

Prince of Wales Medical Research Institute

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Prince of Wales Medical Research Institute
Annual Report
2000-2001

This Annual Report covers the scientific achievements of the Institute for the calendar year 2000, and lists all of its publications that appeared in that year. It gives details of research grants applied for and awarded in 2000 for expenditure through the year 2001. Financial information refers to the year ending 30 June 2001.

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This image is from a series called "Homunculus. Who's inside your brain?" by Heidi Cartwright, a research assistant at the Prince of Wales Medical Research Institute. The images are available for purchase through the Institute.

Finance

Financial Summary

Balance Sheet	1998 \$000	1999 \$000	2000 \$000	2001 \$000
Current Assets	4,363	4,948	2,571	3,641
Property, Plant & Equipment	2,027	2,657	6,280	6,294
Total Assets	6,390	7,605	8,851	9,935
Current Liabilities	22	77	143	177
Provisions	0	20	0	1
Total Liabilities	22	97	143	178
Retained Surplus	2,718	3,858	5,058	6,107
Reserves	3,650	3,650	3,650	3,650
Total Net Funds	6,368	7,508	8,708	9,757

Financial information was extracted from the Financial Statements of the Prince of Wales Medical Research Institute for the year ending 30 June 2001 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.

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Introduction



Premier Bob Carr and Associate Professor Glenda Halliday in the new PC2 laboratory at the Official Opening Stage II of the Prince of Wales Medical Research Institute

Location

The Institute is situated on the Randwick Hospitals' Campus in the eastern suburbs of Sydney, adjacent to the University of New South Wales main Kensington campus and its Faculty of Medicine.

Research Assistants

Ms Heidi Cartwright BSc
 Ms Peggy Chan BSc(Hons)
 Ms Kirsten Chapman BA BSc
 Ms Anurina Das MEpidemiol
 Ms Juliette Drobny MPsychol(Clin)
 Ms Francine Griffiths BSc(Med)
 Mr Robert Gorman BE
 Mr Adam Hamlin BSc(Hons)
 Mr Ping Hu BMed MM
 Mr Refik Kanjhan MSc
 Ms Cindy Lin MEngSc BE
 Ms Heather McCann DipHlthSci
 Ms Penelope McNulty BHMS(Hons)
 Mr Phillip Meyerkort BSc(Hons)
 Ms Bridget Munro BSc(Hons)
 Ms Susan Murray DipRGRT
 MGerontol
 Ms Lara Perryman BSc(Hons)
 Ms Svetlana Pianova MSc
 Mr Gavin Pinniger BSc(Hons)
 Ms Gabrielle Russell BSc(Hons)
 Mr Christopher Scarlett
 BSc(Hons)
 Ms Margaret Smith-White BSc
 Ms Rebecca St George BSc BA
 Ms Emma Thiel BAppSc
 GradDip(Epidemiol)
 Ms Anne Tiedemann BSc
 GradDipBiomedSci
 Ms Hongqin Wang MBBS (China)
 Ms Yewlan Wanigasekara-
 Mohotti BMedSc(Hons)
 Mr Daniel Wardman
 BMedSc(Hons)
 Ms Sophie Watson BSc
 Ms Meme Borzycki BA(Hons)
 [resigned]
 Ms Homei Liu BSc (China) [resigned]
 Ms Neillie Lucas BPsy(Hons)
 [resigned]

Honours students 2000

Mr Daniel Brooks BSc(Hons)
 Ms Emily Stimson BSc(Hons)

Honours students 2001

Ms Haley Bennet BSc(Hons)
 Ms Emma Schofield BSc(Hons)

Finance

Mr Andrew Dermott
 BEc CA, Company Secretary
 Mr Albert Chua BSc MCom

Information Technology and Operations

Ms John Hales BSc MBIomedE

Scientific Support

Ms Roslyn Nickolls BA DipEd
 Ms Mary Sweet

Administration

Ms Deborah McKay BHlthAdmin
 Ms Rosalie Dworjanyan
 BSc GradDiplnfoMgmt
 Ms Ursula Daniels
 Ms Jan Richardson
 Ms Rhonda du Bois [resigned]
 Ms Katherine Krilov
 BSc GradDipAsianSt [resigned]

Public Relations and Marketing

Ms Anne Graham RN
 Ms Anna Cunningham
 Ms Gailene Keen ATCL [resigned]
 Ms Arli Miller [resigned]

Technical, Field and Laboratory

Mr Bob Bryans
 Mr Hilary Carter
 Ms Peggy Chan BE
 Ms Kathleen Kimpton
 Ms Tamara Powell DipAppSc(BCT)
 Ms Amy Watling BSc
 Mr Lajos Weisz
 Mr Collin Yeo
 Mr Paul Lund
 DipAppSc(BCT) [resigned]

Our People

Institute Staff 2000 and 2001

Executive Director

Prof Ian McCloskey AO BSc(Med)
MBBS DPhil DSc FAA FTSE FRACP

Director, Clinical Research and Head, Neurology, Prince Henry/Prince of Wales Hospitals

Prof David Burke
AO MD DSc FAA FTSE FRACP

Chief Operating Officer

Dr George Mammen
PhD MBA BSc

NHMRC Senior Principal Research Fellows

Prof Simon Gandevia BSc(Med)
PhD MD DSc FAA FRACP
Prof Elspeth McLachlan DSc FAA
Prof Erica Potter BSc PhD DSc

NHMRC Principal Research Fellows

Professor George Paxinos
BA MA PhD DSc
Assoc Prof Glenda Halliday
BSc(Hons) PhD

NHMRC Senior Research Fellows

Dr James Brock BSc(Hons) DPhil
Dr Janet Keast BSc(Hons) PhD
Dr Vaughan Macefield
BSc(Hons) PhD

NHMRC Research Fellows

Dr Stephen Lord BSc MA PhD
Dr Janet Taylor MBIomedE MD

Head, Respiratory Medicine, PHH/POWH

Assoc Prof David McKenzie
MBBS BSc(Med) PhD FRACP

Neurosurgeon, PHH/POWH

Dr Marcus Stoodley
MBBS(Hons) PhD FRACS

Senior Research Officers

Dr Richard Fitzpatrick BSc(Hons)
MBBS PhD
Dr Antony Harding BSc(Hons) PhD
Dr Jasmine Henderson
BSc GradDipNutDiet PhD
Dr Yuri Koutcherov BSc(Hons) PhD
Dr Peter Nickolls
MBBS BSc BE(Elec) PhD
Dr Peregrine Osborne
BSc(Hons) PhD

NHMRC R Douglas Wright Research Fellows

Dr Kay Double BSc(Hons) PhD
Dr Paul Hodges
BPhy(Hons) PhD [resigned]

Postdoctoral Research Fellows

Dr Kaarin Anstey BA(Hons) PhD
Dr Jenny Harasty
MAppSc(SpPath) PhD
Dr Matthew Kiernan
MBBS(Hons) PhD FRACP

Honorary Visiting Fellows

Dr Nicolas Petersen MSc PhD
Dr David Collins MSc PhD
[returned to Canada]

(Senior) Research Associates

Prof Tony Broe
AM BA MBBS FRACP FACRM
Prof David Hirst
Zoology, University of Melbourne
Assoc Prof James Colebatch
Neurology, POWH

Assoc Prof John Morris
Neurology, Westmead Hospital

Assoc Prof Alessandro Zagami
Neurology, POWH

Dr William Brooks
CERA, Concord Hospital

Dr Nicholas Cordato

CERA, Concord Hospital

Dr Helen Creasey

CERA, Concord Hospital

Dr William Dunn

Uni of Nottingham, UK

Dr Sharon Kilbreath

Health Sciences, University of Sydney

Dr Murray Killingsworth SWAPS

Dr Jillian Kril CERA, Concord Hospital

Dr John Morley

Physiology & Pharmacology, UNSW

Dr Kathy Refshauge

Health Sciences, University of Sydney

Dr Dominic Rowe

Neurology, Royal North Shore Hospital

Dr John Sarks AM

POWMRI Electron Microscope Unit

Dr Shirley Sarks AM

POWMRI Electron Microscope Unit

Dr Jane Wilton MBBS(Hons 1)

Research Officers

Dr Hayley Bennett

BA(Hons) MA MSc PhD

Dr Melissa Broe BSc(Hons) PhD

Dr Jane Butler BSc(Hons) PhD

Dr Richard Carr BScApp DPhil

Dr Virginia MacDonald

BSc(Hons) PhD

Dr Olivier Piguet

BPsych MA(ClinNeuropsych) PhD

Dr Claire Shepherd BSc(Hons) PhD

Dr Julie Wright BSc(Hons)

ARCS PhD DIC [resigned]

Dr David Zhang BSc PhD [resigned]

Senior Hospital Scientist

Mr Christopher Brown
BAppSc [resigned]

History of the Institute

The Prince of Wales Medical Research Institute was formally established on the signing of a Letter of Agreement between the then-Eastern Sydney Area Health Service, the University of New South Wales, and the Institute's founding group of scientists, in December 1990. The Institute was officially opened on 8 November 1993 by the New South Wales and Commonwealth Health Ministers of the day (The Hon RL Phillips and Senator G Richardson). Research and development commenced under the auspices of the Institute that same year. POWMRI Limited was registered as a public company limited by guarantee under the Corporations Law of New South Wales on 4 August 1993.

The Institute was awarded a \$1.7million grant by the NSW Government in 1992, matching a capital works grant of \$1.7million by the Commonwealth Government in 1991, for conversion of ward units to research laboratories. Since those grants, the Institute has raised substantial additional funding for capital works through its own fundraising activities. Together with the NSW and Commonwealth capital grants, the funds raised have been sufficient to complete both Stage I and, more recently, Stage II works.

The Institute embarked upon the second stage of its Capital Works Program in early 1999. Building and refurbishment was completed in 2000, more than doubling the physical size of the Institute and housing state-of-the-art research laboratory and infrastructure facilities in one larger building formed by linking both sections. The front entry of the building overlooks the main entrance to the Randwick Hospitals' Campus on Barker Street, opposite the Newmarket Stables.

The Official Opening of the second stage of the Institute was held on 15 November 2000, officiated by The Honourable Bob Carr, Premier of New South Wales. The Institute's namesake, His Royal Highness, The Prince of Wales, delivered a congratulatory message via video, praising the Institute on its growth since inception in 1993 and its excellent scientific achievements. Guests at the opening, including the NSW Minister for Health, Craig Knowles, were able to visit many of the laboratories within the Institute, and scientists gave short presentations on current research being conducted within their area of research.

Some of the facilities incorporated in the new development include a Physical Containment Level Two (PC2) laboratory for work on human brain tissue and a Spinal Injuries Research Centre which has been set up with five new laboratories and associated office space dedicated to specific research in this area. All research work is conducted on the premises and includes work on nerve conduction, nerve degeneration and regeneration, neuropathology, and human autonomic and sensorimotor function. The Institute consults with the spinal injuries clinical centres at both Prince Henry and Royal North Shore Hospitals, and has support for collaborative joint programs that would draw together the clinical opportunities there with the research expertise at the Institute.

The Institute has grown rapidly to become Australia's largest single centre for research on the functions and disorders of the brain and nervous system. Its scientific recruits are highly qualified career researchers who usually bring their own salaries as components of peer reviewed research grants, creating an environment conducive to further recruitment and expansion.

The Institute conducts Australia's major research into human balance and coordination, including the major national program of research into the causes of falls in older people. The Institute houses the largest national (and one of the world's five or six largest) 'brain banks' where the invaluable resource of bequeathed brains of patients with a range of conditions under study are held, together with complete clinical records of the patients themselves. The Institute has an established record of leadership in the area of nerve injury, degeneration and regeneration, and the Spinal Injuries Research Centre will be developed further to cover all aspects of this devastating condition. Major and highly distinguished research programs are also in place on pain mechanisms, chronic pain, and on back pain in particular; on neurodegenerative disorders; on macular degeneration and blindness; and on neural regulation of autonomic function and breathing.

The Institute now stands at the brink of a new period of rapid growth and development as it occupies its greatly expanded facilities and draws upon and extends its proven scientific strengths. Its standing and achievements have placed important responsibilities upon it, and it now stands ready to meet those.

Governance and Directorship

The Institute is an independent non-profit company: ABN 94 050 110 346.

The Institute has a formal affiliation with the South Eastern Sydney Area Health Service and the University of New South Wales. The two organisations are represented equally on the Institute's Board of Directors.

The Board is also comprised of eminent community and business leaders. Its Chairman is Mr William Penfold AM, of WC Penfold Ltd.

The Executive Director of the Institute is Professor Ian McCloskey AO FAA FTSE FRACP. Professor McCloskey is an expert on human movement and balance, and cardiovascular regulation. His past appointments include: Chairman of the Medical Research Committee of the National Health and Medical Research Council; member of the Commonwealth Government's Coordination Committee on Science and Technology; member of the Council of the Australian

Academy of Science; and President of the Australian Neuroscience Society.

Funding Sources

NSW Health Infrastructure Grant

The Institute was the smallest of five large independent medical research institutes in New South Wales to receive an infrastructure grant of \$700,000 per annum under Stream 1 of the NSW Health Department R&D Research Infrastructure Program in the first triennium of the Program (1997-2000). In the second (current) triennium of the same program (2000-2003), there are now six large independent institutes recognised, and this Institute's growth has moved it to second position in the group, having been awarded \$1,390,400 million per annum. The increase in funds awarded provides considerable assistance towards the Institute's infrastructure needs.

Research Grants

The Institute attracts competitive external grant funding from

a number of national and international organisations every year, the most significant being the National Health and Medical Research Council. NHMRC funding to the Institute has increased steadily despite the competitiveness in acquiring such peer-reviewed research grants. In 2000, the Institute's total NHMRC grants income exceeded \$2.6million. In 2001, NHMRC grants income exceeds \$4million and represents a success rate of over 90 per cent against a national average of 25 per cent. This income includes a large NHMRC Program Grant for Experimental Neurology that was renewed for a further five years at an increased level of funding (\$1.01million in 2001). This program is the largest of those presently in the NHMRC system. The commitment of further funds by the NHMRC reflects its recognition of the quality of research accomplished in the first four years of the program.

While the NHMRC continues to be a major source of research funding, Institute researchers have also been active in seeking research funds from other sources, such as the

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Mr Ray Boyce
Mr WR Carpenter
Mr Ian Cartwright
Mrs E Castronini
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Mrs K Lenehan
Mr & Mrs A Lindsay
Ms Melanie Lindsay
Mr R Logan
Dr Christine Loo
Miss Dorothy Lord
Mrs Gladys MacCartie
Mr Greg Mackie
Mr B K Mak
Mr & Mrs Maple-Brown
Mrs P Marcellos
Mr Max Markson
Dr P Marley
Mr & Mrs K Mason
Ms Pye McCormack
Dr Colleen McCullough
Sir Ian McFarlane
Mr & Mrs C McLachlan
Prof E McLachlan
Mr William McNally
Mrs Barbara McNulty
Mrs Joyce Millen
Mr David Milman
Mrs Margaret Murray
Mr P Murray
Mrs E Noss
Mr Denis O'Neil
Mr R O'Neil
Ms J O'Neil
Mr J Park
Mr Tony Parker
Mr & Mrs Parsons
Mr Will Penfold
Mr Graham Pennefather
Mrs J Pennington
Mrs MJ Potter
Mr Robert Pratten
Mr Geoff Prenter
Mis Wilga Pruden
Mr A Ramsay
Mr Ian Rayner

Mr Norm Rich
Mrs Thea Riesel
Dr Harley Roberts
Mr & Mrs S Robertson
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Mr Ken Robson
Mrs B Rolston
Ms Jan Rose
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Mr Jeffery Shields
Mr David Shmith
Mrs Ivy Smart
Ms Beth Southwell
Ms P Symons
Mrs Janet Tate
Mr B Taylor
Ms Helen Taylor
Mr & Mrs D Thomas
Dr Neal Thomson
Mr Peter Tyree
Mr & Mrs David Uther
Mr R Utz
Dr M Vaghholkar
Mr Robin Versluis
Rev & Mrs Wade-Main
Mr Robert Wlaker
Mr John Walton
Mr & Mrs Webster
Dr E Wegman
Miss Norma Willis
Mr G White
Mr M Wrigley
Mr & Mrs D Yaffa
Mr & Mrs R Yuncken

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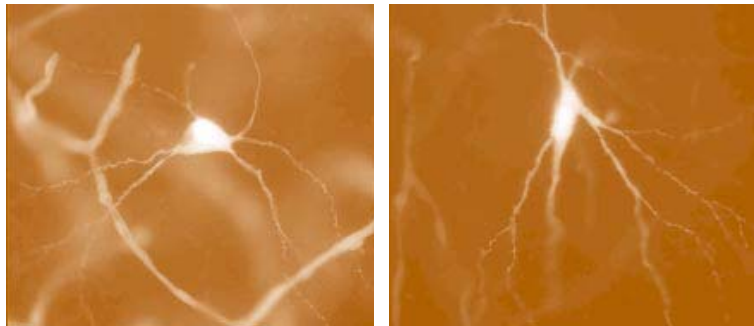
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Mr McCartie

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Estate of J A Gilder

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Identified brain cell taken from the work of an Institute scientist (Osborne)

Fundraising

Acknowledgements

Events

Prunier's Luncheon

The fourth annual Prunier's Luncheon was held in November and raised over \$40,000 for the Institute. Sincere thanks to the generous sponsorship of owner and chef, Michael Moore, master of ceremonies for the day, Channel Nine's Sharon Ghidella and 130 guests who enthusiastically purchased raffle tickets and auction items including a limited edition lithograph by Prince Charles who kindly donated this collector's piece.

Individual and Corporate Giving

Financial support for the Institute continued to grow from regular and new donors. We are indebted to the many corporations, organisations and individuals who have provided this invaluable financial support over the past year.

We also gratefully acknowledge the significant pro bono support provided from many corporations, in particular Hausmann Communications who conducted a highly successful media campaign around the Official Opening.

And thank you to the numerous companies and individuals who generously donated their services and products to ensure the success of all our events. Your support and assistance are invaluable.

Supporting our Research

The Prince of Wales Medical Research Institute is Australia's largest independent site for research on the functions and disorders of the brain and the nervous system. We obtain funding through government sources and successful grant applications. However, there are major costs that cannot be financed from these sources yet are vital expenditure if we are to remain at the leading edge of research internationally.

This is where we are heavily dependent upon generous support from individuals and companies who believe in what we are achieving in the research arena. Through their vital work, our scientists will continue to make a difference to the lives of so many. You can also make a significant difference by supporting the Institute financially and joining with us in an invaluable partnership.

Use of donated funds

All donations are used to support the Institute's research programs and also to assist with the purchase of equipment and laboratory supplies. Donations are not used for administrative purposes or to support our fundraising activities.

Special Purpose

We will be happy to respect a request that your donation be applied to a particular area of research or piece of equipment, or to establish a scholarship for outstanding young scientists to further their research within the Institute.

Donations

All donations over \$2 to the Prince of Wales Medical Research Institute are tax deductible.

Bequests

A bequest to the Prince of Wales Medical Research Institute is a lasting way to ensure that vital research programs will improve the lives of many individuals suffering devastating neurological disorders. A detailed booklet on how to make a bequest to the Institute is available by phoning our Fundraising Department on (02) 9382 2738.

Mailing address for donations

PO Box 82

ST PAULS NSW 2031

All cheques should be made payable to the Prince of Wales Medical Research Institute.

Australian Research Council, Commonwealth Department of Health and Aged Care, Wellcome Trust (UK), Australasian Spinal Research Trust, Australian Brain Foundation, Sylvia and Charles Viertel Charitable Foundation, National Stroke Foundation, Ramaciotti Foundations, and the Christopher Reeve Paralysis Foundation. Funding from non-NHMRC sources has become more diverse over the last few years. Such funds play a very important role in the Institute's work and are becoming vital in an increasingly competitive market for funds to support research.

Publications

The Institute continues to have a strong publications record, with a total of 63 fully refereed works published in 2000. This figure does not include the Institute's extensive record of conference proceedings and abstracts, nor does it include works "in press".

Fundraising

As a not-for-profit company, the Institute holds an "Authority to Fundraise for Charitable Purposes". The incorporated body POWMRI Limited supports the Prince of Wales Medical Research Institute through its Board Finance Group and various public relations and fundraising activities are conducted throughout the year.

The Board of the Institute and its staff recognise that the Institute's work must be supplemented by funding from sources other than those mentioned above for the Institute's work to proceed optimally.



Chairman of the Board, Mr William Penfold, received an AM for "service to the community, particularly through the Prince of Wales Medical Research Institute, the Royal Blind Society and Rotary International"

Recognition of Board Members and Staff

Mr William Penfold, Chairman of the Board, was honoured by the Australian Government in 2000 when he became a Member (AM) in the General Division of the Australia Day Honours List "for service to the community, particularly through the Prince of Wales Medical Research Institute, the Royal Blind Society and Rotary International, and through the reproduction and publication of historic cartographic works".

Professor Alan Pettigrew, former Director of the Institute and Deputy Vice-Chancellor (Academic Affairs) at the University of New South Wales is

congratulated on his appointment as the inaugural Chief Executive Officer of the National Health and Medical Research Council with effect from early 2001. Professor Pettigrew served on the POWMRI Limited Board on two occasions, first as a nominee of the NHMRC and, more recently, as a nominee of UNSW. With his outstanding record in health and medical research and extensive executive managerial experience, Professor Pettigrew is ideally placed to lead the NHMRC in new research directions.

Professor John Niland AC, Vice-Chancellor and President of the University of New South Wales has replaced Professor Pettigrew as the UNSW

nominee to the Institute's Board of Directors.

In 2000, Professor Elspeth McLachlan, a senior scientist at the Institute, continued her appointment with the Commonwealth Department of Health as Director of the Centre for Research Management of the National Health and Medical Research Council, while maintaining her research on the autonomic nervous system at the Institute.

There are currently four Fellows of the Australian Academy of Science on the Institute staff, more than any other medical research institute in the country: Professors Ian McCloskey, David Burke, Simon Gandevia and Elspeth McLachlan. Two of the Institute's staff are former Presidents of the Australian Neuroscience Society; three have been awarded the major national prizes recognising excellence in medical research (the Wellcome and Ramaciotti Awards); and two of the Institute's senior scientists have been made Officers in the Order of Australia (AO) for their services to neurological science. Also, members of the scientific staff occupy senior positions in national and international organisations concerned with nervous system function and dysfunction.

Commercialisation of Research

Further to its recognition as an Approved Research Institute by the Department of Human Services and Health, POWMRI is also a Registered Research Agency (RRA) under the Federal Government's RRA Program



Professor Simon Gandevia

(registration number 30945). The RRA Scheme is intended to facilitate R&D activity with other organisations, an increasingly important focus of the Institute's research directions.

Training and Education

Senior scientific staff of the Institute supervise postgraduate

students from various schools of the Faculty of Medicine, University of New South Wales. This Institute actively supports both staff and students representing the organisation at relevant national and international conferences and symposia.

Paralympian Liesl Tesch and Denis Todorovic are regular visitors to the Institute



Postgraduate Students 2000

STUDENT	DEGREE	PROJECT TITLE	SUPERVISORS
Postgraduate degrees conferred in 2000			
Dr Dominic Rowe	PhD	Immune inflammatory mechanisms in Parkinson's disease and experimental allergic nigral damage	G Halliday J Henderson
Jane Butler	PhD	Control of human inspiratory muscles	S Gandevia
Robert Herbert	PhD	Motoneurons, muscles and tendons: factors influencing muscle force production in humans	S Gandevia
Catherine Sherrington	PhD	The effects of exercise on physical ability following fall-related hip fracture	S Lord
Juliette Drobny	MPsychol	The relationship between vision and memory in older people	K Anstey

Students continuing studies for postgraduate degrees in 2000

Dr Solomon Ni	MD	The role of sensory input in human motor control	S Gandevia
Dr Cecilia Cappelen-Smith	PhD	Activity-dependent conduction block in demyelinating polyneuropathies	D Burke
Dr Robert Turner	PhD	Mechanisms by which anaesthetic drugs affect uterine smooth muscle function	E McLachlan
Melissa Broe	PhD	Molecular changes in Parkinson's disease	G Halliday
Robert Gorman	PhD	Neural control and mechanics of human respiratory muscles during increased ventilatory drive	S Gandevia
Todd Hardy	PhD	Analysis of factors controlling transmitter release from sympathetic nerves	J Brock
Rohan Humphrey	PhD	Pancreatic exocrine cells transdifferentiate to form multipotent cells	S Smith (Anatomy UNSW) / C Yeo
Cindy Lin	PhD	Differences in biophysical properties of cutaneous afferents innervating upper and lower limbs	D Burke
Virginia Macdonald	PhD	The neocortex in Huntington's disease: comparison with other neurodegenerative diseases	G Halliday
Penelope McNulty	PhD	Sensorimotor integration in control of the human hand	V Macefield
Hylton Menz	PhD	Determinants of walking in normal and patient groups	S Lord
Lorimer Moseley	PhD	The influence of psychological factors associated with pain on neural control of spinal stability	P Hodges
Margaret Smith-White	PhD	Role of neuropeptides in autonomic regulation of the cardiovascular system	E Potter
Daniel Wardman	PhD	Neural control of posture and locomotion	R Fitzpatrick
Amelia Howland	MPH	Cost and cost-effectiveness of a tailored falls prevention program	S Lord
Anne Tiedemann	MPH	Development of a validated falls risk assessment for use in general practice	S Lord

Education 2000

Seminars and Workshops

In addition to the following Institute Seminars, regular Seminars were also held throughout the year for Graduate Students.

16 February	RE Burke	How to walk and chew gum at the same time: spinal pattern generators and sensory control
1 March	V Macefield	The effect of skin mechanics on the firing properties of human cutaneous mechanoreceptors
	R Ritzpatrick S Lord	Weakness, proprioception and standing
5 April	R Carr	Noise: from ice ages to muscle receptors
	J Taylor	Direct and reflex muscle responses to transmastoid stimulation in human subjects
3 May	A Harding	What is responsible for the clinical features of dementia with Lewy bodies?
	P Osborne	5-HT7 receptors: a target of atypical antipsychotic drugs in limbic forebrain?
7 June	P McNulty	Does block of sensory input from the hand affect motor cortical output?
	C Lin	Accommodation to depolarizing and hyperpolarizing currents in cutaneous afferents of the human median and sural nerve
5 July	P Hodges	Breathing and moving
	J Keast	How do autonomic ganglion cells cope with losing their synaptic inputs?
6 September	N Petersen	Cortical control of human walking
	A Reynolds	Molecular mechanisms regulating the retrograde axonal transport of neurotrophins
4 October	E Lumbers	Development of the cardiac baroreflex and the role of the cardiac sympathetics in its implementation
1 November	J Brock	Effects of blocking noradrenaline uptake on sympathetic neuromuscular transmission in rat tail artery
	A-K Karlsson	Autonomic dysfunction in spinal cord injury
23 November	C Weiller	Learning, plasticity and recovery in the central nervous system
6 December	K Double	Diagnosing early dopaminergic cell death
	D Howells	Mechanisms of dopaminergic regeneration: sprouting and neurogenesis

Governance and Directorship



Mr William Penfold AM,
Premier Bob Carr and
Professor Ian McCloskey AO

Chairman's Message – Mr William Penfold AM

On November 15, 2000 the Board, our staff and our friends had reason to be distinctly proud of our association with the Prince of Wales Medical Research Institute when Premier Bob Carr performed the official opening of the extensive new facilities. It was an occasion to remember, in the company of many special guests, with a highlight being a congratulatory message on video from the Institute's namesake, His Royal Highness, The Prince of Wales.

Over the construction period, we watched with avid interest as the buildings took shape and we saw the nature of the Institute change with its increased profile. With the new extension to the Institute came significant growth, new opportunities and enhanced national and international recognition through the pursuit of eminent scientific inquiry, clinical application and education.

These myriad new facilities have created a large, modern research complex which provides a tangible base for the highly specialised laboratories in which our exceptional researchers can continue their current programs in neurological sciences and diseases, an area of strength in Australian medical research. We are now able to say that, with our remarkable growth since the original opening in 1993, the Institute has become Australia's largest and most successful centre for research on functions and disorders of the brain and the nervous system.

This centre of excellence, would not be possible without leadership and commitment and so I take this opportunity to congratulate our Executive Director, Professor Ian McCloskey, whose resolute contribution to the establishment of the Institute as we now know it has been instrumental in determining its place in the international scientific arena. He has provided a stimulating environment for his staff who respond with equal enthusiasm, creating a focus for fertile ideas which are realising groundbreaking results.

On behalf of the Board, I congratulate each and every staff member on the significant achievements they have accomplished over the last 12 months.

I also take this opportunity to thank the vast number of people who have personally supported the Institute during the year 2000. In particular, our wonderful Patron, Dr Colleen McCullough whose unquenchable enthusiasm for the work of the Institute is always so very much appreciated and my fellow Board members whose energy and expertise provide a springboard for innovative approaches in fundraising and promotion.

And, most importantly, the Institute gratefully acknowledges the generous financial support received from corporations, individuals, organisations, trusts and foundations and those who provided gifts in kind during the year. On behalf of the Board and staff, I express sincere appreciation for these donations, all of which have helped us to reach a new era in our quest to find so many answers.

We live within a community which expects its investment in medical research to be translated into better health care – and rightly so. Through your continued support, we will be able to develop further and meet our responsibilities to provide a better health environment for all Australians.



Patron

Dr Colleen McCullough

Members of the Board of Directors

Mr William Penfold, AM

- Chairman of the Board, POWMRI Limited, 1991 - present
- Chairman of the Board Finance Group, POWMRI Limited, 1991 - present



(University of New South Wales nominee to the Board)

Chairman of W C Penfold Limited and Director on a number of other Boards. Previously Vice President of Printing and Allied Trades Association, a Director of the Royal Blind Society, a Director of Chief Executive Organisation, USA and held other posts with business and community organisations.

Mr Donald Booth

- Director, POWMRI Limited, 1998 - present
- Member of the Board Finance Group, POWMRI Limited, 1998 - present



(Independent nominee to the Board)

Chairman and Managing Director of Fredk H Booth & Son Pty Ltd, Chairman and Managing Director of Helendon Holdings Pty Ltd, Chairman and Managing Director of Industrial Chrome Group Pty Ltd and previously held a number of executive posts within the wool industry.

Mr Paul Brassil, BEc LLB

- Director, POWMRI Limited, 1997 - present
- Member of the Board Finance Group, POWMRI Limited, 1997 - present



(Independent nominee to the Board)

Partner in the Tax Consulting Services Division of PricewaterhouseCoopers and a Fellow of the Taxation Institute of Australia specialising in advising local and international clients within the manufacturing, media, property and professional service industries on income tax, remuneration planning and FBT matters.

Professor Roger Dampney, BSc PhD DSc

- Director, POWMRI Limited, 1998 - present

(National Health & Medical Research Council nominee to the Board)

Head of the Department of Physiology 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 was previously a Member of NHMRC Regional Grants Interviewing Committees and Member of NHMRC Assigners' Panel.



Professor Bruce Dowton, MBBS MD FACMG FRACP

- Director, POWMRI Limited, 1998 - present

(University of New South Wales nominee to the Board)

Dean of the Faculty of Medicine at the University of New South Wales, he is an honours graduate in Medicine and Surgery from the University of Sydney and has trained as a paediatric geneticist in the USA where he directed the Division of Medical Genetics at Washington University and was Associate Vice Chancellor and Associate Dean for Medical Education.



Mr John Everett, BEc AASA

- Director, POWMRI Limited, 1993 - present
- Member of the Board Finance Group, POWMRI Limited, 1993 - present

(Independent nominee to the Board)

Chairman of Undercoverwear Lingerie and has previously held a number of honorary positions with community and business organisations.



Ms Deborah Green

- Director, POWMRI Limited, 1997 - present

(South Eastern Sydney Area Health Service nominee to the Board)

Chief Executive Officer of South Eastern Sydney Area Health Service, she is the current Vice President of the Australian Healthcare Association and holds an Honorary Appointment at the Faculty of Medicine, University of New South Wales.



Janet Keast

- NHMRC Project Grant Assessment, Discipline Panel for Cellular and Peripheral Neuroscience, 2000
- Grant assessment for the National Heart Foundation (Australia), 1999 – 2000
- Member of Executive Committee, International Society for Autonomic Neuroscience, 1999 –

Stephen Lord

- Member, Strategic Discussion Group, NSW Physical Activity Task Force to promote physical activity in NSW, 1997 – 2002
- Member, Osteoporosis Australia Medical and Scientific Committee
- Member and Scientific Advisor, New South Wales Falls Prevention Network

Vaughan Macefield

- NSW State Representative for the Australian Neuroscience Society and on the organising committee for the Australian Neuroscience Society Annual Meeting to be held in Sydney, Australia in 2002

Antony Harding

- Member, National Board, Transplant Australia
- Member, Organising Committee for the 2000 National Transplant Games
- Vice-President, Liver Support Group Inc

Jasmine Henderson

- Member, Parkinson's Australia, 1997 –
- Member, International Basal Ganglia Society, 1998 –
- Member, Australian Society for Medical Research, 1998 –
- Member, Sydney Movement Disorders Society, 1997 –
- Member, Australian Society for Neuroscience, 1998 –
- Regular invited speaker to community groups on behalf of Parkinson's Australia

Shirley Sarks

- Director, Gerontology Foundation of Australia

Editorships

Ian McCloskey

- *Clinical and Experimental Pharmacology and Physiology*
- *Experimental Physiology*

David Burke

- *Muscle and Nerve* (Associate Editor)
- *Clinical Neurophysiology* (Executive Board Member)
- *Journal of Clinical Neuroscience*
- *Contemporary Neurology*

Simon Gandevia

- *Journal of Physiology*
- *Acta Physiologica Scandinavica*
- *Journal of Applied Physiology*
- *Clinical and Experimental Pharmacology and Physiology*
- *Australian Journal of Physiotherapy*

Elspeth McLachlan

- *Clinical and Experimental Pharmacology and Physiology*
- *Journal of the Autonomic Nervous System*

Erica Potter

- *Asia Pacific Journal of Pharmacology*

George Paxinos

- *NeuroImage*
- *Neuroscience and Biobehavioural Reviews*

Glenda Halliday

- *Neuroscience Letters*

Paul Hodges

- *Physiotherapy Research International* (Associate Editor)

Service to the Scientific Community

Professional service to the scientific community and related organisations:

Ian McCloskey

- Member, National Committee for Medicine, Australian Academy of Science, 1997 – 2000
- Member, Prince Henry/Prince of Wales Hospitals Research Committee, 1998 –

David Burke

- Clinical Program Director, Institute of Neurological Sciences, The Prince Henry and Prince of Wales Hospitals, 1998 –
- Director, Brain Foundation (NSW)
- Co-Chairman, Division of Medicine, The Prince Henry and Prince of Wales Hospitals, 1998 –
- Member, Scientific Advisory Panel, Australasian Spinal Research Trust, 1995 –
- Member, Scientific Advisory Committee, Madeline Foundation for Neurosurgical Research, 1999 –
- Member-at-Large, Executive Committee, International Federation of Clinical Neurophysiology (Region 2 representing North and South America, Japan and Australasia), 1997 – 2001
- Member, Executive Committee, Motor Neurone Disease Research Institute Inc, 1995 –
- Medical Advisor, Motor Neurone Disease Association of NSW, 1993 –
- Chairman, Medical Advisory Panel, Motor Neurone Disease Association of NSW, 1999 –
- Member, Commission on Somatosensory Function & Pain, International Union of Physiologists
- Council Member, Australian Association of Neurologists, 2000 –

Simon Gandeiva

- Chair, Commission on Exercise & Work Physiology for the International Union of Physiological Sciences
- Member, Research Fellowships Committee of the NHMRC, 1997 – 2000
- Member of Advisory Committee, Biennial Conference on Muscle and Nerve Function in Health and Disease, University of Sydney
- Member, Commission on Respiratory Physiology for the International Union of Physiological Sciences

Elsbeth McLachlan

- Member, Nuffield Foundation Medical Fellowship Committee, 1999 –
- Chair, IBRO Asian Pacific Regional Committee, 1999 – 2001
- Chair, Committee to Review John Curtin School of Medical Research, 2000
- Member, IBRO Executive, 2000 –
- Member of Council, Australian Academy of Science, 1998 – 2002
- Member, National Committee for Physiology, Australian Academy of Science, 1998 – 2002
- Member, Ad Hoc IBRO Committee on the By-Laws, 1998 – 2000
- Member, Scientific Advisory Board, John Curtin School of Medical Research, 1996 – 2001

Erica Potter

- Member, NHMRC Program Committee, 2001

Glenda Halliday

- Deputy Chair, NHMRC Project Grant Assessment Sensorimotor Discipline Panel, 2000
- Member, 2000 Biomedical Research Assessing Committee for the Health Research Council of New Zealand
- Member, Scientific Advisory Board, Victorian Movement Disorders Collaborative Research Group, 1998 – 2001
- Member, 2000 – 2002 Local Organising Committee for the 2002 Annual Meeting of the Australian Neuroscience Society
- Member, Research Committee, Faculty of Medicine, University of New South Wales, 1999 – 2001
- Member, 2000 – 2001 Management Council, Parkinson's NSW Inc
- Executive Director, Brain Bank, POWMRI and Parkinson's NSW Inc, 1995 – 2001

James Brock

- Treasurer, Australia and New Zealand Microcirculation Society
- Member of Organising Committee, 7th World Congress of Microcirculation

Dr Don Grimes, AO MBBS HonFAPPHM FRACMA

- Director, POWMRI Limited, 1996 - present
- (South Eastern Sydney Area Health Service nominee to the Board)



Chairman of the Board of South Eastern Sydney Area Health Service, Chair of AusHealth International and Director of Australian Institute of Political Science, he previously held several government ministerial positions.

Professor Ian McCloskey, AO BSc(Med) MBBS DPhil DSc FAA FTSE FRACP

- Executive Director, POWMRI Limited, 1994 - present
- Member of the Board Finance Group, POWMRI Limited, 1994 - present



Foundation Director of the Prince of Wales Medical Research Institute, is currently Conjoint Professor of the School of Physiology and Pharmacology at the University of New South Wales and a member of several committees and advisory councils.

Mrs Andrée Milman

- Director, POWMRI Limited, 1993 - present
- Member of the Board Finance Group, POWMRI Limited, 1993 - present



(Independent nominee to the Board)

A Consultant with MIA Pty Limited, her previous appointments include executive positions and directorships of several major corporations in Australia, Europe and USA where she received a number of awards for her business acumen.

Professor John Niland, AC MCom PhD FASSA

- Director, POWMRI Limited, 2000 - present



(University of New South Wales nominee to the Board)

Vice-Chancellor and President of the University of New South Wales, he previously held the Chair in Industrial Relations and has served periods as Head of the School of Economics, Head of the School of Industrial Relations, and Dean of the Faculty of Commerce and Economics. He has also held extensive positions in corporate, government and community arenas.

Mr David Thomas

- Director, POWMRI Limited, 1997 - present
- Member of the Board Finance Group, POWMRI Limited, 1997 - present



(Independent nominee to the Board)

Licensee and Proprietor in the hotel and hospitality industry, a member of Royal Sydney Yacht Squadron and Dual Holdings, Cassilis NSW.

Mr John Walton, AM MBA BEc CPA FAIM

- Director, POWMRI Limited, 1991 - present
- Member of the Board Finance Group, POWMRI Limited, 1991 - present



(South Eastern Sydney Area Health Service nominee to the Board)

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, Lassiters Holdings, and Sydney Children's Hospital Foundation. He has also served as Chairman of a number of corporate and community boards, including the Eastern Sydney Area Health Service, Waltons Limited and the Australian Retailers Association.

Scientific Advisory Committee

Professor James Lance, AO CBE MD HonDSc FRACP FRCP FAA

- Professor Emeritus, University of New South Wales
- Former Head of Neurology, Prince Henry/ Prince of Wales Hospitals

Professor James McLeod, AO BSc(Med) MBBS DPhil DSc HonDU FRACP FRCP FAA FTSE

- Professor Emeritus, University of Sydney

Professor Stephen Redman, ME PhD DSc FAA

- Head, Division of Neuroscience, John Curtin School of Medical Research

Professor Mark Rowe, BPharm MSc PhD DSc

- School of Physiology and Pharmacology, University of New South Wales

Our Science

Executive Director's Report

The official opening of the Stage II building works of the Institute by Premier Bob Carr in November last year saw the commencement of a new period of rapid growth of the Institute's research. The expanded laboratory space available made it possible for us to recruit outstanding new researchers to our cause and immediately there was a large increase in the income derived from competitively earned research grants from external agencies.

Scientia Professor George Paxinos, author of a number of brain "atlases" that are the most-cited works in the world's neuroscientific literature, joined the Institute from the University of New South Wales, where he had been Professor of Psychology for many years. Professor Paxinos' work in mapping the human brain will add strength to the Institute's research in nervous system morphology, and will itself gain greatly from its association with our brain tissue collection (the 'brain bank').

Dr Marcus Stoodley, a neurosurgeon specialising in cerebrovascular disorders, has also established laboratories in the Institute. Dr Stoodley's research focuses on post-traumatic syringomyelia, an unfortunate sequel of spinal cord injury that can cause increasing deficits through the formation of fluid-filled cysts in the spinal cord years after the original injury. Another area of the research he conducts with his team is on cerebral arteriovenous malformations. This research uses molecular

techniques for targeting these lesions that are frequently very difficult to manage operatively.

Dr Janet Keast, an expert in autonomic neuroscience and the control of urogenital function, joined the Institute from the University of Queensland. Her research on nerve injury and neurotrophic factors builds an important link between the fundamental research on autonomic nervous system function already being carried out in the Institute, and the Institute's rapidly growing body of research on spinal cord injury. She also has a research program investigating the role that steroids (androgens and oestrogens) play in maintaining or altering the function of some parts of the nervous system.

Dr Peregrine Osborne also joined the Institute from the University of Queensland and is a neuropharmacologist. He brings into to the Institute work expertise in recording from single brain cells and investigating how their activity can be changed by drugs. He is currently studying how addictive drugs cause long term changes in brain function and is working to identify cellular targets of antipsychotic drugs used to treat schizophrenia.

Professor Tony Broe, formerly of the University of Sydney and the Repatriation General Hospital at Concord, moved in mid-1999 to the University of New South Wales where he is now Professor of Geriatric Medicine, and to the South Eastern Sydney Area Health Service where he is Director of Community Health and Aged Care. He has also commenced research in the Institute on changes in the function of the



Professor Ian McCloskey AO

brain with ageing. His work in this area adds new dimensions to the work of Associate Professor Glenda Halliday and her associates on neurodegenerative brain disorders.

These notable additions to the expanding Institute, together with the growth and development of our existing work, augur well for the future.

McNulty PA, Macefield VG	Ruffini endings in the nail bed: roles in motor control?	20th Annual Meeting of Australian Neuroscience Society	Melbourne 30 Jan – 2 Feb 2000
Ni S, Collins DF, Gandevia SC	Matching muscle forces	20th Annual Meeting of Australian Neuroscience Society	Melbourne 30 Jan – 2 Feb 2000
Sarks SH	Drusen: Types, natural history, histological correlation, risk of new vessels, whom not to laser	Royal Australasian College of Ophthalmologists, NSW Branch	Leura 31 Mar – 1 Apr 2000
Sarks SH, Sarks JP, Arnold JA, Greaves A	Clinicopathology of adult foveomacular vitelliform degeneration	Oceania Retinal Association	Tasmania 15 – 18 June 2000
Sarks SH, Sarks JP, Arnold JA, Greaves A	Clinicopathological observations related to pathogenesis of vitelliform macular lesions	32nd Annual Congress of Royal Australasian College of Ophthalmology	Sydney 19 – 23 Nov 2000
Shepherd C, Thiel E, McCann H, Halliday GM	Increased cortical expression of non-phosphorylated and phosphorylated neurofilament protein in Alzheimer's disease	20th Annual Meeting of Australian Neuroscience Society	Melbourne 30 Jan – 2 Feb 2000
Taylor JL, Butler JE, Gandevia SC	Magnetic stimulation of the descending tracts in human subjects	20th Annual Meeting of Australian Neuroscience Society	Melbourne 30 Jan – 2 Feb 2000
Wardman DL, Taylor JL, Fitzpatrick RC	The effect of galvanic vestibular stimulation and standing on the perception of the visual vertical	20th Annual Meeting of Australian Neuroscience Society	Melbourne 30 Jan – 2 Feb 2000
Wardman DL, Taylor JL, Fitzpatrick RC	The effect of galvanic vestibular stimulation and standing on the perception of the visual vertical	20th Annual Meeting of Australian Neuroscience Society	Melbourne 30 Jan – 2 Feb 2000
Wright JR, McCloskey DI, Fitzpatrick RC	Effects of systemic arterial blood pressure on the contraction of a human hand muscle	20th Annual Meeting of Australian Neuroscience Society	Melbourne 30 Jan – 2 Feb 2000
Wright JR, McCloskey DI, Fitzpatrick RC	The detection of simultaneous joint rotations in humans	20th Annual Meeting of Australian Neuroscience Society	Melbourne 30 Jan – 2 Feb 2000

Henderson JM, Pell M, O'Sullivan D, Halliday GM	Electrical stimulation of the thalamic centromedian and parafascicular nuclei in a Parkinsonian patient	20th Annual Meeting of Australian Neuroscience Society	Melbourne 30 Jan – 2 Feb 2000
Hendersen JM, Pell M, O'Sullivan D, Halliday GM	The caudal intramar nuclei: a surgical target in the treatment of Parkinson's disease?	50th Annual Meeting of the Australian Association of Neurologists	Melbourne May 2000
Lin CS-Y, Mogyoros I, Kuwabara S, Cappelen-Smith C, Burke D	Differences in behaviour of cutaneous afferents in the median and sural nerves during and following release of ischaemia	2000 Golden Jubilee Annual Scientific Meeting, Australian Association of Neurologists	Melbourne 15 – 19 May 2000
Lord SR	An exercise program for preventing falls in retirement village dwellers	Falls Research Symposium, 4th National Injury Prevention Conference	Canberra Nov 2000
Lopez de-Armentia M, Stebbing MJ, McLachlan EM	Effects of potassium and calcium channel blockers on the action potentials of dorsal root ganglion neurons after axotomy	20th Annual Meeting of Australian Neuroscience Society	Melbourne 30 Jan – 2 Feb 2000
Luff SE, Young SE, McLachlan EM	Sympathetic innervation of mesenteric arteries of adult SHR rats differs from that of WKY rats only in density	20th Annual Meeting of Australian Neuroscience Society	Melbourne 30 Jan – 2 Feb 2000
Macefield VG, Elam M	Sympathetic modulation of human cutaneous mechanoreceptors	20th Annual Meeting of Australian Neuroscience Society	Melbourne 30 Jan – 2 Feb 2000
Martínez-Pinna J, McLachlan EM, Gallego R	Sources of calcium for activation of chloride and potassium channels involved in after potentials in mouse sympathetic neurones	20th Annual Meeting of Australian Neuroscience Society	Melbourne 30 Jan – 2 Feb 2000
McLachlan EM	Sympathetic involvement in pain after nerve injury, Plenary Lecture	Australian Pain Society	Melbourne March 2000

Scientific Reports

An overview of selected research programs is provided below together with some of the scientific highlights.

Neurobiology (Brock laboratory)

Control of neurotransmitter release

In work published as a Special Report in the *British Journal of Pharmacology*, we have been able for the first time to monitor, in intact tissues, the packeted release of noradrenaline from sympathetic nerves. This work uses a combination of electrochemical and electrophysiological techniques and demonstrates that neurotransmitter is released from at least two different nerve terminal stores. In separate studies reported in *Naunyn-Schmiedeberg's Archive of Pharmacology*, we have studied the actions of the intracellular signalling molecule, adenosine 3',5'-cyclic monophosphate, on neurotransmitter release from sympathetic nerves. The results

suggest that this agent increases neurotransmitter release through a novel intracellular pathway that does not involve regulation of protein kinases.

Axonal excitability (Burke laboratory)

Our studies have defined differences in excitability of nerve fibres innervating skin and muscle in the upper and lower limbs, how the excitability of nerve fibres changes during activity, and whether this can impair nerve conduction, in papers published in the *Journal of Physiology, Brain, and Muscle and Nerve*. These findings help explain the apparent vulnerability of different nerve fibres in peripheral nerve diseases. A particularly important finding, relevant to multiple sclerosis, was that natural activity can cause

conduction failure in demyelinated axons, a study published in *Annals of Neurology*. This finding helps explain why a patient's disability can fluctuate without evidence of a change in disease pathology.

Brain pigment and Parkinson's disease (Double laboratory)

This year we have completed our comparative study of the chemical structure of human neuromelanin compared with synthetic dopamine melanin. This pigment is thought to be involved in the aetiology of Parkinson's disease. Our work, published in *Journal of Neurochemistry*, demonstrated significant differences between the endogenous and the synthetic melanin pigment. For example, native pigment contains a protein component which is lacking in the synthetic melanin. This is significant as the majority of studies in this area have used the synthetic melanin as a model of the endogenous pigment. Our results suggest that the synthetic melanin models the native pigment poorly and thus questions the validity of data obtained using the synthetic melanin. In addition, we have continued our work examining the possible causes of Parkinson's disease. In contrast to previously published work, we found that a chemical used in the plastics industry which has been linked to an increased incidence of Parkinson's disease in exposed individuals does not induce significant dopamine cell death and thus is unlikely to be linked to the aetiology of this disorder.



Professor Elspeth McLachlan and Dr James Brock



Associate Professor Glenda Halliday and Dr Kay Double preparing to section a brain

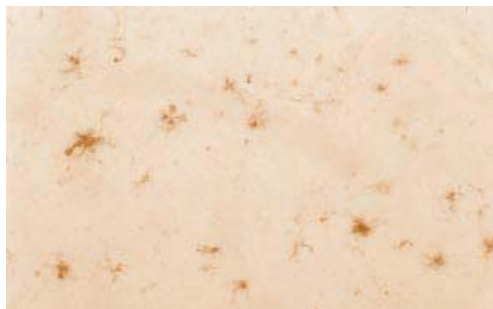
Human sensation and motor control
(Gandevia laboratory)

During the year, we published further reports of how the human diaphragm performs not only during breathing but also during movements made by the limbs. The diaphragm contracts, beginning just prior to movement of the limbs. This contributes to elevate pressure in the abdomen and probably to increase the stability of the spine. We have also been investigating the mechanisms underlying the sensation of movements of joints. We have used simple techniques to show that messages from receptors in the skin of the hand can contribute to the sensation of movement of finger joints. Previously, the role of skin receptors was considered to be relatively minor. This work has been published in the *Journal of Physiology*.

Brain inflammation and dementia
(Halliday laboratory)

We, and others, have found that people who take anti-inflammatory drugs are less likely to have dementia, and if they do have dementia, their

symptoms are often milder compared to those not on anti-inflammatory drugs. The cellular mechanism/s underlying this observation are not understood, and until we know the mechanism/s, more successful treatments will not be able to be developed. A review of the literature suggested that the drugs act directly on the brain to stop the pathology. Our first study analysed pathology in the brains of patients in whom we knew 1) whether they had taken anti-inflammatory drugs and 2) if the drugs were helpful to their dementia. We could not find any difference in the brain pathology or inflammation levels (see figure below), despite the fact that people taking the drugs had less/milder symptoms of dementia. Analysing different types of dementia, brain inflammation was only found in Alzheimer's disease. Our final study analysed the drug doses required for the effect on dementia symptoms and found that the effective doses are too low to act on brain inflammation, but are more likely to affect the blood vessels.



Visualising inflammatory brain cells in patients with Alzheimer's disease (Halliday)

Double KL, Riederer P, Gerlach M	Structural characteristics of human substantia nigra neuromelanin	20th Annual Meeting of Australian Neuroscience Society	Melbourne 30 Jan – 2 Feb 2000
Elam M, McKenzie DK, Macefield VG	The firing pattern of single muscle vasoconstrictor neurones in awake patients with the obstructive sleep apnoea syndrome	20th Annual Meeting of Australian Neuroscience Society	Melbourne 30 Jan – 2 Feb 2000
Gandevia SC, Butler JE, Taylor JL	Effect of voluntary contraction on human motoneurons	20th Annual Meeting of Australian Neuroscience Society	Melbourne 30 Jan – 2 Feb, 2000
Halliday GM,	A review of the neuropathology of schizophrenia	20th Annual Meeting of Australian Neuroscience Society	Melbourne 30 Jan – 2 Feb 2000
Halliday GM (invited speaker), Harding AJ, Broe GA	Do abnormalities in different cortical regions contribute to the clinical features of cases with Lewy bodies?	50th Annual Meeting of the Australian Association of Neurologists	Melbourne May 2000
Harding AJ, Halliday GM	Density of cortical Lewy bodies relating to dementia	20th Annual Meeting of Australian Neuroscience Society	Melbourne 30 Jan – 2 Feb 2000
Harding AJ, Halliday GM	The diagnosis of dementia in Lewy body diseases	50th Annual Meeting of the Australian Association of Neurologists	Melbourne May 2000
Hardy TA, Brock JA	Effects of caffeine at sympathetic neuroeffector junctions in the guinea-pig vas deferens	20th Annual Meeting of Australian Neuroscience Society	Melbourne 30 Jan – 2 Feb 2000
Harker K, Reed VA, Harasty JA	Aspects of school children's written information reports in three grades	2000 Speech Pathology Australia National Conference	Adelaide 8 – 12 May 2000
Hendersen JM, Carpenter K, Cartwright HR, Halliday GM	Loss of thalamic regulation of the basal ganglia in Parkinson's disease	50th Annual Meeting of the Australian Association of Neurologists	Melbourne May 2000

National Conference Presentations 2000

AUTHORS	TITLE	NAME OF CONFERENCE	PLACE & DATE OF CONFERENCE
Anstey KJ, MA, Schreiber S	Underestimation of cognitive decline in longitudinal aging studies due to missing data	Australasian Society for Psychiatric Research	Adelaide 7 – 8 Dec 2000
Brock JA, Dunn WR	Quantal release of noradrenaline from sympathetic nerve terminals	20th Annual Meeting of Australian Neuroscience Society	Melbourne 30 Jan – 2 Feb 2000
Broe M, Shepherd C, Milward EA, Halliday GM	Morphological features of DNA fragmentation in Alzheimer's disease and Lewy body disease	20th Annual Meeting of Australian Neuroscience Society	Melbourne 30 Jan – 2 Feb 2000
Burke D	Motor neurone disease, Invited Presentation	2000 Golden Jubilee Annual Scientific Meeting, Australian Association of Neurologists	Melbourne 15 – 19 May 2000
Cappelen-Smith C, Kuwabara S, Lin CS-Y, Mogyoros I, Burke D	Activity-dependent conduction block in chronic demyelinating polyneuropathy	2000 Golden Jubilee Annual Scientific Meeting, Australian Association of Neurologists	Melbourne 15 – 19 May 2000
Collins DF, Refshauge K, Gandevia SC	Localised stimulation of the dorsal and ventral skin of the hand focusses vibratory-evoked illusions of finger movement in humans	20th Annual Meeting of Australian Neuroscience Society	Melbourne 30 Jan – 2 Feb 2000
Cowell SF, Code C, Harasty JA, Egan GF, Watson J	'Number-forms in neuroimaging? A PET activation study, Nuclear Medicine Communications	30th Annual Scientific Meeting of the Australian and New Zealand Society of Nuclear Medicine	Adelaide 20 – 24 May 2000
Davies PJ, McLachlan EM,	Functional changes in rat lumbar sympathetic ganglia 2-6 weeks after transection of the thoracic spinal cord	20th Annual Meeting of Australian Neuroscience Society	Melbourne 30 Jan – 2 Feb 2000

Progressive supranuclear palsy (Halliday laboratory)

Progressive supranuclear palsy is a disabling movement disorder similar to Parkinson's disease but with the additional symptoms of falling and eye movement problems. The reason for the additional clinical symptoms is not understood. We have been comparing patients with this disorder to those with Parkinson's disease and found that certain brain regions degenerated in both disorders, but that additional regions degenerated in progressive supranuclear palsy. In particular, we have identified the regional brain pathology responsible for their eye movement problems and falling. In collaboration with the Garvan Institute, we identified a family (see figure below) with an abnormality in the tau gene, suggesting that abnormalities in this protein are important in this disorder.

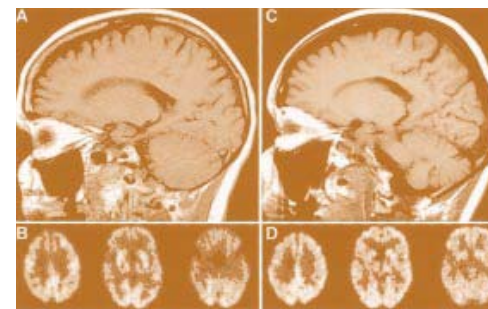
Neurobiology of speech and language (Harasty laboratory)

Unfortunately, about one in seven Australians lose or have impaired speech and language skills. Older Australians lose their speech skills through diseases such as Alzheimer's disease, and other degenerative disorders, while many children and young adults suffer from developmental communication impairments such as stuttering, specific language impairment or dyslexia. Understanding the brain basis for these disorders progresses us toward developing new treatments. We have been examining the brains of people with different types of speech and language symptoms and comparing these to control subjects. Our studies have been conducted in conjunction with Cambridge University, England. Work has been published this year which provides data that suggests an important role for the anterior and posterior insula in phonologic output processing (phonology is the sound system of a language) which is a seminal finding. As well,

differences between the anatomic correlates of fluent and nonfluent language symptoms from dementia were explored using neuronal anatomical measurement techniques for the first time.

Parkinson's disease and glutamate (Henderson laboratory)

Parkinson's disease is a degenerative disorder of the brain in which people develop tremor, rigidity and slowed movements. Until recently, it has been thought that the loss of a chemical, dopamine, from dying cells in the midbrain is responsible for these symptoms. As a result, the main drug treatment for Parkinson's is to replace dopamine. In 2000, we published our exciting discovery of degeneration within another brain structure called the thalamus. Since the thalamus contains glutamate, it may be possible to further improve Parkinson's symptoms using drugs affecting this brain transmitter substance. We are planning further experiments in animal models and humans to address this issue.



Brain imaging of two sisters from the same family identified with a tau gene abnormality, relatively preserved brain tissue (A v C), but abnormalities on functional brain scan (B v D) (Halliday)

Injury
(Keast laboratory)

Remodelling of peripheral nerve pathways after injury

We have been studying a group of autonomic neurons called the pelvic ganglia, which send axons to the bladder and reproductive organs. These nerve cells receive signals from the spinal cord, and these signals are essential for control of the pelvic organs (eg: emptying the bladder). We have previously found that after damaging the connections between the spinal cord and pelvic ganglia, many new nerve connections grow between pelvic ganglion cells. This may be important because the new connections may impede correct regrowth of the original connections with the cord. As part of a longer study to understand the trigger for this new growth, we have carried out an anatomical study (*Neuroscience Letters*) to find out what types of neurons send axons between the spinal cord and the pelvic ganglion. It is possible that the injury also damages axons from ganglion cells that project towards the spinal cord. By using fluorescent tracer dyes and immunohistochemistry we showed that this did not occur in many neurons and so the new growth must be triggered by removal of fibres arising from the spinal cord. This work is being extended to study how neurotrophic factors may be involved in causing this new growth, and how this impacts upon regeneration of the damaged fibres.

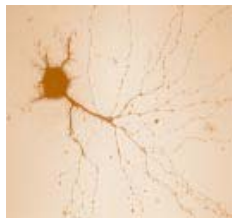


Figure 1 - Pelvic ganglion neuron from an adult rat, cultured in the presence of nerve growth factor for two days (Keast)

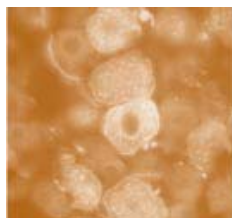


Figure 2 - Lumbar dorsal root ganglion, showing sensory neurons stained for nerve growth factor receptor (Keast)

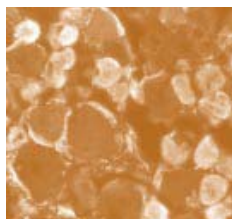


Figure 3 - Lumbar dorsal root ganglion, showing sensory neurons stained for glutamate; many glial cells also store high levels of this amino acid (Keast)

Cellular neuroscience
(Keast laboratory)

Chemical properties of sensory neurons

In work published in the *Journal of Comparative Neurology*, we have investigated how the amino acid substances, aspartate and glutamate, are distributed in different types of sensory neurons, and in different parts of sensory neurons. Glutamate is well-known as an important transmitter released from sensory neurons into the spinal cord, and in many parts of the brain. However, we found that glutamate and the related amino acid aspartate are also transported along sensory nerve fibres that travel out to organs such as the bladder and bowel, or to the skin and leg muscles. This suggests that these amino acids may also be released as transmitters in peripheral tissues or may influence how easily sensory fibres can get excited. We also found the surprising result that even though all sensory neurons are thought to release glutamate in the spinal cord, less than half of them store these amino acids in their cell bodies. This suggests that there is a lot of variability between sensory neurons in the way they use, store or transport these substances. Further studies are being carried out to understand how sex steroids (oestrogen and testosterone) affect the way in which sensory neurons work.

(Osborne laboratory)

Morphine metabolites are more effective than morphine

With colleagues from the University of Sydney, we have

Lord SR	Sensory and motor correlates of balance control in older people	Balance and Motor Control Symposium, Pre-Olympic Congress	Brisbane, Australia Sep 2000
Lord SR	Neurophysiological and sensory changes with ageing	International Conference on the Ageing Brain	University of New South Wales, Sydney, Australia Nov 2000
Luff SE, Young SB, McLachlan EM	Sympathetic innervation of mesenteric arteries of adult SHR rats differs from that of WKY rats only in density	2nd International Meeting of the International Society of Autonomic Neuroscience	London 17 – 21 Jul 2000
Luszcz MA, Anstey KJ, Giles L, Andrews GR	Implications of longitudinal change in cognitive and sensory functioning in very old adults participating in the Australian Longitudinal Study of Ageing	International Society for the Study of Behavioural Development	Beijing, China 11 – 15 Jul 2000
McLachlan EM	Plasticity of the peripheral autonomic nervous system following spinal injury	5th Scientific Congress of the Paralympic Games	Sydney Oct 2000
McLachlan EM	The autonomic nervous system: precise neural control of effector organ responses	Symposium on Sensory Processing, Motor Control and Autonomic Regulation, Meeting of the Federation of Asian and Oceanian Neuroscience Societies	Hong Kong Dec 2000
Macefield VG, McNulty PA	Modulation of ongoing EMG by type II, but not type I, slowly adapting cutaneous afferents in human glabrous skin	30th Annual Meeting of Society for Neuroscience	New Orleans, USA 4 – 9 Nov 2000
Osborne PB, Bengtson CP	Different electrophysiological effects of serotonin in globus pallidus and ventral pallidum	30th Annual Meeting of Society for Neuroscience	New Orleans, USA 4 – 9 Nov 2000
Shepherd C, Krill JJ, Halliday GM	Specificity of inflammatory pathology for Alzheimer's disease	14th International Congress of Neuropathology	Birmingham, UK 3 – 6 Sep 2000

Christensen H, Mackinnon AJ, Kortzen A, Jorm AF, Anstey K, Luszcz M	Predictors of cognitive variability	International Congress of Psychology	Stockholm, Sweden 23 – 28 Jul 2000
Collins DF, Gandevia SC	Afferent activation contributes to force production during electrical stimulation of human muscle	30th Annual Meeting of Society for Neuroscience	New Orleans, USA 4 – 9 Nov 2000
Gerlach M, Double KL, Zecca L, Mauer M, Greisinger E, Riederer P	Structural characteristics of human substantia nigra neuromelanin	The Forum of European Neuroscience 2000	Brighton, UK 24 – 28 Jun 2000
Halliday GM	Dementia with Lewy bodies: its current status	The Ageing Brain, An International Conference University of New South Wales	Sydney, Australia Nov 2000
Hardy TA, Brock JA	Evidence that cAMP controls neurotransmitter release from sympathetic nerve terminals in the guinea-pig vas deferens by a PKA-independent mechanism	2nd International Meeting of the International Society of Autonomic Neuroscience	London, UK 17 – 21 Jul 2000
Keast JR, Ouyang M	Electrophysiological properties of pelvic ganglion cells in intact adult, castrated adult and prepubertal male rats	30th Annual Meeting of Society for Neuroscience	New Orleans, USA 4 – 9 Nov 2000
Lopez de-Armentia M, Stebbing MJ, McLachlan EM	Effects of sodium and calcium channel blockers on the action potentials of dorsal root ganglion cells after spinal nerve transection	30th Annual Meeting of Society for Neuroscience	New Orleans, USA 4 – 9 Nov 2000
Lord SR	Exercise programs improve physical functioning in older people	Ageing and Exercise Symposium, Pre-Olympic Congress	Brisbane, Australia Sep 2000

found that a metabolite of morphine is more effective than morphine itself at inhibiting neurons in the brain (*British Journal of Pharmacology*). Morphine glucuronides are formed in the liver and are biologically active unlike most other drug metabolites. The study measured drug effects on single neurons in slices of rat brain in an area known as the locus coeruleus, and showed the metabolite to be more effective than morphine at inhibiting the electrical activity of the cells. This new result could explain why morphine glucuronide is much better than morphine at reducing pain in animals and humans.

(Osborne laboratory)
Psychosis and drug targets in the forebrain

Antipsychotic drugs used to treat schizophrenia and psychostimulant drugs like cocaine and amphetamine, which cause psychotic symptoms, target dopamine and serotonin (5-HT) networks in the brain. These are chemical signalling systems that regulate forebrain areas affected by schizophrenia

and other mood disorders. We have been studying in rats how drugs affect the electrical activity of neurons in a forebrain area known as the ventral pallidum (*Journal of Neurophysiology*). We found two types of neuron that were strongly affected by 5-HT and dopamine: cells containing the inhibitory chemical GABA and cholinergic cells that are of the type that die in Alzheimer's disease. The early findings of the study identify the ventral pallidum as a previously unrecognised target of antipsychotic and psychostimulant drugs.

Differences in contractile properties of single motor units in human finger muscles
(Macefield laboratory)

Using tungsten microelectrodes inserted into human peripheral nerves, it is possible to electrically stimulate single motor axons and measure the contractile properties of the muscle fibres supplied by that axon. This approach has been applied successfully to single human motor units in the intrinsic and extrinsic muscles of

the hand and in the toe-extensor muscles of the leg. We have employed this approach to assess whether the contractile properties of single human motor units in the short muscles of the fingers differ from those in the long (forearm) muscles. In a paper published in the *Journal of Physiology*, we showed that motor units in the intrinsic (short) muscles of the hand are more sensitive to modulating force output by changes in motoneurone firing rates than are those in the extrinsic (long) muscles of the forearm. These observations suggest that the smaller muscles of the hand may be better suited for fine manipulative tasks than the long muscles acting on the digits.

Firing properties of single muscle vasoconstrictor neurones during the prolonged sympathetic bursts associated with ectopic heartbeats
(Macefield laboratory)

Performing further analyses on our single-unit data obtained from heart-failure patients at Sahlgrenska Hospital in Sweden, we have assessed whether the activity of individual muscle vasoconstrictor neurones changed during the intense sympathetic bursts that follow the sudden fall in blood pressure associated with ectopic heartbeats. In a paper published in the *Journal of Applied Physiology*, we showed that single neurones increased their firing probability and fired more often in the intense sympathetic burst. This shift towards multiple firing will result in an exaggerated release of noradrenaline (and other neurotransmitters) which, given



Dr Vaughan Macefield testing the contractile properties of single motor units in finger muscle

the parallel changes in muscle and cardiac sympathetic outflow that are known to occur generally, may result in a dangerous elevation of noradrenaline at the heart.

Mapping the brain of humans and experimental animals (Paxinos laboratory)

Maps and a suitable coordinate reference system are required for navigation within, and communication about, a three-dimensional space. Neuroscience is no different from geography in its need for standard maps, terminology and coordinate systems for the effective study of the normal and diseased human brain. In geographic atlases, on a single physical reality, a myriad of abstract representations can be superimposed, including climate, religious affiliations and crime statistics. In an analogous fashion, connections, neurochemistry, cell types and imaging data can be superimposed on architectonic maps, the backbone of the wider neuroscience research. We are collaborating with researchers nationally and internationally to produce accurate maps and 3D conceptual stereotaxic space to enable neuroscientists to

navigate the brain of humans and experimental animals to test hypotheses inspired by human considerations, and relate data from experimental animals to humans.

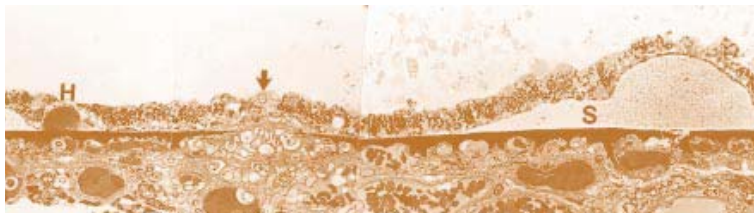
We are establishing the correspondences (homologues) between the human brain and that of experimental animals so that those studying models of human disease in animals can relate their observations to the humans. Additionally, we are producing the atlases used internationally to study the human brain. Imaging techniques now allow visualisation of the living brain. However, researchers and clinicians require the equivalent of a street directory for the brain, and it is these reference atlases that are being constructed at the Institute.

The group is taking advantage of modern molecular techniques to stain the human brain in a way that its structure is revealed. They detect the presence of neurotransmitters and enzymes at the protein level (immunohistochemistry) and at the mRNA level (in situ hybridization). They use the distribution of these substances as a guide to brain organisation. Two of the areas of the human brain where the group is paying

special attention are the autonomic (including cardiovascular) control areas and the cortex.

Macular degeneration (Sarks laboratory)

Age-related macular degeneration is the major cause of legal blindness in the Western world and in 80 per cent of cases this is due to the ingrowth of new blood vessels which bleed. An early clinical sign of the disease is the presence of drusen (seen as yellow spots in the retina) and the present study, which is based on the clinicopathological examination of over 600 eyes collected from elderly donors, has shown that there are different types of drusen. New vessels develop when drusen form a continuous layer of debris beneath the retina, and we have been determining the quantity and type of debris present at the stage when new vessels develop. This corresponds to a change in their clinical appearance from 'hard' to 'soft' and has led to a classification of drusen now being used in clinical trials for the many forms of treatment which are currently achieving considerable publicity.



Semithin plastic section showing early new vessel formation (arrow). The vessel is bulging through the membrane which separates the retina from the underlying tissues. 'Hard' (H) and 'soft' (S) drusen are present. Soft drusen can be seen to separate the retina from the underlying tissue and open a plane into which the new vessels grow. The debris in soft drusen can be seen to have a different composition to hard drusen and is currently being studied.

International Conference Presentations 2000

AUTHORS	TITLE	NAME OF CONFERENCE	PLACE & DATE OF CONFERENCE
Anstey KJ (invited speaker), Luszcz MA, Lord SR, Christensen H	Biomarkers, health and cognitive aging: Results from Australian studies	XXVII International Congress of Psychology	Stockholm, Sweden 23 – 28 Jul 2000
Brock JA	Electrophysiological and electrochemical studies of neurotransmitter release at the sympathetic neuroeffector junction	2nd International Meeting of the International Society of Autonomic Neuroscience	London, UK 17 – 21 Jul 2000
Broe M, Milward EA, Halliday GM, Jensen P	Cellular protein changes in the midbrain pigmented neurons of patients with movement disorders and dementia	6th International Congress of Parkinson's Disease and Movement Disorders	Barcelona, Spain 11 – 15 Jun 2000
Broe M, Shepherd C, Milward E, Halliday G	Morphological features of DNA fragmentation in patients with movement disorders and dementia,	European Neuroscience Congress	Brighton, UK 24 – 28 Jun 2000
Burke D	Intraoperative monitoring of spinal cord function, Invited Lecture	Asian-Oceanian Congress of Clinical Neurophysiology	Manila, Philippines 20 – 21 Jan 2000
Burke D	Axonal excitability in peripheral neuropathies, Invited Lecture	10th European Congress of Clinical Neurophysiology	Lyon, France 26 – 30 Aug 2000
Burke D, Bostock H	Axonal evaluation using threshold tracking, Invited Hands-On Workshop	10th European Congress of Clinical Neurophysiology	Lyon, France 26 – 30 Aug 2000
Cappelen-Smith C, Kuwabara S, Lin CS-Y, Mogyoros I, Burke D	Membrane properties in chronic inflammatory demyelinating polyneuropathy	10th European Congress of Clinical Neurophysiology	Lyon, France 26 – 30 Aug 2000

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Collaborations

National links

- Since Professor Tony Broe joined us at POWMRI, Associate Professor Halliday and Dr Antony Harding have considerably strengthened research activities on various dementia syndromes between POWMRI and CERA (Centre for Education and Research on Ageing) at Concord Hospital. This includes POWMRI staff working at both sites.
- Dr James Brock, Conjoint Senior Lecturer with the School of Physiology and Pharmacology, UNSW, collaborates with a group from the School of Chemistry at Sydney's Macquarie University. The scientists are investigating both electrochemically and electrophysiologically the secretion mechanisms of neurotransmitter from sympathetic nerves.
- Dr Kay Double is a Conjoint Lecturer in the School of Physiology and Pharmacology and a Visiting Scientist, Department of Neurology, Royal North Shore Hospital. Dr Double coordinates a 30-strong team of Basic Scientists, Neurologists, Specialist Nurses and other professionals in the Sydney DEDCeL (Diagnosing Early Dopamine Cell Loss) study which aims to develop novel diagnostic methods for Parkinson's disease.
- Dr Kay Double and Associate Professor Halliday have developed a close collaboration with Dr Dominic Rowe at Royal North Shore Hospital, which has resulted in a potential new blood test for Parkinson's disease. A multicentre trial is currently underway (Westmead, RNS, Concord, John Hunter, Bankstown, POW Hospitals).
- Professor Simon Gandevia and Dr Janet Taylor have continued a collaboration with Professors Phillip Mitchell and Perminder Sachdev (Mood Disorders Unit at the Prince of Wales Hospital). This work aims to examine some of the neural mechanisms accompanying depression and to examine the ability of repetitive transcranial stimulation to alter mood.
- Associate Professor Glenda Halliday and colleagues maintain a close collaboration with Associate Professor John Morris at Westmead Hospital in their research on the neuropathology of Parkinson's disease. Associate Professor Halliday has also formed a collaboration with Dr Andrew Hughes, Dr David Howells and Professor Geoff Donnan at Austin Repatriation Hospital, Heidelberg, Melbourne to unite clinical databasing and tissue resourcing for their work on Parkinson's disease. Associate Professor Halliday and Dr Antony Harding collaborate with Professor Peter Schofield and his team at the Garvan Institute for Medical Research on genetic forms of dementia. Associate Professor Halliday also has a very strong collaborative relationship with Dr Jillian Kril at the Centre for Education and Research on Ageing at Concord Hospital, sharing research team members between sites. The Brain Bank is run between these sites and the harvested tissue is used by both groups for a large number of research projects on neurodegenerative disorders.
- Dr Jenny Harasty is working with Dr Caroline Rae, a neural biochemist from the University of Sydney, on a number of studies examining the human cortex and cerebellum in different disorders and syndromes. Associate Professor Lee Seldon, a physicist and neuroanatomist from La Trobe University, Melbourne has worked with Dr Harasty on a paper examining the shape of the planum temporale comparing the two hemispheres. Professor Vicki Reed, Head of School of Communication Disorders, University of Sydney is also working with Dr Harasty on examining children with developmental disorders.
- Dr Jasmine Henderson, whose research is on Parkinson's disease, has close collaborative links with the following research scientists in hospitals, universities and other institutions in Australia: Associate Professor John Morris, Dr Victor Fung and Dr Mariese Hely of the Department of Neurology, Westmead Hospital (these studies involve clinicopathological analysis of brains of PD patients); Drs Dudley O'Sullivan (neurologist) and Dr Malcolm Pell (neurosurgeon) of St Vincent's Hospital, Sydney (studying patients who underwent neurosurgery for PD); Dr David Finkelstein and Professor Mal Horne of Monash University, Victoria (this involves examination of the effects of basal ganglia surgery in Parkinsonian primate); and Dr Peregrine Osborne of the Prince of Wales Medical Research Institute (a study is planned to examine serotonergic drugs in Parkinsonism).
- Dr Janet Keast is collaborating with Associate Professor Ida Llewellyn-Smith (Flinders University) on a project investigating changes in pelvic autonomic circuitry after spinal cord injury, using male rats as an experimental model. Dr Keast has also recently commenced some studies on expression of various guidance factors and their receptors in adult autonomic neurons with Dr Helen Cooper (WEHI).

- In 2000, Dr Stephen Lord, who heads the Institute's Falls and Injury in the Elderly Program, was awarded a major research partnership by the Federal Government under their Health Research Partnership Grants initiative (a total of \$3.5million). This injection of funding from the Commonwealth Government precipitated a large injection of funds from partner organisations in the research program, including NRMA, MBF, University of Sydney, NSW Department of Health, University of Wollongong, Princess Alexandra Hospital, Lidcombe Hospital, South West Area Health Service, Vincent Fairfax Family Foundation, Queensland University of Technology, Illawarra Insurance Trust, University of Western Sydney, The Joanna Briggs Institute (Adelaide Hospital), University of Queensland, Centre for Research on Ageing and North Sydney Area Health Service. The research on falls seeks to enhance understanding of human balance, predicting at-risk people, interventions to prevent falls and developing falls screening tools. The transport injury project aims to develop a screening tool to identify incapable older drivers.



Mr Hylton Menz and Dr Stephen Lord measuring gait patterns to understand the mechanics of walking

- Dr Vaughan Macefield is a Conjoint Lecturer with the School of Physiology and Pharmacology, UNSW, and his many collaborations include those with Dr Phillip Bolton, University of Newcastle, on the interactions between the vestibular system and the sympathetic nervous system.
- Dr Peter Nickolls has a long-standing collaboration with the Department of Electrical Engineering at the University of Sydney. As an Adjunct Associate Professor at the University of Sydney, Dr Nickolls lectures on Bioengineering to students in Electrical Engineering and supervises their projects.

- Dr Peregrine Osborne is Conjoint Senior Lecturer with the School of Physiology and Pharmacology, UNSW. He has been collaborating for many years with Professor Mac Christie, Head of the Department of Pharmacology at the University of Sydney, in studying how opioid drugs, like heroin, morphine and codeine, affect neurons in the brain. He is also continuing an ongoing project with Dr Kathryn Buller that was started in the Department of Physiology and Pharmacology at the University of Queensland and is looking at the relationship between stress and drug addiction.
- Professor George Paxinos has close collaborative links with research scientists at many institutions. These include University of New South Wales, University of Sydney, University of Wollongong, Monash University, University of Tasmania, and the Howard Florey Institute.
- Drs John and Shirley Sarks continue a close collaboration with Dr Jenny Arnold MBBS (Hons) FRACO in the research of age-related macular degeneration (ARMD). Dr Arnold has recently returned from five years studying macular degeneration overseas. They have been chosen as only one of five centres in Australia to participate in a world-wide clinical study with Eyetech Pharmaceuticals, New York. The study will be researching the safety and efficacy of intravitreal injections of Anti-VEGF pegylated aptamer in the treatment of the neovascular form of ARMD, the major form of loss of central vision in people over age 65.

International links

- A formal collaborative agreement has been established between the Prince of Wales Medical Research Institute and the Institute of Clinical Neuroscience, University of Göteborg, Sahlgrenska University Hospital in Sweden, to acknowledge the long-term concerted action between them in the field of neuroscience, with particular emphasis on autonomic dysfunction after spinal cord injury. Under this agreement, one or other of Professor Gunnar Wallin and Associate Professor Mikael Elam, by agreement, will spend three months of their working year at our Institute in Sydney. Scientific reports resulting from the collaboration will be attributed to the Australian and Swedish Institutes combined, and both Institutes will publicly acknowledge this collaboration.
- Dr James Brock collaborates with researchers at the University of Nottingham, UK, assisted by a Wellcome Trust Biomedical Research Trust

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Publications 2000

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Collaboration Grant. They are working on mechanisms by which chemicals released from sympathetic nerve activate small blood vessels. This work is important in understanding mechanisms that underlie blood vascular diseases such as hypertension. Dr Brock also collaborates with Professor Carlos Belmonte from the Instituto de Neurociencias at the Universidad Miguel-Hernandez in Alicante, Spain on studies investigating the electrophysiological properties of the sensory nerve endings of nociceptors.

- Professor David Burke has continued his collaborative research on spinal cord reflex function with Professor Emmanuel Pierrot-Deseilligny of the Laboratoire de Neurophysiologie Clinique, Hôpital de la Salpêtrière, Paris, France. His studies on axonal excitability in health and disease have also continued in collaboration with Professor Hugh Bostock FRS, Sobell Department of Neurophysiology, Queen Square, London, UK.



Professor David Burke, Professor Simon Gandevia and Professor Emmanuel Pierrot-Deseilligny of the Laboratoire de Neurophysiologie Clinique, Hôpital de la Salpêtrière, Paris, France

- Dr Kay Double collaborates with international colleagues in Germany, particularly at the University of Würzburg, as well as groups in Israel, Italy, Japan and America. These collaborations have been fruitful to advance her work studying the structure of human neuromelanin pigment and also in establishing an international clinical study which aims to develop diagnostic methods for preclinical Parkinson's disease.
- Dr Richard Fitzpatrick and Dr Stephen Lord have continued their collaborative research with Dr Mark Rogers, Associate Professor of Physical Therapy at the Northwestern University Medical School in Chicago, USA. Their research focuses on mechanisms for standing, in particular how

people deal with external perturbations that could lead to trips and falls.

- Dr Jenny Harasty is working with Professor John Hodges, Chair of Behavioural Neurology, Cambridge University, and Dr John Xuereb, Neuropathologist and Senior Lecturer, Cambridge University, examining the neural substrates of language and cognitive loss in dementia. Professor Chris Code, Aphasiologist at Exeter University, UK, has also been working with Dr Harasty examining brain function using PET (also in collaboration with Professor John Watson, University of Sydney and Dr Gary Egan, Howard Florey Institute).
- Dr Jasmine Henderson has close collaborative links with the following research scientists in hospitals and universities overseas: Professor Manfred Gerlach, University of Würzburg, Germany (studying behavioural and neurochemical correlates in Parkinsonian rats); Professor Shaoshi Wang, Head of the Department of Neurology and Deputy Head, and Associate Professor Youyu Lu, 1st Teaching Hospital of the University of Shanghai, China (studies involving examination of the timing and nature of clinical symptoms in Parkinsonian disorders).
- As part of a project funded by ARC, Dr Janet Keast is collaborating with two internationally renowned experts in neuronal development and trophic factors, Professor Jeff Milbrandt (Washington University) and Dr Matti Airaksinen (Helsinki University). This is a study of various molecules that may be trophic factors for pelvic parasympathetic ganglion cells. Dr Keast is now setting up colonies of knockout mice, after importing breeding pairs from each of these collaborators. She is also collaborating with a world expert on steroid receptors, Professor Jan-Åke Gustafsson (Karolinska Institute), to investigate the role of estrogen receptor beta in autonomic neurons.
- One of the Institute's NHMRC CJ Martin Fellows, Dr Matthew Kiernan, who is also a Menzies Fellow, has been conducting research on the kinetics of sodium channels and their behaviour in human axons at the Institute of Neurology, London, UK. Dr Kiernan expects to return to the Institute to continue his research in 2001.
- Professor Elspeth McLachlan has a longstanding collaboration with Professor Wilfrid Jänig and Dr Hans-Joachim Häbler from the Physiologisches Institut at the Universität Kiel in Germany. She has also continued her research association with Professor Hidcho Higashi and Dr Hiroe Inokuchi at Kurume University Medical School, Japan.

- Professor George Paxinos has close collaborative links with research scientists at University of Dusseldorf, University of Murcia, UCLA, University of Boston and Montreal Neurological Institute.

Visiting Scientists

- Dr Paul Bertrand, RD Wright Research Fellow from the Department of Physiology, University of Melbourne, worked with Dr James Brock in September 2000. Their research was on electrochemical detection of chemicals released from the mucosa of the small intestine.
- Dr David Collins, from the University of Alberta, Canada, conducted sensorimotor experiments with the Burke/Gandevia laboratory from February 1999 to July 2001.
- Professor André De Troyer, Professor of Medicine (and Physiology), at the Erasme University Hospital, Belgium, is the world's leading expert on the way in which the breathing muscles work. He spent several weeks in November 2000 at the Institute, collaborating with Professor Simon Gandevia and Associate Professor David McKenzie. He will return in 2001 for a further month to continue the project.
- Dr Billy Dunn, School of Biomedical Sciences, University of Nottingham Medical School, Nottingham, UK, spent several weeks in April 2000 working with Dr James Brock, conducting experiments investigating the interactions between sensory and sympathetic nerves supplying blood vessels.
- Mr Martin Eriksson from Umeå University in Sweden conducted Honours research in intra abdominal pressure and spinal stiffness in Dr Paul Hodges' laboratory from January to May 2000.
- Dr Anna Gabriellson, University of Umeå, Sweden, worked in Dr Hodges' laboratory, from September to December 2000.
- Ms Inger Heijnen, Research Assistant, Netherlands, worked in Dr Hodges' laboratory from November 1999 to June 2000, using ultrasound as a measure of muscle activity.
- Dr Ann-Katrin Karlsson, Director at the Spinal Injury Unit at Sahlgrenska Hospital, Göteborg, Sweden, visited Dr Macefield's laboratory in the Spinal Injuries Research Centre of the Institute, from October to November 2000. Dr Karlsson is involved in the bilateral agreement now established with the University of Göteborg to foster collaborative research into autonomic dysreflexia. Dr Karlsson delivered a lecture at the Institute in November 2000, titled "Autonomic dysfunction in spinal cord injury".
- Associate Professor Satoshi Kuwabara, Department of Neurology, Chiba University Medical School, Japan conducted research in the Burke/Gandevia laboratory for 12 months from April 1999 to April 2000, and also presented an Institute seminar on "Effects of activity on excitability of motor axons".
- Ms Ana Ruiz Nuño, Farmacologia, Universidad Autonoma de Madrid, Spain, studied calcium channels in adrenal medullary cells in Professor McLachlan's laboratory from November 1999 to January 2000.
- Ms Liset Pengel, Research Assistant, Netherlands, conducted research work in Dr Hodges' laboratory from November 1999 to June 2000. She studied the effect of respiratory demands on postural function of the diaphragm.
- Dr Nicolas Petersen, University of Copenhagen, Denmark conducted sensorimotor experiments with the Burke/Gandevia laboratory, from June 1999 to the present. Dr Petersen delivered a lecture in the Institute's seminar series in September 2000 entitled "Cortical control of human walking".
- Professor Randall Powers, Department of Biophysics, University of Washington, USA visited Dr Vaughan Macefield's laboratory in April 2000.
- Associate Professor Lee Seldon, Otolaryngology, University of Melbourne visited Dr Jenny Harasty's laboratory in March 2000.
- Ms Debra Shirley, from the University of Sydney, worked in Dr Hodges' laboratory from February to March 2000.
- Ms Meg Stuart, Cumberland College, University of Sydney conducted research in the Burke/Gandevia laboratory from February to June 2000.

Our Profile

Prizes and Awards

Kaarin Anstey

Won the Organon Award from the Australian Society for Psychiatric Research.

Kay Double

The AW Campbell Award by Australian Neuroscience Society, 2000. This award is to recognise the best contribution to neurosciences by a member of the Society over their first five postdoctoral years. Dr Double was also awarded an R. Douglas Wright Research Fellowship from the National Health & Medical Research Council.

Glenda Halliday

Awarded a Principal Research Fellowship, National Health and Medical Research Council, 2000.

Jenny Harasty

Recognised by Cambridge Bibliographic Society, UK, as one of 2000 outstanding living scientists of the 20th Century.

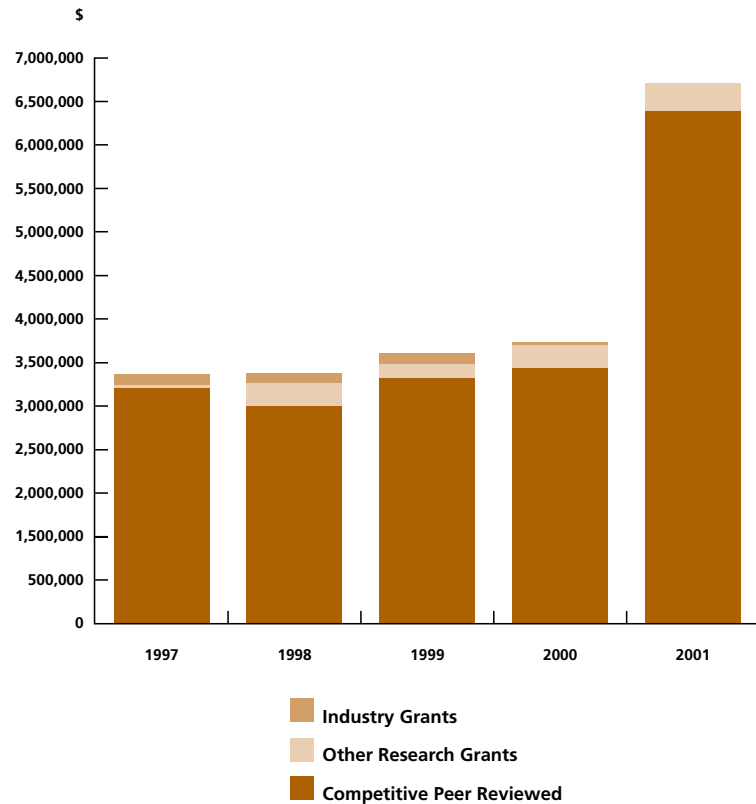
Antony Harding

Received the Australian Sports Medal from the Governor General, Sir William Deane during the opening ceremony of the 7th National Transplant Games in July 2000. Dr Harding was only the seventh Australian to receive this award which is given to those who have contributed significantly to their field of sport, both on and off the field.



Dr Jenny Harasty, "an outstanding living scientist of the 20th Century"

Research Funding 1997-2001



Guests

- The Institute was very pleased to be invited to host the launch of the South Eastern Sydney Area's Research Report on 2 August 2000. The report, which documents all research being undertaken within the Area, including major contributions from this Institute, was officially launched by The Honourable Craig Knowles, NSW Minister for Health. In his speech, the Minister highlighted that the SESAHs plays a major role in developing and sustaining vital medical research in the State. This includes programs at several major teaching hospitals and the two largest Research Institutes in NSW, being the Garvan and the Prince of Wales Medical Research Institute. At the launch, there were many representatives from the Area, business and wider community, as well as the media. Ms Deborah Green, Chief Executive Officer of SESAHs and Dr Don Grimes AO, Chairman of SESAHs (both Board Members of the Institute) expressed their pleasure when they had an opportunity to tour the recently completed second stage of the Institute's building.
- Dr Brenda Bigland-Ritchie and Dr Murdoch Ritchie (Yale University, New Haven, USA) visited the Institute in March 2000 to continue discussions with scientists looking at mechanisms underlying muscle fatigue and mechanisms of axonal excitability. An afternoon symposium was held in the Seminar Room attended by many of the Institute's scientists including some who have worked with Dr Bigland-Ritchie, such as Vaughan Macefield and Simon Gandevia.
- Dr RE (Bob) Burke, a leading neuroscientist from the Laboratory of Neural Control at the National Institute of Neurological Disorders and Stroke in Maryland, USA, visited the Institute in February 2000 and delivered an interesting lecture on "How to walk and chew gum at the same time: spinal pattern generators and sensory control".
- Several major benefactors of the Institute also visited in 2000. These included Mr Philip Goymour (in March 2000), and Mr Rodney O'Neil and his sister, Ms Janette O'Neil (in May 2000).
- Dr David Howells of the Department of Neurology, Austin and Repatriation Medical Centre, Melbourne, visited the Institute in



The Honourable Craig Knowles, NSW Minister for Health, and Mr Will Penfold AM at the opening of the new building

- December 2000 and delivered a lecture on "Mechanisms of dopaminergic regeneration: sprouting and neurogenesis?"
- Professor Eugenie Lumbers of the School of Physiology and Pharmacology, UNSW, delivered a lecture at the Institute in October 2000 on "Development of the cardiac baroreflex and the role of the cardiac sympathetic in its implementation".
- Dr Anna Reynolds of the John Curtin School of Medical Research, ANU, visited the Institute in September 2000 and delivered a lecture on "Molecular mechanisms regulating the retrograde axonal transport of neurotrophins".
- Professor Cornelius Weiller (Professor of Neurology, Hamburg) delivered a special lecture at the Institute in November 2000. Professor Weiller is an expert in the neural mechanisms associated with damage following stroke. He described a number of studies in stroke involving the non-invasive imaging modalities of magnetic resonance imaging and positron emission tomography.
- Senior executives of GlaxoSmithKline visited the Institute in October 2000. These included Dr Tachi Yamada, worldwide Head of Research and Development, and Dr Peter Traber, worldwide head of Clinical Pharmacology of the company. The visitors were accompanied by Dr Tony Johnson, former Director of the James Lance Medicines Research Unit of GlaxoSmithKline at Prince of Wales Hospital.

Research Funding 2001

Research Grants and Fellowships for January-December 2001

Summary information on competitive peer-reviewed research grants, fellowships and scholarships, and other sources of external research grant income applicable to the calendar year 2001:

National Health and Medical Research Council

- McCloskey DI, Burke D, Gandevia S, Potter E, McKenzie D, Macefield V, Fitzpatrick R, Taylor J, Experimental neurology, NHMRC Program Grant, 2001 amount \$1,011,730.
- Anstey K, NHMRC Australian Clinical Research Fellowship Grant, 2001 amount \$60,632.
- Brock J, NHMRC Senior Research Fellowship, 2001 amount \$71,643.
- Brock J, Mechanisms controlling the excitability of corneal nociceptor nerve terminals. NHMRC Project Grant, 2001 amount \$55,622.
- Double K, NHMRC R Douglas Wright Award, 2001 amount \$75,000.
- Gandevia S, NHMRC Senior Principal Research Fellowship, 2001 amount \$123,893.
- Halliday G, NHMRC Principal Research Fellowship, 2001 amount \$85,835.
- Halliday G, What contributes to regional vulnerability in neurodegenerative diseases? A study of familial cases, NHMRC Project Grant, 2001 amount \$66,783.
- Halliday G, Broe A, Harding A, Brooks W, Genetic factors and regional brain atrophy in the diagnosis of dementia with Lewy bodies, NHMRC Project Grant, 2001 amount \$190,000.
- Halliday G, Milward E, Morris J, To identify the cellular components and clinical significance of hippocampal atrophy in Parkinson's disease, NHMRC Project Grant, 2001 amount \$150,844.
- Hodges P, Lord S, Physiology and pathophysiology of trunk control mechanisms, NHMRC Project Grant, 2001 amount \$45,000.
- Keast J, Changes in pelvic autonomic neurons after spinal nerve injury, NHMRC Project Grant, 2001 amount \$56,651.
- Keast J, NHMRC Principal Research Fellowship, 2001 amount \$79,953.
- Keast J, Maintenance of neuron structure and function by testosterone, NHMRC Project Grant, 2001 amount \$116,942.
- Keast J, Halliday GM, Double K, Paxinos G, Molecular and chemical analyses of developing, diseased and injured neurons, NHMRC Equipment Grant, 2001 amount \$45,000.
- Kiernan M, Kinetics of persistent sodium channels in rat nerve and their behaviour in human axons, NHMRC The Menzies Foundation, 2001 amount \$5,000.
- Kiernan M, Kinetics of persistent sodium channels in rat nerve and their behaviour in human axons, NHMRC CJ Martin Fellowship, 2001 amount \$62,374.
- Kril JJ, Creasey H, Halliday GM, Non-Alzheimer dementia: Pathogenesis and clinicopathological correlations, 2001 amount \$190,000.
- Lord S, NHMRC Research Fellowship, 2001 amount \$67,229.
- Lord S, The role of vestibular impairment in instability and falls in older people, NHMRC Project Grant, 2001 amount \$110,788.
- Lord S, Falls in older people: tailored strategies for intervention, NHMRC Project Grant, 2001 amount \$105,643.
- Lord S, Kerr, G, Anstey K, Broe A, Cameron I, Cumming R, Fitzpatrick R, Steele J, Wood J, Prevention of injuries in older people, NHMRC Partnership in Injury Grant 2001-2006. NHMRC funds \$2.16 million, (averaged 2001 amount \$432,000).
- Lord S, Mitchell, P, Hennesey M, Age-related changes in vision and cognitive performance. Are there cognitive benefits from cataract surgery? NHMRC Project Grant, 2001 amount \$49,804.
- Macefield V, NHMRC Senior Research Fellowship, 2001 amount \$71,531.
- Osborne P, Forebrain neuroadaptations to chronic morphine treatment, NHMRC Project Grant, 2001 amount \$153,660.
- Paxinos G, NHMRC Principal Research Fellowship, 2001 amount \$91,110.
- Paxinos G, Human hypothalamic homologues to autonomic control centres identified in rat and monkey, NHMRC Project Grant, 2001 amount \$70,000.
- Potter E, NHMRC Senior Principal Research Fellowship, 2001 amount \$102,844.
- Stoodley M, Investigations of cerebrospinal fluid flow in extracranial syringomyelia, NHMRC Project Grant, 2001 amount \$90,000.
- Taylor J, NHMRC Research Fellowship, 2001 amount \$77,564.
- Wakefield et al, including Halliday GM, The UNSW laser capture microdissection facility, NHMRC Equipment Grant, 2001 amount \$155,000.

Australian Research Council

- Brock J, Characteristics of nerve impulses recorded extracellularly from single nociceptor nerve terminals in guinea-pig cornea. ARC Large Project Grant, 2001 amount \$59,901.
- Keast J, Trophic factors and plasticity of pelvic ganglion neurons, ARC Large Project Grant, 2001 amount \$63,000.

Commonwealth Department of Health and Aged Care

- McLachlan E, Cellular basis for abnormal sensory and sympathetic behaviour after damage to the nervous system, Commonwealth Department of Health & Aged Care, 2001 amount \$107,372

NSW Department of Health

- Prince of Wales Medical Research Institute, NSW Research & Development Infrastructure Grants Program (Stream 1), NSW Health Department, 2001 amount \$1,390,400.

Other funding bodies

- Brock J, McLachlan E, Peripheral mechanisms involved in autonomic hyperreflexia, Christopher Reeve Paralysis Foundation (USA), 2001 amount US\$46,217 (\$89,484 Australian dollars).
- Brock J, McLachlan E, Halliday G, Confocal microscope facility for vital and post mortem imaging of normal and diseased tissue. Wellcome Trust (UK) Equipment Grant, 2001 amount \$12,500.
- Double K, Strategies to improve brain cell survival in Parkinson's disease, Perpetual Trustees Charitable Planning Services, 2001 amount \$5000.
- Double K, Halliday G (at POWMRI as part of the DEDCeL group), A potential new test for diagnosing early dopamine cell loss: an initial screening analysis with risk factor assessment, Australian Brain Foundation, 2001 amount \$75,000.
- Harasty J, The neuroanatomy and neuropathology of language cortex, UNSW Faculty of Medicine, Foundation Fellowship Grant, 2001 amount \$45,000.
- Harding A, Halliday G, Identifying whether dementia with Lewy bodies occurs in families and therefore has a genetic risk, The Phillip Bushell Foundation, 2001 amount \$71,652.
- Keast J, Plasticity and hormone-sensitivity of pelvic autonomic nerve circuits, Clive & Vera Ramaciotti Foundations Equipment Grant, 2001 amount \$25,000.

- McLachlan EM, Halliday G, Keast J, Structural plasticity of the damaged spinal cord, Australasian Spinal Research Trust, 2001 amount \$25,000.
- Paxinos G, Ashwell K, Universal microtome cryostat for the human brain project, Ramaciotti Foundations for Biomedical Research, 2001 amount \$12,000.
- Stoodley M, Endothelial adhesion molecule and cytokine expression in cerebral arteriovenous malformations, Ramaciotti Foundations for Biomedical Research, 2001 amount \$15,000.
- Stoodley M, Pathophysiology of syringomyelia, Sylvia & Charles Viertel Charitable Foundation, 2001 amount \$55,000.
- Stoodley M, Endothelial cell surface adhesion molecule and cytokine expression in arteriovenous malformations, National Stroke Foundation, 2001 amount \$40,000.

Scholarships

- Broe M, Australian Postgraduate Award for PhD studies, DETYA Commonwealth Government of Australia, 2001 amount \$16,630.
- Cheng G, PhD scholarship, UNSW Faculty of Medicine, 2001 amount \$10,000.
- Menz H, Australian Postgraduate Award for PhD studies, DETYA Commonwealth Government of Australia, 2001 amount \$16,630.