COVER ILLUSTRATION

Nerve cell activity recorded in a visual centre (lateral geniculate nucleus) in the primate brain. The vertical elongated activity map ("receptive field") indicates a cell that responds to vertical edges.

Discipline of
PHYSIology

School of Medical Sciences
The University of Sydney

2012 & 2013 Biennial Report
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### TOTAL RESEARCH INCOME & OUTPUT

| Journals of Publication                                       | 118 |
| Grant Funding Totals                                          | 123 |
The Discipline of Physiology is part of the School of Medical Sciences (SoMS). Other disciplines in the School are Anatomy & Histology, Pathology, Pharmacology and Biomedical Sciences. As well as a large cohort of research students undertaking honours projects and post-graduate research, Physiology has major responsibilities for coursework teaching in the Faculties of Science, Pharmacy, Dentistry and Medicine.

**Staff matters**

In 2012, Physiology and SoMS welcomed back a former PhD student and post-doc, Philip Poronnik, as Professor of Biomedical Sciences (Education Strategy). Professor Roger Dampney officially retired in 2012, after very many years on staff here. Roger has continued to serve the Discipline and the School as a Professor Emeritus. A new Professor of Cardiovascular Physiology, Professor Bill Stanley, Editor in Chief of the American Journal of Physiology–Heart and Circulation, took up his position in January 2013, arriving with his wife Beth. Tragically, in September of that year, Bill died, suddenly, at his home. This was a great loss to his family and colleagues, and also to Physiology here and to the field. Dr Miriam Frommer, a very long-standing and valued staff member, retired at the end of 2013, but continues to contribute to student teaching. Dr Sam Solomon accepted a position at University College London in 2012, but maintained a presence here for some of that year and in 2013. Dr Andrew Hoy, an NHMRC Early Career Fellow, moved to Physiology in January 2012. In 2013, Dr Tara Brennan-Speranza, a former PhD student in the Discipline and an NHMRC Biomedical Training Fellow, joined the Discipline. Dr Bronwyn McAllan was promoted to Level C in January 2012. Ms Kris Harrison joined the staff as student liaison officer in 2012, replacing Ms Louise Harrison on maternity leave. Professor Peter Bishop, who graduated in Medicine from this University in 1940, then went on to a distinguished career in Neuroscience, including many years from 1950 to 1967 in Physiology at this University, died in 2012. In his will, he left a sum of money to establish a Fellowship in Neuroscience through the Bosch Institute. Professor Paul Korner, who worked in the Department of Physiology for many years and then became foundation Chair of Physiology at the University of New South Wales, before serving as Director of the Baker Institute in Melbourne from 1975 until his retirement in 1990, but remained a Visiting Professor of Physiology here, also died in 2012. On a cheerier note, a party was held in 2012 to celebrate the 90th birthday of Professor Emeritus Liam Burke, who was Head of Physiology for many years and who retired in 1987, but who still comes in most days and publishes interesting papers.

**Research**

Total research income increased slightly from $3.5 million in 2012 to $3.6 million in 2013. In both years research grant income from sources other than NHMRC or ARC was $650,000–750,000, reflecting greater efforts and success in accessing more specialised funds. Staff in Physiology published approximately 74 peer reviewed journal articles in 2012 with an average impact factor of 4.04. This increased to 94 publications in 2013, with an average impact factor of 4.36. Over the past five years 55% of all journal publications from Physiology have been in the top 5% of journals (impact factor >3.5), up from 45% in the previous report.

Amongst the research achievements in this period, Roger Dampney was awarded a Distinguished Lectureship in Integrative Neuroscience at the University of California in 2012 and, in 2013, Roger spent several months at the University of Bologna as a Senior Visiting Fellow. In that year also, he was awarded the Carl Ludwig Distinguished Lectureship by the American Physiological Society.

Several staff whose laboratories were in the Anderson Stuart building, took the opportunity to move to somewhat newer laboratories in the Medical Foundation Building in 2012. There are now 8 Laboratories headed by Physiology academics in that building. This has improved the exercise levels of staff in both buildings.
Teaching
As noted in previous reports, undergraduate student numbers continue to increase in most units of study. In 2013, after much discussion, it was decided to move many of our practical classes to the new laboratory spaces in the Charles Perkins Centre commissioned early that year. To take full advantage of the facilities, a decision was also made to move many of these classes on to an interactive, online platform called Lab Tutor (ADI Instruments), which would allow multimedia presentations to demonstrate methods, conduct online quizzes and provide remote access to data acquired in the laboratories. Despite many hurdles, including the need to test and optimize new equipment, and with a great deal of effort, a pilot practical class was developed, with some success, in 2013. The template was helpful for many classes starting in 2014. Thanks to the efforts of many staff, but particularly Drs Sharon Herkes, Isabel Arnaiz, Dane King, Haydn Albutt and Mr Adel Mitry, this new platform for practical classes has been very well received by students.

Physiology very much appreciates the efforts made by all our teachers, including many of our research students who demonstrate and tutor for Physiology. Special thanks are due to our unit of study coordinators: Drs Michael Morris and Meloni Muir (Intermediate Physiology), Dr Atomu Sawatari (Advanced Intermediate Physiology), Dr Bronwyn McAllan (Pharmacy), Drs Sharon Herkes and Isabel Arnaiz (Intermediate Medical Science), A/Prof Bill Phillips (Human Cellular Physiology), Dr Matthew Naylor (Heart and Circulation), Drs Dario Protti and Cathy Leamey (Neurosciences), Professor Stephen Assinder (Honours), and a very special thankyou to Dr Haydn Allbutt who coordinates the practical classes program.

Service
Physiology academics serve on a surprisingly large number of committees within the University and in the scientific and general community. A/Prof Bill Phillips was Chair of the School Teaching Committee during this period, while Dr Meloni Muir represented the School at the Faculty of Science Teaching Committee. Professor Jonathan Stone served as Director, and Professor Mason as Deputy Director, of the Bosch Institute for Medical Research, the research arm of the School of Medical Sciences. During 2012–2013, A/Prof Bill Phillips continued to serve as a member of the University Biosafety Committee, while Dr McAllan was a member of the University Animal Ethics Committee and Dr Stephen Assinder was Chair of the University Human Research Ethics Committee in 2012–13. As well as his other roles, Professor David Cook was Deputy Dean of the Faculty of Medicine.

Acknowledgements
Our activities would not be possible without a great deal of support from our dedicated general staff. Although general maintenance of our computers was taken over by University ICT services in 2010–2011, John Dodson and Dane King provided the specialized support required for research programming and equipment. Lali Jacob manages to navigate impenetrable university finance and other systems as Discipline Manager, while Louise Harrison continues to be an excellent student liaison officer and staff manager, ably seconded by Kris Harrison. Finance and related services are supported by the unbelievably efficient Silvana Hourcade, and by David Lawrey, who undertakes academic work in Fine Arts in his other life. Our classrooms, practical classes, equipment and occupational safety are organized by Adel Mitry, a veterinarian by training, and the very helpful Hala Bishay, with the general oversight of Dr Haydn Albutt. Vincent Cheung continues to build and maintain our much needed electronic devices. We all appreciate being part of the Bosch Institute, and make great use of its many facilities. Physiology is part of the School of Medical Sciences, and is very grateful for the continuing supportive leadership of our Associate Dean, Professor Chris Murphy.

Rebecca S Mason
Head of the Discipline of Physiology
Discipline of Physiology 2013

Top Row: Narayan Sankaran, Harrison Shtein, Elysia Neist, Spencer Chen, Courtney Wright, Stefano Di Marco, Adel Mitry, Gaven Lin, Johahn Leung, Thomas Burton, Dan Johnstone, Yue-Kun Ju, Sarah Dalati, Heather Kelly, Alice Brandli, Tanchen Feng, Charmaine Green, Sofie Trajanovska, Francesca Meliton

Second Row: Stephen Assinder, Lilian Morris, John Cannody, Phillip Poronick, Anthony Wakuilcz, Martin Burgess, Jaimie Polson, Alison Ferguson, Marco Morsch, James Shannon, Yu Li, Craig Campbell, Jonathan Larach, Bobby Bournelhem

Third Row: Atomu Sawatani, Clare Gordon-Thomson, Stuart Fraser, Vincent Cheung, Peta Eggins, Douglas Drak, Jie Liu, Lucy Zhang, Hasthi Dissanayake, Louise Prestipino, Selina Solomon, Jin Huang, Monique Fasavalu, Holly Holliday, Salini Sreedharan, Kathryn Davies, Rachel Shparberg, Janine Street, Hala Bishay, Vicky Benson, Naomi Perera, Tang Shao

Bottom Row: David Allen, Haydn Allbutt, Isabel Arnaiz, Max Bennett, Liam Burke, Simon Carlile, Margot Day, Chris Murphy (HoS), Miriam Frommer, John Hearn, Sharon Herkes, Andrew Hoy, Cathy Learny, Paul Martin, Rebecca Mason (HoD), Bronwyn McAllan, Brian Morris, Michael Morris, Meloni Muir, Matt Naylor, Jonathan Stone

Physiology Staff List as of early 2013

Professors
Maxwell Richard Bennett, AO BE MSc PhD Melb DSc FAA. Appointed 1983
David Grant Allen, BSc MB BS PhD Lond, FAA. Appointed 1989
David Ian Cook, BSc(Med) MD BS MSc, FRACP FAA. University of Sydney Medical Foundation Fellow. Appointed 1998
Brian James Morris, BSc Adel PhD Monash DSc FAHA. Appointed 1999
John Patrick Hearn, MSc Dublin PhD ANU. Appointed 2004
Rebecca S Mason, MB BS PhD. Appointed 2007
Jonathan Stone, BSc(Med) PhD DSc FAA. Appointed 2007
William C Stanley, BSc UC Berkeley PhD UC Berkeley Appointed 2013

Adjunct Professor
Paul R Martin, BSc PhD, Professor of Experimental Ophthalmology, Save Sight Institute, Appointed 2010

Associate Professors
Simon Carlile, BSc PhD
Anuwat Dinudom, BSc Prince of Songkla MS Mahidol PhD
William D Phillips, BSc PhD

Senior Lecturers
Stephen J Assinder, BSc East Anglia MSc Bristol PhD Bristol
Margot L Day, BSc PhD
Stuart T Fraser, BSc Monash PhD Hong Kong (Sesqui Lecturer)
Miriam I Frommer, BSc PhD Lond
Catherine A Leamey, BSc PhD
Bronwyn M McAllan, BSc Macq MSc Adel PhD UNE
Michael B Morris, PhD (Sesqui Senior Lecturer)
Meloni M Muir, BSc Purdue PhD McG
Matthew J Naylor, BSc UWS PhD UNSW
Dario A Protti, PhD Buenos Aires

Lecturers
Haydn N Allbutt, BSc Melb PhD
Isabel Arnaiz, PhD
Sharon M Herkes, BSc PhD UQ
Atomu Sawatari, PhD UCSD

Lecturers - Casual
Miguel Iglesias BSc PhD Universidad de Alcalá
Francoise Janod-Groves, BSc NSWIT MApplSc UTS

Adjunct Lecturer
Jaimie Polson BSc PhD
Visiting Professors
Jouji Horiuchi, BSc PhD Yamanashi
Arie Moran, BSc PhD

Senior Research Fellows
Tara Brennan-Speranza, BMedSc PhD
Andrew J Hoy, BSc MSc Wollongong PhD UNSW

Senior Research Officers
Vicky Benson, PhD
Clare Gordon Thompson, MSc Wits PhD Natal (South Africa)
Yue-Kun Ju, MD Xian PhD ANU
Il Ha Lee, PhD Seoul
Jie Liu, PhD
Mark Rybchyn, BSc(Adv) PhD
Sofie Trajanovska, PhD Deakin

Research Fellows
Stefano Di Marco, PhD L’Aquila (Italy)
Daniel Johnstone, BBiomedSc PhD Newcastle
Marco Morsch, PhD Bonn (Germany)

Postdoctoral Research Officers
Luke Anderson, BSc Otago PhD UNSW
Craig R Campbell, BSc Qld PhD
Thomas Owens, BSc PhD Manchester (UK)
Ángeles Sánchez-Pérez, PhD
Tim Young, PhD

Research Officers
Heather Kelly, AB Vassar PostBac Penn MA Arizona

Research Assistants
Rick Ballan
Petra Hanke, BSc
Lilian J Morris, DipBiolSc STC DipIntDes KvB Coll Vis Comm DipLibTech TAFE Syd BusAdminCert3
Elysia Neist BMEDSc Newcastle
Rajini Nagarajah BSc
Sharon Spana
Janine Street
Radu Zamfirescu, BSc Bucharest

Visiting Scholars
Wenchen Ji
Ken Okabayashi
Yu Li
Chief Technical Officer
Adel Mitry, BVSc Cairo ACC STC

Senior Technical Officer
Vincent HW Cheung, HND HK Polytechnic CEI Part 2 UK

Technical Staff
Hala Bishay, BVSc Cairo AssocDip STC
Monique Fasavalu
Greg Mulhearn

Computing Staff
John WA Dodson, HNC Lond MIET I Eng
Li Jin, MInfTech
Dane King, BSc

Discipline Manager
Lali J Jacob, BAEcon MBA

Administrative Officers
Lucinda Guy, GradCertBusMan Deakin
Kris Harrison
Louise Harrison, BT CSU BED UNSW
Silvana Hourcade
David Lawrey, BVA

Professors Emeriti
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Roger Alan Loftus Dampney, PhD DSc
Anne E Sefton, AO BSc(Med) MB BS PhD DSc

Honorary Professors
Adrian Mindel, MB BCh Witw MSc(CTM) MD Lond, FRCP(UK) FRACP FACHSHM
G Philip Moore, PhD Flinders
Paul M Pilowsky, BMedSc MB BS PhD FAHA JP
Allan Snyders, DSc London PhD Univ College London MS Harvard SM MIT

Honorary Associate Professors
David F Davey, BSc MScMed PhD McGill
John J Carmody, MB BS MD Qld
Arthur V Everitt, BSc PhD
Ann Goodchild, BSc PhD
Joseph FY Hoh, BSc(Med) MB BS PhD ANU DSc

Honorary Senior Lecturer
Annick Ansselin, BA Macq MSc PhD
Samuel G Solomon, BBiotech Flin PhD (Sesquicentenary Lecturer)
Honorary Lecturer
Irene Schneider, BSc UNSW PhD

Honorary Associates
David J Adams BSc UTS PhD - Located at Wellcome Trust Sanger Institute (UK)
Rick Ballan, BA City Art Institute DipJazz Sydney Conservatorium of Music (pre-integration)
Don Bowen, BA CSU B Social Work Monash MLitt UNE PhD Macquarie
John F Cossey, BTC STC
Teri Furlong, PhD UNSW
Suzanne Jennings, BMedSc
Heather Jeffrey, MB BS PhD MRCP(UK) FRACP
Craig Jin, BSc Stanford MSc Caltech PhD
Patricia Jusuf
Ruby CY Lin, MSc Otago PhD – located at Univ of NSW
Geoffrey Manley, PhD
M Andrea Markus, BSc PhD Mainz (Germany) – located at Univ of Gottingen, Germany
Francine Z Marques, BSc MGenetMolBiol Fed do Rio Grande do Sul (Brazil) – located at Univ of Ballarat
Philip Poronnik, PhD
Richard Shephard, PhD
Michael Slater, PhD
Helen JL Speirs, BSc Glas PhD Edin – located at UNSW
Louise van der Weyden, BSc UTS PhD - Located at Wellcome Trust Sanger Institute (UK)
Andre van Schalk, MSEE Twente (Netherlands) PhD Lousanne (Switzerland)
William YS Wang, MM BS PhD Cambridge MRCP (UK) FRACP – located at Princess Alexanda Hosp and Univ of Qld
Peter Wenderoth, MA PhD DSc FAPS FASSA

PhD Candidates in 2013
Myriam Abboud, BSc MNutrDiet APD AN
Mohammad Al-Drees, BSc
Veronica Anatas, BSc
Michael Bourke, BSc
Alice Brandli, BSc Melb
Kurt Brigden, BSc
Chanukya Colonne, BSc
Sarah Dalati, BSc
Fabien Delarue, BSc
Alison Ferguson, BMed PharmBiotech UniSA BSc UNSW
Mohammad Ghayyini, BSc
Saba Gharaei, BSc
Nazanin Ghazanfari, BSc
Philip Gladbach, BSc
Charmaine Green, BSc
Jessica Jie Hao, BSc
Melone Laird, BSc
Johann Leung, Beng
Gavin Lin, BSc
Sam Liu, BSc
Angela May O'Connor, BSc
Terence Middleton, BSc
Anne-Marie Mooney, BMedSc UNSW
Josef Nacach, BSc
Charith Nandasena, BSc
Nicola Pitt, BSc
Sivaraman Purushothuman, BSc BSc(Psych) ANU
Rachel Shparberg, BSc
Selina Solomon, MEng Imperial College London
Sung-Hee Song, BSc
Nicole Tom, BSc
Wannit (Anna) Tongkao-on, BSc
Heidi Tran, BSc
Vicki Velonas, BSc
Courtney Wright, BSc

MPhil Candidates 2013
Luke Armour, BSc
Bobby Boumelhem, BSc
Sally Carter, BSc
Peggy Li-Hsiang Chen, BSc
Anson Cheng, BSc
Alex Fox, BMedSc
Roy Hui, BSc
Abbas Hussein, BSc
Sukran Ozsoy, BSc
Naomi Perera, BSc
Darius J H Rountree-Harrison, BSc
Maria (Tang) Shao, BSc

MMed Candidate 2013
Eric Jung Yong Song, MB BS

BSc(Hons) and BMedSc(Hons) Candidates 2013
Leilja Beckric
Martin Burgess
Kathryn Davies
Peta Eggins
Holly Holliday
Jonathan Larach
Shannon Locke
Francesca Melton
Tasnim Rahman
Maxine Rees
James Shannon
Clair De Sousa
Anthony Wakulicz
PhD Candidates in 2013

Myriam Abboud  Mohammad Al-Drees  Veronica Antas  Alice Brandli  Sarah Dalati

Alison Ferguson  Mohammad Ghalayini  Saba Gharaei  Charmaine Green  Johahn Leung

Gavin Lin  Terry Middleton  Anne-Marie Mooney  Josef Nacach  Angela O’Connor

Rachel Shparberg  Selina Solomon  Siva Purushothuman  Nicole Tom  Wannit Tongkaeo-On

MMed Candidate

Heidi Tran  Courtney Wright  Eric Song
MPhil Candidates 2013


Alex Fox  Naomi Perera  Darius Hountree-Harrison  Narayan Sankaran  Salini Sreedharan

BSc(Hons)/BMedSc(Hons) Students 2013

Martin Burgess  Kathryn Davies  Peta Egkins  Holly Holliday  Austin Ko

Jonathan Larach  Shannon Locke  Francesca Meliton  Maxine Rees  James Shannon

Anthony Wakulicz  Jia Hao Yeo
Peter Orlebar Bishop FAA FRS (1917–2012)

Peter Bishop came to the University of Sydney in 1935 after matriculating from Barker College. He came to study Medicine, and his interest in the study of the brain surfaced early, in an article he wrote as an undergraduate, on “The Nature of Consciousness”, in the Sydney University Medical Journal. He graduated MBBS in 1940.

The next decade Bishop spent away from the University, first as a resident in neurosurgery and psychiatry at the Royal Prince Alfred Hospital, then as a surgeon-lieutenant in the Royal Australian Navy, followed by four years in the United Kingdom, as a Fellow of the Postgraduate Committee in Medicine of this University, first at the National Hospital at Queen Square and, from 1947, at University College London, where he gained a strong grounding in membrane biophysics and cellular electrophysiology.

Bishop returned to Australia in May 1950, as an NHMRC Fellow in the Department of Surgery. He moved to a senior lectureship in the Department of Physiology in 1951, and in 1955 succeeded FS Cotton as Professor of Physiology. Over the next 12 years, with AV Everett and new appointments which he made – including Paul Korner, Liam Burke, WR Hayhow, MG Taylor, Ian Darian-Smith and Colin Dunlop – he built the Department to one of excellence, especially in sensory neurophysiology and cardiovascular physiology.

Bishop’s own Laboratory, within his Department, was called the Brain Research Unit, and there he founded a subdiscipline of neuroscience – visual neuroscience – in Australia. The Unit became itself a centre of excellence, a magnet for highly able, research-oriented young medical graduates and medical students, who came, particularly through the Bachelor of Medical Science program, in near-epidemic proportions – David Jeremy, James Lance, James McLeod, WR Levick, Ross Davis, Ann Sefton, JD Pettigrew, Mathew Vadas, WJ Kinston, Douglas Joshua and John Eisman, to name just a few. The Brain Research Unit also attracted young overseas scientists including WM Kozak and RW Rodieck. It was in the Brain Research Unit that Rodieck wrote his classic 1973 volume *The Vertebrate Retina*.

In analyzing, in retrospect, how a young man from the rural tablelands – Bishop grew up in Tamworth and Armidale – could, in the economic restraint of postwar recovery and without a powerful mentor, establish a centre of quality which still influences his field, through many score scientific children and grandchildren, colleagues I have talked to have identified several factors.

Some are common to the successful – energy, determination, strong support from the family, for Bishop from his wife, Hilare, who died 6 months earlier, in December 2011. Other qualities of the man came from we know not where – an openness of mind, a sense of where he needed to manage and where he needed to give people room to develop, and an ability for management of the resources which became available as postwar recovery transitioned to the relative prosperity of the 1950s.

One feature of Peter Bishop was his insight that new equipment would give scientists access to new knowledge, and all of us who worked in the Brain Research Unit realized Peter’s ability to build physiology laboratories on a scale of precision and stability, like an astronomer’s telescope.
The Department of Physiology was – and still is – in one of the University’s oldest buildings, built to be the latest thing in the 1880s. During World War II, his predecessor as Professor of Physiology (FS Cotton) had built a human centrifuge in the floor of a lab, just on the western side of the Building’s northern entrance. There Cotton developed pressurized suits for pilots, able to prevent them from losing consciousness in tight manoeuvres, in the air battles of that terrible conflict.

Bishop, the story goes – or is it a legend? – filled the centrifuge with concrete and built on that big foundation a high-stability apparatus for the precise exploration of the brain with the microelectrode technology which he and Liam Burke were introducing. They sought that rock-like stability against – I was told – vibrations from trams on Parramatta Road. It was on that apparatus, and with the devices which Bishop and Burke and Bill Levick built around it, that he and I and many others gathered data, which we learnt to fashion into discovery. Peter would enjoy knowing, I believe, that we continue his tradition of discovery-in-sandstone and would admire the instruments we have developed and installed in that same Building – now 120 years old: the multi-photon microscopes, the sequencers and analysers, the patch-clamp systems, the setups for imaging living cells, cellular organelles and intracellular signalling.

Bishop spent the last 16 years of his career at another University, the ANU, as Head of Physiology in the John Curtin School of Medical Research. That period of his career was also highly creative and productive, and attracted and trained many able scientists from Australia and overseas, notable among them Bogdan Dreher, in the Discipline of Anatomy & Histology. But it was in the years from 1950–67, in the Department of Physiology, that Bishop laid down the themes of his work, of which there were five:

- The beginnings of parallel processing in the visual system.
- Synaptic transmission in the visual thalamus.
- Physiological optics.
- Information processing in visual cortex.
- And, especially, the neural basis of stereopsis.

Peter Bishop retired from the ANU in 1983, and returned once more to this Faculty in 1987, when he accepted an honorary position in the Department of Anatomy, where, as Head of Department, I was able to offer him the position. He worked and wrote productively there for another decade, during which he was awarded the Australia Prize, one of the highest distinctions earned by scientists of this University. It was a reflective and distinguished period of completion of a career of pioneering discovery.

Peter Bishop died in mid-2012, on June 3, aged 94, survived by his daughters Phillipa and Clare, and by his son Rod, also a graduate of this Faculty. His commitment and energy, his openness to new ideas and new people, the laboratories he built and the discoveries he made remain a lasting example and legacy.

Jonathan Stone
Professor Emeritus Paul Korner passed away on 3 Oct 2012 coinciding with the 24th Scientific Meeting of the International Society of Hypertension, which, but for a short illness, he would have attended at the Sydney Convention and Exhibition Centre. Fittingly, on that same day, he was awarded the Medal for Distinguished Membership. His passing on the evening prior to the last day of the conference enabled his colleagues present from all over the world to be told the sad news and listen to an obituary read by Professor Murray Esler, one of his long-standing colleagues from his time as Director of the Baker Institute in Melbourne.

Korner devoted much of his career to essential hypertension, the most common form of high blood pressure, responsible for myocardial infarction, stroke and kidney disease. The cause of essential hypertension was a mystery when Korner began studying it in the late 1940s. Scientists had various ideas about what was causing high blood pressure. Was it that diets contained too much salt? Could it be that lives were becoming more stressful? Or was it something to do with genetics, or the nervous system? Korner joined the dots from circulation to molecular biology to diet to stress hormones to the nervous system. He was one of the first in the world to compile a holistic picture of hypertension.

Paul Korner was born on 18 Nov 1925 in Moravska Ostrava, a coal mining and steel town in Czechoslovakia, the eldest of two sons to Ernst Korner and his wife, Edith (nee Singer). He grew up in an apartment in the town’s centre, where Ernst, an architect and engineer, designed housing complexes and a department store. A bookish child, Paul wrote a play about the abdication of King Edward VIII when he was still in primary school. Years later he recalled that at 12 he was nose deep in Schiller.

Hitler interrupted Paul’s childhood. The Korners fled to Switzerland, then to London, before deciding that England wasn’t far enough away for a Jewish family. In August 1939 they boarded a ship to Australia, arriving the same year when Korner was 14. Ernst bought a large block of land at Mosman, with sweeping views of Beauty Point and Middle Harbour, and enrolled Paul at Barker College in Hornsby, from where he graduated in 1942.
Paul enrolled in medicine at the University of Sydney. He completed a Bachelor then a Masters of Science. Korner’s physiology teacher left a lasting impression on him. Frank Cotton was almost certainly the most interesting lecturer on the campus. He had been one of the inventors, on the Allied side, of the so-called anti-gravity suit (the g-suit). ‘So at the end of year two I asked him, greatly daring, could I get a holiday job for his research,’ Korner said. Korner couldn’t land a job on the g-suit team, but Cotton said he was interested in the physiology of exercise and asked Korner if he would look at a device he had for recording blood pressure.

In 1945, Korner met Jennifer Woods, who was then 16, while on holiday in Lake Burragorang. The couple found they had much in common – love of literature, music and theatre – and they married in 1950.

After graduating in 1951, Korner undertook clinical training at the Royal Prince Alfred Hospital, then trained in research at Sydney Hospital, London’s Hammersmith Hospital and Harvard Medical School. In 1956, Korner was made a senior lecturer in physiology at the University of Sydney and four years later became foundation Chair in Physiology at the University of New South Wales, where he stayed for eight years before returning to the University of Sydney as its first Professor of Cardiology.

Korner was recruited in 1975 to run Melbourne’s little-known Baker Medical Research Institute. When he retired in 1990, the Baker was a world-class institute. During ‘retirement,’ Korner wrote the closest thing blood pressure has to a bible – *Essential Hypertension and its Causes: Neural and Non-Neural Mechanisms*.

Korner’s colleagues marvelled at how he balanced such a frenetic workload with so many interests. ‘Somehow this man, who worked day and night, seemed to have read all the latest books, gone to the best concerts, and could talk about the latest plays at the Old Tote Theatre and the best operas at the Elizabethan Theatre,’ said Professor John Chalmers of the University of Sydney.

For services to science, Korner was made an Officer of the Order of Australia in 1990.

Paul Korner is survived by Jennifer, children Nicholas, Anthony and Harriet, and six grandchildren.

(Parts of the text above were taken from the obituary column of the *Sydney Morning Herald*).
William (Bill) Stanley PhD (1957–2013)

Professor William Stanley, universally known as Bill, was an outstanding scientist who made major contributions to cardiovascular physiology, particularly in the areas of carbohydrate and lipid metabolism of the heart. He grew up in California in a family who loved outdoor recreations and as a young man he excelled in kayaking and long distance running. His first degree was in Sports Science at the University of California at Berkeley and he went on to do a PhD in Exercise Physiology, awarded in 1986. His post-doctoral training was at the Cardiovascular Research Institute of the University of California School of Medicine in San Francisco where he first studied the metabolic substrates of animal and human hearts. Bill’s first faculty position was at the University of Wisconsin. He subsequently joined the pharmaceutical industry working on drug treatment of heart failure. Bill then took up an appointment at Case Western Reserve, Cleveland, Ohio where he became a full Professor and stayed for 10 years. In 2007 he moved to the University of Maryland, Baltimore where he was Professor and Director of Cardiovascular Sciences and in January 2013 he was appointed as Professor of Cardiovascular Physiology at the University of Sydney. He died suddenly and unexpectedly in October 2013.

Bill’s research career took off as a post-doc at the Cardiovascular Institute in San Francisco where he discovered that the human heart uses lactate preferentially over glucose. These studies led to a life-long interest in the heart, its metabolic pathways and, in particular, the role of the mitochondria. Many of his subsequent studies have focused on the mitochondria and he tried to dissect the details of the regulation of mitochondria and their role in cardiac disease, particularly heart failure. He showed that both mitochondrial structure and function changed drastically in heart failure and the normal preference of the heart for lactate over glucose was reversed. During his period in the pharmaceutical industry Bill studied the role of drug therapy to treat heart failure. But his true love was the idea that by changing diet and mitochondrial metabolism it might be possible to improve outcomes in heart failure. At first he followed the standard paradigm which was that lipids were toxic to the failing heart, but his studies consistently refuted this idea. Bill’s recent work pointed to increased dietary fats being beneficial during heart failure and in his recent and on-going studies he was trying to identify which particular fats were most beneficial in animal models of heart failure. This work has obvious parallels in the repeated observation that the Mediterranean diet, which is rich in fish and plant oils, is beneficial in human coronary artery disease.

Bill authored over 190 publications. Together, these have had a major impact on our understanding of cardiac and mitochondrial metabolism and their role in cardiac disease. As a reflection of this interest Bill was the founding President of the Society for Heart and Vascular Metabolism. This Society exists mainly to organise an annual meeting and in September 2013 Bill Chaired the Organising Committee and attended the Eleventh annual meeting held in Cambridge, Maryland.
In 2010 Bill also took on a new professional role when he became Editor-in-Chief for the *American Journal of Physiology – Heart and Circulation*. This was a major role and Bill told me he read every paper submitted in order to triage them into those that were reviewed and those that were not. At a memorial service for Bill, 5 of his Editors were present by video link and spoke of the innovations that Bill had bought to this role and, particularly, the strong bonds of friendship that Bill developed in all his professional activities. I know that Bill was particularly delighted that his Editorship had recently been extended despite the difficulties of the Editor-in-Chief being in Sydney while the Editorial Office remained in Baltimore.

I got to know Bill and his wife Beth over a number of visits he made to Sydney before his appointment and then during 2013, after his arrival in Sydney. We had common interests in cardiovascular physiology and in running and outdoor activities generally. I was one of those who introduced Bill to the Byzantine complexities of the NHMRC and its grant funding activities. He and Beth visited our vineyard in Bathurst and rapidly threw themselves into the physical activities involved. It is obvious from Bill’s career that he embraced change and he often told me that he found moving stimulating because of the forced changes in directions and collaborations that moving involved. For Bill and Beth, moving to Sydney was an exciting new direction and they were busy exploring Australia, the outback and the people with their trademark enthusiasm. Beth made many close friends in the small street in Leichardt where they were living and these friends provided enormous support to Beth when she suddenly found herself bereaved in a foreign country away from family and old friends.

Bill’s loss has been acutely felt by many. In the Discipline of Physiology he was to have led our Cardiovascular teaching into the future. His Laboratory was about to move to the Charles Perkins Centre and he was closely involved in the planning of the cardiovascular aspects of the Centre. He had joined the Board of the Heart Research Institute and had been helping to map out the future of that Institute and its relations with the University and the Charles Perkins Centre. His role as Editor-in-Chief at the *American Journal of Physiology – Heart and Circulation* was marked by innovation and new directions and his loss has been keenly felt. His wife Beth, his extended family and his many friends across the world have lost a warm, enthusiastic and charismatic individual.

David Allen
Lab Overview
Examination of the role of alpha synuclein in the initiation of Parkinson’s disease.

Research Activities
The years 2012 and 2013 were a time of great learning for us. In 2012 we began a new line of investigation into the role of alpha-synuclein (α-syn) as a possible initiating trigger for Parkinson’s disease. We began by using purified α-syn from a commercial supplier. We learnt to oligomerize (aggregate) the protein using published protocols and to examine the kinetics of the oligomerization using a fluorescent assay. We then started to examine the effect of the misfolded version (the oligomers) on the normal monomeric form of the protein.

When we first began work on α-syn there was very little literature on the protein as the pathological mechanism involved in the initiation and progression of Parkinson’s disease. As other groups began to work on the topic and more papers appeared, we increasingly found that most groups that worked on alpha synuclein used relatively high concentrations of the protein in large volumes, because movement and interaction of the protein molecules with each other was important for protein aggregation. We were trying to use 50 μL samples, but the literature was generally using 2 mL samples. We could not afford to buy the quantity of α-syn we needed from a commercial source to use volumes this large.

During this work Courtney Wright managed to find a group in Australia that had been growing recombinant α-syn in E. coli and they generously gave her a sample of the bacteria. This allowed us to begin producing our own recombinant, full length human α-syn. The Bosch Molecular Biology Facility had an FPLC machine, used in the purification of proteins, which was not being used. So over several months we developed the protocols to produce the protein ourselves. The concentration of our protein was difficult to detect as α-syn does not contain tryptophan. This meant we could not use standard protein assays. Once again the Bosch Institute Molecular Biology facility came to the rescue by purchasing a Direct Detect machine which uses infra red light to detect protein concentration based on the amide bond of the peptide backbone. This allowed us to quantify this protein.

To put it in perspective, a typical purification run took 3 days and would produce around 20 mg of α-syn. A commercial source had meant paying $652 for 500 μg. This meant that in only 3 days we could now produce approximately $26,000 worth of protein. As a result the Lab has now produced several hundred thousand dollars worth of protein which has made our experiments possible.

As we intended to inject alpha synuclein into the brains of rats, and also to feed it to them, we needed to produce aggregates by a method that was not toxic, so we explored several possible techniques for generating the oligomers we needed. We found that oligomerization was often variable, so we sought ways of making oligomerization more consistent. In addition we needed ways of visualizing the oligomers that we produced, so Abdurrahman examined native-PAGE, SDS-PAGE (1D and 2D), Raman spectroscopy, atomic force microscopy and fluorescence spectroscopy. As our protein had been grown in E. coli we had to learn to remove any endotoxins so as not to kill the rats. We achieved this by using Triton X-114, but we then had to learn how to remove the Triton X-114, doing so using acetone extractions.
While this work was in progress we began to look at various environmental factors that may be triggering endogenous \( \alpha \)-syn to misfold. It was our aim to screen possible environmental triggers for their ability to enhance \( \alpha \)-syn aggregation. We used a fluorophore called Thioflavin T, which becomes fluorescent in the presence of aggregated amyloid proteins (such as \( \alpha \)-syn), and meant we could thus monitor the progress of aggregation.

In 2013 third year neuroscience students harvested fungi from their nasal cavities and examined the effect of these fungi on \( \alpha \)-syn oligomerisation. A medical honours student examined the effect of another amyloid protein \( \kappa \)-casein from milk.

We had intended to start injecting and feeding the rats once we obtained some \( \alpha \)-syn, so we ordered 70 rats in 2012. Due to the various technical issues outlined above, however, it was not until the end of 2013 that we were finally ready to inject and feed the aggregated \( \alpha \)-syn to the rats. Two years is very old for rats – the equivalent to 66 years old in a human. Rather than euthanase the rats we decided to proceed with the study in these aged animals, since by far the greatest risk factor for developing PD in humans is age, with the vast majority of cases developing in individuals over the age of 65. Thus we found ourselves with a population of rats that were ideal for the study of the disease we were interested in. Other problems arose, however. The aged rats had become obese, a common occurrence in ad libitum fed rats, and had developed ulcers on their hind feet. They also developed tumours, which according to the literature is another common phenomenon. We placed the rats on a calorie restricted diet in order to combat these problems, and we surgically removed tumours as they appeared.

Thus over the past two years we have learnt to produce and visualize recombinant proteins, aggregate those proteins, remove endotoxins and perform \textit{in vitro} assays that allowed us to follow the aggregation of amyloid proteins such as \( \alpha \)-syn. We began to capture live fungi and produce a number of other possible environmental amyloid proteins that we are intending to study as possible triggers for PD. Lastly, we have been maintaining and caring for our now very valuable aged rat population, which is unique in PD literature as it is generally far too expensive and difficult to maintain rats to this age. We anticipate that all is now in place to at last screen a range of possible initiating triggers against \( \alpha \)-syn, both \textit{in vitro} and \textit{in vivo}, in the hope of discovering what causes Parkinson’s disease.

**Total Annual Citations**

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**BSc(Hons) Awarded**

2012
Abdurrahman Mubayyid

**Scholarships Awarded**

2012
Courtney Wright: Australian Postgraduate Award

**Service to the University**

Chair, Education Design Committee, Charles Perkins Centre: 2009–2013
Lab Overview
Regulation of function in cardiac and skeletal muscle in health and disease.

Research Activities
In 2013 Dr Ju discovered that inositol triphosphate receptors are expressed in the sarcoplasmic reticulum of the pacemaker cells of the heart. This led her to investigate their contribution to Ca\(^{2+}\) release and to pacemaker firing. Dr Liu also worked on the cardiac pacemaker cells and studied the expression of STIM1 and ORAI1, which are proteins that contribute to store-operated Ca\(^{2+}\) influx. During 2012 and 2013 Dr Benson studied the effects of muscle length on ventricular myocytes. When cultured cells are stretched for long periods she discovered that their excitability and Ca\(^{2+}\) release are modified. She then began studies at determination of the cellular and molecular basis of these changes. Dr Trajanovska studied intact skeletal muscle and was involved in developing techniques to measure intracellular calcium in blood-perfused muscle. She and Kushy Athwal were involved in ongoing investigations of muscle fatigue and stretch-induced muscle damage, with a particular aim to identify the proteins whose altered function affects Ca\(^{2+}\) release. Dr Li is a visiting PhD student from China and is studying traumatic brain damage. The Lab's approach has been to grow neurons in culture and expose them to sudden brief stretches which mimic some aspects of brain damage. Neurons develop localized swellings under these conditions and we hypothesise that these are caused by stretch-activated channels.

Publications
Journals
2012

Total Annual Citations
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* ‘Lifetime’ = To end of 2013
Chapter in Book
2012

Editorial in Journal
2013

Letters to the Editor (Journal)
2012 & 2013

Official for Scientific Societies, including for National and International Conferences
Session Chair, ‘Muscle performance’ session, Gage Conference, Canberra; Apr 2012
Session Chair, ‘Excitable cells’ session, Australian Physiological Society annual scientific meeting, Sydney, Dec 2012
Session Chair, ‘Calmodulin kinase and calcium in the heart’ session, International Society for Heart Research/Cardiac Society of Australia and New Zealand meeting Gold Coast, Aug 2013

Conferences and Symposia Organized
Member, Organising committee for Gage Conference, Canberra, ACT, held in April 2012

Invited Presentations at National and International Conferences
Role of phosphate in muscle fatigue, Gage Conference, Canberra, Apr 2012
Muscle fatigue, Gordon Research Conference, Les Diablerets, Switzerland, Jun 2012
Ionic channels in skeletal muscle, University of Geneva, Switzerland, Jun 2012
Duchenne muscular dystrophy, Australian Institute of Musculoskeletal Science, Melbourne, Sep 2012
Speaker in ‘Excitable cells’ session, Australian Physiological Society annual scientific meeting, Sydney, Dec 2012

News Media
Radio
Radio National (by Hagar Cohen) 5 May 2013 on animal ethics committees

BMedSc(Hons) Awarded
2012
Cheung D, 1st Class

Manuscripts Refereed for Journals
2012 (21)

2013 (23)
Am J Physiol Heart Circ (4); J Mol Cell Cardiol (4); Acta Physiol (3); J App Physiol (3); J Physiol (2); PloS One (2); Physiol Reports (1); Frontiers Physiol (1); Clin Exp Physiol Pharmacol (1); Pflug Arch (1), Circ Res (1);

Grant & Award Applications Assessed
2012
NHMRC (3)
ARC (1)
ANR (France) (1)
MDA Venture Philanthropy (1)
NSERC (Canada) (1)

2013
NHMRC (5)
ARC (1)
ARC Future Fellowship (2)
St Vincent’s Foundation (1)
AFM (France) (1)
MDA Venture Philanthropy (1)
NSERC (Canada) (1)

Membership of Editorial Boards of Journals
Journal of Molecular and Cellular Cardiology (2007–)
Frontiers in Skeletal Muscle Physiology (2012–)

Higher Degree Theses Examined
2012
PhD, Univ of Sydney

Service to the University
Chair, Animal Ethics Committee (2012–)
Academic Planning and Development Advisor (for 13 staff in Discipline of Physiology) (2013)
Sub-Dean Research, Anderson-Stuart/Molecular Bioscience, Sydney Medical School (2012–)

Service to Professional Societies, Grant-Giving Bodies or Other External Committees
Member, National Committee for Biomedical Sciences, Australian Academy of Science (2010–13)
Member, Board of the International Union for Physiological Sciences (2012–)
NHMRC Translational Faculty (2012–13)
President, Australian Physiological Society (2010–13)
Board Member, Heart Research Institute (2002–12)

Grant Funding
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Teaching and Research Report

Isabel A Arnaiz

Teaching related activities and collaboration
My teaching portfolio for the last two years has included over 480 face-to-face teaching hours to 2nd and 3rd year Physiology and Sydney Medical Program students. In 2013 I co-ordinated my first Unit of study: BMED2406 Hormones, kidney and reproduction. This was an incredible experience.

The BMED2406 teaching team for 2013 included Dr M Frommer, Dr S Herkes, Dr C Gordon-Thomson and Dr A Sanchez-Perez. All members of the teaching team contributed to the development of the Unit of Study. We successfully introduced an IBL activity that related to the Endocrine lectures. Students were assigned to groups and provided with a question. They had to research the literature to find an answer to the given question and then present the answer to the class a few weeks later. This is currently the only assessment in 2nd year BMED that has a focus on developing oral communication skills, team-work and collaboration. The eLearning platform LabTutor was also introduced into the curriculum as a pilot study using the Renal Diuretics tutorial prior to its purchase for use in the CPC at Dr M Day’s suggestion.

Time was also dedicated contributing to the curriculum development of other Units of Studies including BMED2401 to 05, PHSI2005, PHSI2006 and PHSI3006. An example included the generation of a tutorial module ‘Paraphrase don’t Plagiarize,’ which was used as the basis for a successful grant application for 2013 eLearning Projects for Engaged Enquiry: ‘Using Paraphrasing and Short Writing Tasks to Promote Understanding and Academic Skills in Science.’ Other contributions included the generation of animated power-point presentations for tutorials, electronic report templates, checking for plagiarism using Copyfind software, marking criteria design, proof reading and other related duties.

Community Service
In 2013 Dr Herkes and I initiated an outreach program to Hazelbrook Public School. The main objective of this program was: To educate primary school children about healthy living by performing experiments on themselves. The students designed and performed an experiment that involved collecting data on themselves and interpreting the results. One of the experiments was focused on making students aware of how much exercise they did per week. To do this they used Fitbits provided by Dr Day and Prof Poronnik.

I regularly helped Dr McAllan in the maintenance of her Dunnart colony.

Teaching-related Research
In 2012 John Dodson, Dr Assinder, Dr Fraser and myself completed an eLearning platform that was introduce into the PHSI3006 curriculum. This platform provides a novel way by which students can learn about experimental methodology.
Laboratory-based Research
I collaborated with Prof L Itnner and Dr B McAllan on a project that focuses on Alzheimer’s disease – in particular the protein Tau and how it has evolved over time.

Journal Article
2013

Teaching-related Publications


Grants

Muir M, Taylor C, Drury H, Arnaiz I, Owens C, Bridgeman A. Using paraphrasing and short writing tasks to promote understanding and academic skills in science. IT pedagogical design support application for 2013 eLearning Projects for Engaged Enquiry.
Research Activities

The work of the Andrology Research Group is concerned with two significant issues of male health, namely prostate disease and environmental endocrine disruption of male fertility.

Prostate disease: Prostate cancer is the most commonly diagnosed cancer in Australia, and is the second leading cause of cancer death in men. More than 2,700 men die of prostate cancer in Australia each year. It was estimated that in the year 2000 there were 513,000 new cases worldwide. Benign prostatic hyperplasia is the most common benign growth in men, resulting in severe morbidity. During 2012–2013 the research of the group focused on:

1. Understanding how the loss of structural proteins involved in organization of the cell cytoskeleton contribute to the development of prostate cancer phenotypes.

2. Hormone regulation of prostate cell proliferation. In particular, how the hormones usually associated with females, namely oestrogen and oxytocin, are associated with abnormal growth of the prostate.

3. Since dysfunction of cytokine signalling pathways is a well known factor in the development of cancer, the integration and regulation of the FGF and TGF-β signalling pathways are a focus of collaborations within the Bosch Institute Prostate Cancer Focus Group, and also with A/Prof Frank Lovicu of the Bosch Institute.

4. Treatment of some cancers, but not all, with platinum based drugs is very effective. The inherent resistance of prostate cancer to these drugs and the role of copper transporters is the subject of a collaboration between the Andrology Research Group and Dr Stuart Fraser of the Bosch Institute.

Endocrine disruption of male fertility: It is of increasing concern that human sperm quality is declining. Many environmental factors have been implicated in this decline, including phytoestrogens. Since phytoestrogens were first associated with the disruption of mammalian fertility there has been considerable interest in their effects on sexual development and reproductive function. This is particularly pertinent given the increasing advocacy for the use of phytoestrogens as bioprotective agents against diseases such as cardiovascular disease and prostate cancer. Work has recently demonstrated that exposure to phytoestrogen in adulthood can disrupt factors that regulate fertility. In an attempt to understand the mechanisms involved, the group is developing transgenic models to determine the roles of oestrogen in spermatogenesis.
At the beginning of 2012 the group re-located to shared laboratory space with Dr Stuart Fraser in the Medical Foundation Building. Work has continued on establishing the role of the cytoskeletal protein transgelin in prostate cancer development. This has confirmed *in silico* analysis of expression libraries that predicted a decrease in transgelin expression to occur early in development of prostate cancer in cell models. Furthermore, study of prostate biopsies from patients suffering from this disease has demonstrated that expression of transgelin is lost in 90% of prostate cancer cases. Work is continuing on demonstration of the significance of this loss in cancer development, and to establish the power of this event as a diagnostic marker of prostate cancer. Development of biomarker approach towards a diagnostic platform based on circulating immune cells and prostasome microparticles has been initiated in collaboration with Prof Cris dos Remedios (Discipline of Anatomy & Histology) and A/Prof Henry Woo (Adventist Hospital). This work is the focus of a PhD project by Vicki Velonas co-supervised by Dr Assinder.

Our long interest in the roles of oxytocin, a hormone usually associated with the female sex, has continued. Nicole Tom, a PhD student supported by an Australian Postgraduate Award, is working on this project. Nicole was also in receipt of a Cancer Institute NSW scholarship during 2012 to support her endeavours. In 2012 and 2013 Honours students Alex Cole and Kathryn Davies undertook projects to further investigate, respectively, the effects that location of the oxytocin receptor in membrane microdomains had on caveolae expression and the effects of oxytocin on steroidogenesis in prostate cancer cells. This is particularly important in the context of *de novo* steroidogenesis, one mechanism by which prostate cancer is thought to escape androgen ablation therapy.

The Andrology Research group was a founding member of the Bosch Prostate Cancer Research Group. This valuable venture has initiated a collaborative research programme that combines the research interests of the member groups. The focus of this collaboration is the integration of the biochemical pathways of PI3K/AKT, PTEN and TGF-beta. An NHMRC grant funded part of the work of the Andrology Research Group and provided a research scholarship to Mohammad Ghalayini through 2012.

Some new endeavours and collaborations of note were the instigation of the Copper Biology Research Group with Dr Stuart Fraser. This group was started after some exciting findings of an Honours student, Natalie Wee. This formed the foundation for projects concerning copper transport and susceptibility of cancers to platinum based drugs. The group was successful in securing funds from the National Breast Cancer Foundation and a Bosch Translational Grant-in-Aid to support this work.

Finally, a collaboration with Prof Frank Lovicu, in the Discipline of Anatomy & Histology, was instigated in 2012 and formed the basis of an Honours project undertaken by Daniella Beniamen. We have employed mouse models deficient in negative regulators in FGF signalling and demonstrated that these mice develop prostate cancer.

**Journal Articles**

**2012**


**2013**


**Total Annual Citations**

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* ‘Lifetime’ = To end of 2013

**H index = 14**

**BSc(Hons) Awarded**

2012

Daniella Beniamen. Sprouts in prostate and breast cancer development. 2nd Class, division 1

Alex Cole. The effect of oxytocin receptor localisation on cell signalling in DU145 and PC3 prostate cancer cell lines. 1st Class

Natalie Wee. Targeting the copper-transport locus for therapeutic benefit in prostate cancer. 1st Class.

2013

Kathryn Davies. The effect of oxytocin on de novo steroidogenesis in advanced prostate cancer. 1st Class

**Manuscripts Refereed for Journals (18)**

Various journals in 2012 and 2013

**Membership of Editorial Board of Journal**

Frontiers in Physiology: 2012–

**Grant & Award Applications Assessed**

2012

NHMRC (1)

2013

NHMRC (3)

Prostate Cancer Charity (UK) (1)

**Service to the University**

Chair, Human Research Ethics Committee: 2011–

**Grant Funding**

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**Teaching**

Unit of Study coordinator PHSI3005/3905 Heart and Circulation – Normal Function
Unit of Study coordinator PHSI3006/3906 Heart and Circulation – Dysfunction
Unit of study coordinator for Honours
PHSI3007/3907 and PHSI 3008/3908 Heart and Circulation: PBLs/advanced project supervisor
PHSI3005/3905 and PHSI 3006/3906 Human Cellular Physiology: Lectures/laboratory/PBLs/advanced project supervisor
PHSI2906 Integrated Physiology Advanced Labs
ORHL1006/1007-(BoH) Life Sciences 1 Cell biology/Tissue Biology: lectures
HSTO3003/3004 Cells and Development; Lectures/Practical classes
USyd Medical and Dental program: Stage 1, Block 1: lectures
USyd Medical and Dental program: Stage 2, Block 7: lectures
Lab Overview
The focus of research is to gain an understanding of the function of synapses at the both the cellular and integrative level, particularly in neuropsychiatry.

Research Activities
Research on these themes continued during 2012 and 2013 with the very significant findings that grey matter changes in stress, determined by magnetic resonance imaging, are due to the loss of synapses and that the energy expended by neurons in sustaining synaptic activity is constant per impulse per neuron over all behavioural states and vertebrate species.

Journal Articles
2012

2013

Books
2013
Letters to the Editor (Journals)
2013

Founder for Institute and Foundation
Founded ‘The Queensland Mind and Neuroscience Centre’ at Univ of Sunshine Coast.
Founded ‘The Tropical Brain and Mind Research Foundation’ in Townsville.
Initiated ‘The Anzac Centenary Brain and Mind Research Centre’ for the Board of the Anzac Centenary.

Invited Presentation at International Conference
The Franke Lectures at Yale Univ, USA, 2013.

Membership of Editorial Board of Journal
Progress in Neurobiology 1995–
Research Activities
Previous research concerning the effect of the Moon (and the Sun) on visual acuity in both the oedematous eye and the normal eye was completed and published in two papers in 2012 and 2013 (see below). The results of research on sneezing was published in 2012 and a paper on yawning in 2013. The immediate cause of yawning is not known. I have proposed that a yawn is caused by a restricted alveolar collapse which at present cannot be detected by X-radiography or in any other way. My evidence is based primarily on the fact that deep breaths inhibit yawns. This is true whether the deep breaths are made using air, nitrogen or carbogen.

In more recent experiments in which we recorded breathing using a spirometer, we have found that there are two kinds of breath, one fairly quick, one slow. These occur in small episodes and alternate continually but in an irregular pattern. If several deep breaths are interposed deliberately, thereby causing all alveoli to open, the next few breaths are seen to be slow ones. Thus, the slow breath is associated with open alveoli. On the other hand, if holding the breath for 0.5-1.0 minute is interposed, the next few breaths are fast ones. Thus the fast breath is associated with a relative collapse of some alveoli.

My conclusion is that under normal quiet conditions there is an alternation of opening and closing of some alveoli. During a common cold or bronchitis there is an increased frequency of fast breaths, indicating a relative alveolar collapse.

Finally, on the few occasions when a yawn occurred during the recording, the yawns were immediately preceded by fast breaths, indicating a relative alveolar collapse. This provides good support for the hypothesis proposed in the published paper on yawning.

Experiments were also resumed on a project which had been interrupted unavoidably, namely, the composition of nasal fluid regardless of how this is produced. My preliminary results show that nasal fluid produced by exposure of the face to a low temperature (4°C or less) is similar to that produced by a sneeze, but if the expired air goes through the nostrils there is a dilution caused by admixture of the nasal secretion with condensed water.

I am also studying the occurrence of migraine auras in the absence of the migraine.

Journal articles
2012

2013

Total Annual Citations

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<tr>
<td>W Burke</td>
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<td>2765</td>
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</table>

* ‘Lifetime’ = To end of 2013.
AUDITORY NEUROSCIENCE LABORATORY

SIMON CARLILE

Lab Overview
Research in the Laboratory during 2012 and 2013 focused on three main areas: (1) The role of spatial attention and localisation in speech intelligibility in noisy environments in normally hearing and hearing impaired individuals; (2) The capacity of the auditory system to adapt to chronic changes in spectral input as occurs with normal ageing and with the fitting of a new hearing aid or hearing prosthesis; (3) The perception of moving auditory stimuli.

Research Activities
Speech intelligibility and the ‘cocktail party problem’: During this 2-year period we developed a radical new approach to studying the cocktail party problem. This arose out of work completed in collaboration with Macquarie University that was published in the Nature publishing group’s journal Science Reports at the beginning of 2013. In the study we examined a group of school age children who had been referred to an audiology specialist because they had problems listening in noise – particularly in the class room. Our audiological colleagues or the paediatric psychologists could find nothing wrong with the hearing or behaviour of these children. Following the development of a new testing paradigm we discovered that these children had great difficulty in reorienting their auditory attention and as a result they were unable to properly follow a conversation that shifted quickly from one talker to the next. This finding caused us to question the whole basis of the so called, ‘cocktail party problem,’ such that we have now shifted the approach from a static foreground-background segregation problem to a more dynamic problem of shifting attention. To that end we have piloted a new speech corpus designed specifically to look the listening costs of shifting attention. That work has led to two conference presentations and a manuscript in preparation. This work is now being funded through a large research contract with the world’s third largest hearing aid company.
Studies of auditory accommodation: The auditory system calibrates itself to subtle acoustic changes produced by changes in the outer ears during maturation and ageing, but almost nothing is known about this process. New work in the Laboratory during the period began examining how experience and training can affect the accommodation process. This has a particular focus on the roles of sensory-motor interaction, auditory-visual coherence and top-down processes such as selective spatial attention. In developing a better understanding of what drives this process we aim to develop training programs to expedite accommodation to hearing aids and hearing prosthesis. Small moulds are inserted into the outer ears to produce subtle changes in the acoustic spectral cues to sound location and sound localization performance is measured over the period of accommodation. We have developed novel training paradigms to accelerate this accommodation process and we are currently examining ways in which this can be leveraged to assist hearing aid wearers to accommodate to new hearing aids. This work has led to three refereed manuscripts, two more in preparation, several conference presentations and is now being funded through a large research contract with a hearing aid company.

The perception of moving auditory stimuli: The tracking of moving stimuli is an essential ability and involves complex integration of sensory-motor information. Our understanding of visual tracking has enabled a huge range of applications from vigilance detection to schizophrenia diagnosis. Nothing is known about tracking moving sounds. We have been developing a state of the art dynamic multisensory system capable of tracking performance for a wide range of both head and target motion. This system allows different kinds of motion to be used to help characterise the underlying control systems. Not only will this work result in a deep understanding of this basic human behaviour, it will provide the basis for high fidelity motion capture and analysis as well as diagnosis and study of many sensory motor and neurological deficits. On the clinical front, this work has already demonstrated a significant auditory tacking deficit in schizophrenia. This is showing considerable promise as a means of early diagnosis of those at risk, allowing early intervention that will considerably improve treatment outcomes.

Publications

Journal Articles

2012

2013

Total Annual Citations

<table>
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<tr>
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<th>2009</th>
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*Lifetime = to end of 2013
H-index = 17
Commercial Activities
In 2003 a University of Sydney spin-off company, VAST Audio Pty Ltd, was created to commercialize patented technology emerging from ARC funded research in the Auditory Neuroscience Laboratory from 1996–2002. Biotech Innovation funding, AusIndustry Commercial Ready funding and Venture Capital investments were obtained over the next three years. The period 2012 and 2013 saw the successful conclusion of a commercial platform implementation and field testing/clinical trial of our new spatial hearing aid. The successful commercialization of VAST Audio’s spatial hearing aid will provide breakthrough hearing and communications support to millions of Australians and hundreds of millions of hearing impaired listeners internationally. This will significantly improve their communications capability in every-day work and social settings and result in a leap forward in productivity and quality of life.

Conference Abstracts and Presentations
(O, oral; P, poster; P+O, poster with short oral)

2012
Leung J, Wei V, Carlile S. Dynamics of multisensory tracking. 35th Midwinter Meeting of the Association for Research in Otolaryngology, San Diego, Feb 2012, #1055. P

2013
Carlile S, Balachandar K, Kelly H. Accommodating to new ears: The effects of sensory and sensory-motor training. 36th Midwinter Meeting of the Association for Research in Otolaryngology, Baltimore, MD, USA, Feb 2013, #519. P

Official for Scientific Society
Consulting Advisor, Australian Association of Audiologists in Private Practice: 2013

Conferences and Symposia Organized
Member, Conference committee (scientific program), Australian Association of Audiologists in Private Practice, Summer meeting: 2013

Invited Presentations at National and International Conferences
2013
Opening Keynote Address at Australian Association of Audiologists in Private Practice, Summer meeting
Keynote speaker at Australasian Society for Human Biology Annual Scientific Meeting
PhDs Awarded
2012
Jorge Mejia
Kirsty Gardner-Berry

2013
Imran Dhamani

Higher Degree Theses Examined
2013
MSc, Univ of Sydney

External Funding to Laboratory

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<th>The effects of multi-sensory and sensory-motor training on auditory accommodation</th>
<th>Carlile S</th>
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LABORATORY OF EXOCRINE PHYSIOLOGY & BIOPHYSICS

DAVID I COOK & ANUWAT DINUDOM

Laboratory Personnel 2012–2013

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<th>Name</th>
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<th>Institution</th>
<th>Year</th>
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<tr>
<td>David I Cook</td>
<td>Professor</td>
<td>University</td>
<td>1986–</td>
</tr>
<tr>
<td>Anuwat Dinudom</td>
<td>Associate Professor</td>
<td>University</td>
<td>1994–</td>
</tr>
<tr>
<td>Arie Moran</td>
<td>Visiting Professor</td>
<td>Ben Gurion University of the Negev, Israel</td>
<td>2010–</td>
</tr>
<tr>
<td>Il-Ha Lee</td>
<td>Senior Research Officer</td>
<td>NHMRC</td>
<td>2004–</td>
</tr>
<tr>
<td>Sung-Hee Song</td>
<td>PhD student</td>
<td></td>
<td>2008–13</td>
</tr>
<tr>
<td>Ken Okabayashi</td>
<td>Visiting Scholar</td>
<td>Nihon University, Japan</td>
<td>2012–13</td>
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<td>Craig Campbell</td>
<td>Research Officer</td>
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<td>2010–</td>
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<td>Maria Shao</td>
<td>MPhil student</td>
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<td><strong>Total Effective full-time personnel</strong></td>
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Research Activities

Our research program in 2012 and 2013 has been focussed on investigating (1) the mechanism by which avian influenza virus (H5N1) regulates ion transport and production of proinflammatory cytokines in the respiratory epithelium, and (2) the role of protein kinases in the regulation of the epithelial Na⁺ channel (ENaC).

We have made a novel discovery that H5N1 increases Cl⁻ secretion in respiratory epithelial cells and that this effect of H5N1 is mediated by purinergic signalling. Furthermore, activity of Cl⁻ channels in the epithelial cells is essential for the induction of proinflammatory cytokine secretion by H5N1. Our study has elucidated key elements of the signalling pathway involved, including MAP kinases, transcription factors and the Cl⁻ channels TMEM16A and CFTR. This research project will continue into 2014.

Following on from our earlier studies which showed that activity of ENaC is downregulated by in the presence of G-protein coupled receptor kinase (Grk2), in 2012 and 2013, we further explored the G-protein signalling pathways upon which this effect is dependent, specifically identifying the interaction domain within Grk2 responsible and establishing the importance of Gαq/11 signalling proteins to down-regulation of ENaC activity. Furthermore, our team has identified the signalling pathways by which protein kinases Ask1, c-Src and c-Abl regulate ENaC.

In collaboration with Prof Arie Moran (Ben Gurion University of the Negev, Israel) and Professor Shmuel Muallem (NIH), our Laboratory have been successful to obtain ARC grant support to investigate the signalling pathway by which a zinc transporter, ZnT-1, regulates uptake of zinc. Zinc ions play an essential role in embryonic development and zinc toxicity is the major cause of neuronal damage during brain ischaemia, seizures and trauma. We found that ZnT-1 facilitates zinc efflux in a sodium-independent, pH-driven and calcium-sensitive manner. A manuscript that describes these finding was submitted for publication.

In 2012–2013, Dr Ken Okabayashi from Nihon University, Japan, visited our Laboratory to investigate the role of IRBIT, an inositol 1,4,5-trisphosphate receptor-binding protein, in regulation of the activities of ENaC and CFTR channels. He found that IRBIT regulates membrane expression of ENaC. The mechanism that underlies this effect of IRBIT continues to be investigated.
Journal Articles

2012


2013

Total Annual Citations

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<td>Anuwat Dinudom</td>
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* to end of 2013

PhD Awarded

2013
Sung Hee Song

Membership of Editorial Board of Journal

David I Cook
Cellular Physiology and Biochemistry, 2002–
Editorial board, Cellular Physiology and Biochemistry, 2012–

Anuwat Dinudom
Clinical and Experimental Pharmacology and Physiology, 2013
The Japanese Dental Science Review, 2013–
Proceedings of the Australian Physiological Society, 2013

Service to the University

David I Cook
Deputy Dean for the Faculty of Medicine
Ethics Committees of the University and Royal Prince Alfred Hospital
Acting Head of the Graduate Medical Program (Oct–Dec 2013)

Higher Degree Theses Examined

Anuwat Dinudom
PhD, University of Queensland (1)

Manuscripts refereed for Journals

Anuwat Dinudom
12
Service to Scientific Societies
David I Cook
Treasurer, Federation of the Asian & Oceanian Physiological Societies, 2011–2015

Anuwat Dinudom
Editor, Australian Physiological Society, 2013
Editorial board, the Japanese Dental Science Review

International Collaborations and Visits
Prof Christoph Korbmacher and Dr Silke Haerteis, Friedrich-Alexander Universität Erlangen-Nürnberg, Germany
Prof Arie Moran, Ben-Gurion University of the Negev, Israel
Dr Ken Okabayashi, Nihon University, Japan
Prof Shmuel Muallem, NIH, USA
Prof Chumpol Pholpramool and A/Prof Arunee Thitithayanont, Mahidol University, Thailand

Grant Funding

<table>
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<tr>
<th>Agency</th>
<th>Description</th>
<th>Authors</th>
<th>Years</th>
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<tr>
<td>NHMRC</td>
<td>Dietary fats as drivers of obesity-related inflammation</td>
<td>Storlien L, Hunt N, Cook D, Caterson I</td>
<td>2010-2012</td>
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<td>NHMRC</td>
<td>Regulation of epithelial sodium channels by caveolin</td>
<td>Cook DI, Dinudom A</td>
<td>2011-2013</td>
<td>$131,000</td>
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<td>NHMRC</td>
<td>How avian influenza affects the lungs</td>
<td>Cook DI, Dinudom A</td>
<td>2011-2013</td>
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<td>ARC</td>
<td>Novel kinases – how do they regulate epithelial ion transport, and what is their role in epithelial function?</td>
<td>Cook DI</td>
<td>2010-2012</td>
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<td>ARC</td>
<td>ZnT-1 regulates store operated calcium channels in salivary gland physiology and pathology</td>
<td>Cook DI, Moran A, Muallem S</td>
<td>2013-2015</td>
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CARDIOVASCULAR NEUROSCIENCE LABORATORY

ROGER AL DAMPNEY

Laboratory Personnel 2012–2013

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<th>Name</th>
<th>Position</th>
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<tr>
<td>Roger AL Dampney</td>
<td>Professor</td>
<td>University</td>
<td>1977–2013</td>
</tr>
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<td></td>
<td>Professor Emeritus</td>
<td>University</td>
<td>2013–</td>
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<tr>
<td>Jouji Horiuchi</td>
<td>Visiting Professor</td>
<td></td>
<td>2010–</td>
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<tr>
<td>Lucinda Guy</td>
<td>Administration Officer (0.2)</td>
<td>NHMRC</td>
<td>2006–</td>
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Total effective full time personnel 2012: 2.2 2013: 2.2

Lab Overview
Our research is aimed at defining the brain mechanisms that regulate the cardiovascular system as part of more generalized behaviours, such as arousal or sleep.

Research Activities
In 2012 and 2013 the Lab focused on three main themes, as described below.

Midbrain tectum (superior and inferior colliculi)
Neurons in the superior and inferior colliculi have long been known to have a vital role in generating stereotyped orienting and defensive behaviours to visual and auditory signals that indicate a novel or threatening stimulus. The colliculi in mammals are the homologue of the midbrain tectum in amphibia and reptiles. This is a phylogenetically ancient part of the brain. We had discovered earlier that disinhibition of neurons within a circumscribed region in the superior and inferior colliculi evokes a remarkable cardiovascular and respiratory response, which is characterized by intense and highly synchronised bursts of sympathetic and respiratory activity, together with increases in arterial pressure and heart rate. In 2012, Flavia Muller-Ribeiro, who performed these experiments at Macquarie University under the supervision of collaborator A/Prof Ann Goodchild and Prof Dampney, found that this pattern of synchronized responses could also be evoked by natural auditory and visual stimuli in anaesthetized rats, but only under conditions in which the circumscribed collicular region described above was disinhibited. Furthermore, these responses were accompanied by somatomotor activation. The findings demonstrated that there is a population of ‘command neurons’ within the midbrain tectum that generate rapid, automatic and stereotyped responses to visual and auditory signals. The output pathways and afferent inputs to these neurons will be determined in future studies.

Cardiovascular regulation during sleep
In 2012 Prof Dampney spent 2 months at the University of Bologna as a Visiting Professor, where he worked in collaboration with Prof Alessandro Silvani, whose team studies the cardiovascular changes that are associated with the different phases of sleep. They worked together writing a review article focused on the brain mechanisms that are responsible for these sleep-related cardiovascular changes. This review was subsequently published in the American Journal of Physiology (Heart and Circulatory Physiology).

Orexin neurons
These neurons, which were first discovered in 1998, synthesize the peptide orexin, and have widespread projections to many regions in the brain and spinal cord. They are located within a circumscribed region within the perifornical area in the hypothalamus. In collaboration with A/Prof Pascal Carrive at the University of New South Wales, the Lab studied the role of orexin receptors in the cardiovascular and respiratory responses associated with behavioural arousal. We showed previously that cardiovascular and respiratory responses evoked from the hypothalamus are greatly reduced, by more than 50%, after administration of the drug almorexant (a dual orexin receptor antagonist, which was a gift from Actelion Pharmaceuticals). In contrast, almorexant did not alter the sympathetic and respiratory reflex response to baroreceptor or chemoreceptor stimulation, indicating that orexin receptors are not important for the expression of those reflexes under resting conditions. The Lab then went on to study the specific role of each of the two orexin receptors in modulating responses from the hypothalamus.
Journal Articles

2012

2013

Total Annual Citations

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<td>Roger Dampney</td>
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* ‘Lifetime’ = To end of 2013

Invited Presentations at National and International Conferences
Carl Ludwig Distinguished Lecture, American Physiological Society Meeting, Boston, MA, USA, 22 Apr 2013

Professor Roger Dampney at his well-attended retirement celebration.
From left to right: Suzanne Jennings, Jason Potas, Roger Dampney, Robin McAllen
Awards, Prizes and Other Recognition
Visiting Professorship, University of Bologna, 2012
Carl Ludwig Distinguished Lectureship, Neural Control and Autonomic Regulation Section of the American Physiological Society. Apr 2013
Appointed Adjunct Professor, Australian School of Advanced Medicine, Macquarie Univ, 2012
Appointed Honorary Professor, Univ of New South Wales, 2013
Awarded Levitt Visiting Professorship, Univ of Iowa (for visit planned in 2014)
Appointed Fellow of the Cardiovascular Section of the American Physiological Society

Manuscripts Refereed for Journals
Approximately 30 per year in 2012 and 2013

Grant Applications Assessed
2012
NHMRC (8)
2013
NHMRC (7)

Membership of Editorial Boards of Journals
American Journal of Physiology (Regulatory, Integrative and Comparative Physiology) (2001–)
American Journal of Physiology (Heart and Circulatory Physiology) (2010–)

Higher Degree Theses Examined
2012
PhD, Macquarie Univ (1)
2013
PhD, Univ of Melbourne (1)
PhD, Monash Univ (1)

Service to the University
Council member, University of Sydney Association of Professors (2011–)

Grant Funding
<table>
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<tr>
<th>NHMRC</th>
<th>Reduction of the cardiovascular response of psychological stress through blockade of orexin’s action on one of its receptors</th>
<th>Carrive P</th>
<th>Dampney RAL</th>
<th>Horiuchi J</th>
<th>McNally G</th>
<th>Klugmann M</th>
<th>2012</th>
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Lab Overview
Research conducted by this Laboratory is related to the cellular processes occurring during development of the embryo before implantation, including fertilization, cell division and cell differentiation. Approximately 3% of babies born in Australia result from assisted reproduction involving fertilization and then culture of the embryo in vitro. It is known that the embryo culture environment causes significant alterations in gene expression, epigenetics, metabolism and cell proliferation during preimplantation development and that these alterations may have effects on later life. Our studies aim to help us to understand the impact of the culture environment on pre-implantation embryonic development in order to improve reproductive outcomes. The Laboratory uses a range of techniques including in vitro fertilization, isolation and culture of preimplantation mouse embryos, gene expression, cell signalling, electrophysiology and live cell imaging in its research.

Research Activities
Current research of the Laboratory is aimed at understanding the regulation and role of ion and solute transport during preimplantation embryonic development. Some of our recent studies have shown that oocytes fertilized in the presence of a specific amino acid, namely L-proline, show improved development to the blastocyst stage. Furthermore, embryos cultured in medium containing L-proline from the 1-cell stage to the blastocyst stage developed significantly better than embryos cultured with other amino acids. We used competitive inhibitors of L-proline to identify the transporter responsible for the uptake of L-proline into the embryo. These studies provide evidence for the beneficial effect of specific amino acids, such as L-proline, on development and their inclusion in culture medium to see whether this might be useful for improving human assisted reproduction.

Journal Articles
2012
Kaneko Y, Murphy C, Day M. Extracellular matrix proteins secreted from both the endometrium and the embryo are required for attachment: A study using a co-culture model of rat blastocysts and Ishikawa cells. J Morphol 2012; 274: 63-72.

2013


**Conference Abstracts and Presentations**

*(O, oral; P, poster; P+O, poster with short oral)*

**2012**

Dalati S, Day ML. The role of ion channels and membrane potential changes at fertilisation in the mouse oocyte. 28th Meeting of the European Society of Human Reproduction and Embryology, Istanbul, Turkey, 1-4 Jul 2012.  O


Green CJ, Day ML. Insulin-like growth factor 1 acts as an autocrine factor to improve early embryogenesis in vitro. Society for Reproductive Biology, Gold Coast, Qld.  P


Choate J, Day ML. Undergraduate research skills in physiology/science: What are they and how do we evaluate them. Australian Physiological Society Education workshop, 2012.  O


Dalati S, Day ML. The role of ion channels and membrane potential changes at fertilisation in the mouse oocyte. Bosch Young Investigators Symposium 2012.  O

Poon CE, Day ML, Murphy CR. Claudin 7 and EpCAM proteins interact in a protein complex to mediate intercellular and cell matrix adhesions which contribute to non-receptivity in the rat uterus. Bosch Young Investigators Symposium 2012.  P

**2013**

Poon CE, Day ML, Murphy CR. Claudin 7 and EpCAM proteins interact in a protein complex to mediate intercellular and cell matrix adhesions which contribute to non-receptivity in the rat uterus. Society for the Study of Reproduction meeting, Montreal, Canada, 2013.  P


Green CJ, Day ML. Attachment of mouse blastocysts to endometrial epithelial cells in vitro is increased by insulin-like growth factor 1. Society for Reproductive Biology meeting, Sydney, 2013.  P


Assinder S, Cole A, Davies K, Day ML, Tom N. Differential effects of oxytocin in prostate cancer cell lines and de novo steroidogenesis. 18th World Congress on Advances in Oncology, Hersonissos, Crete, Greece, 10-12 Oct 2013.  P

Dalati S, Day ML. The role of membrane potential changes at fertilisation in the mouse oocyte. Bosch Young Investigators Symposium 2013.  P

**Service to the University**

Research Integrity Advisor (2010–)
Service to Sydney Medical School
Sub-Dean Honours, University of Sydney Medical Program (2007–12)
Member, NHMRC Biomedical Scholarships Assessment Panel (2004–12)
Member, Dean’s Publication Prize Ranking Committee (2011–)
Medicine & Health Careers and Research Fair Advisor (2010–)

Service to the Charles Perkins Centre
Member of CPC Learning and Teaching committee (2012–)
Member of CPC Education Operations Advisory Group (2012–)
Member CPC Superlab Design Subgroup (2012–)
Deputy Chair, CPC Timetabling Subgroup, (2012–)

Service to the Bosch Institute
Member, Executive Leadership Group (2013–)

Grant Funding

| Bosch Institute Small Equipment Grant | Purchase of electroporator for transfection of early embryos | Day ML 2012 | $9,232 |
| Bosch Institute Small Equipment Grant | Purchase of objective for confocal microscope | Day ML 2013 | $1,400 |

Teaching And Research Report: Margot Day

Face-to-Face Teaching Hours 2012/2013

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Total = 130/159

Unit of Study Co-ordinator, Talented Science Program for School of Medical Sciences and Discipline of Physiology
Post-graduate co-ordinator, Discipline of Physiology

Teaching-related Research and conference presentations
Day ML., Research-enriched L & T opportunities in the Charles Perkins Centre. Sydney Teaching Colloquium 2013
BLOOD CELL DEVELOPMENT LABORATORY

STUART FRASER

Laboratory Personnel 2012–2013

<table>
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<tr>
<th>Name</th>
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<tr>
<td>Stuart Fraser</td>
<td>Senior Lecturer</td>
<td>University</td>
<td>2010–</td>
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<tr>
<td>Veronica Antas</td>
<td>PhD candidate</td>
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<tr>
<td>Mohammad Al-Drees</td>
<td>PhD candidate</td>
<td></td>
<td>2011–</td>
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<tr>
<td>Chanukya Colonne</td>
<td>PhD candidate</td>
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<td>2011–</td>
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<tr>
<td>Kurt Brigden</td>
<td>PhD candidate</td>
<td></td>
<td>2012–</td>
</tr>
<tr>
<td>Badwi Bob Boumelhem</td>
<td>MPhil candidate</td>
<td></td>
<td>2012–</td>
</tr>
<tr>
<td>Alexander Prudence</td>
<td>BSc(Hons) student</td>
<td></td>
<td>2012</td>
</tr>
<tr>
<td>Natalie Wee</td>
<td>BSc(Hons) student</td>
<td></td>
<td>2012</td>
</tr>
<tr>
<td>Austin Ko</td>
<td>BSc(Hons) student</td>
<td></td>
<td>2013</td>
</tr>
<tr>
<td>Jia Hao Yeo</td>
<td>BSc(Hons) student</td>
<td></td>
<td>2013</td>
</tr>
<tr>
<td>Angeles Sanchez-Perez</td>
<td>Bosch Institute flow cytometry officer</td>
<td></td>
<td>2010–</td>
</tr>
<tr>
<td>Janine Street</td>
<td>Research Assistant (NBCF)</td>
<td></td>
<td>2013–</td>
</tr>
</tbody>
</table>

Effective full-time personnel: 2010: 8.0 2011: 8.0

Lab Overview

Our research focuses on the regulation of blood cell production in the embryo and adult. Models used to investigation this process include: embryonic stem cell differentiation in vitro; embryo dissection and analysis; erythroblastic island isolation and characterization and flow cytometric analyses of embryonic, adult and stress blood cell production.

Research Activities

During 2012 and 2013 the Lab developed methods to utilize mouse embryonic stem cells as a model system to monitor developmental processes leading to production of blood in vitro.

Journal Articles

2012

2013
Fraser ST. The modern primitives: Applying new technological approaches to explore the biology of the earliest red blood cells. *ISRN Hematol* 2013; 2013: 568928.


### Awards and Prizes

**2013**

Dreher Prize for outstanding research during the Honours Year: Jia Hao Yeo

Sapphire Prize for Outstanding Poster Presentation. Bosch Young Investigator Symposium: Jia Hao Yeo

National Stem Cell Foundation of Australia Conference Education Award: Veronica Antas

### Service to the Faculty

School of Medical Sciences Learning and Teaching Committee 2013–

Charles Perkins Centre Learning and Teaching Committee 2013–

Future Facilities Committee 2013–

### Grant & Award Applications Assessed

**2012**

NHMRC project grants (4)

**2013**

Czech Science Foundation (1)

### Grant Funding

<table>
<thead>
<tr>
<th>Fund</th>
<th>Description</th>
<th>Applicant</th>
<th>Year</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>NWG Macintosh Fund</td>
<td>Red blood cells and the deep blue sea: A novel animal model to explore erythroid enucleation</td>
<td>Fraser ST</td>
<td>2012</td>
<td>$5,000</td>
</tr>
<tr>
<td>Bosch Institute Small Equipment Grant</td>
<td>Purchase of a new Zeiss Colour Microscopy Camera and Imaging workstation</td>
<td>Fraser ST</td>
<td>2012</td>
<td>$6,800</td>
</tr>
<tr>
<td>Feline Health Research Fund</td>
<td>A novel system for diagnosing and monitoring haemotrophic mycoplasmia in cats</td>
<td>Fraser ST</td>
<td>2012</td>
<td>$4,600</td>
</tr>
<tr>
<td>National Breast Cancer Foundation</td>
<td>Chemotherapy transporters in Breast Cancer</td>
<td>Fraser ST</td>
<td>2013</td>
<td>$100,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2014</td>
<td></td>
</tr>
<tr>
<td>Bosch Institute Small Equipment Grant</td>
<td></td>
<td>Fraser ST</td>
<td>2013</td>
<td>$6,800</td>
</tr>
<tr>
<td>Bosch Institute Translational Grant-in-Aid</td>
<td>Calming the beast: Assessing a novel therapeutic strategy to treat macrophage hyperactivation syndrome</td>
<td>Fraser ST</td>
<td>2013</td>
<td>$20,000</td>
</tr>
</tbody>
</table>

### Teaching: Units of study taught

PHSI3005, PHSI3006, PHSI3905, PHSI3906, PHSI3007, PHSI3907, PHSI3008, PHSI3908, ANAT2008, HSTO3003, HSTO3004.
Face-to-Face Teaching Hours 2012/2013

<table>
<thead>
<tr>
<th>Activity</th>
<th>Physiology 2</th>
<th>Physiology 3</th>
<th>Pharmacy</th>
<th>BMEDSc</th>
<th>USydMP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures/Tutorials</td>
<td>12/8</td>
<td>–</td>
<td>16/12</td>
<td>10/9</td>
<td>–</td>
</tr>
<tr>
<td>PBL Tutorials</td>
<td>–</td>
<td>8/-</td>
<td>–</td>
<td>–</td>
<td>30/15</td>
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<tr>
<td>Practicals/Tutorials</td>
<td>78/39 (S1 only)</td>
<td>–</td>
<td>–</td>
<td>54/48</td>
<td>–</td>
</tr>
<tr>
<td>Total</td>
<td>90/47</td>
<td>8/-</td>
<td>16/12</td>
<td>64/48</td>
<td>30/15</td>
</tr>
<tr>
<td>Total = 208/122</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Time was also spent on setting and marking assessments for all courses, including the application of new standards for criterion-based assessment. In 2012 I was a Unit of Study Coordinator for one Intermediate level unit per semester in the BMEDSc degree, and managed the BMEDSc practical staffing for the increased number of practical and tutorial slots which had been made available under the new curriculum. In 2013 I was involved in preparing my two successors in these coordinating roles and contributed to the reorganization of the practical stream in order to link it better to the lectures. We implemented new continuous assessment tasks in the form of IBL projects based on my endocrine lectures, which culminated in group oral presentations. I participated in numerous planning meetings and discussions on our new assessment processes.

Teaching-related Research

In 2012 relevant exercises from PHLEX, my Physiology Logic Exercises manual, were incorporated into the practical notes for Intermediate year BMEDSc to further students’ understanding of the theoretical framework of each topic, so that consolidation could occur. These were extended in 2013.

University of Sydney Medical Program

I continued tutoring in PBLs and contributing to the setting and evaluation of exam questions.

Teaching research interests – Grants and Publications

Research was continued on the TIES project: Feedback in the Sciences: what is given, and how it can be improved amongst a diverse student population, culminating in the provision of an online handbook in 2013.
Overview
Personal research involves long-term studies on the fertility of primates and large mammals, including the human. These studies centre on the regulatory endocrinology of male and female reproduction, the natural and artificial enhancement of reproductive success, and how large mammals are tuned to their micro-environments to ensure successful and sustained reproduction. In addition, international university networks are being developed to build teamwork in addressing major global challenges.

Research Activities
Stem Cell Biology and Regenerative Medicine. International developments in the science, ethics and policy of stem cell science were studied to gain a global perspective on the discovery, development, translation and application of stem cell therapies.

Higher Education Reform. International approaches to reform of higher education were studied to focus on the main drivers to 2020. The evolution of universities was found to include the management of talent, public-private balance, interdisciplinary research, enlightened curriculum, the student experience, transfer of technology, engagement with communities and influence in society.

International University Networks. Prof Hearn continued his service as the Executive Director of the Worldwide Universities Network, a consortium of 18 peer research universities working on climate and food security, public health in non-communicable disease, higher education and research reform, and understanding cultures. Other service included his role as the Chair and Executive Director of the Australian African Universities Network, which has eleven Australian and nine African research universities working on development, food, health, education, mining and public sector reform.

Reports, Book Chapters and Article
2012

2013
Newspaper, Magazine and Newsletter Articles

2012
Hearn JP. Time to Reassess the Academic Relationship. *Australia–China Business Insight* 2012.
Hearn JP. Beijing beckons, but will an opportunity be lost? *The Australian* 9 Nov 2012.

2013

Conference Abstracts and Presentations

(O, oral; P, poster; P+O, poster with short oral)

2012
Hearn JP. The role of the Global Network in higher education. *International Education Association of South Africa Conference*, Capetown, South Africa, (Keynote speaker) O
Hearn JP. ASEM Universities and business for a sustainable future. *3rd Asia Europe Association of Southeast Asian Nations Conference*, Groningen, The Netherlands (invited speaker and rapporteur) O

2013
Hearn JP. The power of partnership: international research networks to address global challenges. *Going Global*, British Council, Dubai, United Arab Emirates, 2013, (Chair and speaker) O

Conferences Organized

3 strategic workshops for the Worldwide Universities Network
6 conferences and strategic workshops in 2012–13 for international networks.

Invited Presentations at National and International Conferences

2012
British Council Going Global, London, UK
OECD Roundtable. *Universities for Skills, Entrepreneurship, Innovation and Growth*, Paris, France
3rd Asia Europe Association of Southeast Asian Nations Conference, Groningen, The Netherlands

2013
OECD World Forum, Paris, France
Service to the University
Deputy Vice Chancellor Academic and International, 2004–13
Chairman, Sydney Confucius Institute, 2008-13
Board member of Australian National Nuclear Research and Development Organisation, representing the University of Sydney, 2008-13

Service to Professional Societies, Grant-Giving Bodies or Other External Committees
Society for Reproductive Biology, Life Member, Society for Reproductive Biology, 1988–
The Worldwide Universities Network, Executive Director, 2009–
The Australia Africa Universities Network, Chairman/Executive Director, 2011–
Australian Institute of Company, Directors Graduate, 2008–
OECD Paris (Futures; International Management in Higher Education; Innovation, Higher Education and Research for Development; World Fora), Advisory Group Member, 2006–

Grant Funding
| Australian International Food Security Centre/Australian Centre for International Agricultural ResearchCIAR | Food security | Hearn J |
| | AUSAID | Conference support | Hearn J |
| Network partners | Conference support | Hearn J |

Teaching Activities
Human Biology 1003: 9–12 lectures per year on integrated physiology of reproduction (1800 students).
Physiology 2006: 5 lectures per year on advanced physiology of fertility, reproduction and stem cell biology (200 students).
Talented Student Program, Honours: occasional mentorship and advice to students.
LIPID METABOLISM LABORATORY

ANDREW J HOY

Laboratory Personnel 2012–2013

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andrew J Hoy</td>
<td>NHMRC Research Fellow</td>
<td>2012–</td>
</tr>
<tr>
<td>Seher Balaban</td>
<td>MPhil student</td>
<td>2012</td>
</tr>
</tbody>
</table>

Total effective full time personnel 2012: 2.0  2013: 1.0

Lab Overview
The Laboratory investigates the role that metabolism plays in diseases such as type 2 diabetes, obesity and cancer.

Research Activities in 2012 and 2013
The Lipid Metabolism Laboratory was established in 2012 and has during 2012–2013 established its research program. Research was undertaken to:

- Understand the link between perturbed adipocyte biology that characterizes obesity and cancer progression, including breast, and prostate.
- Identify the role key regulators of lipid metabolism play in cancer biology.
- Understand the role enzymes that control the breakdown of intracellular stores of fatty acids in mitochondrial oxidation.
- Determine the regulation of key lipid metabolism pathways by insulin in insulin resistance.
- Determine the intracellular spatial relationships between bioactive lipid accumulation and signalling intermediates that impair insulin action.

Progress was made in each of these areas.

Journal Articles

2012


2013


Total Annual Citations

<table>
<thead>
<tr>
<th></th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>Lifetime*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andrew J Hoy</td>
<td>45</td>
<td>83</td>
<td>120</td>
<td>133</td>
<td>55</td>
<td>443</td>
</tr>
</tbody>
</table>

*‘Lifetime’ = To end of 2013

Editorial in Journal


Conference Abstracts and Presentations

(O, oral; P, poster; P+O, poster with short oral)

2012
Hoy AJ, Barnett AC, Bruce CR, Schenk S, Horowitz JF, Watt MJ. Regulation of plasma ceramide levels with fatty acid oversupply – evidence that the liver detects and secretes de novo synthesized ceramide. Australian Physiological Society Annual Scientific Meeting, Univ of New South Wales, Sydney, Dec 2012. O

2013

Official for Scientific Societies, including for National and International Conferences

IT Manager, Australian Physiological Society

Invited Presentations at National and International Conferences

Australian Physiological Society Annual Scientific Meeting, Feature Symposium – Intricacies of Type 2 Diabetes, Deakin Univ, Waterfront Campus, Geelong, Vic, Dec 2013
ComBio, Feature Symposium, Exploring Electronic Lab Notebooks – A Window into the Lab of the Future? Perth, Western Australia, Sep 2013

Travel Grant

From CASS Foundation to attend Keystone Symposium – Lipid Pathways in Biology and Disease in Dublin, Ireland, Mar 2014

Scholarship Awarded

Seher Balaban, Australian Postgraduate Award

Manuscripts Refereed for Journals

2012
Am J Physiol Endocrinol Metab (1), Am J Physiol Regul Integr Comp Physiol (1), Biochim Biophys Acta (Gen Subj) (1), Diabetologia (3), J Clin Endocrinol Metab (1).

2013
J Biochem Nutrition (1), Brit J Pharmacol (1), Endocrinology (1).
Grant & Award Applications Assessed
2012
NHMRC (4)
Canadian Cancer Society Research Institute (1)
Diabetes Australia Research Trust (6)

2013
NHMRC (3)
Netherlands Organisation for Scientific Research (1)

Service to the University
Member, Laboratory Animal Services Advisory Committee, Aug 2013–
Member, ICT Electronic Laboratory Notebook Evaluation Committee, Feb 2013–
Member, Charles Perkins Centre Collaboration Tools Project Board, Oct 2013–
Member, Charles Perkins Centre Office Workspace Working Group, Nov 2012–Apr 2013
Member, Charles Perkins Centre Wet Laboratory Workspace Working Group, Dec 2012–Apr 2013

Grant Funding
<table>
<thead>
<tr>
<th></th>
<th>Circulating fat, insulin resistance and obesity</th>
<th>Hoy A</th>
<th>Year</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>NHMRC</td>
<td></td>
<td></td>
<td>2010</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2011</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2012</td>
<td>$73,813</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2013</td>
<td>$73,813</td>
</tr>
</tbody>
</table>
DEVELOPMENTAL NEUROBIOLOGY LABORATORY

CATHERINE A LEAMEY

Laboratory Personnel 2012–2013

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catherine A Leamey</td>
<td>Senior Lecturer</td>
<td>2003–</td>
</tr>
<tr>
<td>Rajini Nagarajah</td>
<td>Research Assistant</td>
<td>2010–13</td>
</tr>
<tr>
<td>Tim Young</td>
<td>PhD student/Postdoc</td>
<td>2007–13</td>
</tr>
<tr>
<td>Heidi Tran</td>
<td>BSc(Hons) then PhD student</td>
<td>2009–</td>
</tr>
<tr>
<td>Sam Liu</td>
<td>PhD student</td>
<td>2013–</td>
</tr>
<tr>
<td>Nigel Tse</td>
<td>MPhil student</td>
<td>2013–</td>
</tr>
<tr>
<td>Larissa Savvas</td>
<td>BSc(Hons) student</td>
<td>2012</td>
</tr>
<tr>
<td>Tomasz Szczesnik</td>
<td>BSc(Hons) student</td>
<td>2012</td>
</tr>
<tr>
<td>Peta Eggins</td>
<td>BSc(Hons) student</td>
<td>2013</td>
</tr>
</tbody>
</table>

Total effective full time personnel: 2012: 6.0  2013: 7.0

Lab Overview

The primary aim of research in the Laboratory is to understand the mechanisms which regulate neural connectivity.

Research Activities

During 2012 and 2013 the Laboratory continued our investigations into the roles of multiple members of the Teneurin family of transmembrane proteins in the generation of neural connectivity. PhD student Heidi Tran demonstrated multiple roles for Ten-m3 in the formation of thalamo-striatal circuits and the functional effects of its deletion. Postdoctoral researcher Tim Young and Honours student Tomasz Szczesnik demonstrated reciprocal phenotypes in the formation of ipsilateral retinal projections in Ten-m2 and Ten-m4 knockout mice, and their complex interactions. Honours student Larissa Savvas and Peta Eggins commenced work investigating the capacity for environmental enrichment to reverse deficits in the visual pathway of Ten-m3 knockout mice. Masters student Nigel Tse commenced a project investigating the impact of Ten-m3 deletion on the neuromuscular junction. This project was carried out in collaboration with A/Prof Bill Phillips. PhD student Sam Liu joined the Laboratory and commenced a project examining the role of EphA7 in the regulation of ipsilateral retinal projections.

Journal Articles

2012

2013

Total Annual Citations

<table>
<thead>
<tr>
<th>Year</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>Lifetime*</th>
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</thead>
<tbody>
<tr>
<td>Cathein A Leamey</td>
<td>25</td>
<td>30</td>
<td>36</td>
<td>31</td>
<td>45</td>
<td>492</td>
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</tbody>
</table>

* ‘Lifetime’ = To end of 2012
Awards, Prizes and Other Recognition
2012
University Medal and Colin Dunlop Prize – to BSc(Hons) student Tomasz Szczesnik
HG Chapman Prize, 2012 – to BSc(Hons) student Larissa Savvas

PhDs Awarded
2012
Kelly Glendinning
Timothy Young

BSc(Hons) Awarded
2012
Larissa Savvas
Tomasz Szczesnik
2013
Peta Eggins

Manuscripts Refereed for Journals
2012
BMC Neurosci (1), Mol Biol Evol (1)
2013

Grants Assessed for funding bodies
2012
NHMRC (4)
2013
NHMRC (3)

Higher Degree Theses Examined
2012
PhD, Univ of Queensland (1)
2013
PhD, Univ of Western Australia (1)

Service to the University
Bosch Executive Leadership Group, 2013–

Grant Funding

<table>
<thead>
<tr>
<th>Source</th>
<th>Title</th>
<th>Author(s)</th>
<th>Year</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>NHMRC</td>
<td>The role of Ten-m3 is patterning ipsilateral retinal projections.</td>
<td>Leamey CA</td>
<td>2010</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Marotte LR</td>
<td>2011</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Phillips WD</td>
<td>2012</td>
<td>$145,000</td>
</tr>
<tr>
<td>MJ Fox Foundation</td>
<td>Novel enzymatic method for improving therapeutic targeting of dopaminergic afferents in a mouse model of Parkinson’s disease</td>
<td>Sawatari A</td>
<td>2013</td>
<td>US$37,500</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Leamey CA</td>
<td>2014</td>
<td>–</td>
</tr>
</tbody>
</table>
Laboratory Personnel 2012–2013
Since Prof Martin and his personnel are primarily affiliated with the Save Sight Institute on Sydney Eye Hospital Campus they are not listed here. Prof Martin’s sensory neurophysiology laboratories are located in the Anderson Stuart Building, room E501.

Lab Overview
Research involves the physiological basis of visual processing and colour vision in human, non-human primate and rodent systems.

Research Activities
Studies of non-standard visual pathways: The visual system, like all sensory and motor systems, comprises evolutionary old (termed koniocellular or K) and evolutionary new pathways (termed magnocellular or M, and parvocellular or P). These pathways carry visual information, in parallel, through a structure called the lateral geniculate nucleus (LGN), to the cerebral neocortex. The koniocellular pathways were traditionally considered to have at most vestigial function, but we have shown that signals for blue-yellow colour vision travel on K pathways. During this period we continued our investigations to determine what other aspects of conscious and sub-conscious visual function are mediated by K pathways.

Studies of attention, prediction and decision: We studied the modulation of cortical and sub-cortical visual pathways by ongoing (resting state or ‘spontaneous’) brain dynamics as part of an ARC funded Centre of Excellence. We recorded massed activity of neuronal populations to establish how nerve networks are activated and de-activated by intrinsic and extrinsic (environmental) signals.

Journal Articles
2012

2013

Total Annual Citations

<table>
<thead>
<tr>
<th></th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
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<tbody>
<tr>
<td>Paul R Martin</td>
<td>176</td>
<td>183</td>
<td>221</td>
<td>276</td>
<td>145</td>
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</table>

*“Lifetime” = To end of 2013

H-index = 34
Chapter in Book
2013

Conference Abstracts and Presentations
(O, oral; P, poster; P+O, poster with short oral)
2012
Cheong SK, Pietersen ANJ, Solomon SG, Martin PR. Antidromic and visual evoked response latency in marmoset lateral geniculate nucleus. Proceedings of the Australian Neuroscience Society, Gold Coast, Jan 2012, O-03. O
Martin PR, Tailby C, Solomon SG, Cheong SK, Pietersen ANJ. Contribution of short wavelength sensitive (s or “blue”) cones to visual responses in superior colliculus. Proceedings of the Australian Neuroscience Society, Gold Coast, Jan 2012, POS-WED. P
Percival KA, Martin PR, Grunert U. Koniocellular superficial layer projecting ganglion cells in marmoset retina. Proceedings of the Australian Neuroscience Society, Gold Coast, Jan 2012, POS-WED. P
Zeater N, Grunert U, Dreher B, Szmajda BA, Martin PR. Midbrain projections to the dorsal lateral geniculate nucleus in marmoset. Proceedings of the Australian Neuroscience Society, Gold Coast, Jan 2012, POS-MON. P
2013
Martin PR. Colour vision, colour blindness, and importance of an eye for detail. Proceedings of the Australian Neuroscience Society, Melbourne, Feb 2013, Ple-Mon. O
Pietersen ANJ, Cheong SK, Solomon SG, Martin PR. Relation of koniocellular pathway activity to low frequency (delta) electroencephalogram power in anaesthetised marmosets. Proceedings of the Australian Neuroscience Society, Melbourne, Feb 2013, Pos-Tue. P
Conferences and Symposia Organized
2012
Convenor and chair: ‘Vision Down Under 2012,’ O’Reilly’s, Lamington National Park, Qld

2013
Co-organiser, ‘Visual Neuroscience: Modern Challenges and Australian Pioneers,’ Bosch Institute Scientific Meeting, Sydney

Invited Presentations at National and International Conferences
2012
Centre for integrated research and understanding of sleep (CIRUS), Sydney, Feb.
Australian Course in Advanced Neuroscience, Stradbroke Island, Qld, Apr.
Invited symposium presentation, Asian Retina Meeting, Hsinchu, Taiwan, Oct.

2013
Lawrie Austin Plenary Lecture, Australian Neuroscience Society Meeting, Melbourne, Feb.
Invited symposium presentation, European Retina Meeting, Alicante, Spain, Oct.

News Media
Radio (3)
2012
ABC, regional NSW, interviewed on ‘StateDrive with John Morrison,’ aired 25 Jul.
ABC, Canberra, interviewed on ‘666 Drive with Pete Williams,’ aired 10 Aug.

Awards, Prizes and Other Recognition
PhD Awarded
2012
SK Cheong (2012)

Scholarships Awarded
2012
N Zeater

Service to Grant giving bodies
2012
NHMRC Grant review panel
ARC Ozreader

2013
ARC Ozreader
**Membership of Editorial Board of Journal**

*Journal of Physiology: 2009–2013*

*Visual Neuroscience: 2006–*

*Vision Research: 2007–*

**Grant Funding**

<table>
<thead>
<tr>
<th>Grant Provider</th>
<th>Project Title</th>
<th>Investigator(s)</th>
<th>Year(s)</th>
<th>Total Funding</th>
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<tbody>
<tr>
<td><strong>NHMRC</strong></td>
<td>Interaction of thalamic and cortical activity in the primate visual system</td>
<td>Martin PR, Solomon SG, Grunert U, Dreher B</td>
<td>2012-2014</td>
<td>$163,745, $153,745</td>
</tr>
<tr>
<td><strong>NHMRC</strong></td>
<td>The cellular organisation of interneurones in human retina</td>
<td>Grunert U, Martin PR</td>
<td>2012-2014</td>
<td>$169,428, $169,428</td>
</tr>
</tbody>
</table>
VITAMIN D, BONE AND SKIN LABORATORY

REBECCA S MASON

Lab Overview
This Laboratory has two major areas of interest – Vitamin D physiology generally with a particular interest in protection from UV irradiation by vitamin D compounds and how muscle contributes to the maintenance of vitamin D status, and the physiology of bone remodelling, with relevance to the prevention and treatment of osteoporosis.

Research Activities
In 2012 and 2013 we studied how strontium, a new agent for the prevention of osteoporotic fractures, actually affects bone cells. This work, in collaboration with Prof Arthur Conigrave, showed that strontium affects bone cell function by mimicking the activities of the natural ion, calcium, to which strontium is related on the periodic table, although strontium is more potent in bone cells than in other tissues. We identified some new pathways of action. Calcium has similar effects on bone cells to strontium and studies of agents that might target the calcium sensing receptor in bone cells as possible therapeutic agents for osteoporosis were commenced.

In work carried out with Prof David Fraser, evidence was obtained for specific uptake and release mechanisms in muscle for the major circulating vitamin D metabolite. This mechanism may explain why the half-life of the major circulating metabolite of vitamin D, 25-hydroxy vitamin D is much longer than any other steroid and much longer than that of its binding protein in blood. Further studies on the mechanism of action of vitamin D compounds in photoprotection, carried out in collaboration with Prof Gary Halliday, Prof Diona Damian, A/Prof Vivienne Reeve and Dr Katie Dixon showed that these compounds protect skin cells in humans and mice from UV-induced DNA and other damage, including induced skin cancers, through a novel pathway. Work in our group showed that vitamin D-like compounds, which have less capacity to cause hypercalcaemia and are cheaper and more stable than the vitamin D hormone, also provide protection from the adverse effects of UV, including protection from DNA damage and UV-induced immunosuppression.
Journal Articles

2012


2013


**Letters to the Editor (Journals)**


**Chapters in Books**


**Total Annual Citations**

<table>
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<tr>
<th></th>
<th>2009</th>
<th>2010</th>
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<th>2012</th>
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<td>Rebecca S Mason</td>
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* ‘Lifetime’ = To end of 2013.

**MPhil awarded:**
2013
Luke Armour

**Conference Abstracts and Presentations**

Official for Scientific Societies, including for National and International Conferences

Fifteenth International Workshop on Vitamin D (held in Houston, USA in Jun 2012).

Member, Workshop Executive Committee, Sixteenth International Workshop on Vitamin D (held in San Francisco, USA in, Jun 2013).
**Member, program organizing committee,**
Sixth Asia and Oceania Congress of Photobiology (held in Sydney in Nov 2013).

**Invited Presentations at National and International Conferences**

**2012**

How effective is sunlight exposure in maintaining adequate vitamin D status in Australians? *ILSI SEAR Australasia and the Australian Academy of Science National Committee for Nutrition Symposium on ‘Should Australia and New Zealand allow more Vitamin D into the food supply’,* Melbourne, Jun 2012.


The role of the vitamin D receptor and ERp57 in protection from UV-induced DNA damage by 1,25(OH)2D3. *Fifteenth International Workshop on Vitamin D,* Houston, Texas, USA, Jun 2012.


**2013**


Vitamin D and photoprotection. *Australian and New Zealand Bone and Mineral Society Annual Scientific Meeting,* Melbourne, Sep 2013.

Extra-skeletal effects of vitamin D. *9th Joint Meeting of Paediatric Endocrinology,* Milan, Italy, Sep 2013.


**In magazine articles**


UV protection, by Gill Fish, *Construction,* Feb 2013.


*MEDICAL OBSERVER, Vitamin D in pregnancy, infants,* by Marina Kamenev, 19 Feb 2013.


*MEDICAL OBSERVER, Vitamin D in mushrooms,* by Niamh Millen, 5 Sep 2013.
News Media
In newspaper articles
2012
Vitamin D, by Victoria Meppen, Sydney (magazine of the Sydney Morning Herald), Jun 2012.
Vitamin D testing, by Amy Corderoy, Sydney Morning Herald and The Age (front page), 23 Jul 2012.
Vitamin D and photoprotection, by Sue Dunlevy, Sunday Telegraph, 23 Dec 2012.
2013
Vitamin D in mushrooms, Daily Telegraph, 5 Sep 2013.
Vitamin D in mushrooms, by Clifford Fram, AAP, 4 Sep 2013.

TV
2012
The 7:30 Report, ABC1, Vitamin D, Interviewed by Natasha Johnson, 27 Mar 2012.
2013
NTV Japan, vitamin D and cancer, interview by Satoshi Naraki and Duglass Hocking on a family program, May 2013.
Vitamin D and skin cancer, interview by Gill Fish, Today Tonight, Channel 7, prerecorded on 29 Nov 2012 for a broadcast at a later date.
Vitamin D photoprotection, Evening News, Channel 9, 23 Dec 2012.

Radio
Vitamin D, interview on George and Paul Show (producer: Barb Heffernan), 2UE, 1 Apr 2012.
Vitamin D testing, interview by Sonya Feldhoff, PM Drive show, ABC Radio 691, Adelaide, 23 Jul 2012.
Radio 2UE Sydney, Afternoon Drive Show, Vitamin, Interview by John Stanley, 5 Sep 2012
Understanding vitamin D, interview by Ron McCoy, ABC National, Australia, 13 Dec 2012.
Vitamin D in winter, interview by Libby Gor, ABC Radio 774, Melbourne, 17 Aug 2013.

Scholarships Awarded
2012
Australian Post-graduate Award – Wannit Tongkao-On

2013
Australian Post-graduate Award – Myriam Abboud.

Editorial Boards of Journals
Journal of Bone & Mineral Research (2010–)
Endocrinology (2013–)

Manuscripts Refereed for Journals:
2012 (11)

2013 (10)
Service to Grant-giving Body
Member, NHMRC Grant Review Panel (2012 & 2013).

Grant & Award Applications Assessed
2012
NHMRC (as member of panel)
ARC Future Fellowship
2013
NHMRC (3)
St Vincents Clinic Foundation (1)

Higher Degree Theses Examined
2013
PhD, Univ of Sydney (1)

Service to the University
Deputy Director, Bosch Institute (2010–)

Service to Government, and the Profession
Board Member, Osteoporosis Australia (2002–)
Member, working party, Sun and Health, Cancer Councils of Australia (2004–)
Member, Technical Committee, Commission Internationale de L’Eclairage (International Commission of Illumination).
Member, 6-66 (Maintaining summer levels of 25hydroxyvitamin D during winter) (2012–)

Grant Funding

<table>
<thead>
<tr>
<th>ARC Linkage</th>
<th>Enhancing sunscreen DNA and photo-ageing protection</th>
<th>Mason RS</th>
<th>2012</th>
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<td>Rohanizadeh R</td>
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<td>Halliday GM</td>
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<td>Bosch Institute</td>
<td>Do vitamin D-like compounds enhance protection by sunscreen in human subjects?</td>
<td>Mason RS</td>
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<td>Novel strategies for the treatment of bone disease by nutrient activators of calcium sensing receptors</td>
<td>Mason RS</td>
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<td>Conigrave AD</td>
<td>2013</td>
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</table>
Research Activities

During 2012 and 2013 we continued work on the environmental control of reproduction and thermoregulation in marsupials, especially the dunnarts (Sminthopsis spp). In collaboration with Dr Julie Old (University of Western Sydney) we found that dietary preferences affect behaviour and activity patterns in Sminthopsis crassicaudata (fat-tailed dunnart). Other work included the continued collaborations with colleagues from around the world on the physiology, biochemistry and molecular biology of mammals.

We continued work on the neuroanatomy and thermal physiology of marsupials using dunnarts in collaboration with Prof Ken Ashwell, Prof Jürgen Götzt and Dr Lars Ittner (Brain & Mind Research Institute), Dr Jan Slapeta (Veterinary Sciences) and Prof Fritz Geiser (University of New England).

In 2013, in collaboration with Prof Chris Murphy and Prof Mike Thompson, we began a project on the evolution of viviparity in vertebrates.

Journal Articles

2012


2013


Book Chapter

2012

Abstracts and presentations at conferences
2013

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<th>Total Annual Citations</th>
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<td>Bronwyn M McAllan</td>
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* ‘Lifetime’ = to end of 2013.

Grant Funding

<table>
<thead>
<tr>
<th>ARC Discovery Project</th>
<th>Lively reproduction: do common molecules underlie all vertebrate live birth?</th>
<th>Murphy CR</th>
<th>2013</th>
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<tr>
<td></td>
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<td>Thompson MB</td>
<td>2014</td>
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<td></td>
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<td>McAllan BM</td>
<td>2015</td>
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Official for Scientific Society

Member, Governing committee of Asia and Oceania Society for Comparative Endocrinology, 2009–2012 (sole Australian representative).

Manuscripts Refereed for Journals

2012 (7)


2013 (19)


Membership of Editorial Board of Journal

Associate Editor, *Australian Mammalogy* (2007–)

University Committees

Member, Animal Ethics Committee (Category B Member) (2008–)

Teaching

In 2012 and 2013 Dr McAllan continued to co-ordinate and teach *Physiology for Pharmacy*, PHSI 2601, a unit designed to cover the physiology of all the body systems for Bachelor of Pharmacy students in the Faculty of Pharmacy. There were 265 students enrolled in 2012, and 239 students enrolled in 2013. She continued to devise new practical tasks and modify assessment procedures, as well as run all practical sessions. Other teaching duties included teaching tutorial sessions in *Heart and Circulation: Dysfunction* PHSI 3008, and Block 7, 8 and 9 in the Graduate Medical Programme as required.
Lab Overview
Research involves molecular genetics of hypertension and longevity, the function of two splicing factors, the (pro)renin-angiotensin system in premature labour, and benefits of male circumcision.

Research Activities
Mechanism of hypertension in Schlager mice: High blood pressure (BP) in Schlager hypertensive (BPH/2J) mice is contributed by increased sympathetic outflow from the hypothalamus. In collaboration with Prof Geoff Head’s group at the Baker IDI Heart Research Institute in Melbourne and Prof Fadi Charchar and Dr Francine Marques at the University of Ballarat (now the Federation University of Australia) we examined whether activation of the intrarenal renin-angiotensin system might also be involved. Arrays were performed at the Ramaciotti Gene Function Analysis Centre at Univ of NSW. During the active period we found higher renal renin mRNA and renin-dependence of the hypertension in the hypertensive strain (BPH/2J) than the normotensive strain (BPN/3J) of mice. The increase in renin mRNA was associated with a reduction in microRNA-181a, which we identified previously as a negative regulator of renin mRNA in human kidneys. We found greater sympathetic innervation density in the kidneys of the hypertensive mice. Our study suggested that hyperinnervation and enhanced sympathetically-induced renin synthesis mediated by lower microRNA-181a contributes to hypertension in these mice.

Splicing factors: With the bioinformatics expertise of A/Prof Jean Yang in the School of mathematics and statistics, we completed analyses of a large body of data on the function of ZRANB2, a pre-mRNA splicing factor the Lab had cloned previously. Data showing ZRANB2 is part of the supraspliceosome, that phosphorylation affects its subcellular location and results of transcriptome-wide experiments to determine its splicing targets were published. The latter showed that ZRANB2 influenced the alternative splicing of primary transcripts of CENTB1, WDR78, C10orf18, CABP4, SMARCC2, SPATA13, OR4C6, ZNF263, CAPN10, SALL1, ST18 and ZP2. Several of these have been implicated in tumor development. Analyses of another splicing factor, RBM4, were completed. These and findings from other experiments are yet to be published.

Molecular genetics of longevity and ageing: In Nov 2012 Prof Brian Morris undertook a special studies program at the University of Hawaii’s Department of Geriatric Medicine, Kuakini Medical Center in Honolulu with Prof Bradley Willcox and co-workers, continuing as a collaboration after his return to Sydney. The research involved a large cohort of American men of Japanese ancestry aged over 95 years and a normal-lifespan control group. Collection of these began in 1965 as the Honolulu Heart Program, with 12 follow-up examinations to the present time. As such it is one of the best human population resources in the world for research on factors associated with healthy ageing and exceptional longevity. Prof Morris’ particular research focused on the molecular genetics of longevity. It led to two 1st author papers in the Journal of Gerontology and Biological Sciences, one directed as single nucleotide polymorphisms (SNPs) in genes belonging to the insulin/insulin-like growth factor signalling pathway (ATF4, CBL, CDKN2, EXO1 and JUN) and the other involving tagging SNPs in genes and flanking DNA in the mechanistic target of rapamycin (mTOR) pathway (MTOR, RPTOR, RICTOR and RPS6KA1). No association was found with longevity or
a large array of ageing-related phenotypes. He is undertaking a follow-up series of case-control studies of a possible association of \textit{RPTOR} SNPs with hypertension and overweight/obesity. In another study an association of short stature with exceptional lifespan was found. Interestingly a longevity-associated allele of \textit{FOXO3} was associated with short stature, suggesting a mechanism that could be responsible. Separate from his work with the Honolulu group, Prof Morris published an invited review on sirtuins, a group of 7 proteins implicated in longevity and most common diseases of ageing. His article in \textit{Free Radical Biology and Medicine} contained 627 references, making it the largest published on the topic.

\textbf{Male circumcision:} During the period Prof Morris continued to make a significant contribution to this field by publishing systematic reviews and other articles on lifetime urinary tract infections, sexual function, sensitivity and sensation, HIV and other sexually transmitted infections, genital cancers, ethical and legal aspects, and critiques of inferior publications that included the Royal Australasian College of Physicians policy statement that he and his co-authors showed was not evidence-based. Prof Morris took a leading role in the development of an affirmative policy statement on infant male circumcision on behalf of the Circumcision Academy of Australia and published this in a peer-reviewed journal.

\textbf{Journal Articles}

\textbf{2012}


Morris BJ, Wamai RG. Biological basis for the protective effect conferred by male circumcision against HIV infection. \textit{Int J STD AIDS} 2012; 23: 153-159.


2013

Total Annual Citations

<table>
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<tr>
<th>Year</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
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* "Lifetime" = to end of 2013.

H-index = 42

Chapters in Books
2012

Editorials

Letters to the Editor (in Journals)
2012


Scholarly Magazine and Newsletter Articles

2012


2013


Morris BJ. Science supports infant circumcision, so should skeptics. The Skeptic (UK) 2013; 24: 30-33.

Conference Abstracts and Presentations

(O, oral; P, poster; P+O, poster with short oral)

2012


Morris BJ. Molecular genetics of longevity. 1st World Congress on Healthy Ageing, Kuala Lumpur, Malaysia, 19-22 Mar 2012, Lecture L5, p 82. [Invited] O


Official for Scientific Societies, including for National and International Conferences
Member, Executive Committee, High Blood Pressure Research Council of Australia, Dec 2013– (NSW representative and Editor for Proceedings)

Conferences and Symposia Organized
Secretary for Cardiovascular Genetics Symposium (incorporating the 15th International Spontaneously Hypertensive Rat (SHR) Symposium & 48th Japanese SHR Meeting), Melbourne, Sep 2012

Invited Presentations at National and International Conferences
2012
First Annual World Congress: Understanding the Molecular Basis of Heart Disease and Cancer, Hawaii Institute of Molecular Education, Honolulu, 17-18 Feb 2012
1st World Congress on Healthy Ageing, Kuala Lumpur, Malaysia, 19-22 Mar 2012
Festival of Dangerous Ideas, Sydney Opera House, 28-30 Sep 2012

Seminar
2013
Renin, genes and finding the cause of hypertension. University of Ballarat: Oct 2013

News Media
Newspaper articles authored
2012
[Die chirurgische Impfung http://www.theeuropean.de/brian-j-morris/12188-gesundheitlicher-nutzen-der-beschneidung]

Letters to the Editor (newspapers)
Morris BJ. The first cut. ‘Good Weekend Magazine’ of Fairfax newspapers. 24 Nov 2012.

In Newspaper articles
2012
Circumcision is good for you, say local experts. (by Mark Metherell) WA Today http://www.watoday.com.au/national/circumcision-is-good-for-you-say-local-experts-20120301-1u60f.html
Researchers suggest circumcision for infants. TopNews Arab Emirates 7 May 2012. http://topnews.ae/content/210793-researchers-suggest-circumcision-infants


2013
An open letter to the Prime Minister from Australian Professors and Associate Professors. National Tertiary Education Union. The Australian 1 May 2013 p 7.
The snip does not make sex less enjoyable for men. (by Malcolm Holland) The Daily Telegraph 15 Aug 2013
Sex no issue after snip. The Advertiser (South Australia) 17 Aug 2013 p 21
Circumcision is a health issue. Sunday Telegraph (early edition) 15 Sep 2013 p 43
Circumcisions protect children. Sunday Telegraph (morning edition) 15 Sep 2013 p 43

In Magazine articles
2012 (8)

2013

Television (3)
Fore and against: The case for circumcision. Sixty Minutes, Channel Nine, 3 Mar 2013 https://www.youtube.com/watch?v=n7a7RLMc4Cg
Criticism of Tasmanian Law Reform Institute’s report on circumcision. WIN News (Tasmania) 19 Sep 2013

Radio
2012 (15)
New circumcision policy statement by Circumcision Foundation of Australia
ABC 774 Melbourne 7:10 am 2 Mar 2012 interviewed by Red Symonds.
ABC 707 Sydney 10:10 am 2 Mar 2012
3AW 10.05 am 2 Mar 2012
Rhema Broadcasting Group (New Zealand’s largest Christian media organization) 4.10 pm and 6.55 pm 2 Mar 2012
Circumcision protects against prostate cancer
SBS World News Australia (pre-recorded for 14 Mar 2012 broadcast)
Circumcision
ABC Newcastle 8:45 am 31 Oct 2012 interviewed by Jill Emberson
Circumcision Foundation of Australia re proposed review of Medicare rebate for circumcision
ABC Illawarra 10.05 am 8 May 2012
2GB ‘Drive’ 3:20 pm 8 May interviewed by Ben Fordam
On-line News and Forums

2012 (23)


Fresh controversy over circumcision and cancer. (by Hugo Wilcken) Oncology Update 30 Nov 2012.


Uncircumcised boys and men may face more UTIs. (by Trevor Stokes) Reuters, USA 7 Dec 2012. http://www.reuters.com/article/2012/12/07/us-uncircumcised-boys-idUSBRE8860Y720121207


2013 (25)


Should Australian boys be circumcised? A Tasmanian report recommending a ban on the circumcision of most baby boys continues to cause controversy a year after it was published. (by Greg Dyatt) SBS radio (online) 19 Sep 2013. http://www.sbs.com.au/news/article/2013/09/18/should-australian-boys-be-circumcised


‘Foreskin’ doesn’t increase pleasure. The Times of Israel 8 Dec 2013 http://www.timesofisrael.com/foreskin-doesnt-increase-pleasure/


Circumcision may not affect pleasure: study. NZ Men 10 Dec 2013 http://lifestyle.msn.co.nz/menshealth/sexandrelationships/8768764/circumcision-may-not-affect-pleasure-study


Study: Bris doen’t reduce sexual pleasure. (by Danile Koren) Ynetnews 13 Dec 2013 http://www.ynetnews.com/articles/0,7340,L-4464760,00.html

Circumcision does not affect pleasure. IOL (South Africa) 13 Dec 2013 http://m.iol.co.za/article/view/s/11/a/516475

Podcasts
2012
Would you circumcise your son? BBC World Service 12 July 2012. Podcast: http://www.bbc.co.uk/programmes/p00v3y1d [referred to 3 times during interview of Tim Farley, Jenny Goodman, Georgia Chapin and Marilyn Milos on the Cologne court ban]


PhD Awarded
2012
FZ Marques

Fellowship Awarded
2012
FZ Marques: NHMRC Peter Doherty Postdoctoral Fellowship (awarded in 2012)
Manuscripts Refereed for Journals

2012 (31)

2013 (32)

Grant & Award Applications Assessed

2012
NHMRC project grants (6)
NHMRC Early career Fellowship (1)
Canadian Research Council Research Chair renewal (1)

2013
NHMRC project grants (4)
Princess Alexandra Hospital Research Support Scheme, Small Grant

Membership of Editorial Board of Journal
Hypertension (2002–)

Higher Degree Thesis Examined
2013
PhD, Univ of Melbourne (1)

Promotions Refereed
2013
To Scientist at Research Institute at Hospital for Sick Children, Toronto, Canada.
To Associate Professor at Johns Hopkins University School of Medicine.

Service to Professional Societies, Grant-Giving Bodies or Other External Committees
Website of the Circumcision Foundation of Australia: 2010–

External Funding to Laboratory

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<td>Regulation of the placental renin-angiotensin system and and placentaion</td>
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<td>Lumbers ER</td>
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<td>Broughton-Pipkin F</td>
<td>2015</td>
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<td>Morris BJ*</td>
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EMBRYONIC STEM CELL LABORATORY
MICHAEL B MORRIS

Laboratory Personnel 2012-2013

<table>
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<tr>
<th>Name</th>
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<tr>
<td>Michael B Morris</td>
<td>Sesqui Senior Lecturer in Embryonic Stem Cells</td>
<td>2007–</td>
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<td>Rachel Shparberg</td>
<td>PhD student (2013–); BSc(Hons) student (2012)</td>
<td>2012–</td>
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<td>Matthew Bright</td>
<td>BSc(Hons) student</td>
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<td>Jonathan Bruck</td>
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<td>Holly Holliday</td>
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<td>Jonathan Larach</td>
<td>BSc(Hons) student</td>
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<td>Tanya Saraogi</td>
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<tr>
<td>Nicola Pitt</td>
<td>PhD student</td>
<td>2013–</td>
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<tr>
<td>Radu Zamfirescu</td>
<td>Research Assistant</td>
<td>2011–</td>
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<td>Kevin Sampang</td>
<td>Faculty of Medicine Summer Scholar</td>
<td>2012–13</td>
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<td>Sandra Li</td>
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<td>Tim Mason</td>
<td>Talented Student Program</td>
<td>2013–</td>
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Total effective full time personnel 2012: 9.0 2013: 9.0

Research Overview
Research of the Lab involves (i) investigation of molecular mechanisms underpinning pluripotency and directed differentiation of embryonic stem (ES) cells and embryos and (ii) development of computational tools for predicting, refining, and comparing the 3D structures of integral-membrane proteins.

Research Activities
The Laboratory, which was initially established on the Royal North Shore Hospital campus, moved to the main University campus in late 2012. We have been using mouse ES cells as a model of embryogenesis and have been investigating the signalling and gene expression circuitry controlling neural-cell fate. This will provide information about the molecular mechanisms underpinning normal and abnormal development, as well as protocols for the generation of neural cells that can be used in animal models of human disease and injury. Of particular importance, we have shown that selected amino acids, including L-proline, behave as growth factors that act at multiple points in the developmental process as ES cells differentiate sequentially to pluripotent primitive ectoderm, multipotent germ-layer ectoderm, and on to neural progenitor cells used to establish the initial template of the nervous system. L-Proline acts via the specific cell-membrane amino-acid transporter, SNAT2, and serves to activate or modulate a large number of signalling pathways, including mTOR, JAK/Stat, ERK1/2, and Akt. The modulation of these pathways, in conjunction with those activated by the cytokine LIF, serve to drive differentiation of ES cells, as well as alter cell proliferation, cell shape and motility, and metabolism.

To confirm molecular models generated from the ES-cell model in vitro, we have an ongoing collaboration with Dr Margot Day (Physiology and Bosch Institute) as well as Dr Charles Bailey and Prof John Rasko (Centenary Institute) to examine signalling pathways and amino-acid transporters controlling preimplantation mouse embryo development. We showed, using wild-type and knockout mice, that analogous mechanisms mediated by selected amino acids promote early development at several different stages, consistent with these acids acting in a growth-factor-like manner. This work has implications for improving the number and quality of embryos generated in artificial reproductive technologies being used and developed for humans, livestock and the horse-racing industry.

In a collaboration with Assoc Prof Paul Thomas (University of Adelaide) we examined Sox3-mediated transcriptional regulation of embryonic brain development. In a Sox3 transgenic mouse model, midline development is corrupted. This included failure to develop the subcommisural organ, resulting in congenital hydrocephalus.
The Lab continues its research in developing computational tools for predicting, refining, and comparing the 3D structures of integral-membrane proteins, with a particular focus on the use of our new tool, REPIMPS, applied to G protein-coupled receptors (GPCRs). This work is being performed in collaboration with Dr B. Church (Faculty of Pharmacy) and Dr S. Dastmalchi (Tabriz University, Iran).

Journal Articles
2012

2013

Chapter in Book

Total Annual Citations

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*‘Lifetime’ = to end of 2013.

H-index = 19

Conference Abstracts and Presentations
(O, oral; P, poster; P+O, poster with short oral)
2012

2013

Saraogi TA, Morris M. Role of different amino acids in self-renewal of mESCs and directed differentiation to specialized cells. *21st ASMR NSW Annual Scientific Meeting*, Sydney, 2013, PP-83.


**News Media**

**Radio**

Stem cells and clinical applications

**Official for Scientific Societies, including for National and International Conferences**

Member, Executive Committee, Sydney Centre for Developmental and Regenerative Medicine, 2009–

Member, Executive Committee, Scientific Staff Council, North Shore and Central Coast Area Health Service, 2010–2012

Member, Executive Committee, NSW Stem Cell Network, 2011–

Secretary and Public Officer, Australasian Society for Stem Cell Research, 2012–

Member, Management Committee, Kolling Institute of Medical Research, 2009–2012

**Conferences and Symposia Organised**


**Invited Presentations at National and International Conferences**

**Invited presentation**

Mechanism-based Natural Product Development Conference, Mouse ES cells as a model for embryo development, Vancouver, 2012

**Invited panelist**

Stem Cell Revolutions, Museum of Contemporary Art, Sydney, 2012

Stem Cell Revolutions, Museum of Contemporary Art, Sydney, 2013

**Session Chair**


Australasian Society for Stem Cell Research 6th Annual Scientific Meeting, Brisbane, 2013

**Manuscripts Refereed for Journals**

*Int J Biochem Cell Biol* (1)

*Stem Cells Devel* (3)

**Grant & Award Applications Assessed**

2013

NHMRC (1)

Garnett Passe and Rodney Williams Medical Foundation (1)
Membership of Editorial Board of Journal
Member, Editorial Board, Journal of Pediatric Biochemistry, 2009–present
Member, Review Editorial Board, Frontiers in Integrative Physiology, 2011–present

Translation into Policy/Practice
Submission (NSW Stem Cell Network) to NHMRC Public Consultation on Stem Cell Treatment: A quick guide for medical practitioners and Frequently asked questions: a resource for patients, 2012
Submission (NSW Stem Cell Network) to Australian Government Department of Industry on Innovating the Marketplace with Stem Cells, 2013

Research Funding

<table>
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<tr>
<th>Bosch Institute Translational Grant</th>
<th>L-Proline and LIF supplementation for cultured human embryos – Improving embryo health and birth rates from assisted reproduction</th>
<th>Day ML Morris MB</th>
<th>2012</th>
<th>$24,100</th>
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<tr>
<td>RL Cooper Medical Foundation Equipment Grant</td>
<td>Upgrade of the Palm Duoflex Combi laser microdissection and optical tweezer system</td>
<td>Cole L Mason RS Richardson D dos Remedios C Bao W Buckland Morris MB</td>
<td>2012</td>
<td>$22,000</td>
</tr>
</tbody>
</table>

Teaching
Coordinator, PHSI2005 Integrated Physiology A, 2012–
Total face-to-face and teaching-related hours per year: 1,140
RESEARCH AND TEACHING REPORT

MELONI M MUIR

Research Activities

Education in Science: My science education research has two foci: how students communicate their understanding of science in writing and the examination of enhancing science teaching to diverse student cohorts. Inherent to understanding how students communicate their science knowledge is an understanding of how students perceive and use feedback. My research has been examining this through questionnaires, reflective diaries and student interviews and focus groups. Outcomes of this research have been influential on assessment and curriculum development within our School as well as the Faculty of Science.

The University has been encouraging greater diversity in the student cohort through several initiatives. This increase in student heterogeneity brings challenges to the provision of optimal and equal learning opportunities for all students. I, along with colleagues from the Learning Centre, the Business School and the Schools of Psychology and Mathematics & Statistics, developed a Knowing Your Student (KYS) report to help academics to learn more about their student cohorts. We are studying how academics use information about their students to develop assessments and make curriculum decisions. The KYS report was first distributed in 2013 to Unit of Study coordinators in the Faculty of Science and the Business School and received an overwhelmingly positive response. The University is now considering how to expand its distribution university-wide.

I became a member of the Board of the Institute for Innovation in Science and Mathematics Education (IISME) in 2012. In 2013 I was the convener for the annual IISME symposium, Teaching Science to non-Science Majors: How do we Engage Students?, which focused on Science service teaching. A highlight of the symposium was a panel of undergraduate and post-graduate students discussing their experiences and offering insight into how service teaching could be improved to enhance learning and teaching.

In 2013 I hosted two visiting scholars, Drs Nisha Vashishtra and Sadhna Sharma, from Miranda House, University of Delhi, Delhi, India. They were part of a delegation of Indian academics visiting Australia interested in developing collaborative research projects in tertiary science education.

For the past two years I have been a member of the Education Working Group of the Charles Perkins Centre (CPC). I have been actively involved in the design and review of the teaching spaces in the CPC which will open for classes in semester 1, 2014. The new teaching spaces include a super lab for more than 200 students with state-of-the art lab equipment, information technology and audiovisual facilities.

Teaching Activities

2012
Coordinator, PHSI2006 – Integrated Human Physiology B
Lecturer, PHSI2005 – Integrated Physiology A
Lecturer, PSPC2602 – Physiology and Pharmacology
PBL tutor, PHSI3006 – Human Cellular Physiology
PBL tutor, PHSI3008 – Heart and Circulation
PBL tutor, Graduate Medical Program
As unit of study coordinator for PHSI2006, I am involved in both teaching and administrative roles for this undergraduate Unit of Study in which approximately 260 Bachelor of Science students are enrolled. My colleagues teaching in this Unit of Study are supported by pre-practical, marker and curriculum development meetings which I run throughout the semester. The IBL activity, implemented in 2006, continues to be a popular component of this unit of study. It involves a semester-long project culminating in a multimedia student presentation. The activity extends students’ discipline-specific knowledge beyond the lecture material and develops graduate attributes such as critical thinking, evidence integration from multiple sources, teamwork and oral and written skills, by providing the students with a scaffolded approach to problem solving and independent learning.

Conference Abstracts and Presentations

2013


Conference and Symposia Organized

2012

2013

Program Committee Member, International Society for the Scholarship of Teaching and Learning Conference, Critical Transitions in Teaching and Learning, Raleigh, NC, USA, Oct 2013.

Grant Funding
Univ of Sydney eLearning Strategic Development Grant
Using paraphrasing and short writing tasks to promote understanding and academic skills in science

Muir MM 2013
Membership of Editorial Boards of Journals
Frontiers in Integrative Physiology: 2012–
International Journal of Science and Mathematics Education: 2012–

Service to the University
Sydney Medical School
Admissions Interviewer (2005–)
Social Inclusion Scholar (2010–)

School of Medical Sciences
Deputy Chair, School of Medical Sciences Teaching Committee (2008–12)
Discipline Representative, School of Medical Sciences Teaching Committee (2012–)
Charles Perkins Centre Education Working Group (2012–)

Faculty of Science
Sub-dean of Student Affairs (2009–)
School of Medical Sciences Representative, Faculty of Science Teaching Committee (2005–)
Social Inclusion Scholar (2010–)
Institute of Innovation in Science and Mathematics Education Board (2012–)
Science Faculty Education Research Group (2000–)
First Year Experience Network (2012–)

Service to the Community
iScience judge (2012–)
DEVELOPMENTAL & CANCER BIOLOGY
MATTHEW J NAYLOR

Laboratory Personnel 2012-2013

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Institution</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matthew J Naylor</td>
<td>NHMRC &amp; NBCF Fellow</td>
<td>NHMRC/University</td>
<td>2011-</td>
</tr>
<tr>
<td>Luke R Anderson</td>
<td>Research Officer</td>
<td>CCNSW</td>
<td>2011-</td>
</tr>
<tr>
<td>Thomas Owens</td>
<td>Research Officer</td>
<td>NHMRC</td>
<td>2011-</td>
</tr>
<tr>
<td>Elysia Neist</td>
<td>Research Assistant</td>
<td>NBCF/CCNSW</td>
<td>2011-</td>
</tr>
<tr>
<td>Monique Fasavalu</td>
<td>Technical Officer</td>
<td>PCFA/NHMRC</td>
<td>2011-</td>
</tr>
<tr>
<td>Anne-Marie Mooney</td>
<td>PhD student</td>
<td>APA</td>
<td>2011-</td>
</tr>
<tr>
<td>Alison Ferguson</td>
<td>PhD student</td>
<td>APA</td>
<td>2011-</td>
</tr>
<tr>
<td>Maxine Rees</td>
<td>BSc(Hons) student</td>
<td></td>
<td>2013-</td>
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<td><strong>Total effective full time personnel</strong></td>
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<tr>
<td><strong>2012:</strong> 7.0</td>
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<tr>
<td><strong>2013:</strong> 8.0</td>
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Lab Overview

Research in the Developmental & Cancer Biology Laboratory focuses on understanding the mechanisms that control normal development and cell function and then how these processes are perturbed in human disease such as cancer.

Research Activities

The Lab’s focus continued on two main streams: (1) Investigating b1 integrin and downstream signalling molecules in prostate development and tumourigenesis; and (2) Investigating the role of transcriptional regulators of mammary gland development and breast cancer.

Our research demonstrating a new role for b1 integrin as both a regulator of normal prostate cell function and having a role in the progression of prostate cancer development was published in *Scientific Reports*. In addition to demonstrating a new role for b1 integrin in the regulation of basal cell populations during androgen-driven prostate development, we also showed that deletion of b1 integrin resulted in enhanced prostate tumourigenesis in an experimental mouse model, which has important implications for the targeting of this molecule in human prostate cancer.

Together with our colleagues at the Garvan Institute we demonstrated a novel role for Elf5, a transcription factor, in the specification of breast cancer cell phenotype (published in *PLoS Biology*), and new oncogenic function and cooperation between HER2 and c-Myc during the progression of breast cancer (published in *Oncogene*).

A further focus of research in the Lab was the investigation of the role of Runx/CBF transcription factors during mammary gland development and breast cancer progression. We showed for the first time a novel role for Runx2 as a new regulator of mammary gland development and that its deletion inhibits breast cancer progression. Furthermore we expanded these findings to examine the potential role of its heterodimer binding partner CBFb. In preliminary findings we obtained data indicating a completely novel role for CBFb as a regulator of breast cancer cell phenotype. These data were the basis of a successful NHMRC project grant for continuation of the project in 2014.

In addition we have also begun to examine the link between obesity, lipid metabolism and breast cancer. Deletion of a key enzymatic regulator of lipid metabolism seems to impair breast cancer progression. This work was part of Maxine Rees’ Honours project and was the basis of a successful Early Career Research Grant to Dr Owens for continuation of the project in 2014.
Journal Articles

2012


2013


Total Annual Citations

<table>
<thead>
<tr>
<th></th>
<th>2009</th>
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<th>Lifetime*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matthew Naylor</td>
<td>89</td>
<td>106</td>
<td>96</td>
<td>93</td>
<td>84</td>
<td>852</td>
</tr>
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</table>

* ‘Lifetime’ = To end of 2013.

H-index = 16

Official for Scientific Society

State Representative (NSW), Australia and New Zealand Society for Cell and Developmental Biology: 2013–

Invited Presentations at National and International Conferences

2012

2013

Naylor MJ. Runx2 is a regulator of mammary gland development and cell fate. EMBO Workshop, RUNX Transcription Factors in Development & Disease, Wilsede, Germany, 16-19 Jun 2013.

Seminars

Naylor MJ. Dissecting integrin signalling in glandular epithelium during development and carcinogenesis. Invited speaker. Physiology Seminar Series, Department of Physiology, School of Biomedical Sciences, Monash University, Clayton, Vic, 13 Oct 2013.

Naylor MJ. Cell fate regulation during developmental and carcinogenesis. Anderson Stuart Seminar Series, School of Medical Sciences, University of Sydney, 18 Oct 2013.

Manuscripts Refereed for Journals

2012 & 2013
Approximately 10 each year, mainly for Cancer Research, Developmental Biology, Developmental Dynamics, Molecular Endocrinology, Endocrinology.
Grant & Award Applications Assessed  
2012 & 2013  
Approximately 15–30 each year, mainly for NHMRC, ARC, National Breast Cancer Foundation and Prostate Cancer Foundation of Australia.

Membership of Editorial Board of Journal  
*Frontiers in Integrative Physiology* (2011–)

BSc(Hons) Awarded  
2013  
Maxine Rees

Service to Grant-Giving Bodies  
Deputy Chair, NHMRC Grant Review Panel 2012  
Member, Infrastructure Grant Review Panel, National Breast Cancer Foundation Australia 2012

Grant Funding

<table>
<thead>
<tr>
<th>Funding Source</th>
<th>Project Description</th>
<th>Principal Investigator(s)</th>
<th>Funding Years</th>
<th>Total Funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Univ of Sydney</td>
<td>Sydney Medical School Early Career Researcher Pilot Grant</td>
<td>Anderson L</td>
<td>2012</td>
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</tr>
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</table>
Teaching Activities

Face-to-face teaching
In 2012–2013 Dr Naylor continued to teach the following subjects:

PHSI3005 Human Cellular Physiology Theory; PHSI3007 Heart & Circulation Normal Function; PHSI3907 Heart & Circulation Normal Function Advanced; PHSI3008 Heart & Circulation Dysfunction; PHSI3908 Heart & Circulation Dysfunction Advanced

In 2012-2013, lecturing, problem-based learning tutorials and wet lab practicals amounted to approximately 170 face-to-face contact teaching hours.

Unit of Study Coordination
In 2012–2013 Dr Naylor was Unit of Study Coordinator for 4 advanced level (3rd year) subjects in the BMedSc and BSc degrees:

PHSI3007 Heart & Circulation Normal Function
PHSI3907 Heart & Circulation Normal Function Advanced
PHSI3008 Heart & Circulation Dysfunction
PHSI3908 Heart & Circulation Dysfunction Advanced

Research Student Supervision
Dr Naylor undertook research student supervision of PhD students, Honours students and advanced project lab based and research project students from the PHSI3907 Heart & Circulation Normal Function Advanced and PHSI3908 Heart & Circulation Dysfunction Advanced undergraduate units.

Student supervision included:
Anne-Marie Mooney (PhD student)
Alison Ferguson (PhD student)
Maxine Rees (BSc(Hons) student in 2013)
12 Advanced Student Projects (2012–2013)

Total = 578 research student supervision teaching hours for 2012–2013.
MOLECULAR NEUROSCIENCE LABORATORY
WILLIAM D PHILLIPS

Laboratory Personnel 2012–2013

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>William (Bill) Phillips</td>
<td>Associate Professor</td>
<td>1993–</td>
</tr>
<tr>
<td>Marco Morsch</td>
<td>Postdoctoral Research Fellow</td>
<td>2009–</td>
</tr>
<tr>
<td>Nazanin Ghazanfari</td>
<td>PhD student</td>
<td>2010–</td>
</tr>
<tr>
<td>Anson Cheng</td>
<td>MPhil student</td>
<td>2011–13</td>
</tr>
<tr>
<td>Nigel Tse (co-supervised with Cathy Leamey)</td>
<td>MPhil student</td>
<td>2013–</td>
</tr>
<tr>
<td>Archunan Visvanathan</td>
<td>MPhil student</td>
<td>2013–</td>
</tr>
</tbody>
</table>

Effective full-time personnel: 2012: 4.0 2013: 6.0

Lab Overview
The neuromuscular junction is the synapse through which the motor nerve controls voluntary muscle. Bill Phillips’ group uses techniques of molecular physiology to study how this vital synapse is able to adapt to the challenges of growth, disease and sedentary aging. Impairment of neuromuscular synapses causes weakness in diseases called myasthenias, while complete loss of these synapses contributes to weakness in motor neuron disease and in sedentary ageing. The group seeks to understand the natural physiological mechanisms that drive renewal of the neuromuscular synapse and find ways of enhancing these pathways of renewal.

Members of the Molecular Neuroscience Laboratory in early 2013. From left: Nigel Tse, Anson Cheng, Bill Phillips, Nazanin Ghazanfari and Marco Morsch.
Research Activities

In myasthenia gravis the human body produces autoimmune antibodies that attack the neuromuscular junction, resulting in weakness. The Lab investigated a new form of myasthenia gravis caused by autoimmune antibodies against muscle specific kinase (MuSK). We previously showed that when antibodies from anti-MuSK-positive myasthenia gravis patients were injected into mice they modified the organization of the neuromuscular junction by reducing the density of acetylcholine receptors on the muscle fibre surface. Acetylcholine receptors are needed to respond to the acetylcholine signals from the nerve that trigger muscle contraction. During 2012 and 2013 we showed that antibodies from patients cause the slow progressive loss of these receptors, so leading directly to failure of the ability of the synapse to control muscle and consequently to muscle weakness. Treatment options for anti-MuSK myasthenia gravis patients are limited, so Marco Morsch employed our mouse model to test two drugs that have been used to treat other forms of myasthenia. One drug, 3,4-diaminopyridine, showed promise in the mice. The second drug, a widely-used cholinesterase inhibitor, pyridostigmine, caused the synaptic damage and weakness to become even worse than what was seen in the absence of treatment.

As humans grow old connections between motor nerve and muscle begin to break down. The cause is not well understood. The loss of neuromuscular connections contributes to the weakness and frailty of individuals in old age. In 2012 and 2013 the Lab studied the effects of age and exercise on the neuromuscular junctions in laboratory mice. Anson Cheng observed remodelling of the neuromuscular junction beginning in early middle age. This was followed by a progressive loss of the nerve contacts with muscle fibres as middle age progressed into old age. However, elderly mice that were provided with a running wheel when they reached late middle age engaged in voluntary running. These active mice avoided nearly all of the loss of nerve-muscle connections found in sedentary neighbours (see Figure). Perhaps, just as in mice, voluntary exercise might help humans maintain robust control of their muscles well into old age.

Exercise helps sustain nerve-muscle connections in old age. Microscopic images show neuromuscular synapses from an elderly sedentary mouse (A) and an elderly mouse that engaged in voluntary wheel running beginning in late middle age (B). Red fluorescence shows synaptic specializations on the muscle surface, green shows the motor nerve terminal, while white represents the area is the synaptic alignment. (Modified from Cheng et al. PLoS One 2013; 8: e67970)
Journal Articles
2012


2013


Total Annual Citations

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<thead>
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<th>2012</th>
<th>2013</th>
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<tr>
<td>William D Phillips</td>
<td>48</td>
<td>44</td>
<td>41</td>
<td>54</td>
<td>42</td>
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* ‘Lifetime’ = To end of 2013.

Conference Abstracts and Presentations
(O, oral; P, poster; P+O, poster with short oral)
2012


Morsch M, Reddel SW, Ghazanfari N, Toyka KV, Phillips WD. Patient autoantibodies reveal the role of muscle specific kinase in maintaining the mature neuromuscular junction. *Australian Physiological Society Meeting*, Sydney, Dec 2012, 228P.

2013
Morsch M, Reddel SW, Ghazanfari N, Toyka KV and Phillips WD. Patient autoantibodies reveal the role of muscle specific kinase in maintaining the mature neuromuscular junction. *Australian Neuroscience Society Annual Scientific Meeting*, Melbourne, 3-6 Feb 2013, ORAL-03-08.

Morsch M, Reddel SW, Ghazanfari N, Toyka KV and Phillips WD. Synaptic failure and muscle weakness in anti-MuSK-Myasthenia gravis are exacerbated by cholinesterase inhibition. *Australian Physiological Society Meeting*, Geelong, 8-11 Dec 2013, 142P.
Organizer for Weekly Seminars
Anderson Stuart Seminar Series: 1993–

MPhil Awarded
2013
Anson Cheng

Manuscripts Refereed for Journals
2012 (2)
*Biochem J* (1), *Frontiers Physiol* (1)
2013 (3)
*Exp Physiol* (1), *Exp Neurol* (1), *Proc Natl Acad Sci USA* (1)

Grant & Award Applications Assessed
2012
NHMRC (2)
2013
MRC (UK) (1)
Neurological Foundation of New Zealand (1)

Membership of Editorial Boards of Journal
PLoS One, 2012– (29 manuscripts to final disposition)

Higher Degree Theses Examined
2012
PhD: Univ of Sydney (1)

Service to the University
University Committees
University Biosafety Committee (Genetically Modified Organisms): 1995–
School of Medical Sciences Committee
Chair, School Teaching Committee: 2003–12
Co-chair, School Teaching Committee 2013–

Bosch Institute
Theme Leader for Neuroscience: 2011–

Teaching Activities
Face-to-Face Teaching Hours 2012/2013

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<td>PBL Tutorials</td>
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<td>32</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
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<td>Practicals/Tutorials</td>
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<td>32</td>
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<td>Total</td>
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<td>82/82</td>
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Total = 96/96

Unit of Study Coordination responsibilities

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<th>Unit code</th>
<th>Enrolment 2012/13</th>
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<tbody>
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<td>Human Cellular Physiology: Theory</td>
<td>PHSI3005</td>
<td>208/203</td>
</tr>
<tr>
<td>Human Cellular Physiology: Research</td>
<td>PHSI3006</td>
<td>147/147</td>
</tr>
<tr>
<td>Human Cellular Physiology: Theory (Advanced)</td>
<td>PHSI3905</td>
<td>19/18</td>
</tr>
<tr>
<td>Human Cellular Physiology: Research (Advanced)</td>
<td>PHSI3906</td>
<td>19/15</td>
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VISION LABORATORY
DARIO PROTTI

Laboratory Personnel

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dario A Protti</td>
<td>Senior Lecturer</td>
<td>2003–</td>
</tr>
<tr>
<td>Stefano Di Marco</td>
<td>Post-doctoral fellow</td>
<td>2009–12</td>
</tr>
<tr>
<td>Jin Huang</td>
<td>Lecturer</td>
<td>2008–</td>
</tr>
<tr>
<td>Terry Middleton</td>
<td>PhD student</td>
<td>2007–13</td>
</tr>
</tbody>
</table>

Total effective full time personnel 2012: 4.0 2013: 4.0

Lab Overview

Our research focuses on signal processing in the retina, in particular on the synaptic mechanisms involved in the detection of specific features of the visual world. In addition, we are investigating the synaptic mechanisms underlying plasticity phenomena in the retina and the role of neurotransmitters and neuromodulators in these phenomena.

Research Activities

During this period, our Lab investigated the synaptic mechanisms involved in a short-term plasticity phenomenon in the retina and the functional organisation of neural networks responsible for contrast enhancement. In addition, we investigated how cannabinoids modulate neuronal responses to light stimulation.

Contrast adaptation in the mammalian retina: We investigated the different synaptic mechanisms involved in the adaptation to different levels of contrast in OFF-alpha ganglion cells. We found that high spatial acuity is particularly reliant on disinhibitory circuits and identified two different sources of inhibition.

Cannabinoid modulation of light responses in the retina: The endocannabinoids are bioactive lipids that act as neuromodulators in the central nervous system. We have shown that exogenous cannabinoids modulate spontaneous excitatory and inhibitory transmitter release in the mammalian retina, modulate light-responses and modify the receptive field organization of retinal ganglion cells. Our research also showed that endocannabinoids are released in the retina and modulate the strength of light-responses as well as the receptive field properties of retinal ganglion cells.

Lateral inhibition in the primate retina: We completed the characterisation of the spatial organization of retinal ganglion cells in the primate retina in collaboration with Dr Sam Solomon (Discipline of Physiology). We found that inhibitory mechanisms originating in the inner plexiform layer mediate lateral inhibition in both ON and OFF ganglion cells.

Role of inhibitory signalling in the inner plexiform layer: We continued our studies on the role of inhibition in the generation of directionally selective responses in the retina by doing dynamic clamp recordings. We found that direct inhibitory input onto ganglion cells is critical for the generation of direction selectivity as well as for preventing non-selective responses.

Journal Articles

2012


2013

Huang JY, Stiefel KM, Protti DA. Implementing dynamic clamp with synaptic and artificial conductances in mouse retinal ganglion cells. J Vis Exp 2013; article e50400.

**Total Annual Citations**

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<th>2013</th>
<th>Lifetime*</th>
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<tr>
<td>Dario Protti</td>
<td>39</td>
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* ‘Lifetime’ = To end of 2013.

**H-index = 14**

**Conference Abstracts and Presentations**

(O, oral; P, poster; P+O, poster with short oral)

**2012**


Huang JY, Protti DA. Inhibition generated by spiking amacrine cells shaped the receptive field properties of mouse retinal ganglion cells. *Proceedings of Australian Neuroscience Society, Gold Coast, Jan 2012.*


Huang JY, Protti DA. Direct inhibition plays an important role in surround inhibition and direction selectivity of retinal ganglion cells. *Proceedings of The Royal Australian and New Zealand College of Ophthalmologists, Melbourne, Nov 2012.*

Huang JY, Protti DA. The sharpness of spatial-tuning curves and response output of retinal ganglion cells are modified by direct inhibition. *UWS Sensory Neuroscience Symposium, Sydney, Dec 2012.*

**2013**

Huang JY, Protti DA. Direct inhibition modifies the sharpness of spatial-tuning curves and response output of ganglion cells. *Proceedings of Australian Neuroscience Society, Melbourne, Feb 2013*

Middleton TP, Protti DA. Endocannabinoids modulate light signals in the retina. *Proceedings of Australian Neuroscience Society, Melbourne, Feb 2013*

Huang JY, Protti DA. The effects of excitation and inhibition on the sharpness of spatial-tuning curves and response output of retinal ganglion cells. *Bosch Institute Annual Scientific Meeting: Visual Neuroscience: Modern Challenges and Australian Pioneers, Sydney, Jun 2013*


Official for Scientific Societies, including for National and International Conferences
Convenor of Vision Discussion Seminars, which bring together approximately 100 visual scientists in the Sydney area: 2012–2013.

Conferences and Symposia Organized
Member of the local organising committee of the 6th Asia and Oceania Conference on Photobiology Sydney, Oct 2013

Manuscripts Refereed for Journals
Develop Neurosci (1), PLoS One (1), J Physiol (Lond) (1)

Grant & Award Applications Assessed
2012
NHMRC (1)
ARC (1)
Argentinean National Science Agency (2)

2013
NHMRC (1)
ARC (1)
Argentinean National Science Agency (1)

Higher Degree Theses Examined
2012
PhD, Univ of Sydney (1)

2013
PhD, Australian National Univ (1)
SYSTEMS NEUROSCIENCE LABORATORY

ATOMU SAWATARI

Laboratory Personnel 2012–2013

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Years</th>
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<tbody>
<tr>
<td>Atamu Sawatari</td>
<td>Lecturer</td>
<td>2006–</td>
</tr>
<tr>
<td>Michael Bourke</td>
<td>PhD student (0.5)</td>
<td>2009–</td>
</tr>
<tr>
<td>Angela O’Connor</td>
<td>PhD student</td>
<td>2010–</td>
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<tr>
<td>Darius Rountree-Harrison</td>
<td>MPhil student</td>
<td>2011–</td>
</tr>
<tr>
<td>Thomas Burton</td>
<td>MPhil student (0.5)</td>
<td>2011–</td>
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<tr>
<td>Tasnim Rahman</td>
<td>BSc(Hons) student</td>
<td>2012</td>
</tr>
<tr>
<td>Anthony Wakulicz</td>
<td>BSc(Hons) student</td>
<td>2013</td>
</tr>
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</table>

Total effective full time personnel 2012: 5.0  2013: 5.0

Lab Overview

The research of this Laboratory is focussed on three main themes: (1) the influence of environmental factors on the development of cognitive circuits in mice; (2) the mechanisms underlying neural plasticity; and (3) the anatomical, physiological and behavioural characterization of the murine visual system.

Research Activities

Influence of environmental factors on neural development and mechanisms underlying neural plasticity: 2012–2013 saw the completion of the initial phase of a project that focused on the contribution of perineuronal nets (PNNs) to the plasticity of neural circuits within the motor control and skill acquisition circuits of the mouse striatum (caudate/putamin, the input nucleus of the basal ganglia). Previously, we have established that the initial formation of PNNs during postnatal development within this structure correlated with a host of anatomical, physiological and behavioural changes associated with the consolidation of striatal circuitry. Further, we discovered that raising mice in enriched environments from birth accelerated both the formation of PNNs and the emergence of behaviours associated with striatal function, including coordinated movements and open field exploration. These findings suggested that PNNs may play a vital role in regulating neural plasticity by consolidating developing striatal circuitry, akin to what has been observed during “critical periods” (brief epoch during early postnatal development that is characterized by heightened neural plasticity) in other brain areas. To test this possibility, a series of experiments were initiated to assess how the enzymatic removal of these structures in the striatum of adult mice affected the behaviour of these animals. We found that treatment with chondroitinase ABC, an enzyme that digests a key glycoprotein component of PNNs, leads to changes in ambulation: specifically, hind limb gait exhibits variability reminiscent of that exhibited in animals at an earlier stage of development. These findings were published in PLoS One and served as the basis for a successful grant application to the Michael J. Fox Foundation.

New projects were initiated in an attempt to further elucidate the role PNNs play in mature as well as developing cognitive neural circuits. A developmental study examining the time course of PNN expression in the hippocampus, a brain area vital for the formation, consolidation and recall of declarative memories, in enriched and non-enriched mice was begun. In order to properly assess changes in cognitive function due to pharmacological and/or environmental factors, several new behavioural tasks and paradigms were developed. This was accomplished in collaboration with the Bosch Animal Behavioural Facility.
Characterization of the murine visual system: Continuing collaborative work with the Leamey Lab led to further groundbreaking discoveries. Physiological as well as behavioural examination of mice missing axon guidance proteins Ten-m2 and Ten-m3, revealed that deficits exhibited by these gene knock-out animals can be attributed to readily apparent and consistent phenotypes associated with retinal input specifically to the binocular processing regions of early visual pathways. These findings have led to several publications, including a tent-pole paper in the Journal of Neuroscience.

Dr Sawatari visited the Laboratory of Professor Mriganka Sur at Massachusetts Institute of Technology (MIT) in 2013 in order to acquire the skills necessary to properly utilize the multiphoton microscope available at the Bosch Advanced Microscopy Facility, as well as maintain a well established overseas collaboration. An invited talk entitled “Development of neural connectivity and function: roles of genes and experience” was given at the Simons Center for the Social Brain, MIT during this visit.

Journals Articles
2012

2013

Total Annual Citations

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* ‘Lifetime’ = To end of 2012.

Conference Abstracts and Presentations
(O, oral; P, poster; P+O, poster with short oral)
2012
Society for Neuroscience: 1 poster
Australian Neuroscience: 2 orals, 2 posters

2013
Society for Neuroscience: 2 posters
Australian Neuroscience Society, 1 oral, 5 posters

Research degrees awarded
PhD Awarded
2012
Hyunchul Lee

BSc(Hons) Awarded
2013
Tasnim Rahman
Anthony Wakulicz
Manuscripts Refereed for Journals
2012
PLoS One (1)

Membership of Editorial Board of Journal
Frontiers in Integrative Physiology: 2011–

Higher Degree Thesis Examined
2012
PhD, Univ of Newcastle

Grant Funding
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Teaching
2012 and 2013 saw the continued evolution of the PHSI2905/2906 Advanced 2nd year Physiology course. Three new extension practicals spearheaded by Haydn Allbutt (two in first semester (PHSI2905)) and Steven Assinder (one in second semester (PHSI2906)), were developed and added to the course. Initial feedback has been positive.
Lab Overview
The main focus of this Laboratory is to address questions regarding the role of energy metabolism and diet in the pathophysiology of heart failure and metabolic diseases using a broad systems approach.

Research Activities
This Lab was formed at the beginning of 2013 following the appointment of Bill Stanley to a Chair of Cardiovascular Physiology. The research included understanding mitochondria dysfunction in heart disease and evaluation of the effects of dietary lipids on cardiac structure, function and pathology. The Lab used a wide variety of experimental systems for this research, ranging from biochemical assessment of isolated mitochondria to studies in patients.

In 2013, we initiated a study on the effects of dietary lipids in two heart failure models. Multiple clinically relevant endpoints were used to assess cardiac function and the possible therapeutic benefit of a diet rich in polyunsaturated fats. Potential underlying mechanisms involving mitochondrial respiratory function were investigated. We also initiated protein and lipid profiling studies in these models with national collaborators. In collaboration with Prof David Celermajer of Royal Prince Alfred Hospital, we established animal models to study long term complications of aortic coarctation, a congenital malformation of the aorta. These novel animal models will provide insight into the effects of transient pressure overload in early life and its impact on long-term cardiac function.

Journal Articles
2012


2013


Stanley WC. Introduction to special issue on cardiac metabolism in hypertrophy and failure. Heart Fail Rev 2013; 18: 553-553. (Editorial)


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* ‘Lifetime’ = To end of 2013.


Conference abstracts:

2012


2013


Editor of Journals

Editor-in-Chief, *American Journal of Physiology – Heart and Circulatory Physiology*: 2011– (Role: Oversee operations of the journal, including review and editing of ~1000 manuscripts per year, and the work of two editorial managers and 16 associate editors)

Section Editor for Basic Science, Heart Failure Reviews: 2011–2013

Guest Editor, Heart Failure Reviews, 2013. Special Issue entitled: ‘Cardiac Energy Metabolism in Hypertrophy and Failure’

Associate Editor, *Cardiovascular Drugs and Therapy*: 2006–2013

Consulting Editor, *Journal of Molecular and Cellular Cardiology*: 2011–2013
Membership of Editorial Board of Journal
Basic Research in Cardiology (2013–)

Manuscripts Refereed for Journals

Reviewer of Abstracts for Conferences
American Heart Association Scientific Session: 2012 and 2013

Service to Professional Societies
Member of the Communications Committee, American Physiological Society; Member of the Steering Committee of the Cardiovascular Section: 2011–2012
Member of the Board of Governors, Heart Research Institute, Sydney: 2013–

Grant Reviewer:
2012
NHMRC

National Institutes of Health, Center for Scientific Review, Permanent Member of the ‘Myocardial Ischemia and Metabolism’ study section
National Institutes of Health, NIA (Jul 2012), NHLBI (Sep 2012)

2013
National Institutes of Health, Center for Scientific Review, Permanent Member of the ‘Myocardial Ischemia and Metabolism’ study section
National Institutes of Health, NHLBI, Feb 2013.

Conference Organizer:
Member of the Organizing Committee, International Society for Heart Research North American Meeting, Banff, Alberta, Canada, May 2012.
Chair of the Organizing Committee, ‘Lipids in Cardiac Health and Disease: From Toxicity to Protection’, 11th Annual Meeting of the Society for Heart and Vascular Metabolism, Cambridge, Maryland, 30 Sep--2 Oct, 2013.

Grants and Award Application assessed
2013
Stanley:
NHMRC (3)
Liu:
NHMRC (1)
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Research Activities

**Neuroprotection in the retina:** Following a series of studies that established the neuroprotective potential of two low-toxicity, low-stress neuroprotectants (dietary saffron and photobiomodulation), we next determined the time course of their protective effects. We also examined the effect of combined therapy, as a test of whether these compounds activate the same or separate mechanisms. In earlier studies, we had shown the ability of several interventions (control of oxygen levels, preconditioning with light, dietary saffron, photobiomodulation) to slow the degeneration of the retina in rodent models. In the period 2012 and 2013, we explored interactions between distant parts of the body – remote ischaemic preconditioning – with the potential to protect the retina against degenerative stress. Remote conditioning both protects the retina, and enhances the response of the unstressed retina to light. The mechanisms involved were explored using molecular biology techniques (DNA array, qPCR, ELISA), as well as cellular analysis of microglial activity in the stressed and preconditioned retina.

A class of cells known as Myo/Nog cells have recently been investigated by the lab, in collaboration with a US-based group. The Myo/Nog cells express MyoD mRNA and the protein Noggin, a well established inducer of neural tissue and skeletal muscles in early embryogenesis. Myo/Nog cells integrate into the developing retina and affect the developing optic primordia. Our investigations found Myo/Nog cells continued to be expressed in the adult retina. Live cell harvesting and cell tagging techniques were used to probe the role of Myo/Nog cells in light damaged retina. Exogenous Myo/Nog cells were found to promote photoreceptor cell survival. Further research into the mechanism of their neuroprotective action is currently being undertaken.

**Neuroprotection in the brain:** Our work on neuroprotection was extended to the brain using several mouse models of cerebral degeneration, including an acute toxin-induced model of Parkinson’s disease and transgenic models of Parkinsonism, and of dementia. The work has shown evidence that photobiomodulation and saffron can reduce cerebral degeneration in these models, as assessed by both neuropathology and behavioural techniques. The challenge of these studies was to identify mechanisms – namely how three very different interventions (one dietary, one radiation and one ischemic) act, and to identify the molecular and cellular mechanisms involved.

**Vascular basis of dementia:** This work investigated the involvement of vascular degeneration in the causation of the age-related dementia, Alzheimer’s disease. Our work tested the idea that haemorrhage from cerebral vessels can lead to the formation of plaques and neurofibrillary tangles, two of the features of the demented brain described by Alzheimer, a century ago. The response of brain tissue to small, haemorrhagic lesions was studied in a rodent model. This showed a complex ‘halo’ around the lesion site, which may be important in understanding the full response of tissue to the small haemorrhages that are prominent in dementia.

**Arterial stiffening and dementia:** The Lab also analyzed epidemiological evidence that long-established changes in the properties of the great arteries (principally the stiffening of the arterial wall) plays a key role in the causation of age-related dementia.
Effects of iron excess on the CNS: Through a long-term collaboration with researchers at the University of Newcastle, the Lab is studying the effects of excess iron on the brain and retina, as well as some peripheral tissues such as heart. These studies involve the use of various mouse models of the hereditary systemic iron overload disorder haemochromatosis. Previous studies from this collaboration have employed transcriptomic techniques to determine alterations in molecular systems in these models, and current studies are focussed on mapping metal distribution in CNS structures and correlating this with markers of damage and pathology. We will soon be commencing studies to trial our neuroprotective strategies in these models.

Journals Articles

2012


2013

Acikyol B, Graham RM, Trinder D, House M, Olynyk JK, Scott RJ, Milward EA, Johnstone DM. Brain transcriptome perturbations in the transferrin receptor 2 mutant mouse support the case for brain changes in iron loading disorders, including effects relating to long-term depression and long-term potentiation. *Neuroscience* 2013; 235: 119-128.


### Total Annual Citations

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* ‘Lifetime’ = To end of 2013.

### Chapter in Book

2012


### Commercial Activities

J Stone: founding director of CSCM Pty Ltd

### Published Conference Proceedings (Articles) (2012 & 2013)


### Letters to the Editor (Journals)

2013


### Conference Abstracts and Presentations

(O, oral; P, poster; P+O, poster with short oral)

2012


2013


**Official for Scientific Societies, including for National and International Conferences**

D Johnstone

Director, *Australian Society for Medical Research* (2012–)

NSW State Committee Member, *Australian Society for Medical Research* (2011–)

**Conferences and Symposia Organized**

D Johnstone

2012

Member of Organising Committee, *Australian Society for Medical Research NSW State Scientific Conference*, Jun 2012

2013

Member of Organising Committee, *Australian Society for Medical Research NSW State Scientific Conference*, Jun 2013

J Stone

2013

Annual Scientific Meeting, Bosch Institute: Visual Neurosciences and Australian Pioneers

**Awards, Prizes and Other Recognition**

D Johnstone

Finalist, *Univ of Newcastle Young Alumni Award*, 2013

**Manuscripts Refereed for Journals**

D Johnstone

2012

*Metallomics* (2), *Brain Res* (1)

2013

*PLoS One* (1)

**Grant & Award Applications Assessed**

D Johnstone
2012
NHMRC project grants (2)

2013
Australian Bioinformatics Network connection grants (5)

Higher Degree Theses Examined
D Johnstone
2012
PhD, Univ of Newcastle

Service to the University
J Stone
Convenor, Anderson Stuart Heritage Committee (2008–)
Executive Director, Bosch Institute (2010–)

Service to Professional Societies, Grant-Giving Bodies or Other External Committees
J Stone
Managing Trustee, Sir Zelman Cowen Universities Fund (1995–)

D Johnstone
Member, Managing Committee, Haemochromatosis Australia (2013)

External Funding

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| ARC                                  | Centre of Excellence in Vision Science                                             | 2012       | $100,000
|                                      |                                                                                    | 2013       | $50,000
| Foote Foundation                     | Testing safe and simple treatments for preventing brain and eye disease             | 2013       | $40,000
| Lord Mayor’s Charitable Foundation   | Finding saffron                                                                    | 2013       | $25,000
|                                      |                                                                                    | 2014       |        |
| NHMRC Early Career Fellowship         | Testing safe and simple treatments for preventing brain and eye disease             | 2013-2016  | $299,564
| CASS Foundation                      | Travel grant to attend Neuroscience 2013, San Diego.                                | 2013       | $3,250
| NHMRC Equipment Grants               | QX100 Droplet Digital PCR System for Shared Use at the Multi-User Molecular Biology Core Facility | 2013       | $74,750


## JOURNALS OF PUBLICATION

Number in each, and ranking for Discipline of Physiology in the last five years

From SCI© Journal Citation Reports: based on source items in 2013

The rankings of journals are made according to the 2013 SCI© Science Citation Index ‘impact factor’, which is a measure of the frequency with the ‘average article’ in a given journal in a given journal has been cited in a given year. It is a ratio between citations and citable items published. The 2013 impact factor for a journal has been calculated by dividing the number of all the SCI© Science Citation Index source journals’ 2013 citations of articles that journal published in 2012 and 2013 by the total number of source items it published in 2012 and 2013. For all journals covered by the Index, a plot impact factor score vs number of journals with that score gives a distribution skewed towards the higher scores and having a median of 0.6 and a mode of 0.1. (In the left column below NL means that the journal has not been listed in the index.)

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Mean ± SD of impact factors for journals of publication =

- 4.04 ± 2.03 for 2012
- 4.36 ± 2.80 for 2013
- 4.01 ± 2.19 for five years of publication 2009–2013

% published in top 5% of journals (ie, impact factor > 3.5) = 55% over the five years of publication
# GRANT FUNDING TOTALS

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