIAHS Human Research Ethics Committee
- Board Member, RACS Board of Neurosurgery

#### **Charles Watson**

- Board Member and Chair of Research Advisory Committee, Cancer Council of WA, 1998-
- Chair, Genetic Support Council of WA, 2002-2007
- · Chair, Neurological Council of WA, 2007-
- Editorial Board Australian and New Zealand Journal of Public Health
- Editorial Board Communicable Disease Intelligence

#### Cyndi Shannon Weickert

- Member and Program Committee-Society for Biological Psychiatry
- Member, Society for Neuroscience
- Member, Board of Directors, Schizophrenia Research Institute
- Member, Research Committee, Prince
   of Wales Medical Research Institute
- Member, Brain Sciences, University of New South Wales
- Delegate, Australasian Society for Psychiatric Research
- Chair, Developmental Neurobiology Panel, Schizophrenia Research Institute
- Member, Scientific Advisory Board Tissue Resource Center, University of Sydney
- Member, Australian Neuroscience Society
- Member, Schizophrenia International Research Society

#### **Thomas Weickert**

- Member, Organization for Human Brain Mapping
- Member, Society for Neuroscience
- Member, Scientific Research Committee, Australian Schizophrenia Research Bank
- Member, Research Committee, Prince
   of Wales Medical Research Institute
- Member, Brain Sciences, University
   of New South Wales
- Delegate, Australasian Society for Psychiatric Research
- Member, Infrastructure Panel, Schizophrenia Research Institute, (formerly Neuroscience Institute for Schizophrenia and Allied Disorders)
- Member, Cognition and Connectivity Panel, Schizophrenia Research Institute, Australia
- Member, Australian Neuroscience Society
- Member, Schizophrenia International Research Society

#### dr scott kim Senior Research Officer

Scott heads the molecular biology laboratory within the cellular lipidology group

## our people

The Institute is led by eminent neuroscientists and outstanding research leaders. In 2007, from over 200 staff and students, 19 Institute scientists held appointments at levels of Professor or Associate Professor and 9 held ARC or NHMRC Research Fellowships. Professors Simon Gandevia and Elspeth McLachlan are **Fellows of the Australian Academy** of Science. Professor Glenda Halliday is President of the Australian Neuroscience Society, following in the footsteps of Professor George Paxinos who formerly held this position. Institute senior scientists have also been recognised by distinguished awards: Professors Elspeth McLachlan and George Paxinos have been awarded the Ramaciotti Medal recognising excellence in medical research; Professor George Paxinos has also been made an Officer in the Order of Australia (AO) for his service to neurological science; and two of the Institute's senior scientists, Professors Tony Broe and Shirley Sarks have been awarded Member of the Order of Australia (AM). Members of the scientific staff also occupy senior positions in national and international organisations concerned with nervous system function and dysfunction.

#### Executive Director & CEO

Prof Peter Schofield BScAgr (Hons) PhD DSc

#### Deputy Director & Co-Director SIRC

 Prof Simon Gandevia BSc (Med) PhD MD DSc FAA FRACP (NHMRC SPRF)

#### Senior Principal Research Fellows

 Assoc Prof Lynne Bilston BE (Mech) (Hons) MSE (BioEng) PhD (NHMRC SRF)

- Assoc Prof James Brock BSc (Hons) DPhil (NHMRC SRF)
- Prof GA (Tony) Broe AM BA MBBS FRACP FACRM (POWH Ageing Research Centre)
- Prof James Colebatch PhD MD FRACP (Director of Clinical Research, POWH Head Neurology)
- Prof Glenda Halliday BSc(Hons) PhD (NHMRC PRF)
- Prof John Hodges MBBS MRCP MD FRCP FMedSci (ARC Federation Fellow ) [from Nov 2007]
- Prof Stephen Lord BSc MA PhD DSc (NHMRC SPRF)
- Prof Elspeth McLachlan DSc FAA (Co-Director SIRC, UNSW Professor)
- Prof George Paxinos AO BA MA PhD DSc (NHMRC SPRF)
- Prof Caroline Rae BSc (Hons) PhD (UNSW NSGlobal Professor)
- Prof Shirley Sarks AM MD FRCS FRANZCO (Honorary)
- Prof Cynthia Shannon Weickert BA PhD (Macquarie Group Foundation Chair of Schizophrenia Research)
- Prof Charles Watson BSc (med) (Hons) MBBS MD FAFPHM

#### Principal Research Fellows

- Assoc Prof Matthew Kiernan MBBS (Hons) PhD FRACP (UNSW Senior Lecturer, POW Consultant Neurologist)
- Prof Vaughan Macefield BSc (Hons) PhD (UWS Prof, Honorary )
- Assoc Prof David McKenzie MBBS BSc (Med) PhD FRACP (POW, Head, Respiratory Medicine)
- Assoc Prof Marcus Stoodley MBBS (Hons) PhD FRACS (POWH Neurosurgeon, UNSW Senior Lecturer)
- Dr Janet Taylor MBiomedE MD (NHMRC SRF)

#### Senior Research Fellows

- Dr Jacqueline Close MB BS MD FRCP (POWH Staff Specialist, Geriatric Medicine)
- Dr Kay Double BSc (Hons) PhD Priv.-Doz. (NHMRC SRF)

#### **Research Fellows**

- Dr Jane Butler BSc (Hons) PhD (NHMRC RD Wright Fellow)
- Dr Brett Garner BSc (Hons) PhD (NHMRC RD Wright Fellow)
- Dr John Kwok BSc PhD (NHMRC RD Wright Fellow)
- Dr Tom Weickert BA MA MPhil PhD (UNSW Senior Lecturer, Psychology)

#### Senior Research Officers

- Dr Ingvars Birznieks Dr. MedSci, Dr. Biol
- Dr Robert Boland BAppSc (Phty) GradDipAppSc (ManipPhty) PhD
- Dr William Brooks BA MBBS MPH
- Dr Richard Fitzpatrick BSc (Hons) MBBS PhD
- Dr Janice Fullerton BSc PhD (NHMRC Howard
- Florey Centenary Research Fellow)
  Dr Woojin (Scott) Kim BSc PhD
- Dr Cindy Lin MEngSc BE PhD
   (NHMRC CJ Martin Fellow ) [to Sep 2007]
- Dr Penelope McNulty BHMS (Hons) PhD (NHMRC Peter Doherty Fellow)
- Dr Peter Nickolls MBBS BSc BE(Elec) PhD (Honorary)
- Dr Olivier Piguet BPsych MA (ClinNeuropsych) PhD
- Dr Tertia Purves-Tyson BSc (Hons) MSc PhD (NHMRC Peter Doherty Fellow)
- Dr Claire Shepherd BSc (Hons) PhD
- Dr Sinthuja Sivagnanasundaram BSc (Hons) PhD [from Jul 2007]
- Dr Stuart Smith BSc MSc PhD [from Oct 2007]
- Dr James Tu MBBS MSc PhD (POWH Senior Hospital Scientist)

#### **Research Officers**

- Dr Shaokoon Cheng BMechEng (Hons) PhD
- Dr Albert Chetcuti BTechBiotech
- Dr Blandine Courcot BSc (Hons) PhD [from Apr 2007]
- Dr Vadim Dedov MD PhD
- Dr Kim Delbaere MPT PhD
- Dr Carol Dobson-Stone BSc DPhil (UNSW
- Vice-Chancellor's Postdoctoral Fellow)

- Dr Paul Foley BSc (Hons) PhD (ARC APD/UNSW Strategic Research Fellow)
- Dr Yuhong Fu BMed MNeurol PhD
- Dr Michael Green BSc PhD
- Dr Claire Heise BSc (Hons) PhD
- Dr Michael Hornberger BA (Hons) MSc PhD
- Dr Yue Huang BM MSc PhD
- Dr Sabine Krofczik DipBio PhD [from Mar 2007]
- Dr HuaZheng Liang MBBS MNeuropath
- Dr Christopher McNeil BSc (Hons) BE PhD (Postdoctoral Fellow, NSERC, Canada)
- Dr Peter Martin BHMvt (Hons) BA (Comm) PhD
- Dr Renee Morris BSc MSc PhD [to Feb 2007]
  Dr Nicole Rummery BAppSci (Hon) PhD
- [from Apr 2007] • Ms Jacqueline Rushby BSc (Hons) [from Oct 2007]
- Dr Emma Schofield BSc (Hons) PhD
- Dr Janette Smith BPsych PhD [to Apr 2007]
- Dr Daina Sturnieks BAppSc (Hons) PhD
- Dr Hiske van Duinen MSc PhD
- Dr Nivan Weerakkody BBiomedSc (Hons) PhD
- Dr Jenny Wong BSc (Hons) PhD

#### Senior Research Assistants

- Ms Julie Brown BSc
- Dr Svetlana Cherepanoff BSc MBBS MPH
- Mr Ping Hu BMed MM
- Ms Heather McCann DipHlthSci BMedSci (Path)
- Ms Kerrie Pierce BSc (Hons)
- Ms Debora Rothmond BSc [from Jul 2007]
- Mr Steve Turner BAppSc (MedLabSc) BSc (Hons)
- MSc GradCert (Mgmt)

  Ms Hongqin Wang MBBS (China) [to May 2007]

#### **Research Assistants**

- Ms Miriam Abeshouse BSc (Hons) Psych
- Mr Amr Al Abed BSc (Hons) [to Jan 2007]
- Ms Rachelle Arkles
- Ms Elizabeth Barraclough BAppSc (Phy)
- Ms Claire Boswell-Ruys BPhty
- Ms Jocelyn Bowden Bland Arch BHMvt
- Ms Rachael Brown RN [to Sep 2007]
- Mr Adam Bryan TAFE Cert [from Aug 2007]
- Mr Bob Bryans
- Mrs Danielle Burton RN
- Ms Anne Butler BA (TourMgmt)
- Ms Francine Carew-Jones BSc (Med)
- Mr Hilary Carter TAFE Cert
- Ms Heidi Cartwright BSc
- Ms Jennie Cederholm MSc (MedBio)
- Ms Elizabeth Clarke BSc BE (Hons)
- Mr Marshall Dalton BA (Hons) [from Aug 2007]
- Ms Kristy Dunlop BPsych (Hons)
- Ms Elissa Gilbertson [to Aug 2007]
- Ms Marianne Hallupp BSc
- Ms Anna Heath BSc (BiomedSc) BAppSc (Hons)
- Ms Sarah Hemley BBiotech (Hons)
- Mr Phu Hoang BAppSc (Phy) (Hon)
- [from Feb 2007]
- Ms Sharpley Hsieh BPsych
- Ms Sadaf Jafri BMedSc (Hons)
- Ms Marcella Kwan BSC GradDip (Biotech) GCHSM MPH [to Jul 2007]
- Ms Grace Wai Gei Lee BMedSc (Hons)
- Ms Meng Wei Leong [Mar 2007 Jul 2007]
- Ms Yen Lim BPsych (Hons)

Ms Ariel Luo MSc (MedSci) [to Oct 2007]

Dr Jacob Fairhall BSc (Med) MBBS (Hons)

Dr Nicholas Murray MBBS (Hons) FRACP

Dr Alfred Wong MBBS (Hons) FRACP

· Jason Amatoury BEng (Hons) MBiomedE

Claire Boswell-Ruys BSc BAppSc (Hons)

Alexander Burton BSc (Hons) BNursing RN

Dr Clement Loy BA MBBS MMed

Dr Steve Vucic MBBS (Hons)

Daniel Brooks BSc (Hons)

Annie Butler BA (Tourism Mgmt)

John Chew BE (Comp Eng) (Hons)

Elizabeth Clarke BSc BE (Hons)

Stephen Duma BEng (Elec) (Hons)

Carlotta Duncan BSc(Adv)(Hons)

• Phu Hoang BAppSc (Phy) (Hon)

Guanggiang (John) Geng B Biomed Eng

· Elias Glaros DipAppSci BMedPharmBiotech

Anna Hudson BSc (Biomed Sc) BSc (Hons)

Marcella Kwan BSc GradDip(Biotech) GCHSM

Sharon Chan BSc (Hons)

Julie Brown BSc

MBiomedEna

MBiomedEna

M Biomed Ena

· Eric Han BE (Hons)

MPH [from Aug 2007]

Agnes Luty BMedSci (Hons)

Erica McAuley BA BSc (Hons)

Fatma Nasrallah BSc (Biochem)

Susanna Park BPsvch/BSc (Hons)

Rebecca St George BA BSc (Hons)

· Farrah-Yasmin Tate BSc (Hons)

Alex Voukelatous MA (Psychol)

· Wei Shin Yu BE (Hons) Ph.D

**Masters Candidates** 

**Honours Candidates** 

Rai Reddy MSurg

Amy Watling BSc

Danni Cheng

Jamie Foo

Alex Owen

Justin Pack

Kristy Tan

Faradila Paiman

Cameron Talbot-Stern

Ganesha Thayaparan

Our Profile

47 >

Max Fu

Mai Fang Chev

Franciska Eckhardt

Bronwyn Graham

Lolita Warden BAppSc Biotech (Hons)

Henry Zheng MEcon MComm (Hons)

Julian Saboisky BHMv (Hons)

Christine Song BSc (Hons)

Jasmine Menant BSc (Hons)

Khuen Yen (lan ) Ng MSc

Troy Rubin BSc (Hons)

Maoyi Tian BEng MSc

Linda Truong BSc (Hons)

Billy Luu BMedSc (Hons)

David Elliott BSc(Hons)

Bachael Brown BN

Dr Jack Liao MBBS

(Clin Epi) FRACP

- Ms Rachel McBain BMedSc (Hons)
- Ms Eneida Mioshi BA (Hons) MSc
- Ms Karen Murphy BSc (Hons)
- Ms Sandra O'Rourke BMedSc (Hons)
- Ms Teresa Orr RN MN [from Oct 2007]
- Ms Svetlana Pianova MSc
- Ms Kate Plumb BA (Hons)
- Ms Mamta Porwal BHMS MPH
- Ms Rathi Ramasamy BSc (Hons)
- Ms Betty Ramsay BSc (Hons) [from Nov 2007]
- Ms Jodie Rattey BHMvt (Hons)
- Ms Stefanie Reyes BSc (Hons)
- Ms Layla Roberts BA (Hons)
- Ms Sharon Savage BPsych (Hons) MClinNeuropsych
- Ms Connie Severino
- Mr Duncan Sinclair BSc (Hons)
- Ms Rebecca St George BSc (Hons) BA
- Ms Lauren Staples BA (Hons)
- Ms Julia Stevens BBiotech (Hons)
- Mr William Thompson [from Mar 2007]
- Ms Anne Tiedemann BSc GradDipBiomedSci
- Ms Diana Tripovic BSc (Hons)
- Ms Shan Yuan Tsai BSc [from Aug 2007]
- Dr Esther Vance BSc (Hons) PhD
- Mr Lee Walsh BE (Hons) BSc (Hons)
- Mr Lajos Weisz
- Ms Vanessa Young BSc [from Apr 2007]
- Mr Peter Zhao BMedClinMed MNeurosci

#### **Technical Assistants**

- Mr Fabricio Amaral DipLabTech [from Jul 2007]
- Mrs Kathy (Ping) Wang BSc (Chem) MEnvStud
- Ms Jacqueline Zheng BSc (Med) MComm (Acct&Fin) BVSc (Hons) [from Apr 2007]

#### Finance

- Mr Andrew Dermott BEc CA, Company Secretary
- Ms Rosalie Dworjanyn BSc GradDipInfoMgmt
- Mrs Lee Hilton
- Ms Ruby Wang MCom

#### Information Technology

Dr Andrew Cartwright BSc PhD

**Fundraising and Communications** 

Ms Leonie Harle [from Aug 2007] MFIA

Mr Michael Cartwright BSc

Ms Anne Graham RN AIMM

Ms Angela Fury BA LLB MFIA

Ms Catherine Rienmueller MFIA

Ms Robyn Maher Ito Jun 20071

Ms Inara Bebris [from May 2007]

Ms Deborah McKay BHIthAdmin JP

Ms Roslyn Nickolls BA DipEd

Dr Liz Temple BA PhD DipEd

Dr Elizabeth Brown MBBS FRACP

Mr Gunawin BIS

Administration

Ms Cathy Foster

Ms Ursula Daniels

Mrs Karen Gobbe

Mrs Andrea Rilev

**PhD Candidates** 



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## Finance



## finance

#### Statement of Financial Performance for the Year Ended 30 June 2007

	02/03	03/04	04/05	05/06	06/07
Revenue	\$'000	\$'000	\$'000	\$'000	\$'000
Research Grants	1,678	4,147	3,828	4,592	5,213
Infrastructure	2,228	1,592	1,826	2,550	4,016
Donations and fundraising	1,262	211	1,000	1,298	1,579
Financial	246	219	313	403	770
Other	296	345	509	304	953
Total	5,710	6,514	7,476	9,147	12,531
Expenses					
Salaries and employee benefits	3,271	4,832	4,955	5,909	7,417
Depreciation and amortisation	430	478	467	454	534
Research supplies	401	43	94	286	757
Fundraising	405	7	176	151	203
Building	91	80	201	93	187
General operations	135	314	297	268	250
Other	453	615	714	968	968
Total	5,186	6,369	6,904	8,129	10,316
Operating Surplus	524	145	572	1,018	2,215

#### Statement of Financial Position as at 30 June 2007

	02/03	03/04	04/05	05/06	06/07
Balance Sheet	\$'000	\$'000	\$'000	\$'000	\$'000
Current Assets	5,096	5,163	6,938	11,081	44,696
Property, Plant & Equipment	7,220	6,945	6,552	6,703	7,315
Total Assets	12,316	12,108	13,490	17,784	52,011
Current Liabilities	1,351	885	1,655	4,831	36,729
Provisions	112	225	265	365	480
Total Liabilities	1,463	1,110	1,920	5,196	37,209
Retained Surplus	7,203	7,348	7,920	8,938	14,802
Reserves	3,650	3,650	3,650	3,650	0*
Total Net Funds	10,853	10,998	11,570	12,588	14,802

\* Reserves transferred to Retained Surplus

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 30 June 2007 and is included here for information purposes only. A full copy of the audited Financial Statements, including Notes to the Financial Statements and the Audit Opinions, can be obtained free of charge on request to the Finance Manager, Prince of Wales Medical Research Institute, Barker Street, Randwick NSW 2031.

	Rev	/enue
	41%	Competitive Research Grar
	32%	Infrastructure Support
-	13%	Donations & Fundraising
	6%	Financial
	8%	Other

nts

#### Expenses

73%	Salaries & Employee Benefit
5%	Depreciation & Amortisation
2%	Fundraising
7%	Research Supplies
2%	Building
<b>2</b> %	General Operations
9%	Other



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# 5000 ml Approximes

#### Funding

Research Grants The Institute attracts competitive external grant funding from a number of national and international organisations every year. Total peerreviewed funds for the 2007 calendar year were \$8.74M. The most significant funding body is the National Health and Medical Research Council. In 2007, NHMRC income was \$4.66M. While the NHMRC continues to be a major source of research funding, there has been a significant expansion in ARC funding as Institute researchers continue to actively seek research funds from other sources.

#### **NSW Medical Research Support**

Program The Institute has been successful in securing funding of \$4.41M for the 2006-2009 triennium from the NSW Medical Research Support Program. The Institute also received \$1.41M of infrastructure funding from UNSW in 2007.

#### research funding 2007

#### **Research Grants and Fellowships**

for January – December 2007 Summary information on competitive peer reviewed research grants, fellowships and scholarships, and other sources of external research grant income, applied for and awarded in 2006/07 for expenditure through the calendar year 2007:

#### National Health and Medical Research Council

Bilston LE, Senior Research Fellowship A (2004-2008), 2007 amount \$99,250

Bilston LE, Gandevia SC, McKenzie D, Novel neuromechanical measurements of the human upper airway in health and disease, NHMRC Project Grant (2007-2009), 2007 amount \$189,125

Brock J, Senior Research Fellowship B (2005-2009), 2007 amount \$103,500

Brock J, McLachlan E, Mechanisms underlying disordered skin blood flow following nerve injury, NHMRC Project Grant (2005-2007), 2007 amount \$134,000

Bryant R, Williams L, Schofield P, Raphael B, Richardson R, Dadds M, Centre for Clinical Research Excellence in Anxiety and Neuroscience, NHMRC Centre for Clinical Research Excellence (2007-2011), 2007 amount \$400,000

Butler J, Studies of motor control in health and disease, NHMRC RD Wright Fellowship (2004-2008), 2007 amount \$83,500 Butler J, McKenzie D, Gandevia S, Cortical, descending and reflex control of human inspiratory muscles, NHMRC Project Grant (2005-2007), 2007 amount \$104,625

Dickson P, Dunkley P, Double K, Differential regulation of human tyrosine hydroxylase isoforms and the development of Parkinson's disease, NHMRC Project Grant (2007-2009), administered by University of Newcastle, 2007 amount \$104,250, POWMRI 2007 Sub-contract amount \$3,000

**Double KL**, Senior Research Fellowship A (2006-2010), 2007 amount \$103,500

Double KL, Garner B, Halliday GM, Isoprenoids, neuromelanin and neuronal vulnerability in Parkinson's disease, NHMRC Project Grant (2006-2008), 2007 amount \$176,000

Fullerton J, The molecular basis of bipolar disorder, NHMRC Howard Florey Centenary Research Fellowship (2006-2007), 2007 amount \$62,812

Finch CF, Stevenson MR, Norton RN, Zye AB, Lord SR, Williamson AM, Cameron DI, Addressing injury in a population health framework – an integrated approach to prevention, acute care and prevention, NHMRC Capacity Building Grant in Population Health (2005-2009), 2007 sub-contract amount \$77,400

Gandevia S, Senior Principal Research Fellowship + SEO (2005-2009), 2007 amount \$156,500 Kiernan M, Pathophysiology of oxaliplatininduced nerve dysfunction and neuropathy, NHMRC Project Grant (2006-2008), 2007 amount \$83,750

Kwok J, Identification and characterisation of causative and modifier genes involved in variant forms of Alzheimer's disease, NHMRC RD Wright Career Development Award (2006-2007), 2007 amount \$87,250

Lin C, NHMRC CJ Martin Fellowship (2003-2007), 2007 amount \$50,438

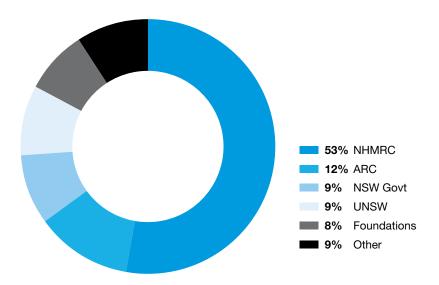
Little D, Bilston LE, Cowell C, Relationship of the anabolic and catabolic responses in healing a critical sized defect in rats, NHMRC Project Grant (2005-2007), 2007 amount \$113,345 administered by the University of Sydney

Lord SR, Extension of CODA Motion Analysis System, NHMRC Equipment Grant, 2007 amount \$28,197

Lord SR, NHMRC Senior Principal Research Fellowship (2007-2011), 2007 amount \$147,250

Lord SR, Close J, Identification and quantification of risk of falls in cognitively impaired older adults, NHMRC Dementia Research Grants Program Strategic Award (2007-2010), \$186,014

Lord SR, Close J, Fitzpatrick R, Understanding fear of falling and risk taking in older people, NHMRC Project grant (2006-2008), 2007 amount \$95,875



Gandevia SC, Taylor J, Novel assessments of the central and peripheral control of the human head, NHMRC Project Grant (2007-2009), 2007 amount \$117,125

Gandevia S, Proske U, Taylor JL, Fitzpatrick RC, Neural mechanisms underlying human proprioception, NHMRC Project Grant (2005-2007), 2007 amount \$156,000

Garner B, Cholesterol efflux, apolipoprotein-E and glycobiology, NHMRC RD Wright Career Development Award (2005-2009), 2007 amount \$87,250

Halliday GM, Principal Research Fellowship (2005-2009), 2007 amount \$125,250

Lord SR, Haran M, Cameron I, Ivers R, Simpson J, A randomised controlled falls prevention trial of long distance glasses in elderly multifocal wearers, NHMRC Project Grant (2005-2007), 2007 amount \$169,000

**Macefield VG**, Sympathetic control of cutaneous blood flow and blood pressure in human spinal cord injury, NHMRC Project grant (2006-2008), 2007 amount \$15,437.50

Macefield VG, Henderson L, The autonomic, somatic and central neural responses to deep and superficial pain in human subjects, NHMRC Project Grant (2005 -2007), 2007 amount \$123,250



McLachlan E, Delayed neuronal death after peripheral nerve and spinal cord injury, NHMRC Project Grant (2006-2008), 2007 amount \$149,250

McNulty P, Neurophysiological investigation of motor pathways in subjects with stroke, NHMRC Peter Doherty Fellowship (2004-2008), 2007 amount \$64,750

Murray G, Henderson L, Macefield V, Klineberg I, An fMRI analysis of the functional organization within the central nervous system of experimental superficial and deep orofacial pain (2007-2009), NHMRC Project Grant, administered University of Sydney, 2007 amount \$103,750, POWMRI sub-contract amount \$20,750

Paxinos G, Zeiss Stereo Discovery V12 + Axiocam HRc macro imaging system, NHMRC Equipment Grant, 2007 amount \$35,000

Paxinos G, NHMRC Senior Principal Research Fellow (2006-2010), 2007 amount \$141,500

Paxinos G, Watson C, A new map of the human cortex to assist the interpretation of fMRI and PET studies, NHMRC Project grant (2007-2009), 2007 amount \$83,750

**Purves-Tyson T**, The effect of estrogen on signaling mechanisms of the pelvic autonomic nervous system underlying bladder and erectile dysfunction in diabetes, NHMRC Peter Doherty Fellowship (2004-2008), 2007 amount \$66,000

Rae C, Coltheart M, McArthur G, The Rane and Spain routes in the brain: functional studies and remediation in dyslexia subtypes, NHMRC Project Grant (2006-2008), 2007 amount \$121,750

Sachdev P, Martin N, Ames D, Schofield P, Broe GA, Brodaty H, Trollor J, Wright M, Wen W, Halliday G, Lee T, Gene-environment interactions in healthy brain ageing and agerelated neurodegeneration, NHMRC/ARC Ageing Well, Ageing productively Program (2007-2011), 2007 amount \$400,000

Schofield PR, Blair I, The biological role of the cadherin gene FAT in bipolar disorder susceptibility, NHMRC Project Grant, (2006-2008), 2007 amount \$135,875

Schofield PR, Cavanaugh J, Forrest S, Hopper J, Genetic Repositories Australia, NHMRC Enabling Grant – Special Facilities (2006-2010), 2007 amount \$400,000 Schofield PR, Lewis T, Barry P, Clements J, Mechanisms of signal transduction and receptor activation in ligand gated ion channel receptors, NHMRC Project Grant, (2007-2009), 2007 amount \$183,250

Sherrington C, Cumming R, Lord S, Close J, Dean C, Vogler C, Minimising disability and falls in older people through a post-hospital individualized exercise program (2007-2009), administered University of Sydney, 2007 amount \$196,375, POWMRI sub-contract amount \$52,345

Taylor J, Mobile data acquisition system for general use, NHMRC Equipment Grant, 2007 amount \$16,000

Taylor J, Senior Research Fellowship A (2007-2011), 2007 amount \$107,500

Taylor J, Butler J, Corticospinal transmission in human subjects, NHMRC Project Grant (2007-2009), 2007 amount \$144,423

Taylor J, Butler J, Gandevia S, How changes in the motor cortex and spinal cord with exercise contribute to fatigue in humans, NHMRC Project Grant (2005-2007), 2007 amount \$102,000

#### **Australian Research Council**

Anstey K, Byles J, Harding A, Broe GA,

et al, Using health outcome data from pooled longitudinal studies of ageing to develop statistical and microsimulation models to determine how to best compress morbidity and optimize healthy and productive ageing, NHMRC/ARC Ageing Well Ageing Productively Research Program (2007-2011), administered by the Australian National University, 2007 POWMRI sub-contract amount \$13,000

Bilston LE, Finch CF, Hatfield J, Effectiveness and appropriateness of child restraints, Linkage Project Grant (2005-2007), 2007 amount \$120,000

Bilston LE, Gandevia S, Ehman RL, Development of new methods to measure in vivo properties of human body tissues, Discovery Project (2004-2007), 2007 amount \$150,000

Breakspear M, Morley J, Harris J, Sammut C, Goodhill G, Paxinos G, Lovell N, Knock S, Lagopoulos J, Malhi G, Macefield V, Optimizing autonomous system control with brain-like hierarchical control systems, Thinking Systems Grant (2006-2010), 2007 amount \$644,000, 2007 POWMRI component \$82,165 Broe GA, ARC research network in ageing well, Research Network Grant (2004-2008), 2007 amount \$10,000

Garner B, Jans DA, Nuclear trafficking of apolipoprotein-E, Discovery Project (2005-2007), 2007 amount \$105,000

Herbert R, Gandevia SC, Bilston LE, Passive mechanical properties of human muscles, ARC Discovery project (2007-2009), administered by the University of Sydney, 2007 POWMRI subcontract amount \$46,500

Hodges J, Long-term memory systems and the human brain, ARC Federation Fellowship (2007/08-2011/12), 2007 amount \$263,027

#### Kilpatrick T, Mastaglia F, Halliday GM,

Cowie TF, Rubio JP, Horne MK, Development of the PD GeneChip: a research and diagnostic tool for Parkinson's disease, ARC Linkage Project (2007-2009), Administered by University of Queensland

#### Mareels I, Egan G, McDonnell K, Rae C,

**Kotagiri R**, Data management technologies for the magnetic resonance imaging e-research grid, ARC Linkage Project Grant (2006-2009), 2007 amount \$58,000

Paxinos G, Watson C, Bilston LE, Puelles L, Rhombomeric topography of structure in the adult mouse: evidence from avian homologies and mouse gene expression, ARC Discovery Project (2006-2007), 2007 amount \$54,000

Schofield PR, Gordon E, Identification of genetic polymorphisms of synaptically expressed genes that contribute to variation in normal brain function, ARC Discovery Project (2007-2009), 2007 amount \$90,000

Schofield PR, Williams L, Development of integrated biological markers of brain function, ARC Linkage Project Grant (2005-2007), 2007 amount \$69,117

#### NSW Health Dept/Office for Science & Medical Research

**Double K**, New frontiers in basic and clinical research in Parkinson's disease and other synucleinopathies, 8-9th July, 2007, NSW Office for Science and Medical Research Conference and Event Support, 2007 amount \$1,800

Hodges J, Long-term memory systems and the human brain, Office for Science and Medical Research – NSW Life Sciences Award (2007/08-2011/12), 2007 amount \$100,000

Kiernan MC, Amyotrophic Lateral Sclerosis (ALS) symposium – International Brain Research Organization (IBRO) World Congress of Neuroscience, NSW Office for Science and Medical Research Conference and Event Support, 2007 amount \$1,520

Lord S, Close J, Tiedemann A, Sherrington C, Development and validation of a fall risk screening tool for use in the emergency departments, NSW Health, Injury Prevention and Policy Branch, Research Consultancy (2007-2009), 2007 amount \$28,465

Lord S, Close J, Tiedemann A, Sherrington C, Development and validation of a fall risk screening tool for use by ambulance officers, NSW Health, Injury Prevention and Policy Branch, Research Consultancy (2007-2009), 2007 amount \$28,105

Lord S, Close J, Tiedemann A, Sherrington C, Development and validation of a fall risk

screening tool for use by Aged care and Rehabilitation Services, NSW Health, Injury Prevention and Policy Branch, Research Consultancy (2007-2008), 2007 amount \$37,631

McLachlan E, Special Interest Forum, International Brain Research Organization (IBRO) World Congress of Neuroscience, NSW Office for Science and Medical Research Conference and Event Support, 2007 amount \$1,500

McLachlan E, Brock J, Kiernan M, Macefield V, Altered nerve and muscle excitability after spinal cord injury – challenges for functional recovery, NSW Office for Science and Medical Research Program Grant (2006-2010), 2007 amount \$375,000

Middleton J, Davis G, Gandevia S, Craig A, Nickolls P et al, Enhancing functional recovery and independence after spinal cord injury, NSW Office for Science and Medical Research Spinal Cord Injury & Other Neurological conditions Program Grant (2005-2008), administered by the University of Sydney, 2007 POWMRI sub-contract amount \$57,332

Paxinos G, The spinal cord of the rat and human: Atlases and 3D models, NSW Office for Science & Medical Research Spinal Cord Injury & Other Neurological Conditions Project Grant (2006-2007), 2007 amount \$100,000

#### **Other Funding Bodies**

Bilston LE, Finch CF, Hatfield J, Effectiveness and appropriateness of child restraints, Motor Accidents Authority industry partner contribution to ARC Linkage Project Grant (2005-2007), 2007 amount \$20,000

Bilston LE, Finch C, Hatfield J, Effectiveness and appropriateness of child restraints, Roads & Traffic Authority of NSW industry partner contribution to ARC Linkage Project Grant (2005-2007), 2007 amount \$33,000

Broe GA, Research network in ageing well, UNSW Faculty of Medicine contribution to ARC Research Network Grant (2004-2008), 2007 amount \$10,000

Butler J, Hudson A, Muscle fibre composition of the human intercostal muscles, UNSW Faculty Research Grant, 2007 amount \$39,200

**Chetcuti A, Schofield PR**, Characterisation of schizophrenia associated genes using a model of antipsychotic drug action, UNSW Early Career Researcher program, 2007 amount \$37,000

Dobson-Stone C, Genetics of variation in normal and attention-deficit hyperactivity disorder brain function, UNSW Vice-Chancellor's Postdoctoral Research Fellowship (2007-2009), 2007 amount \$73,060

Dobson-Stone C, Schofield PR, Genetic analysis of attention-deficit hyperactivity disorder 'signature' brain markers, UNSW Early Career Researcher program, 2007 amount \$40,000

**Double K**, New Frontiers in Basic and Clinical Research in Parkinson's disease and other Synucleinopathies – 8th and 9th July 2007, Movement Disorders Society (USA), 2007 amount US\$5,000

**Double K**, New frontiers in basic and clinical research in Parkinson's disease and other synucleinopathies, 8-9th July, 2007, International Society for Neurochemistry Support for Conferences, 2007 amount \$3,000 **Double K, Shepherd C**, To support Professor Hirsch's attendance at the 7th International Brain Research Organisation (IBRO) Conference in Melbourne 12-17 July 2007, Ian Potter Foundation Travel Conference Support, 2007 amount \$9,000

**Double K**, Synchrotron microprobe analysis and speciation of trace metals in neuromelanin in the healthy and Parkinsonian brain, DEST International Science Linkages Program French-Australian Science and Technology Program Round 4, 2007 amount \$15,600

**Double K, Hayes M, Ng I**, Peripheral isoprenoid changes in Parkinson's disease, Brain Foundation, 2007 amount \$15,000

Fitzpatrick R, Neurophysiology of human balance and posture in the young and elderly, UNSW Goldstar Award, 2007 amount \$40,000

Fitzpatrick R, Identifying central processes of postural control and effects of ageing and cognitive impairment, Anonymous, 2007 amount \$140.000

Foley P, UNSW Strategic Research Fellowship, 2007 amount \$63,750

**Foley P**, German neuroscience 1901-1945: Biological ideology and the brain, 2007 UNSW Goldstar Award, 2007 amount \$30,000

Fullerton J, Identification of variants causing altered expression of melatonin receptor in bipolar disorder, NARSAD 2007 Young Investigator Award,(2007/08-2008/09) 2007 amount \$15,000

Gandevia SC, Bilston L, Double K, Broe GA, McKenzie D, Rae C, Ultrasound machine for human research, UNSW Major Research Equipment Infrastructure Initiative, 2007 amount \$250,000

**Garner B**, Role of ABCA/G transporters in neuronal cholesterol regulation and Alzheimer's disease, UNSW Goldstar Award, 2007 amount \$40,000

Kwok J, Schofield PR, Loy C, The role of genetic contributors in the presentation of psychiatric symptoms in Alzheimer's disease, Australian Rotary Health Research Fund, 2007 amount \$27,000

Macefield VG, Sander M, Celermajer DS, Nitric oxide and sympathetic reflex control of blood pressure in health and hypertension, National Heart Foundation Grant-in-Aid (2006-2007), 2007 amount \$60,000

McNulty P, Changes in the properties of single sensory receptors in the skin with aging in humans, UNSW Faculty Research Grant, 2007 amount \$40,000

Paul R, Schofield PR, Neuromarkers of age-related cognitive decline, National Institutes of Neurological Disorders and Stroke, NIH, 2007 amount \$173,250

Paxinos G, An atlas of the human cerebral cortex, Ronald Geoffrey Arnott Foundation (2005-2007), 2007 amount \$10,000

Paxinos G, The spinal cord of the human and rat, Christopher Reeve Paralysis Foundation (2006-2007), 2007 amount US\$37,490 (AUD ~\$49,426)

Piguet O, Improvements to aid the early identification and diagnosis of frontotemporal dementia, Anonymous, 2007 amount \$100,000 Purves-Tyson T, Is neuritin regulation involved in steroid-induced regeneration of pelvic autonomic neurons, implications for diabetes-related erectile and bladder dysfunction?, UNSW Early Career Researcher program, 2007 amount \$39,000

Rae C, Career advancement fund for female academics returning from maternity leave, UNSW Career Advancement Fund, 2007 amount \$10,000

Rae C, Balcar V, Griffin J, Neurochemical and metabolic studies of the cortical GABA-ergic system, 2007 UNSW Goldstar Award, 2007 amount \$40,000

Russell P, Khachigian L, Crowe P, Rae C, Walsh W, Haber M, Lock R, Yang J-L, Tuch B, Rose M, Price W, Establishment of networking data base and animal support for live animal imaging, Cancer Institute NSW Infrastructure Grant, 2007 amount \$240,200, POWMRI sub-contract amount \$27,900

Sarks S, Cherepanoff S, McMenamin P,

Localisation and characterisation of human choroidal macrophage subpopulations in health and ageing: implications for age-related macular degeneration, Ophthalmic Research Institute of Australia, 2007 amount \$32,138

Schofield PR, Pilot study for a treatment for multiple sclerosis, Department of Health and Ageing Pilot Study, 2007 amount \$143,000

Schofield PR, Brooks W, An information support system for families with hereditary dementia – An Australia-wide program, JO & JR Wicking Trust, 2007 amount \$50,000

Schofield PR, Porter M, Kwok J, Dobson-Stone C, Investigating the molecular basis of intellectual disability through the correlation of cognitive and genetic heterogeneity of Williams' syndrome, Apex Foundation for Research into Intellectual Disability Ltd, 2007 amount \$14,000

**Shepherd C**, Targeting mediators of inflammation in Alzheimer's disease, Anonymous, 2007 amount \$100,000

Song C, Halliday GM, Investigating the severity of pathology in atypical Parkinsonian syndromes, GlaxoSmithKline Postgraduate Support Grant, 2007 amount \$15,000

**Song C**, UNSW Faculty of Medicine Travel Award, 2007 amount \$3,000

**Stoodley MA**, Does a deficient blood-spinal cord barrier contribute to post-traumatic syringomyelia, Neurosurgical Society of Australasia, Medtronic Sofamor Danek – Research Grant, 2007 amount \$30,000

Stoodley MA, Bilston LE, Studies of fluid flow in Chiari malformation and syringomyelia, C & S Patient Education Foundation, Conquer Chiari & Column of Hope Research Grant, 2007 amount US\$50.000

Stoodley MA, Fairhall J, Enhancement of intravascular thrombosis in cerebral arteriovenous malformations after radiosurgery, Neurosurgical Society of Australasia, Medtronic Sofamor Danek – Research Grant, 2007 amount \$30,000

Stoodley MA, Tu J, Does a deficient bloodspinal cord barrier contribute to post-traumatic syringomyelia? Brain Foundation Research grant, 2007 amount \$40,000

Taylor J, Neuromuscular performance in post-infective fatigue syndrome, The Mason Foundation Medical & Scientific Research Grant, 2007 amount \$63,213

#### **Scholarships**

Brooks D, Michael & Elizabeth Gilbert Postgraduate Scholarship in Parkinson's Disease Research, 2007 amount \$25,000

Butler A, Albert Chua Scholarship, 2007 amount \$19,000

Clarke E, Department of Education Science and Training, Australian Postgraduate Award (2004-2007), 2007 amount \$13,077

**Duma S**, NHMRC Public Health Postgraduate Scholarship, 2007 amount \$21,866

**Duncan C**, Department of Education Science and Training, Australian Postgraduate Award (2004-2007), 2007 amount \$19,616

Fairhall J, Royal Australasian College of Surgeons Scholarship (2006-2008), 2007 amount \$50,000

**Glaros E**, Department of Education Science and Training, Australian Postgraduate Award (2007–2009), 2007 amount \$19,616

Loy C, NHMRC Medical Postgraduate Scholarship (2005-2007), 2007 amount \$31,422

Luty A, Department of Education Science and Training, Australian Postgraduate Award 2004-2007), 2007 amount \$19,616

Luu B, Department of Education Science and Training, Australian Postgraduate Award (2005-2007), 2007 amount \$19,616 + UNSW Faculty of Medicine Rising Star Award

McAuley E, NHMRC Dora Lush (Biomedical) Postgraduate Scholarship (2005-2007), 2007 amount \$21,866

Murray N, NHMRC Postgraduate (Medical) Research Scholarship (2006-2007), 2007 amount \$31,422

**Park S**, Department of Education Science and Training, Australian Postgraduate Award (2007–2009), 2007 amount \$19,616

**Song C**, Department of Education Science and Training, Australian Postgraduate Award (2005-2007), 2007 amount \$19,616

**St George R**, Department of Education Science and Training, Australian Postgraduate Award (2004-2007), 2007 amount \$19,616

Vucic S, NHMRC Medical Postgraduate Scholarship, 2007 amount \$31,422

Warden L, Alzheimer's Australia Research Hunter Doctoral Research Scholarship into the Causes of Alzheimer's Disease (2006-2007), 2007 amount \$20,000

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Our health tomorrow depends on the discoveries from medical research today. It is difficult to envisage a cause more worthy of support than research which is designed to eliminate or alleviate human suffering. Please consider making a gift to the Institute, and become a part of something really important – the prevention and eventual cure of some of the world's major diseases and disabilities. While the challenges are daunting, solutions are attainable – with your help.

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A bequest For more information on how to include a bequest to the Prince of Wales Medical Research Institute in your Will, please call Bequest Manager, Leonie Harle on 02 9399 1125.

**Regular or a single donation** A regular donation every month, or even every year, is immensely valuable as it enables research teams to plan ahead with confidence. Every donation is sincerely appreciated.

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We appreciate all donations, small or large, and we greatly value our donors. Should you have any enquiries please do not hesitate to call Anne Graham on 02 9399 1077.

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#### raising funds, raising awareness

The Institute's fundraising strategy is to integrate many diverse activities which recruit new donors and increase our regular giving supporter base. All our fundraising is focused on promoting the work of our scientists and researchers and helps them achieve the results they strive for.

Institute scientists are highly successful in securing competitive research grants within Australia and overseas, but they still depend on financial support from government infrastructure grants, private donations and bequests.

Donations we receive are our most flexible source of funds as they allow us to seed promising new areas of endeavour through setting up laboratories and acquiring the latest equipment. This ensures new research can be conducted in the most productive environment possible. By attracting outstanding researchers to the Institute and supporting scholarships for a new generation of young researchers, we are ensuring Australia has preeminent scientific leaders in the future.

As a result of contributions and commitment from so many people throughout 2007, the Institute is well positioned to continue its growth into the future as it goes from strength to strength. We offer our sincere thanks for your belief in our ability to make a difference and improve the health and wellbeing of our community.

Use of donated funds All donations are used to support the Institute's medical research program. Donations are not directed towards administrative costs or fundraising activities.

Tax deductibility All donations over \$2 are tax-deductible and the Institute has endorsement as a deductible gift recipient (DGR).

Bequests – The Phyllis Luker Society The Phyllis Luker Society, comprising friends of the Institute, was established to honour all those who have taken the special step of including the Institute in their long-term plans through making a bequest in their Wills. The Society celebrates and promotes the tradition of generosity, connectedness and trust. If you would like to learn more about ways to include the Institute in your Will, please contact our Bequest Manager, Leonie Harle on 02 9399 1125.

Direct mail appeal program The Institute's direct mail program has been very successful resulting in a significant increase in the donor database and in donations supporting our research. We sincerely thank those families who generously allowed the Institute to tell their personal stories in our appeal letters.

ASX-Reuters Charity Foundation Through continued support from the ASX-Reuters Charity Foundation, the Institute has once again been able to employ a full time Clinical Studies Coordinator to assist scientists in recruiting, enrolling and managing research volunteers for a wide range of neurological studies.

Our researchers are sincerely grateful to the Foundation for their on-going financial assistance.

**Institute tours** Regular Institute tours continued through 2007 and we have been overwhelmed by the positive response to this initiative. Visitors gain first-hand knowledge of the workings of a medical research laboratory, our research and our governance through meeting senior scientists and Board members. These evenings have provided the opportunity for supporters to see how their financial support assists our scientists in their research areas.

Key events The Institute acknowledges the support of a core group of volunteers who work to make our annual Gala Dinner a success. We extend our sincere thanks to Mike Da Silva, Judi Hausmann, Robert Goldman, Leanne Hayward, Mardi Le Page, Sandra Constantine, Guy McEwan, Ian Brown, Verity Gibson, Robyn Kiddle, David Morgan and Alastair Keep.

Café de Paris Gala Dinner A French-themed evening, which raised funds for the Institute's Alzheimer's disease research program, was a feature on Sydney's 2007 events calendar. A high-kicking troupe of Can Can dancers from Brent Street Studios provided a big, brassy entrance for the 450 guests against a backdrop of the Paris skyline and Eiffel Tower. A six course French degustation menu, created by Sydney's award winning French chefs, gave guests an unforgettable dining experience. Sincere thanks to Simon Marnie, Sue Pieter's-Hawke, Rawson Graphics, Cairellie Showcraft, chefs Tony Bilson, Matt Kemp, Justin North, Darren Taylor and Mark Best, sponsors and generous guests.

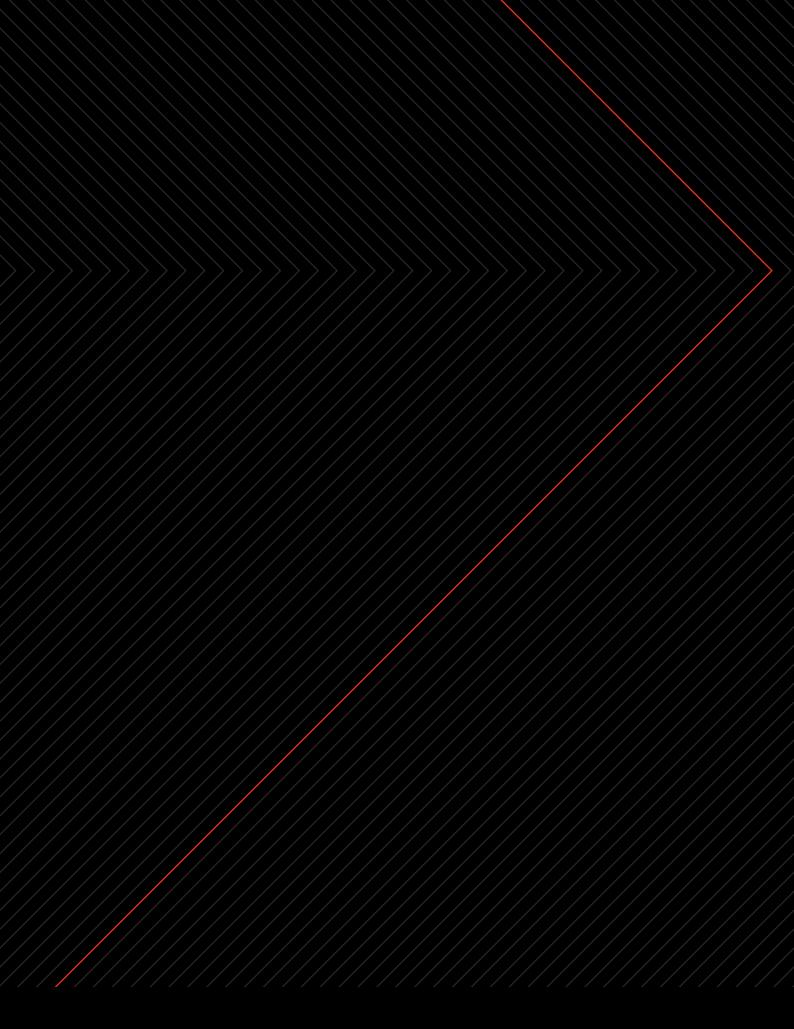
Bridge for Brain Research Challenge This unique event, created by the Institute's special events team in 2004, sees over 86 Clubs and 2,500 players throughout Australia playing their hands to raise funds for dementia research. Over \$100,000 has been raised to date. Special thanks this year to Valerie Cummings, Ron Klinger, the Australian Bridge Federation and major sponsors Captain Cook Cruises, The Bridge Shop, Nokia and Penguin Books Australia.

A Frosted Evening A Frosted Evening was held by Hospitality students at Hamilton, NSW TAFE with the proceeds going to neural injury research. The Institute thanks all students involved, especially Ursula Crichton who initiated the event in memory of her father and brother who were tragically lost through unexpected brain conditions.

Publications and media Publications such as our regular newsletter Brainworks and the Annual Report play an important part in the Institute's communication program and are produced to promote our strong research areas, educate the community on the latest research outcomes and keep our donors and potential donors informed.

Securing media coverage is also integral to the success of our communication program through providing a conduit to the public which often leads to surprising opportunities and funding. This year, researchers were featured in national television programs and news bulletins, radio, and major Australian and international print media. In particular, Professor Peter Schofield (Neurological Research Precinct, stem cell debate and therapeutic cloning), Professor George Paxinos and Professor Charles Watson (modern day explorers), Professor Cyndi Shannon Weickert (schizophrenia), Dr Kay Double (Parkinson's disease), Professor Tony Broe (video games and the elderly), Assoc Professor Lynne Bilston (child restraints) Professor Stephen Lord (falls in the elderly), Professor Caroline Rae (MRI), Professor John Hodges (Federation Fellowship) and Dr Brett Garner (cholesterol and Alzheimer's disease).

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