OUR VISION
TO BE A LEADING INTERNATIONAL BRAIN RESEARCH INSTITUTE

OUR MISSION
IMPROVING LIFE THROUGH BRAIN RESEARCH

OUR VALUES
INNOVATION AND EXCELLENCE
COMMITMENT AND PASSION
INTEGRITY AND RIGOUR
COLLABORATION AND TEAMWORK

ADDICTION
ALZHEIMER’S DISEASE
CARDIOVASCULAR DISEASE
MENTAL ILLNESS
EPILEPSY
HUNTINGTON’S DISEASE
MOTOR NEURON DISEASE
MULTIPLE SCLEROSIS
PARKINSON’S DISEASE
SCHIZOPHRENIA
STROKE
TRAUMATIC BRAIN AND SPINAL CORD INJURY

THIS IMAGE WAS PRODUCED BY HEATHER MADSEN AS PART OF HER PHD STUDIES AND INVOLVES THE DELETION OF A MOLECULE IN THE BRAIN.
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SNAPSHOT HISTORY - FROM THEN TO NOW

- In 1947 the Florey’s founder, Professor Derek Ashworth Denton began researching the control of salt and water balance in health and disease.
- Denton’s friends, brothers Ken and Bailieu Myer (of the retail family) and stockbroker Ian Potter, worked together to raise the money to found a research institute. The building, in the grounds of Melbourne University’s Parkville campus, was opened in 1963.
- Established by an Act of State Parliament in 1971, the Howard Florey Institute was named after Sir Howard Florey, the Australian Nobel laureate who discovered the process for the large scale production of penicillin which continues to save millions of lives each year.
- Professor Geoffrey Donnan created the National Stroke Research Institute in 1994 at the Austin and Repatriation Medical Centre.
- Professor Graeme Jackson created the Brain Research Institute in 1996 at Austin Health.
- As the neuroscience explosion occurred during the 1990s, the Florey Board made the strategic decision in 2000 to change the Howard Florey Institute’s focus to brain disorders.
- In 2007 the Howard Florey Institute amalgamated with the Brain Research Institute and the National Stroke Research Institute to create the Florey Neuroscience Institutes, a major player in neuroscientific discovery on the international stage.
- Key areas of research include: addiction, Alzheimer’s disease, cardiovascular disease, depression, epilepsy, Huntington’s disease, motor neuron disease, multiple sclerosis, Parkinson’s disease, schizophrenia, stroke and traumatic and spinal cord injury.
- The institute has trained more than 750 scientists, including clinically trained associates.

WE’RE ACTUALLY DOING THE RESEARCH NOW THAT UNDERPINS THE FUTURE OF MEDICINE

PROFESSOR GRAEME JACKSON, NEUROLOGIST AND FLOREY DEPUTY DIRECTOR
# Florey by Numbers

<table>
<thead>
<tr>
<th>Category</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staff and Students</td>
<td>416</td>
</tr>
<tr>
<td>Faculty</td>
<td>70</td>
</tr>
<tr>
<td>Research Staff and Students</td>
<td>353</td>
</tr>
<tr>
<td>Honorary Members</td>
<td>130</td>
</tr>
<tr>
<td>Graduate Students</td>
<td>134</td>
</tr>
<tr>
<td>Alumni</td>
<td>1373</td>
</tr>
<tr>
<td>PhD Students</td>
<td>96</td>
</tr>
<tr>
<td>Early Career Fellows</td>
<td>4</td>
</tr>
<tr>
<td>Professorial Fellows</td>
<td>10</td>
</tr>
<tr>
<td>Senior NHMRC Research Fellows</td>
<td>23</td>
</tr>
<tr>
<td>Visiting Fellows</td>
<td>35</td>
</tr>
<tr>
<td>Members of the Faculty of 1000</td>
<td>5</td>
</tr>
<tr>
<td>Countries Represented by Florey Staff and Students</td>
<td>21</td>
</tr>
<tr>
<td>Countries Collaborating with our Scientists</td>
<td>31</td>
</tr>
<tr>
<td>Australian Academy of Sciences Members</td>
<td>3</td>
</tr>
<tr>
<td>2011 Fellowships:</td>
<td></td>
</tr>
<tr>
<td>Reappointed</td>
<td>3</td>
</tr>
<tr>
<td>New Fellows</td>
<td>2</td>
</tr>
<tr>
<td>School Students Involved in the ‘Meet a Scientist’ Programme</td>
<td>1200</td>
</tr>
<tr>
<td>2011 Papers Published</td>
<td>310</td>
</tr>
<tr>
<td>Media Mentions in 2011</td>
<td>926</td>
</tr>
<tr>
<td>Audience Reached as Audited by Sentia Media for Media Monitors, January 2012</td>
<td>21,017,690</td>
</tr>
</tbody>
</table>

**New NHMRC Project Grants in 2011**: 16 at a 46% success rate (national average 22 per cent).

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Thousands of medical researchers protested against mooted cuts to NHMRC funding prior to the Federal Government budget in April, 2011. Their voices were heard, funding was maintained and an independent review of health and medical research was announced. It is headed by 2011 Australian of the Year, Simon McKeon.

### Investments

Our ability to support our scientists in their work depends on the success of peer-reviewed grants, our investment portfolio and the generosity of our philanthropic supporters and donors. In the face of continuing global financial instability, we are pleased to report our investment portfolio recorded a total return of 3.3 per cent.

#### Casualties of financial uncertainty

<table>
<thead>
<tr>
<th>Biotech companies spun-off</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neuprotect Pty Ltd</td>
</tr>
<tr>
<td>Nephrodyamics Pty Ltd</td>
</tr>
<tr>
<td>Radical Biotechnology Pty Ltd</td>
</tr>
<tr>
<td>Genvartec Pty Ltd</td>
</tr>
<tr>
<td>Global Kinetics Corporation</td>
</tr>
</tbody>
</table>

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### Key Financials

<table>
<thead>
<tr>
<th><strong>$6.6 Million</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Venture Capital Finance Total into Florey Spin-out Companies 2002-2011</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>$31.376 Million</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Annual Operating Budget</td>
</tr>
</tbody>
</table>

### Patents

46 Patent families currently either granted or being prosecuted around the world.

### Florey Neuroscience Institute

#### Citations

Over the last nine years Florey scientists have had their work cited over 30,000 times. This ranks us among the top neuroscience institutes in the world.

<table>
<thead>
<tr>
<th>Institute</th>
<th>Citations</th>
</tr>
</thead>
<tbody>
<tr>
<td>UCLA Neuro</td>
<td>6991</td>
</tr>
<tr>
<td>INSt NeurOL London</td>
<td>29062</td>
</tr>
<tr>
<td>Florey Neuro</td>
<td>30091</td>
</tr>
<tr>
<td>Salk Neuro</td>
<td>31229</td>
</tr>
<tr>
<td>Riken Neuro</td>
<td>33561</td>
</tr>
<tr>
<td>Montreal Neuro</td>
<td>41144</td>
</tr>
<tr>
<td>Nat Inst NeurO Stroke (USa)</td>
<td>44639</td>
</tr>
<tr>
<td>Karolinska Neuro</td>
<td>80270</td>
</tr>
</tbody>
</table>

#### Average Citations per Publication

<table>
<thead>
<tr>
<th>Institute</th>
<th>Average Citations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Riken Neuro</td>
<td>10.04</td>
</tr>
<tr>
<td>UCLA Neuro</td>
<td>12.01</td>
</tr>
<tr>
<td>Karolinska Neuro</td>
<td>14.40</td>
</tr>
<tr>
<td>Inst NeurO London</td>
<td>14.69</td>
</tr>
<tr>
<td>Florey Neuro</td>
<td>16.03</td>
</tr>
<tr>
<td>Montreal Neuro</td>
<td>20.71</td>
</tr>
<tr>
<td>Nat Inst NeurO Stroke (USa)</td>
<td>21.27</td>
</tr>
<tr>
<td>Salk Neuro</td>
<td>34.39</td>
</tr>
</tbody>
</table>

Over the last nine years Florey scientists have had their work cited over 30,000 times. This ranks us among the top neuroscience institutes in the world.

Citations per publication rank the Florey even higher when compared to other institutes. This is an indication of the quality of the Florey research.

#### Florey Neuroscience Institute

Florey scientists have had their work cited over 30,000 times. This ranks us among the top neuroscience institutes in the world. Citations per publication rank the Florey even higher when compared to other institutes. This is an indication of the quality of the Florey research.
The year of 2011 was exciting for the Florey Neuroscience Institutes, being the fourth year since the coming together of the three institutes that make up the Florey. The most visible sign of this has been the completion and occupation by neuroscientists from the Florey, the Mental Health Research Institute (MHRI) and the University of Melbourne in the two new buildings. These are based at Austin Health in Heidelberg and in Parkville. Collectively these are now branded the Melbourne Brain Centre, one of the major brain research centres in the world.

The two buildings were completed within the budget of the grants provided by the State and Federal governments to pay for their construction and for the complex legal and administrative measures to bring the three institutes together. The Florey, as lead agent, is obliged to report to the State Government on the status of the amalgamation by July 1, 2012. This task has been complicated by current negotiations to complete what had been the original wish of the parties when the consolidation was first proposed, to include the MHRI. Unfortunately this did not happen in July 2007. Negotiations with the MHRI to amalgamate with the Florey are at an advanced stage.

Apart from our ongoing negotiations with MHRI, we have recently completed a most significant agreement with the University of Melbourne by which we will host a department of the University without losing our financial and intellectual independence as a medical research institute. This new arrangement will not only be extremely beneficial to our science and scientists in their relationship with the University, but will also have financial benefits for the Florey in the medium to longer term.

One of the key elements of the amalgamation in 2007 was the future expansion of the new institute, not only with laboratory space but also with outstanding new scientists. For this the previous board of the Howard Florey Institute, through its directors and foundations associated with them, pledged a considerable sum for laboratories and staff. The new laboratory at Parkville has an additional 8000 sqm of laboratory space for the Florey’s expansion. Already, significant recruitment of new scientists has commenced. At this stage, however, we are in something of a cleft stick since, until these new scientists obtain grants for their research, we have to support them from our own funds. Meantime, pending further recruitment, we still have much vacant laboratory space, particularly in our original home, the institute’s 1963 building which has recently been renamed the ‘Howard Florey Laboratories’.

The Florey has a very active and competent board and I would like to take this opportunity to thank them all for their huge contribution. To give you some idea of their involvement with management, routinely the board has a scientific presentation, it receives a safety report quarterly and annually reviews the scientific vision, the risk profile, the commercialisation status and the fundraising strategy and performance. It has, of course, regular audit and finance committee meetings to monitor investment and operating performance. During 2011 a board performance review was conducted pro bono by KPMG with a most satisfactory result. Additionally in 2011, individual members were closely involved in the Project Committee responsible for the joint expenditure on the new buildings, and with the new agreement completed with the University. The negotiations on the amalgamation with MHRI are ongoing under the chairmanship of Professor Jim Angus, Dean of the Faculty of Medicine, Dentistry and Health Sciences, University of Melbourne. These negotiations and the full integration of the administration processes within the institute including conditions of service and superannuation, will continue to exercise management and the board in 2012 but over and above all this, the quality and impact of our science remains the board’s primary responsibility and focus.

In September last year the Minister for Mental Health and Ageing, Mr. Mark Butler, announced the establishment of an independent review of health and medical research in Australia chaired by Mr. Simon McKeon, Chairman of the CSIRO. Its purpose is to recommend a 10 year strategic plan for health and medical research for Australia. It is to be hoped that its recommendations will include increased funding for medical research institutes and, in particular, the support of research into brain diseases which are becoming such a major cost to the nation. In the meantime the Florey, like other medical research institutes, will continue to rely heavily on the philanthropic generosity of private individuals and foundations to maintain and expand its research efforts. We thank all those who have given so generously to us in the past and we hope that they and others like them will continue to donate funds to complement the grants and awards won by our scientists. The research we are undertaking is important and will, in the coming decades, lead to a significant improvement in the quality of life for a large section of the community - to say nothing of alleviating the cost of mental illness to the nation. As we move into the year, I would like to thank and congratulate Professor Geoff Donnan, all our outstanding scientists and our administration under Gary Gray for their dedication and successes.

CHARLES ALLEN AO
CHAIRMAN
While political and financial climates in Australia and around the world continue to be volatile, we can be reassured that our medical researchers are working in a dynamic and productive environment, contributing to the nation’s wealth and to international global health. While industries like the car manufacturing sector might falter in this tough climate, governments must continue to recognise the long-term value of smart investment in science. Some 39,000 people are employed in science in Australia. As a group they are improving health and wealth through therapeutic developments and more efficient health care. It’s worth remembering that NHMRC funding produces eight patents per million dollars spent and some 65 per cent of all Australian patents are for medical research innovations.

Back in September, the Florey Board and I were very pleased to hear the Minister for Mental Health and Ageing, Mark Butler, announce that the former Australian of the Year, Simon McKeon, would chair an independent review of health and medical research in Australia. Mr McKeon has been asked to recommend a 10-year strategic health and medical research plan for the nation. He is joined by leading Australian researchers and prominent business leaders including Professor Ian Frazer, Bill Ferris AC, Elizabeth Alexander, Professor Henry Brodaty and Professor Melissa Little.

I hope the committee will overcome the mismatch between the development in infrastructure and the static funding available to boost intellectual capital. As well, the career path for scientists is now quite unstable. A streamlined process needs to be put in place to ensure dynamic career progression and security. This will demonstrate to young scientists that a career in science is worth pursuing.

We look forward to their findings and anticipate an increase in NHMRC funding to help us produce world-class neuroscience, from discovery through to translation. As you will read in this report, new drugs and therapeutic devices are being developed and trialled, stem cells are being manipulated and investment in our discoveries, negotiated. While Western Australia has mines, Victoria has brains. Our neuroscientists are contributing to the country’s wealth in so many ways.

THE MELBOURNE BRAIN CENTRE
State and federal investment and philanthropic generosity have provided a magnificent environment in which our neuroscientists may excel. Our two new buildings, in Parkville and Heidelberg, are operating at full pace with a burst of productivity and enthusiasm. The $204 million investment will prove well worth the long-term vision applied. Florey researchers now work side-by-side with colleagues from The University of Melbourne and the Mental Health Research Institute. Collaboration is the norm in the new buildings where researchers with different employers - but working in common disease areas - share laboratories, equipment and knowledge.

THESE ARE TRULY EXCITING TIMES FOR SCIENCE IN MELBOURNE
GEOFFREY A DONNAN, DIRECTOR

OUR SCIENCE AND PEOPLE
Our scientists have also been extremely successful in competitive NHMRC and ARC grant rounds with a success rate over double the national average. This is an impressive result, reflecting both the hard work of our fundraising and marketing team and the talent of our scientists. On behalf of the Board, I congratulate and thank them for their achievements. I am also pleased to report that three senior research fellows were reappointed and two new fellows were admitted bringing our total to 23 senior staff who mentor and develop the next generation of scientists.

We have been actively recruiting internationally and, armed with our magnificent new facilities, have managed to lure several very talented scientists to Melbourne. Professor Martin Peros has returned from California to head Stem Cells Australia and Dr Ben Emery has returned after five years at Stanford University. With the return to Australia of the Florey’s Dr Daniel Scott, we can be reassured that the Florey is making its contribution towards reversing the brain drain that has seen so many of our most talented scientists take their skills overseas. As a part of this influx, we also welcome Dr Mathias Dutschmann and Dr Han Subramaniam from Leeds University in the UK. Dr Stuart McDougall has also joined us from the UK to work with our systems neurophysiology team.

They are joined by young Swiss researcher Dr Stephanie Bissiere who has flown in to work with the Neuropeptides and Behavioural Neuroscience divisions as a senior research fellow. Stephanie comes from the Department of Psychology and Brain Research Institute at UCLA, USA. Her fascinating research involves the way mammals store fear memories and the way they might impact on mental disorders.

At the end of 2011, we farewelled Ruston Barlow, a Florey stalwart who retired after 39 years. In his last position as laboratory manager, Ruston provided an extraordinary level of care for the ageing Howard Florey building. I wish him a wonderful retirement.

Finally, I must congratulate Professor Ingrid Scheffer, a paediatric neurologist and senior principal research fellow with the Florey. Ingrid was one of five international scientists to win the prestigious L’Oréal-UNESCO Women in Science Award for her ground-breaking research into epilepsy.

She has devoted the last 20 years to clinical research, has identified many new forms of epilepsy and, together with molecular collaborators, discovered multiple genes that cause seizures; she was instrumental, with colleagues, in identifying the first epilepsy gene and 13 of the 23 genes currently known.

This has been one of our most successful years overall. Now we look to the future, buoyed by the fact that we are embedded in our new laboratories and ready to contribute to reducing the burden of disease caused by neurological disorders on the global stage.

GEOFFREY A DONNAN DIRECTOR
The University of Melbourne and Mental Health Research Institute share some of our project objectives and therefore have joined us on the journey. Importantly, for our translational research capabilities, Austin Health and Melbourne Health have come along as well. A common belief amongst us all, including our Commonwealth and State government funders, is that both neuroscience and mental health research will benefit from sharing of space. Through strategic placement of physical assets, the impact upon higher education and clinical practice will be strengthened many times over.

With so many project objectives and interests, there has been a great deal of time spent on ways to symbolise our collective commitment to collaboration. This is no more evident than through adoption of the term “Melbourne Brain Centre”. The Melbourne Brain Centre is not necessarily a building or group of buildings nor is it a corporate entity with a legal identity. It is a term used to signal change to all those now working in shared facilities. It is a term symbolising the strength of our partnership. It is not a substitute to the Florey’s own identity or any of its partners. It is secondary but nevertheless complementary to the Florey’s identity.

We are moving into a new phase; the governance structure associated with construction begins to fold and other arrangements are gaining prominence as we move our focus to the management of shared facilities and, for the Florey, recruitment of new scientists.

In amongst everything that has been achieved to improve ongoing management support for an amalgamated Florey, there have been other changes associated with occupation of shared facilities which, in their own right, are transformational.

There has been a complete change to our information technology and communication strategy. These services are no longer provided entirely internally but with the support of the University of Melbourne’s IT service. The delivery model is new to the partners and perhaps unprecedented in the research sector.

In less than 12 months, the Florey has moved from managing one building measuring approximately 7500 m2, to facility management responsibility for 19500 m2 over three sites. The University of Melbourne assumes a key responsibility relating to the new Kenneth Myer Building in Parkville. The Florey assumes a key responsibility for facilities management at the Austin campus via an outsourced model, while the focus is now on rejuvenating and management our original Howard Florey Laboratories.

There are further management implications regarding shared platform services with agreement reached regarding agency responsibility for delivery, but further agreement needs to be reached regarding responsibility for financial risk. These are complex matters with potentially complex solutions; however, the partners are increasingly turning to solutions based upon the dual principles of transparency accompanied by relative simplicity.

With capital works winding down, the Florey Project Commissioning and Building Development office was closed at year’s end. The team was led by David Foxley and closely supported by Alison Worland. They shared our frustrations and sense of achievement and were ambassadors for change. Throughout they showed resilience and resolve which is what is expected from seasoned professionals. Zoe Dowding and Michael Astone were also part of the team. Zoe provided project communication services and Michael assumed responsibility for procurement across Parkville and Heidelberg. I take this opportunity to thank them all for their contributions to the project.

Leon Conway, our IT manager, also resigned during the year due to a change in residence, opting for Melbourne’s semi rural life style. Leon had been with us for 11 years and witnessed the growing expectation upon IT and its changing requirements. Again, our thanks to Leon.

Ruston Barlow retired after 39 years. Ruston started with Howard Florey Institute doing everything and anything and witnessed the growing expectation upon IT and its changing requirements. Again, our thanks to Leon.

Finally, whilst there were many known implications arising from the Melbourne Neuroscience Project, there were others which were not anticipated. Amongst these was the downturn in revenues associated with our own platform services due to a reduction in demand from internal and external scientific users. As scientists prepared to relocate to the new buildings, scientific experimentation inevitably wound down for several months.

A loss in platform revenues, an almost threefold increase in floor space and associated outgoings, a more expensive ITC strategy and the cost of recruiting new scientists without additional revenues - all contributed to a deficit result. However, the result was not outside expectation and we will continue to face a financial challenge for some years to come. My view is that the Florey is now in its most critical phase of development leading to a long-term future, and now is the time for its supporters to rally.

We acknowledge the Victorian Government’s strong support, particularly through the funding from the Operational Infrastructure Support Grant. All funding received through the Department of Business and Innovation and other Government agencies are expended on our research activities and services to support the science.
I am pleased to report that, despite the continuing uncertain economic times, the Florey received a total of $3,011,544 in philanthropy from all sources during 2011 to assist our science and build the Florey Endowment Fund.

The revenue received through grants from philanthropic trusts and foundations surpassed expectations and delivered more than $1.2 million this year. Such support enables our scientists to continue to make a positive difference in continuing the vital research necessary to help people affected by brain disorders and diseases.

WOMEN IN SCIENCE
In August, Ms Naomi Milgrom, leading philanthropist and former Florey Board Member, launched a campaign to raise an endowment of $5 million to support the development of the scientific careers of women at the Florey.

Naomi generously made a personal contribution to the endowment of $500,000. This gift inspired other support and $900,042 has been committed to date. The further support received includes a pledge of $300,000 from The Trust Company as trustee for the Fred P. Archer Charitable Trust, which will “seed fund” a fellowship whilst the endowment is growing.

We thank Naomi, The Trust Company and our other visionary supporters most sincerely for their commitment to assisting the scientific careers of women.

STROKE ANNUAL SCIENTIFIC MEETING
The 10th Stroke Annual Scientific Meeting was held between August 5 and 7, 2011 and we thank Boehringer Ingelheim Pty Ltd and Lundbeck Australia Pty Ltd for their most generous support.

BRAIN FITNESS CHALLENGE
The second Brain Fitness Challenge was conducted in August 2011 with 235 participants competing to attain the highest point score and the highest fundraising total. The competition was supported by The Trust Company, LEK Consulting and Australian Institute of Management – Victoria and Tasmania - and funds raised amounted to $72,000.
COMMUNICATING WITH OUR SUPPORTERS

During the year, the Fundraising and Marketing Group produced a range of publications to communicate with the Florey’s supporters. These programmes included four issues of our highly regarded Brain Matter(s) newsletter, the Research and Annual reports, and a number of other promotional brochures and leaflets for events, including for Brain Awareness Week, Medical Research Week, and various conferences and study programmes.

A number of Florey scientists participated in our Brain Matter(s) community outreach programme by delivering 12 scientific talks to a range of community groups and clubs, including Rotary, Probus and U3A.

Our public affairs and marketing manager secured some excellent media coverage for the Florey’s work during the year. The main highlights were:

- The Discoveries Need Dollars campaign featuring Professor Geoff Donnan and other Florey scientists
- ABC’s 7.30 Report with Prof Geoff Donnan and the power of tPA on stroke
- Prof Graeme Jackson featured on page 5 of The Age, discussing a patient who had experienced a dramatic turn-around after surgery for epilepsy
- International coverage across all media of Professor Ingrid Scheffer’s award as a L’Oreal Women in Science Award ambassador and later her announcement of a gene identifying a childhood form of epilepsy.

2011 KENNETH MYER LECTURE

The 15th Annual Kenneth Myer Lecture was delivered on October 4, 2011 by leading British neuroscientist Professor David Attwell from University College London. Professor Attwell’s lecture, Brain Power, was an exciting presentation in which he explained how all our thoughts are produced by electrical signals and how the blood supplies nerve cells with energy to power our thoughts. Professor Attwell used movie clips from Star Wars and other movies to illustrate the power within the brain.

COMMUNITY FUNDRAISING

Several external groups and people arranged their own fundraising activities on behalf of the Florey, collectively raising almost $20,000, and their dedicated support is very much appreciated. Of particular note was intrepid cyclist, Kieran Donlon, who undertook a mammoth journey by cycling 4,000 kms from Cairns to his hometown of Warrnambool to raise funds for Parkinson’s disease research.

AWARDS AND PRIZES

We are fortunate to receive support from a number of people and organisations who provide funding each year for travel awards and prizes for the career development of our young scientists. We particularly thank the Browne Family, the Miller Family, Andrew and Cathryn Darbyshire, Alan and Elizabeth Finkel, the Goodsite Company, the Harold Mitchell Foundation, Life Technologies, John Milne, Millipore, Olympus and Scientix for their generous support.

OUR SUPPORTERS

The Florey is indebted to the many individuals and organisations who have provided financial and gift-in-kind support during 2011. Each gift is vitally important as it enables our scientists to move closer to their goal of curing neurological disease.

The Ian Potter Foundation and the Myer Foundation and Family have been our most long-term and generous supporters. For many years at the Howard Florey Institute, and latterly Florey Neuroscience Institutes, their support has been vital in our progress towards unravelling the mysteries of the brain. The Besen Family Foundation and The Pratt Foundation, too, have generously supported a collaborative research project between the Florey and the Weizmann Institute in Israel over the past three years.

It only remains for me to thank, most warmly, all who have given and supported us in 2011, and whose generosity underpins the research excellence of the Florey of which we are all so proud.

STEPHEN SPARGO
FOUNDATION CHAIRMAN
THE NEW BUILDINGS OFFER THE FRISSON. WE’VE PROVIDED THE PLATFORMS AND THE STRUCTURE TO SUPPORT OUR PEOPLE. GREAT PEOPLE MAKE GREAT SCIENCE.

PROFESSOR GEOFFREY DONNAN,
FLOREY DIRECTOR
MR CHARLES K ALLEN AO (CHAIRMAN)
MA MSc
Mr Charles Allen was born and educated in England. His working career was in the oil and gas industry. He was appointed Executive Director (1980) and Managing Director (1982) of Woodside Petroleum and retired in 1996. He has been a Director and Chairman of CSIRO, National Australia Bank and Air Liquide Australia. He has also been a Director of Metals Manufactures, Amcor and AGL.

PROFESSOR GEOFFREY DONNAN (FLOREY DIRECTOR)
MBBS MD FRACP FRCP (Edin)
Director of FNI, Professor Geoffrey Donnan was previously founding Director of the National Stroke Research Institute and Professor of Neurology, University of Melbourne, Austin Hospital campus. His research interest is clinical stroke management and he was co-founder of the Australian Stroke Trials Network. He is immediate Past-President of the World Stroke Organisation. He received the American Stroke Association William Feinberg Award for Excellence in Clinical Stroke Research in 2007 and the 2008 Bethlehem Griffiths Research Foundation Medal for outstanding contributions to research in stroke.

PROFESSOR GRAEME JACKSON (BRI SCIENTIFIC DIRECTOR)
BSc (Hons) MBBS FRACP MD
Professor Graeme Jackson is the Deputy Director of the Florey Neuroscience Institutes, Director of the Brain Research Institute, a practicing clinical neurologist specializing in epilepsy at the Austin Hospital and a Professorial Fellow of the University of Melbourne.
He is recognised as an expert and world authority in understanding brain function and structure using new MR technologies, particularly as they apply to understanding and treating epilepsy. The National Health and Medical Research Council of Australia (NHMRC) awarded him the prestigious Outstanding Achievement Award for research excellence in 2008.

MR ANDREW ABERCROMBIE
BEd LLB MBA
Andrew Abercrombie is the Founding Director of FlexiGroup Limited (FXL) and remains on the FlexiGroup Board. FXL is a Top 200 company on the ASX. Formerly a commercial and taxation lawyer, he is now engaged in a broad range of commercial interests. As Regional Chairman of World Presidents’ Organisation, he continues to participate in international education programs in various roles. Formerly a member of one of Victoria’s Alpine Resort Management Boards, he is also a Director of the Menzies Research Centre, the Melbourne Zoo Foundation and Treasurer of the Liberal Party of Australia (Victorian Division).

MR CRAIG DRUMMOND
BComm (Melb) ACA SFFIN
Mr Craig Drummond is Chief Executive Officer and Country Head of Bank of America Merrill Lynch Australia, and brings with him more than 25 years of banking and securities experience. He is a member of the Business Council of Australia, a Senior Fellow of FINSIA and is a Chartered Accountant. He is a Director of Scotch College, the Australian Davos Connection, Australian Financial Markets Association (AFMA) and the Geelong Football Club.

EMERITUS PROFESSOR ANDREA HULL AO
BA Dip Ed [Univ of Sydney] MBA [MBS Univ of Melb] FAICD FAIM
Professor Andrea Hull has had a distinguished career in CEO and executive roles, and also as a non-executive Board member in government and not-for-profit organisations. She is an Emeritus Professor at the University of Melbourne, and sits on the Boards of the National Museum of Australia, the Abbotsford Convent Foundation, and the Breast Cancer Network of Australia. Professor Hull has undertaken numerous international and national assignments, and served on many international, federal and state bodies to advance the integration of economic, social and cultural agendas.
**Professor Anne Kelso AO**

BSc (Hons) PhD (Melb)

Professor Anne Kelso is Director of the WHO Collaborating Centre for Reference and Research on Influenza at Melbourne Health. She is also an honorary professional fellow at the University of Melbourne where she undertakes research on immunity to influenza. She is currently a member of the Council of QUT, the Board of the Telethon Institute for Child Health Research and a number of committees advising the WHO and the Australian Government on influenza.

**Emeritus Professor Richard Larkins AO**

MBBS LL.D(Hon) PhD (University of London) FTSE

Richard Larkins is an Emeritus Professor at Monash University, where he was Vice-Chancellor and President from 2003 to 2009. Other past roles have included Dean of the Faculty of Medicine, Dentistry and Health Sciences at the University of Melbourne, Chair of the National Health and Medical Research Council and President of the Royal Australasian College of Physicians. His current roles include President of the National Stroke Foundation, President of Australian University Sport, Chair of the Council of the European Molecular Biology Laboratory, Australia, and Chair of the Victorian Comprehensive Cancer Centre.

**Mark J. Jones**

BA (Hons) (Sheff) MBA (MBS)

Mr Mark Jones is a Partner in KPMG’s Advisory Services practice, with national responsibility for and internal risk management. He provides professional services in the areas of corporate governance and internal audit. Mr. Jones is a Fellow of both the Institute of Chartered Accountants in England and Wales and the Institute of Chartered Accountants in Australia, and is a member of both CPA Australia and the Australian Institute of Company Directors.

**Professor James McCluskey**

BMedSci MBBS MD FRACP FRCPA

Professor James McCluskey is the Deputy Vice-Chancellor (Research) at the University of Melbourne. He has an international reputation for his research in basic and clinical immunology and is recognised for his leadership in the field of immunogenetics. He is Editor-in-Chief of the international immunogenetics journal Tissue Antigens and past President of the Australasian Society for Immunology, the Australasian and South East Asian Tissue Typing Society and International Histocompatibility Workshop Group. Professor McCluskey has led the development of the Peter Doherty Institute for Infection and Immunity.

**Dr Thomas Schneider**

AB magna cum laude with highest hons (Harvard) D Phil (Oxon) JD (Harvard) Hon D Laws (Deakin)

Dr Thomas Schneider is the President and CEO of Restructuring Associates Inc in Washington, DC. Dr Schneider is a Board member of the J Venter Institute and the American Australian Educational Leadership Foundation. He is a member of the Harvard University Committee on University Resources.

**Mr Stephen Spargo**

LLB LLM

Mr Stephen Spargo is a solicitor practising in the financial services and projects department of Allens Arthur Robinson where he has been a partner since 1983. He is a director of Asia Society Australasia Centre, Chairman of The Royal Agricultural Society of Victoria Limited, a Vice-President of the Melbourne Cricket Club and a member of the Victorian State Council, Committee for the Economic Development of Australia.

**Mr Robert Trenberth**

BEng (Melb) MA Sc (Waterloo, Canada) MBA (Harvard) FAICD

Mr Robert Trenberth began his professional career as a structural engineer and now serves as Chairman and Director in a number of companies and not-for-profit organisations. His corporate business career includes consulting with McKinsey & Company, followed by senior executive appointments with Carlton and United Breweries Ltd and McPherson’s Ltd. His current company appointments include Chairman of Rivera Properties Ltd and of Upstream Print Solutions and Director of the CRC for Polymers. Mr Trenberth’s not-for-profit appointments include Chairman of the Australian Sustainable Industries Research Centre and Vice President and Director of the National Stroke Foundation.

**Dr Brendan Murphy**

MBBS PhD FRACP FAICD

Dr Brendan Murphy was appointed Chief Executive Officer of Austin Health in January 2005. He is currently a member of the Board of Health Workforce Australia and a Professorial Fellow with the title of Professor at Melbourne University.
DIVISION HEADS

UNDERSTANDING WHY NEURONS DIE IN STROKE IS FUNDAMENTAL TO PRODUCING BETTER TREATMENTS

PROFESSOR SEONG-SENG TAN, DIVISION HEAD, BRAIN DEVELOPMENT
FLOREY NEUROSCIENCE INSTITUTES ANNUAL REPORT 2011

DIVISION HEADS 2011

A/PROFESSOR STEVEN PETROU
EPILEPSY
BSc (Hons) PhD
Associate Professor Petrou is a Deputy Director and Head of the Florey Neuroscience Institutes’ Division of Epilepsy, and heads the Laboratory of Ion Channels and Human Disease, a multidisciplinary team of researchers with a focus on revealing fundamental mechanisms of disease genesis in the central nervous system. Current major areas of investigation centre on the development and characterisation of genetically engineered mice models for the study of human familial epilepsy. He works closely with industry and has several patents for his discoveries. In addition to his many roles within the Florey Neuroscience Institutes he is the Deputy Director of the Centre for Neural Engineering at University of Melbourne, he serves on the editorial board of the Journal Neurobiology of Disease the Basic Science Committee for the International League Against Epilepsy and is Editor of the Australian and New Zealand Society for Neuroscience.

PROFESSOR ALAN CONNELLY
IMAGING
BSc (Hons), PhD
Professor Alan Connelly is an NHMRC Principal Research Fellow based at FNI Austin. He is an FNI Associate Director, Head of the FNI Imaging Division, and Head of the Advanced MRI Development group. He also heads the MRI imaging Facility at FNI Austin (including two research-only 3T MRI scanners) and the FNI Parkville Small Animal Imaging Facility. Prof Connelly is a development MRI physicist whose work has encompassed a range of MR methods, with current focus primarily on diffusion and perfusion MRI and their application to the investigation of epilepsy, stroke, and cognitive function. His group is internationally recognised as leaders in the field of diffusion MRI fibre tractography, and has developed novel methods to characterise the complex white matter fibre connections in the brain. He has published widely in magnetic resonance, general scientific, and neuroscientific journals, and is a member of the editorial board of Epilepsia.

PROFESSOR MALCOLM HORNE
NEURODEGENERATION
BMEdSci (Hons), MBBS (Hons), PhD, FRACP
Professor Horne is Deputy Director of Florey Neuroscience Institutes, Consultant Neurologist at St Vincent’s Hospital, Fitzroy, and Conjoint Professor, Centre for Neurosciences at the University of Melbourne. He is a member of The Australian Society for Neurosciences, The Australian Association of Neurologists, The Royal Australasian College of Physicians and The American Society for Neurosciences.

PROFESSOR GRAEME JACKSON
EPILEPSY
BSc (Hons) MBBS FRACP MD
Professor Graeme Jackson is the Deputy Director of the Florey Neuroscience Institutes, Director of the Brain Research Institute, a practicing clinical neurologist specializing in epilepsy at the Austin Hospital and a Professorial Fellow of the University of Melbourne.

He is recognised as an expert and world authority in understanding brain function and structure using new MR technologies, particularly as they apply to understanding and treating epilepsy. The National Health and Medical Research Council of Australia (NHMRC) awarded him the prestigious Outstanding Achievement Award for research excellence in 2008.

PROFESSOR ANDREW LAWRENCE
BEHAVIOURAL NEUROSCIENCE
BSc (Hons) PhD (Loughborough)
Professor Lawrence is an Associate Director and Head of the Florey Neuroscience Institutes’ Division of Behavioural Neuroscience, running the Addiction Neuroscience laboratory. His primary research interest is in the development of robust animal models of drug-seeking, drug-taking and drug-induced neural adaptation. In addition, his group uses these models to define new potential therapeutic targets for drug and alcohol abuse disorders. He has published over 180 original articles and reviews. Andrew Lawrence is currently Senior Editor of The British Journal of Pharmacology and also sits on the editorial boards of Neurochemical Research, the Journal of Pharmacological Sciences & Addiction Biology. In 2009, Professor Lawrence was awarded the Australian Neuroscience Society medalion for services to the society. In his spare time, Andrew is a keen cyclist and a surf life guard.

DR AMY BRODTMANN
BEHAVIOURAL NEUROSCIENCE
MBBS FRACP PhD
Dr Amy Brodtmann is Co-Division Head of Behavioural Neuroscience at the Florey Neuroscience Institutes, consultant neurologist at Austin Health and Director of the Eastern Cognitive Disorders clinic, Eastern Health, Box Hill Hospital. She is a past recipient of a National Health and Medical Research Council Australian Training Research Fellowship, and previous National Brain School Co-ordinator for the Australian and New Zealand Association of Neurologists. She sits on the editorial board of Neurology, the research board of Alzheimer’s Australia Victoria, and is the founding director of the Australian Frontotemporal Dementia Association. Her research focuses on imaging correlates of cognitive decline in stroke, the neural basis of neglect, and the diagnosis and management of focal onset dementias.
TREVOR KILPATRICK  
**MULTIPLE SCLEROSIS**

MBBS PhD FRACP

Trevor Kilpatrick leads the MS Division at FNI and is a neurologist and Head of the MS Unit at the Royal Melbourne Hospital, in addition to being Director of the Centre for Neuroscience at The University of Melbourne. His research interests include the neurobiology of multiple sclerosis, neural precursor cell biology and the study of genetic and environmental factors that contribute to MS as well as the translation of basic research discoveries to the clinic. Professor Kilpatrick has been the recipient of the Sunderland Award, AMRAD Postdoctoral Award and the inaugural Leonard Cox Award. More recently, Professor Kilpatrick and his group were awarded the Australian Museum’s Jamie Callacher Eureka Prize for Medical Research (2008) in recognition of their extraordinary contribution to medical research into multiple sclerosis.

SEONG-SENG TAN  
**BRAIN DEVELOPMENT & REGENERATION**

BDS (Mal), MDS (Adel), DPhil (Oxon), FRACDS

Professor Tan is NHMRC Senior Principal Research Fellow, and Adjunct Professor at The University of Melbourne Centre for Neuroscience, and University of Queensland Brain Institute. He is interested in understanding how the brain is assembled during development, and what mechanisms protect brain cells from death following brain injury such as trauma and stroke. Professor Tan has published over 100 papers and was awarded the Amgen Australia Medical Research Award (1997). He is on the Editorial Boards of the Journal of Neuroscience (USA) and Experimental Neurology. Professor Tan is a keen swimmer and a member of the Brighton Iceburgers.

ROBBIE ACDONELL  
**SYSTEMS NEUROPHYSIOLOGY**

MD, FRACP, FA/FAFM(RACP)

Professor Richard Macdonell is Director of Neurology at Austin Health and an Honorary Professorial Fellow at FNI. He trained in Neurology and Clinical Neurophysiology at Austin Health, Massachusetts General and the London Hospitals and has been in charge of the Neurophysiology and Neuroimmunology services at Austin Health since 1991. His research interests include multiple sclerosis, peripheral nerve and muscle disorders and using transcranial magnetic stimulation to study the pathophysiology of epilepsy.

ROSS BATHGATE  
**NEUROPEPTIDES**

BSc(Hons) PhD

Associate Professor Ross Bathgate is a NHMRC Senior Research Fellow and an Honorary Principle Research Fellow in the Department of Biochemistry and Molecular Biology at The University of Melbourne. His work focuses on the relaxin family of peptides and their G-protein coupled receptors. These peptide-receptor systems show enormous potential for therapeutic targeting and the hormone relaxin is currently in Phase III clinical trials for the treatment of acute heart failure. He works closely with Novartis who are conducting the clinical trial on relaxin as well as a number of other pharmaceutical companies interested in the clinical development of these peptides. He currently serves on the editorial boards of Molecular and Cellular Endocrinology, Frontiers in Molecular and Structural Endocrinology and Journal of Pharmacological Sciences.

JULIE BERNHARDT  
**STROKE**

BSc PhD

Associate Professor Julie Bernhardt leads the AVERT Early Intervention Research Program, which includes a multidisciplinary team of researchers committed to the development and testing of new, rehabilitation interventions that can reduce the burden of stroke related disability. AVERT, the largest, international, acute stroke rehabilitation trial ever conducted, sits at the core of the program. Advancing understanding of how exercise-based interventions alter bone, muscle and brain function after stroke is another aim of the program. Julie’s clinical career has been devoted to working with people with stroke and other neurological diseases. As a strong proponent of evidence based care, another key theme within her program is the synthesis and translation of evidence into practice. Julie sits on the Board of the National Stroke Foundation and on a number of national and international stroke advisory groups.

DAVID HOWELLS  
**STROKE**

PhD

Associate Professor Howells began his career investigating the biochemical and genetic basis of dopamine and serotonin deficits in children. He went on to describe a new population of dopaminergic neurons, demonstrated that BDNF depletion can cause parkinsonism and that Parkinson’s disease patients are deficient in BDNF. His other research interest is in stroke: his studies of neuroprotection in stroke have led to improved modelling of stroke in animals, the development of new methods of imaging, and development of systematic review and analysis as tools for rigorously evaluating basic science literature. The latter have led three leading stroke journals to publish guidelines for Good Laboratory Practice.
OUR DIVISIONS

THE AUSTRALIAN COMMUNITY FACES A BILL FOR OVER 300 BILLION IN THE NEXT DECADE BECAUSE DISEASES OF THE BRAIN AND MIND WILL ACCOUNT FOR NEARLY HALF OF ALL ILLNESSES.

DR HENRY DE AIZPURUA, DEPUTY DIRECTOR AND HEAD OF BUSINESS DEVELOPMENT
INSPIRING DAYS FOR HUNTINGTON’S RESEARCH

Having inherited the Huntington’s disease gene from his father, restaurant owner Tony is driven to help researchers like Associate Professor Anthony Hannan (right) to find a cure.

And for researchers like Anthony, there is no greater motivator than to mix with patients and families who live with the disease every day. “To meet people like Tony is utterly inspirational,” Anthony says. “The people in my lab and I are passionate about our research and to be face-to-face with people you might help is very inspiring.”

Huntington’s is an inherited single-gene abnormality that causes specific neurons in the brain to become dysfunctional and eventually die. The condition involves cognitive deficits culminating in dementia, psychiatric symptoms like depression and movement disorders.

Anthony’s research has shown that physical exercise and mental activity are good for the brain and may build a “reserve” to assist those who are asymptomatic. His lab has previously shown that increased mental and physical activity can delay onset of Huntington’s in mice. They are now identifying molecules crucial for the beneficial effects of mental and physical stimulation. The aim is to use the molecules in new drugs that will mimic or enhance the therapeutic effects of cognitive stimulation and physical exercise.

These drugs would not only have potential benefits for Huntington’s, but also other major brain diseases such as Alzheimer’s and Parkinson’s.

But for Tony, life is travelling well. “When you’re told you have the gene, you go through a range of phases starting with a very emotional period when you consider your own life and what lies ahead. But then, nothing really changes and you develop great hope that work by people like Anthony will come up with a breakthrough cure or treatment.”

And for Anthony and his team in the neural plasticity lab at the Florey, the work continues at an urgent pace.
ADDICTION

DESCRIPTION
Chronic alcohol and drug use can lead to a cycle of addiction which has serious implications for our society and the families and friends of the drug-affected person. The Florey’s Addiction Neuroscience group investigates how alcohol and drugs change the brain’s structure, chemistry and function.

RESEARCH HIGHLIGHTS
The Addiction group, headed by Prof Andrew Lawrence, examines the neural pathways implicated in drug-seeking behaviour. To achieve this they are using genetic approaches in combination with relevant animal models of drug-seeking and relapse. This latter aspect is of critical importance, as the defining feature of addiction is its chronic and relapsing nature. In this regard, the group has recently demonstrated the enduring vulnerability of relapse in a rodent model which closely resembles the human experience.

Projects currently underway involve the self-administration of alcohol, opiates, cocaine and nicotine in genetically modified animal models. In addition, we have developed an animal model of adolescent solvent abusing (“chroming”) that we are using to study the impact of chronic intermittent exposure to inhalants on the maturing brain. For example, we are currently assessing the epigenetic consequences of inhalant use in the prefrontal cortex. Other ongoing research examines where in the brain specific neuropeptides are activated or downregulated, and what effect this has on the rewarding properties of drugs.

SCHIZOPHRENIA, RETT SYNDROME AND WILLIAMS SYNDROME

DESCRIPTION
Many brain disorders, including schizophrenia, mental retardation and autism, involve abnormal development and function of the brain. In a condition like schizophrenia, the experience of loss of contact with reality for sufferers can be intolerable, and also devastating for family and friends.

The Neural Plasticity group, headed by Assoc Prof Anthony Hannan, is interested in the mechanisms whereby the genes underlying maturation of the brain are dynamically regulated by interaction with the environment in conditions like schizophrenia, Rett syndrome (an autistic spectrum disorder) and Williams syndrome (another disorder of brain development).

RESEARCH HIGHLIGHTS
The team is currently studying the effects of mental and physical activity on these brain disorders, which may provide information that will guide development of future treatments. Using animal models of both schizophrenia and Rett syndrome, it has shown that enhanced mental and physical activity can ameliorate behavioural symptoms and exert beneficial effects in specific areas of the brain. Identification of specific molecules that are modulated by environmental stimulation has paved the way for future development of new therapeutic approaches. In collaboration with scientists at the University of New South Wales, the Neural Plasticity group has also characterised a new model of Williams syndrome, providing new insights into how brain development is disrupted in this disorder.

HUNTINGTON’S DISEASE

DESCRIPTION
Huntington’s disease is an inherited single-gene abnormality that causes neurons in the brain to become dysfunctional and eventually die. The condition involves cognitive deficits (culminating in dementia), psychiatric symptoms (e.g. depression) and movement disorders (e.g. chorea). Huntington’s is one of an increasing number of fatal brain diseases known to be caused by expanding DNA (a ‘genetic stutter’) in the disease genes.

RESEARCH HIGHLIGHTS
Previous work done in collaboration with colleagues at Oxford University demonstrated that environmental stimulation delays disease onset and progression in a model of Huntington’s. Building on this research, Assoc Prof Anthony Hannan’s group is currently identifying molecular targets for ‘enviromimetics’: novel drugs which would mimic or enhance the beneficial effects of environmental stimulation.

Furthermore, they have been able to show for the first time that depression in Huntington’s can be modelled, and ameliorated by enhanced mental and physical activity. They have also identified key molecules involved in this psychiatric disorder. This will have implications not only for Huntington’s, but for depression in the wider community.

Further study of gene-environment interactions and experience-dependent changes in the nervous system may lead to new therapeutic approaches for Huntington’s and other brain disorders.

MODELS OF NEURODEGENERATIVE DISEASE

DESCRIPTION
Disorders such as Parkinson’s disease, Huntington’s disease and Alzheimer’s disease are characterized by the progressive loss of a particular brain cell type, leading to a variety of symptoms including motor and cognitive impairment. The Florey’s Neurodegeneration group, headed by Assoc Prof John Drago, aims to exploit the tools of genetic engineering to understand this spectrum of neurodegenerative diseases.

RESEARCH HIGHLIGHTS
The group has generated a number of animal models relevant to neurodegenerative diseases. These animals are important in understanding how the adult brain responds to a focused injury of specific cell populations. The models will also provide information on the precise function of discrete brain cell populations. The surprising findings are that dystonia, a condition characterised by involuntary twisting of the body or limbs, results not from disease of the basal ganglia (a discrete population of cells within the brain) but from damage to solid brain structures. Other aspects of neurodegenerative disease such as disturbances of gait and orofacial function do indeed reside in the basal ganglia; our model of focal death of basal ganglia cells had a classic gait disturbance typically seen in Parkinsonian syndromes. These models are also providing insight into the anatomical network for anxiety.

COGNITIVE NEUROSCIENCE

DESCRIPTION
Cognitive disorders can develop from a range of brain diseases, including stroke, Alzheimer’s disease, and other less well known dementias such as frontotemporal dementia. Stroke and dementia are two of the most common and disabling conditions worldwide, responsible for an enormous and growing burden of disease. There is increasing awareness that the two conditions are linked, with cognitive impairment and dementia common after stroke, vascular dementia accounting for about one-fifth of all dementia cases, and recent evidence on the contribution of vascular risk factors to Alzheimer’s. Yet we still know very little about whether brain volume loss – a hallmark of dementia – occurs after stroke, and whether such atrophy is related to cognitive decline.

The clinical cognitive neuroscience group headed by Dr Amy Brodmann aims to establish whether stroke patients have reductions in brain volume in the first three years post-stroke compared to control subjects, and whether regional and global brain volume change is associated with post-stroke dementia in order to elucidate potential causal mechanisms (including genetic markers, amyloid deposition and vascular risk factors). An understanding of whether stroke is neurodegenerative, and in which patients, may be used to help guide the early delivery of disease-modifying therapies. With Assoc Prof David Darby (also MHR), we’ve developed the use of on-line computerized cognitive testing to detect early prodromal Alzheimer’s in wider-scale community screening programs. In addition, we are interested in how advanced imaging techniques, such as cortical thickness analyses, can improve the diagnosis of frontotemporal dementia.

RESEARCH HIGHLIGHTS
2011 was a remarkable year for the team. The group received five philanthropic grants for its stroke dementia project, culminating in the award of a $1 million NHMRC grant in October. This funding will enable this project to continue for five years as researchers follow a group of stroke patients over the three years after their stroke, acquiring serial brain imaging and cognitive testing. Preliminary analysis of the initial pilot data revealed regional variability in brain volume measures in the first three months after stroke, suggesting that changes are demonstrable even over short time-frames. Significant reductions in thalamic volume may represent evidence of early post-stroke atrophy.

With Dr Brodmann’s Eastern Cognitive Disorders Clinic, we received a Telematics Trust and Ross Trust seedung fund to establish a website for frontotemporal dementia patients and carers. In collaboration with Alzheimer’s Australia, Dementia Behavioural Management Advisory Service (Department of Health and Ageing), we developed the frontotemporal dementia toolkit, a set of freely downloadable pdfs hosted on our website: eccd.org.au. This is the only resource of its type for this group of stakeholders, and represents a considerable contribution to the international frontotemporal dementia community.
DIVISION
BRAIN DEVELOPMENT AND REGENERATION

AREAS OF RESEARCH
BRAIN DEVELOPMENT
TRAUMATIC BRAIN INJURY
STROKE

TRAUMATIC BRAIN INJURY & STROKE
DESCRIPTION
Damage to the brain from injury or stroke is a major issue confronting Australians. At present, there is no treatment to reverse the process of cell death in the brain. Five years ago, the group discovered that the brain is able to defend itself against adverse circumstances by producing protective proteins. One of these, called Ndfip1, was identified by our team. Using animal models, researchers have proved that certain compounds created in the laboratory can increase Ndfip1 to promote neuron survival. The researchers now understand more about how this protein works, and are currently devising drugs to increase Ndfip1 during a stress episode.

RESEARCH HIGHLIGHTS
The team has made significant progress in understanding how Ndfip1 can improve the survival of brain cells after injury. At least two mechanisms have been uncovered. First, it was found that Ndfip1 can seal off the entry of toxic metal ions into injured neurons. Using this information, researchers have created a synthetic metal compound which, at low doses, increases Ndfip1 in brain cells. Second, the scientists were surprised to discover that Ndfip1 can improve the survival of brain cells by using cancer cell survival pathways. Going forward, the group has intensified its efforts to search for more compounds that can increase Ndfip1.

The group has conducted a drug screening protocol to identify bioactive compounds capable of increasing Ndfip1 in cells. Of the 5000 compound classes, the team has identified 18 suitable for this purpose. These compounds will be further investigated for their action mechanisms to allow design and manufacture of lead compounds for therapeutic use.

BRAIN DEVELOPMENT
DESCRIPTION
Work in the Brain Development group aims to discover how newly-born neurons are properly assembled, interconnected and electrically activated. In particular, the group is interested in how immature brain cells in the embryonic brain know where to go, what to become, and what other cells they should be connected to.

The scientists have been studying the migration of brain cells, in particular those neurons that have been identified as intimately associated with causing autism and schizophrenia. Known as inhibitory interneurons, they comprise a minority but their functions exceed their numbers. The group knows that interneurons travel long distances in the embryonic brain, compounding their vulnerability to disruptions causing brain disease. Although the primary study subjects have been laboratory animals, the group has also achieved some success using human brain tissue in culture. The team is confident that the knowledge gained by using different models will benefit its understanding of how interneurons migrate, reach their destinations and participate in the wiring of the young brain.

HIGHLIGHTS
The scientists have synthesized CS03, a cobalt linked to Salen complex that can increase Ndfip1 in cultured neurons, and also when injected into the rodent brain. This lead compound promises to improve neuron survival following experimental stroke and brain injury.

The team has identified the binding of Ndfip1 to PTEN, an anti-cancer protein. Using biochemistry, the group has unravelled the way these two proteins interact, and how this interaction can improve neuron survival in a stress episode.

Finally, studies have been conducted to track the movement and destinations of cortical interneurons using rodent models. Simultaneously, we have also performed experiments to monitor the migration of human interneurons in slice cultures.
Epilepsy is the most common serious neurological disorder of children and one of the major neurological conditions affecting the general population. Up to 10 percent of people will have a seizure at some time in their life.

As one of the world leading centres for epilepsy research, the Florey’s epilepsy division specialises in imaging and molecular neurobiology in both humans and animal models. It is integrated with other leading researchers as a core part of the Florey’s Neurosciences. At Parkville, research has revealed many of the fundamental neurobiological mechanisms by which genetic abnormalities give rise to epilepsy. Together with our colleagues from The University of Melbourne and across Australia, we are working towards finding a cure for epilepsy. The Florey in Parkville also houses the Australian Ion Channel Analysis facility, established by education and infrastructure funding to create a pharmaceutical development network or “Virtual Pharma” within Australia.

The epilepsy division has almost 50 full time staff and more than 20 students and honorary fellows. It has four of nine chief investigators on the recently announced $16.45M epilepsy program grant renewal, a five year grant with funding to commence in 2011.

At the Florey’s Heidelberg campus, researchers have been undertaking high impact research using Magnetic Resonance Imaging (MRI) for more than 15 years to understand the structural and functional basis of human epilepsy. At Parkville, research has revealed many of the fundamental neurobiological mechanisms by which genetic abnormalities give rise to epilepsy. Together with our colleagues from The University of Melbourne and across Australia, we are working towards finding a cure for epilepsy. The Florey in Parkville also houses the Australian Ion Channel Analysis facility, established by education and infrastructure funding to create a pharmaceutical development network or “Virtual Pharma” within Australia.

Epilepsy Imaging

Through the use of cutting-edge MRI methods, major advances continue to be achieved in understanding epilepsy. They are rapidly translated to improved patient care through the Victorian Epilepsy Centres’ comprehensive epilepsy programs, like at the Austin Hospital in Heidelberg where the Florey imaging team is an integral part of the investigation and treatment of epilepsy in patients.

The epilepsy imaging group is led by Professor Graeme Jackson. Three of the core scientific aims of the researchers are:

- to characterise structural and functional effects of genes involved in human epilepsy
- to develop advanced MRI techniques able to detect subtle structural and functional brain abnormalities not previously possible through human imaging methods
- to identify abnormal brain networks by defining structural network abnormalities - functional networks in the resting state and during EEG defined events.

In order to better understand the effect of epilepsy on cognition, we are using advanced neuroimaging techniques to map the functional effect of epilepsy in several cognitive areas. One of the key questions when considering brain surgery to remove an epileptic focus is: will this damage the normal functioning of the patient? To answer this, one needs a good understanding of how normal brain function is organised, and how this may be perturbed in a person with epilepsy. The group has now mapped disease-related changes in brain regions responsible for language, memory and music (singing), and is also examining changes in these domains post-surgery.

Little is known about specific brain networks involved in musical ability and how these may be perturbed by epilepsy, but this information is crucial when treating patients who are musicians. In the process of mapping brain areas responsible for singing in healthy individuals, we have discovered that expert singers appear to use less of their language regions when singing than non-expert singers. This means that the age-old singing practice of “finding your singing voice” may be neurologically mediated by changing how strongly singing is coupled to the language system.

For over 10 years we have been studying the electrical features that are associated with different types of epilepsy. We have found that symptoms relate to the brain networks activated. This is a major advance in trying to understand the basis of epilepsy and what treatment is appropriate for each form of epilepsy.

We recently completed a study of patients with epilepsy who had only recently had their first seizure and were not taking medication. Using transcranial magnetic stimulation (TMS), we found that there is an alteration in brain cell activity associated with epilepsy, with a net increase in brain cell excitability. We were also able to demonstrate that there was a cycle of change in excitability, as there was an additional increase in excitability for 24 hours before a seizure, and a marked drop in excitability lasting for 24 hours after a seizure before it returned to baseline levels. Excitability was also influenced by many factors known to provoke seizures. Our studies showed direct evidence of increased excitability early in the morning, during pre-menstrual phase and with sleep deprivation. When the patients started anti-epileptic medication, this disturbance in excitability normalised only if patients stopped having seizures. Patients who continued to have seizures showed progressive alterations in brain excitability. These findings provide novel insights into the mechanisms underlying human epilepsy. Furthermore they are currently being translated into clinical practice both in the diagnosis of new onset seizures and also to monitor responsiveness to treatment.

The National Institutes of Health-funded project, “Long-term outcomes in childhood-onset epilepsy” is an ongoing prospective cohort of 613 children recruited when first diagnosed with epilepsy. The Florey’s role in the project is to apply advanced image analysis techniques to structural MRI scans acquired from a large subset of the original group. These provide insight into the links between brain structure and social, educational, and health-related outcomes in patients with childhood-onset epilepsy.
ION CHANNELS AND DISEASE
Genetics play a major role in epilepsy and, in particular, subtle changes in the properties of mutated ion channel proteins have been identified as the cause of many cases of human epilepsy. Through the use of advanced electrophysiological and biophysical tools, the group’s efforts are focused on exposing the fundamental physiological changes that predispose to epilepsy and to reveal novel methods and approaches for diagnosis and therapy.

The Ion Channels and Disease group, led by Associate Professor Steven Petrou, continued study along these lines in 2011:

• Using state-of-the-art high throughput, high content analysis methodology, they developed and are perfecting a new approach for revealing small changes in ion channel function in epilepsy patients, and showed for the first time that mutations in a new type of ion channel are the likely cause of fever-related seizures.

• Using computational methods, they continue to provide and analyse evidence that small changes in ion channel function can cause network level changes consistent with the development of epilepsy.

• Development of novel automated electrophysiological assays for assessment of drug action. Working with industry partners the team is focused on creating a more realistic biological context in which to assess the action of drugs in automated assays. The goal is to enhance the efficiency in which the drug discovery process moves from discovery to pre-clinical development.

NEUROBIOLOGY OF EPILEPSY
The goal of the Neurobiology of Epilepsy group is to use an integrative, systems level approach to reveal the neural mechanisms that cause epilepsy. Genetic engineering, seizure threshold analysis, EEG analysis, quantitative morphology, physiology and computation are combined by a diverse and multi-disciplinary group to achieve this goal.

The Neurobiology of Epilepsy group, led by Assoc Prof Steven Petrou and Dr Christopher Reid, continue their work in several key areas:

• Revealing mechanisms underlying clinical heterogeneity in genetic epilepsy where mutations in the same gene can lead to different seizure outcomes. This is critical for creating predictive diagnostics because it demonstrates that in epilepsy, both the gene and the nature of the actual mutation are major determinants of disease prognosis.

• Demonstrating that mechanism based drug therapy is an effective approach for treating early onset epileptic encephalopathies using a genetically engineered mouse model. Ongoing work in the mouse model will be focused on providing sufficient evidence to trigger clinical studies.

• Working towards functionally and structurally mapping genetically defined networks in the brains of mice using combined optogenetic and MRI approaches.

• Showing that the anaploretic diet is an effective therapy for genetic epilepsy in pre-clinical studies. This work has triggered a clinical trial.

• In an international collaboration we have shown that clinically safe levels of carbon dioxide are effective in treating certain types of seizures in our pre-clinical models. We went on to show the actions of pH at the level of brain networks, linking neuronal level function with behavioural seizures. This work has also triggered a clinical trial led by Florey scientist Dr Saul Mullen.

• Shown that structural changes are evident in “idiopathic” epilepsy where absence of structural abnormality was thought to be a defining feature. The team has gone on to reveal a potential neurobiological mechanism.

• Using the hyperpolarisation activated cation channel (“H+-channel”) as a biomarker, the group has shown that certain EEG patterns, arising from one region in the brain, can alter the neurobiology of neighbouring regions, potentially providing a basis to explain comorbidities such as depression and anxiety seen in epilepsy.

INTERDISCIPLINARY RESEARCH FOR DEVELOPMENT NOVEL METHODS FOR THE STUDY OF CNS FUNCTION
These projects are aimed at creating devices and approaches for revealing new aspects of the function of the brain, networks, neurons and proteins. In one collaborative project the group is working with University of Melbourne physiologist, Professor Lloyd Hollenberg, to exploit his research in nanodiamonds and magnetometry to develop devices that can detect the minute magnetic fields associated with neural activity. A theoretical account showing feasibility has been completed, and currently we are working with Prof Hollenberg’s team to show that their nano-magnetometer can detect activity in real neurons. In another project with The University of Melbourne’s Prof Stan Skafidas, we are working on developing micrometer scale voltage sensors that can be placed in any location in the brain that can wirelessly relay data to an external receiver. Such devices will revolutionise our ability to study the inner workings of the brain in health and disease. In a final project with Prof Skafidas and Florey MRI engineer, Steve Fleming, we are developing a high throughput dynamic clamp assay for assessing ion channel function under physiologically relevant conditions. We have commercial partners that will incorporate this technology into their automated assay workstations and are working with two drug companies at this time to test bed this approach in a real drug discovery setting.

When 12 year-old Michael McKean came home from his first day of high school, he had a peanut butter sandwich and then began spinning in a perfect circle, around and around. At first his mum, Sian Pickersgill, thought he was being silly but it soon became clear Michael couldn’t hear and was locked in a violent fit. For the next five years, Michael suffered up to six or seven exhausting extratemporal epileptic seizures each day, thanks to experimental imaging techniques that allowed surgeons to remove a part of his brain.

Graeme is cautious, there is real hope that the seizures will stop occurring. “This is such a success story because we have been able to identify exactly where his seizures were coming from and to offer him a possible cure.” Graeme’s novel approach to brain imaging was the key. “I think Michael is the first of many, which is why it’s so exciting.”
DIVISION
MULTIPLE SCLEROSIS

DESCRIPTION
Multiple Sclerosis (MS) is a disease of the central nervous system that causes demyelination (cellular layer stripping of the nerve sheath). The disease strikes young adults in their prime of life, and in its most severe form results in multiple neurological symptoms including weakness, visual loss and cognitive decline. The MS division, led by Professor Trevor Kilpatrick, aims to make fundamental discoveries that will improve our capacity to treat and ultimately prevent MS.

RESEARCH HIGHLIGHTS
Exploring the cause
The group’s genetics work has recently received wide scientific and media attention. As principal members of the ANZ gene consortium, the group published data in the highly regarded journal Nature Genetics, and, more recently, contributed to a communications in Nature under the umbrella of the International Multiple Sclerosis Genetics Consortium. In the Nature Genetics study the team reported on two novel genetic associations, one that encompasses a number of genes (including one that converts inactive Vitamin D to its active form) and the other a gene (CD40) that modifies immune cell activation. The IMSGC study represented ground breaking work that established S7 genetic loci that convey susceptibility to MS.

Further to this end, Dr Judith Field and her collaborators established that the mutation identified in the CD40 gene alters the expression of the CD40 protein in subsets of immune cells. Our researchers are examining the relevance of CD40 to initiate MS.

The group’s genetics work has identified another gene, named Mertk, which also presents as a susceptibility gene for MS. Importantly, Mertk is one of three receptors the team has shown to minimise the severity of demyelinating disease. Discovering how these receptors exert this beneficial effect and designing drugs that stimulate activation of these receptors will form an important part of the future research strategy.

Understanding myelin
Dr Ben Emery and his team have discovered a master regulator of myelin known as myelin gene regulatory factor. Ben made this seminal discovery as a postdoctoral fellow at Stanford University and we have been fortunate to attract him back to Australia where he will continue his important work. Ben has recently discovered that the factor is not only important in controlling myelination within the central nervous system during development but that it is also essential for the maintenance of myelin during adult life. His ongoing work aims to determine whether the factor influences repair after demyelination in disease as well as determining how the expression of the factor is regulated and how it influences the synthesis of key myelin proteins.

A new animal model of MS
Dr Toby Merson and PhD students Laura Oluich and Jo Stratton have generated and analysed a new model of MS. Their work concentrates on oligodendrocytes, the cells responsible for producing myelin, a fatty protein which insulates axons (the long extension of nerve cells) as they transmit nerve signals.

The oligodendrocytes are selectively induced to die, enabling a detailed study of downstream responses, including axonal degeneration, immune activation and oligodendroglial regeneration. The animal models develop disease in a common way and this precedes the development of demyelination, indicating that subtle changes in oligodendroglial-axon interactions can cause disease well before demyelination occurs. These mice will be important in assisting the lab’s understanding of how a complex disease such as MS is initiated and in testing the efficacy of therapeutic agents. The work was recently submitted to the Journal of Neuroscience for publication.
Novel therapies

Dr Holly Cate and her PhD student, Jennifer Sabo, have established that a family of molecules known as BMPs is critical in regulating how the nervous system regenerates in response to demyelination. They have found that BMP signalling increases the number of cells in the brain of animals with demyelinating disease, but inhibition of this signalling enables these cells to mature into oligodendrocytes, which are responsible for inducing repair and remyelination. The work has recently been published in the Journal of Neuroscience and provides important perspectives on how regeneration can be enhanced in MS. It is now proceeding in collaboration with Professor Patrizia Casaccia at Mount Sinai in New York.

Dr Simon Murray and co-scientists continue to study the important signalling molecules known as BDNF that influence myelination. The BDNF molecules signal via two receptors, one of which is important in promoting the capacity of oligodendrocytes to myelinate within the central nervous system. Dr Murray and his collaborators are now exploring ways in which BDNF signalling might be promoted for therapeutic benefit, utilising synthetic peptides. The peptide research is being undertaken in collaboration with Dr Tony Hughes of the Department of Pharmacology, The University of Melbourne.

Resident immune cells within the brain known as microglia have an important role to play in MS. Working with Assoc Professor Helmut Butzkueven and Professor Trevor Kilpatrick, Vilija Jokubaitis has discovered that the protein Disabled-2 (Dab2) is expressed by microglia during demyelinating disease, and that depletion of Dab2 in mice diminishes disease severity. In ongoing research, we are now assessing the mechanism by which Dab2 increases microglial-mediated tissue damage. This research aims to identify potential ways of modulating microglia in order to reduce brain damage (in particular axonal injury) in MS.

Novel measures of disease activity

Most MS disability is thought to be caused by nerve cell and in particular axonal process injury that occurs during demyelination. The team is attempting to identify a suite of markers that can be used to test the efficacy of novel neuroprotective agents which could be useful treatments for MS. At present there is no way to accurately quantify the degree of nervous system damage in clinical studies. To address this need, the scientists are undertaking two ongoing and complementary approaches, the first involving neuroimaging and the second developing a blood-based biomarker.

Dr Anneke van der Walt and Dr Scott Kolbe have undertaken a detailed study of patients with acute optic neuritis, a common problem in MS. Unlike other regions of the central nervous system, the optic nerve is a relatively simple structure that is amenable to detailed study, using MRI measures of retinal nerve thickness and measuring the efficiency of electrical conduction from the eye to the visual cortex. We have used a new MRI technique that measures the efficiency of water diffusion along nerves - this is compromised when they become damaged. Our preliminary results indicate that early abnormality in this measure is useful in predicting subsequent damage. This could have a role both in selecting appropriate patients for clinical studies and in efficient monitoring of the response to novel therapies.

Associate Professor Helmut Butzkueven and Dr Melissa Gresle, who have recently relocated to The University of Melbourne’s Department of Medicine at the Royal Melbourne Hospital, continue to assess the utility of recently described blood-based markers of axonal injury in MS. In particular, they have found that phosphorylated Neurofilament Heavy Chain (pNF-H), a protein produced by neurons, leaks into the blood after nerve damage. Emerging data indicates that pNF-H is expressed in a subset of patients with MS and that these patients, on average, experience more severe forms of the disease.
WE CONTRIBUTED TO ONE OF THE LARGEST HUMAN GENETIC STUDIES EVER UNDERTAKEN - IDENTIFYING THE MAJOR COMMON GENETIC VARIANTS IN MS

PROFESSOR TREvor KILPATRICK, DIVISION HEAD, MULTIPLE SCLEROSIS. THE RESULTS WERE PUBLISHED IN NATURE.

OVERVIEW
The Genomic Disorders Research Centre was formed to lead the world in research on genetic mutations and their effect on human well-being. It was the first and remains the only centre to focus on gene mutation, its cause, documentation, collection and consequences. The centre coordinates national and international activities such as the Human Variome Project, along with courses, workshops, and the high profile genetics journal Human Mutation.

PURPOSE
The Human Variome Project is the global community effort to collect, curate and make accessible information on all genetic variations. The project’s consortium of researchers and healthcare professionals works to establish and maintain the standards, systems and infrastructure necessary for the routine sharing of genetic variation information.

One of the major initiatives of the Human Variome Project is its neurogenetics consortium which collects genetic data implicated in many neurological disorders.

ACHIEVEMENTS
The Human Variome Project consortium continues to grow. Twelve countries have now joined the Project as country nodes: Austria, Australia, Belgium, China, Cyprus, Egypt, Greece, Kuwait, Malaysia, Nepal, Spain and Vietnam. The project has also welcomed its first gene/disease specific database partner: the International Society for Gastrointestinal Hereditary Tumours. This new partnership solidifies the ongoing collaboration between the project and InSiGHT.

Australian Node – Human Variome Project
During 2011, the centre continued work on developing software and systems for the Human Variome Project Australian node. This work is funded by a federal government national e-architecture task force grant scheme. The project will enable gene variation data to be collected from Australian laboratories, allowing enhanced diagnostic abilities for Australian clinicians treating patients with inherited cancers and other debilitating disorders. It is intended to form a model for data collection elsewhere.

2011 Meetings
In 2011, the centre held the Human Variome Project Beijing meeting, continuing the valuable relationship between the project and China.

The centre also organised the International Mutation Detection meeting in Santorini and attended meetings in Amsterdam, Montreal and Dubai to speak about the Human Variome Project.
PARKINSON’S DISEASE
DESCRIPTION
Parkinson’s disease is a progressive and degenerative condition that impairs the control of movement. There is currently no cure. It is the second most common neurological condition in Australia, having an incidence of 30-300 per 10,000, with the estimated health burden costs of $500 million per annum. The incidence of Parkinson’s in the elderly is much higher than the population at large, so as the Australian community ages, it will increase in frequency. Not only is there a desperate need for new treatments, but the disease mechanisms need to be fully elucidated.

RESEARCH HIGHLIGHTS
The Parkinson’s research group led by Prof Malcolm Horne has made advances on both the clinical and basic frontiers. They have developed a wristband device for measuring bradykinesia and dyskinesia, and the trial demonstrating its capacity to record these movements over ten days was completed in 2011; it also proved to be effective in detecting drug-related somnolence. The device has received approval for clinical use in Australia, the first commercial models have just been manufactured, and sales are to commence shortly. Dr Tim Aumann, a member of this team, has continued to advance their discovery of the birth and maturation of new neurons in the adult mouse midbrain, as well as factors controlling their maturation into dopamine neurons. These neurons die in Parkinson’s disease, and it is hoped we can better treat the disease by promoting dopamine “neurogenesis” in patients.

MOTOR NEURON DISEASE
DESCRIPTION
Motor Neuron disease is a debilitating disease striking 1,400 Australians each year. It often begins with weakness of the muscles in the hands or feet, and eventually leads to generalised paralysis, including an inability to speak, swallow and breathe. Dr Brad Turner, Prof Malcolm Horne and Prof Philip Beart in the Motor Neuron disease research group are investigating the molecular events that lead to motor neuron injury and how neighbouring cell types exacerbate disease progression, with a view to creating new treatments.

RESEARCH HIGHLIGHTS
The team has continued to dissect the sequence of key events leading to the death of the affected cells. Motor neurons lead a precarious existence - not only do they have deficient handling of toxic proteins, but we have found they are uniquely sensitive to various stressors released from adjoining cells which result in multifactorial death processes. One of the earliest defects in affected nerve cells was found to be a blockade of protein traffic in the cellular compartment responsible for recycling and waste management inside cells. In particular, they have identified that signature molecules for endosomes called Rabs are abnormally high in motor neuron disease and that this causes build-up of toxic proteins; this may explain why motor neurons are struck down in this disease.
NEUROPHARMACOLOGY

DESCRIPTION
Brain cell death occurs in all acute and chronic neurodegenerative conditions, and eventual demise occurs by programmed cell death (death signalling involving gene programmes). This occurs in both Parkinson’s and Motor Neuron diseases, so that understanding the cascade of destructive events will identify new ways to manage brain cell death in these conditions.

RESEARCH HIGHLIGHTS

The Neuropharmacology group, led by Dr Lachlan Thompson, are developing new strategies to integrate appropriately into the brain after transplantation. Importantly, that these neurons have a remarkable capacity to grow stem cells in the laboratory in large numbers and are thus a potentially limitless source of new cells. They can also be directed to become a particular cell type, such as a dopamine neuron (the degenerating cells in Parkinson’s), or even a non-neuronal brain cell. The cell therapies team aims to use these two capabilities to produce cells that can partially restore function after disease or trauma. Repair of the injured brain also depends on identifying the optimal cell for transplantation, and understanding the appropriate signals to promote the integration of these cells into the host circuit. Specific signals may be required to produce select neuronal subpopulations (such as dopamine neurons) and to regulate axonal growth and guidance; both goals are currently being pursued.

STEROID NEUROBIOLOGY

DESCRIPTION
Experience tells us that sex hormones influence brain behaviour, but how well do we understand the mechanism? To demonstrate the effects of sex hormones on brain functions and behaviour, we are studying an animal model which is completely oestrogen-deficient.

RESEARCH HIGHLIGHTS

The Steroid Neurobiology group, led by Dr Wah Chin Boon, is investigating the life and death of neurons in the complete absence of oestrogen. A valuable advance here has been the recent generation of a genetic mouse expressing in a tissue-specific manner) aromatase, a key protein linked to oestrogen receptor function. This key breakthrough will allow dissection of tissue functions when circulating levels of oestrogens are low, for example in men and postmenopausal women. Studies relevant to osteoporosis, prostate cancer and breast cancer will now be possible, in addition to elucidating the local functions of oestrogens in the brain.

CELL THERAPIES & NEURAL DEVELOPMENT

DESCRIPTION
Transplantation of stem cells is an exciting future therapy for replacing damaged or injured neurons. Stem cells can divide, and are thus a potentially limitless source of new cells. They can also be directed to become a particular cell type, such as a dopamine neuron (the degenerating cells in Parkinson’s), or even a non-neuronal brain cell. The cell therapies team aims to use these two capabilities to produce cells that can partially restore function after disease or trauma. Repair of the injured brain also depends on identifying the optimal cell for transplantation, and understanding the appropriate signals to promote the integration of these cells into the host circuit. Specific signals may be required to produce select neuronal subpopulations (such as dopamine neurons) and to regulate axonal growth and guidance; both goals are currently being pursued.

RESEARCH HIGHLIGHTS

The Stem Cell Research teams, led by Dr Clare Parish and Dr Lachlan Thompson, are developing new strategies to improve the potential of stem cells for treating brain disorders. The groups have developed the capacity to grow stem cells in the laboratory in large numbers and to modulate them for potential treatment of various neurological conditions. In 2011, they found that cortical neurons can be readily generated from stem cells and, importantly, that these neurons have a remarkable capacity to integrate appropriately into the brain after transplantation. These results allow the teams to extend their work to new restorative therapies for neurological conditions affecting the cortex, such as stroke or traumatic injury.

GENDER BALANCE AT THE BENCH

Equality in the workplace is a key initiative of the Florey. Some 67 per cent of the Florey’s Honours and PhD students are women, and half the post-docs are female. However, at the Parkville campus where most of our basic science is carried out, there is not one female NHMRC senior research fellow.

Florey Director, Professor Geoffrey Donnan, is determined to see a change in the gender balance in senior ranks. He is a great supporter of the Equality in Science committee which works, for the first time, to our stakeholders.

The Florey’s Equality in Science committee has launched some exciting initiatives in the past year as well as making major progress on several fronts to promote its aim of achieving greater equality. Momentum is building since great has been achieved in the gender balance in senior ranks. He is a great supporter of the Equality in Science committee which works, for the first time, to our stakeholders.

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For more information about the Florey Equality in Science committee, please visit:

If you would like to support the Women in Science Endowment, please contact the Florey’s community engagement and fundraising manager, Astrid Sweres on (03) 8344 1629. All gifts will be invested in the Florey Foundation, and both the fellowship and award will be funded in perpetuity by the income from these gifts.
DESCRIPTION
The Neuropeptides division conducts broad-ranging studies on the relaxin family of peptides/hormones and their receptors. The division focuses on determining the role of these peptides in a wide range of physiological and disease states. The aim of this research is to develop therapeutics based on these peptides to treat vascular, fibrotic, metabolic and psychiatric diseases.

RESEARCH HIGHLIGHTS
The division’s long-standing research focus on relaxins and their receptors continued in 2011, with more exciting advances in understanding receptor signalling and function. The team increased their understanding of the structure of relaxin peptides, identifying the components that determine their biological activity and how they are metabolized. New viral-based methods for peptide delivery and peptide depletion in brain were also pioneered and revealed an ability of chronic relaxin-3 receptor activation to alter feeding and body weight.

Further studies of brain relaxin-3 networks using newly developed receptor-specific analogues and mouse strains in which the peptide or its receptor has been deleted or "knocked-out", have uncovered likely roles for this neuropeptide in the regulation of circadian activity, spatial navigation, fear memory, anxiety and social interaction and motivation and reward. The work is being conducted in collaboration with members of the Behavioural Neuroscience Division at the Florey and international scientists. This program has been boosted by new NHMRC funding and a renewal of support from The Besen Family and Pratt Foundations for a collaboration with the Weizmann Institute, Israel.

Following the acquisition by Novartis (Basel, Switzerland) of our commercial partner, Conthera Inc. (San Mateo, USA) in 2009, the Phase III clinical trial for relaxin in heart failure continued during 2011 and results should be known soon. A successful outcome could lead to royalty-based research funding for the Florey and the Neuropeptides Division. If relaxin is adopted for broader clinical use, it should have a significant impact on the treatment of acute heart failure, and could open the way for testing the efficacy of relaxin in other fibrosis-related diseases.
**DIVISION
STROKE**

**AREAS OF RESEARCH**

- **BASIC SCIENCES**
- **IMAGING AND ULTRASOUND**
- **PUBLIC HEALTH AND EPIDEMIOLOGY**
- **REHABILITATION AND RECOVERY**
- **AVERT - EARLY INTERVENTION**

**BASIC SCIENCES**

**DESCRIPTION**

Basic Sciences focuses on improving therapy for stroke. We evaluate the potential of existing drugs by systematic review and meta-analysis, screen the best candidate drugs for efficacy in stem cell derived human neurons and glia, and subsequently test them in rodent models of stroke incorporating common human co-morbidities which increase stroke risk or make stroke worse for patients. This work has contributed to the development of international guidelines for the conduct of animal experiments to increase the chances of finding drugs that will be successful in clinical use. We study the development of stroke pathophysiology to help understand the long term consequences of stroke, and are developing new models of stroke aimed at avoiding use of anaesthetics and invasive surgery. Our team also develops new methods for assessing stroke outcome, both in the laboratory and the clinic.

**RESEARCH HIGHLIGHTS**

Led by Associate Professor David Howells, the Basic Sciences group has continued its leadership role within the CAMARADES collaboration, an international group which continues to drive worldwide improvements in the standards of stroke research. This work has increased understanding of how hypertension and diabetes influence the benefits provided by candidate drugs, the detrimental impact of bias in pre-clinical studies and has provided a significant part of the evidence base for the EU-funded Euro-Hyp1 RCT of hypothermia to treat stroke. Assessment of neuroprotection in human stem cell derived neurons is identifying new candidate therapies and helping explain why past attempts at translation to the clinic may have failed. Biomarker discovery projects in animal models of stroke have led to patents for the experimental work done in the basic science division by Professor David Howells and colleagues, and is driving biomarker studies within the START-TIMES and START-EXTEND human observational and penumbral selection clinical trial of late thrombolysis.

A major new collaboration with CSIRO has led to the discovery of blood biomarkers which we hope will expand the range of patients who qualify for the use of clot-busting drugs.

**IMAGING AND ULTRASOUND**

**DESCRIPTION**

Research led by Professor Geoffrey Donnan and Associate Professor Brian Chambers is directed at developing methods to obtain a view into the brain and blood vessels before and after stroke. This involves state-of-the-art technology such as positron emission tomography (PET), magnetic resonance imaging (MRI) and ultrasound.

**RESEARCH HIGHLIGHTS**

The ischaemic penumbra (a region adjoining the stroke site where metabolism is still active but blood flow is diminished) continues to be an important focus of our research. In collaboration with colleagues at the Royal Melbourne and Austin hospitals, our research group showed that MRI imaging could identify patients with potentially viable brain tissue after stroke onset. In particular, a Phase II study led by Professors Stephen Davis and Geoffrey Donnan showed that a selection of patients using this approach for therapy with the clot dissolving agent tPA could be safely extended out to six hours after stroke onset. They are now leading a Phase III trial (EXTEND, a part of a CSIRO Flagship program led by Prof Donnan) to apply this same principle up to nine hours post-stroke, thus potentially increasing the number of patients eligible to receive tPA therapy.

As a further part of the CSIRO Flagship program, a collaborative clinical study across the two campuses of the Austin and Royal Melbourne hospitals concerning biomarkers in acute ischaemic stroke is being undertaken. Based on the experimental work done in the basic science division by Professor David Howells and colleagues, myriad changes occur during the period immediately after vessel occlusion and by sophisticated statistical techniques these have been narrowed down to only a few which appear in the serum. These will be exploited to establish the time of stroke onset, or develop a “stroke clock” to be validated in humans. The research is being led by Prof Donnan, Drs Dewey and Howells, while Dr Marie Dagonnier is the lead PhD student and Dr Atte Meretoja, research fellow.

Another significant initiative is the use of PET which provides an image of chemical changes associated with dementia in patients with recent onset of stroke. There are interesting links between vascular dementia, stroke and Alzheimer’s disease which may be in part unravelled by this technique. The research is led by Professor Donnan, Dr Amy Brodtmann and PhD student Ramesh Sahathevan.

Assoc Prof Brian Chambers, with funding from MS Research Australia, is investigating a possible relationship between multiple sclerosis and obstruction of vein drainage in the brain and spinal cord. The study involves an ultrasound examination of 100 MS patients and matched healthy controls.
Two members of a Florey trial, Sharnie Redmond, 24 and Ron Wilson, 96, are generously participating in a worldwide effort to improve the outcomes for people who have suffered a stroke.

They are the youngest and oldest participants in a Florey trial into the benefits of exercise soon after a stroke.

Sharnie, from Yarrambat, was playing basketball four years ago when she felt as though “someone was pouring an icy slushie into my head”. The piercing headache was severe but momentary. Sharnie was delivered to the Austin within an hour and early treatment for her stroke began.

Doncaster gentleman Ron Wilson arrived in hospital within hours of experiencing stroke symptoms. Ron, a former teacher, is now back to his old self, walking and driving.

The trial is evaluating whether starting exercise and getting out of bed within 24 hours of stroke can improve a patient’s chances of walking independently. In fact, fifty per cent of people who start exercise early are back on their feet within three days, unlike those who take longer to start exercising. The cost saving was estimated to be approximately $8000 per patient as people do not need to spend so many days having rehabilitation.

The AVERT team at the Florey is celebrating its 1200th recruit and runs in 40 hospitals in five countries - Australia, New Zealand, Singapore, Malaysia and the UK.

Post-doctoral fellow Toby Cumming completed his study examining the changes in cognitive function (thinking ability) that occur after stroke. He was able to establish that computer-based cognitive tasks (CogState(TM) could be completed by many people newly affected by stroke, and that these tasks relate well to established and more complex and time-consuming tests of thinking. He will continue to use these tasks to measure cognition in a planned new study examining how exercise early after stroke influences thinking.

Post-doctoral fellow Coralie English joined the team, supported by an NHMRC Training Fellowship. Her early postdoc work focussed on measurement and evaluation of changes in body composition early after stroke. Two systematic reviews found evidence for significant loss of muscle in the hemiparetic (affected) arm and leg later after stroke, but few changes in fat mass. She also found that measuring muscle thickness in people in hospital early after stroke was feasible and reliable in some, but not all anatomical sites. Her current postdoc work is focussed on the specific health effects of stroke survivors sitting for prolonged periods each day. She has been awarded a total of $50,000 in funding to carry out pilot work to (a) examine patterns of activity and inactivity in stroke survivors living at home after stroke and (b) pilot a novel intervention to reduce daily sitting time in community-dwelling stroke survivors.

In 2011 we held our second physical activity forum at the new Florey’s Heidelberg campus. Researchers from across Australia, and from a wide range of disciplines, spent an exciting day sharing knowledge about the effects of physical activity and exercise on health and disease.

**AVERT – EARLY INTERVENTION**

**DESCRIPTION**

Research led by Associate Professor Julie Bernhardt focuses on the development, testing and implementation of pragmatic early physical activity and exercise-based interventions for people with stroke, and on understanding how they affect muscle, bone, mood and cognitive ability. The key objective of the program is to find new ways to reduce the burden of disease due to stroke.

**RESEARCH HIGHLIGHTS**

A Very Early Rehabilitation Trial (AVERT) is now the largest clinical trial of stroke rehabilitation in the world. AVERT is an international, multi-centre study testing whether commencing frequent, out-of-bed activity within 24 hours of stroke reduces death and disability compared with current stroke care. A cost-effectiveness study also sits beside the trial, and involves approximately $50 physiotherapy and nursing clinical leaders and other acute stroke clinicians from a broad range of backgrounds from six countries. Funding from the Stroke Association (UK) has supported the employment of a dedicated trial manager in the UK. The trial expanded to a further 15 hospitals throughout the UK in 2011. The study will recruit over 2000 patients who are followed for 12 months and it is expected to complete recruitment in 2014. In 2011 the group reached a major milestone for the collaboration, with 1200 patients recruited to the trial.

The longitudinal study of how stroke influences bone and muscle loss and glucose sensitivity continued in 2011. Led by Karen Borschmann, this study follows stroke patients for twelve months. This project brings together researchers from many disciplines including physiotherapy, neurology, endocrinology, exercise physiology and nutrition and imaging. The gold standard pQCT bone CT scanner, the only one of its kind in Australia, allows the team to study bone changes in detail. Phase one will determine both the rate of loss of bone and muscle, and changes in glucose sensitivity after stroke. The influence of physical activity on these outcomes will be investigated. This information will be used to develop intervention strategies to help delay or prevent the often disabling effects of musculoskeletal changes after stroke.
NEUROREHABILITATION AND RECOVERY

DESCRIPTION
Neurorehabilitation and recovery research, led by Professor Leeanne Carey, focuses on the scientific foundations of stroke recovery and rehabilitation in order to optimise outcomes for stroke survivors. This is achieved through four complementary streams of research.

RESEARCH HIGHLIGHTS
Restorative approaches to rehabilitation: In 2011 Prof Carey published the first controlled evidence of the effectiveness of a novel approach to retrain the brain to feel lost sensations after stroke. The approach known as SENSE (Study of the Effectiveness of Neurorehabilitation on Sensation), builds on the ability of the brain to adapt and helps the client rediscover a sense of touch. One in two stroke survivors lose the sense of touch after a stroke. The method trains the brain to make sense of the altered sensations and help the person use this skill in the context of everyday tasks. The group has found that stroke survivors improved their ability to feel touch, knew where their limbs were in space and recognised everyday objects through touch – compared to current treatments or by exposure alone. They also improved their ability to use the arm in everyday activities. This active approach to training the brain is a major shift in current rehabilitation approaches that typically focus on compensation. Prof Carey is now developing a DVD, training manual and online materials to teach therapists how to use this approach in the clinical setting.

During 2011, Prof Carey edited the book Stroke Rehabilitation: Insights from Neuroscience and Imaging. This book challenges clinicians to adopt more restorative and scientific approaches to stroke rehabilitation. It guides clinicians to maximise and shape neural plastic changes in the brain after stroke. Active skill-based learning is identified as a central element for restorative stroke rehabilitation. The evidence behind core and function-specific learning strategies are interrogated for their application to training lost functions of movement, sensation, cognition, and language. Clinical interventions are evaluated and successful applications highlighted. Focusing on new insights from neuroscience and imaging, this book encourages clinicians to tailor interventions to the individual based on viable brain networks.

Mechanisms of Recovery using Brain Imaging: In 2011 the group was successful in obtaining an NHMRC project grant titled “Effective sensory rehabilitation after stroke: Targeting viable brain networks”. Findings from this study will guide therapists in choosing the best therapy for the right individual, based on knowledge of brain networks that have capacity to adapt. We also reported on the relationship between altered touch sensation after stroke and how the brain processes this information. This novel finding, found in a group of stroke survivors with cortical or subcortical lesions, provides important insight into brain regions associated with better recovery, and how these may change over time and be used in therapy. Finally, supported by the Dunlop foundation and ARC future fellowship, the group conducted pilot studies on how the brain changes in response to the SENSE training program. Our preliminary findings include a return to activation in sensory regions in the lesioned hemisphere as well as use of related vision and attention networks targeted in therapy.

Predictors of post-stroke depression and recovery: This project is part of the START (Stroke Imaging Prevention and Treatment) stroke cohort study that is supported by the preventative Health Flagship program of CSIRO. Ethics is approved at 17 sites. The linked PrePARE (Prediction and Prevention to Achieve Optimal Recovery Endpoints) study was also approved as a stand-alone study in 2011 with an increase in numbers from 75 to 100 for advanced clinical and imaging outcomes. Sixty-four patients have been recruited to study cohort, 27 to the PrePARE cohort.

Nature of Sensormotor Impairment and its Impact on Function: During 2011 the group focused on translating its recent developments in quantitative measures of sensation for use in the clinical setting. This has involved evaluating brief versions of new measures for use in a sensory screening tool with rehabilitation patients, post-stroke.

PUBLIC HEALTH AND EPIDEMIOLOGY

DESCRIPTION
Research led by Associate Professor Dominique Cadilhac in Public Health and Associate Professor Helen Dewey in Epidemiology is focused on understanding how to achieve better outcomes and efficiencies in the clinical management of stroke and disease prevention.

RESEARCH HIGHLIGHTS
In 2011, several major projects focused on the assessment of the quality of care for patients with stroke and/or transient ischaemic attack admitted to Australian hospitals. This included expanding the Australian Stroke Clinical Registry (www.auscr.com.au) to 20 sites, conducting an evaluation of eight hospitals as part of the Victorian Stroke Clinical Network initiatives, undertaking pre/post assessments of acute stroke services as part of the NSW Rural Stroke Project and providing academic input to the National Audit Program of the National Stroke Foundation. Partners included The George Institute for Global Health, the National Stroke Foundation, State Government of Victoria, New South Wales Health and La Trobe University.

In the area of acute clinical management, treatment within the first four hours of stroke is most critical. The Victorian Stroke Telemedicine project is designed to test the feasibility of enhancing the diagnosis and treatment of stroke using telemedicine equipment to link Bendigo Health and Melbourne-based neurologists. The aim of the project is to develop an acute stroke telemedicine model that could be applied in other regional and rural communities. In 2011, we piloted the program and following modifications established full implementation of the program. At the end of 2011, 21 telemedicine patient consultations had occurred. The project has included education activities for hospital clinical staff and general practitioners. Feedback has been actively sought from a range of clinicians to ensure the success of the program. The project is led by Florey Neuroscience Institutes, on behalf of the Department of Health (Victorian Stroke Clinical Network), Bendigo Health, Loddon Mallee Rural Health Alliance, National Stroke Foundation and Ambulance Victoria. The Victorian Stroke Telemedicine project also acknowledges the support of Polycom Inc, Telstra and the Stroke Association of Victoria Inc. The $2.13 million project received co-funding from the Victorian Department of Innovation, Industry and Regional Development.

In the area of stroke awareness and prevention, the Public Health division worked with the National Stroke Foundation and Monash University staff to design an evaluation to test the feasibility of community-based diabetes risk screening as well as a blood pressure measurement and educational information on stroke risk factors. This initiative was part of the National Stroke Foundation’s ‘Know your numbers program’ provided in Queensland pharmacies. In 2011, data on nearly 6,000 registrants involved in this component of the program were collected and analysed.

In the field of epidemiology, Dr Wenwen Zhang is completing her PhD investigating the diurnal blood pressure patterns of patients with transient ischaemic attack compared to control subjects. This project is supervised by Assoc Prof Helen Dewey, Dominique Cadilhac and Prof Geoffrey Donnan.
Neuroscience Trials Australia is a not-for-profit, contract research organisation within the Florey Neuroscience Institutes. It offers an Australian approach to global clients seeking economical, smart and timely neuroscientific clinical research.

Neuroscience Trials Australia is co-founded by two of Australia’s most experienced clinicians and medical researchers, Professors Geoffrey Donnan and Stephen Davis. With business growing rapidly through pharmaceutical, biotechnical and academic-initiated studies, a general manager, Dr Tina Soulis, was appointed in 2011.

The team’s areas of expertise include stroke and stroke-related conditions, multiple sclerosis, epilepsy, Parkinson’s disease, spinal cord injuries, Huntington’s disease, neurosurgery, pain, neuromuscular disease, mental illness and migraine. They have strategic alliances with many therapeutic disease groups and can provide access to key opinion leaders, sites and clinical trial expertise through a range of tailored services. Staff have global management experience in all phases (I to IV), of clinical research. The services provided include study feasibility, project management, monitoring of studies to global regulatory standards, safety reporting throughout the clinical trial, data management and biostatistics and report writing. The relationship with services provided and key stakeholders are outlines in the diagram below.

**Key Services Provided by Neuroscience Trials Australia to Various Stakeholders**

The division continues to expand with multiple trials in various neuroscience therapeutic areas being conducted at any one time. These projects consist of investigator initiated studies as well as those initiated by commercial interests.

Outlined, below, are three projects currently underway:

1. **Limiting brain damage following stroke**
   - The STOP imAgIng Prevention and Treatment (START) program is a research consortium funded by the CSIRO. The program targets stroke, the most widespread and economically costly of central neurodegenerative diseases. The collaborators include the National Stroke Research Institute, Brain Research Institute, University of Melbourne, Neurosciences Victoria, Melbourne Health and of course CSIRO. The flagship cluster leaders for the project are Prof Geoffrey Donnan (Florey) and Prof Stephen Davis (Melbourne Health).
   - This study is closely aligned to the Australian Government’s National Research Priorities and involves a clinical trial of stroke patients involving data and tissue collection, with an intervention and treatment arm. It uses the registered thrombolysis treatment, Tissue Plasminogen Activator (tPA®, Boehringer-Ingelheim), beyond the usual registered time window of up to nine hours post-stroke, double the usual time window for treatment.
   - The trial is being conducted at approximately 20 hospitals throughout Australia and New Zealand and aims to recruit 200 patients.

2. **Saving spinal cords**
   - A study, lead by Prof Mary Galea of the University of Melbourne, offers intensive exercise to those with a spinal cord injury – from the acute phase of care to community programs.
   - This trial challenges traditional approaches to rehabilitation based on evidence from basic and applied science promoting activity-dependent plasticity of neural circuits below the level of injury.
   - The multi-centre randomised controlled clinical trials involving all spinal units in Australia and New Zealand are examining the effectiveness of very early exercise for the lower limbs, task-specific training for the arm and hand, and an intensive activity-based therapy program for the whole body including the paralysed limbs. In addition, an on-line educational program to improve the knowledge and confidence of fitness instructors in the community regarding exercise for people with spinal cord injury has been developed and is being evaluated.

   Once again, Neuroscience Trials Australia is the program manager and is responsible for setting up the program studies and data management.

3. **Early exercise after stroke**
   - A phase 3, multicentre, randomised controlled trial of very early rehabilitation after stroke (AVERT) is a large (n = 2104) randomised controlled trial of very early rehabilitation compared to standard care in stroke patients. It is an investigator-initiated clinical trial, funded by an NHMRC grant to the National Stroke Research Institute in 2006. At that point, Neuroscience Trials Australia contracted a part-time project manager to the team who delivered skills from both a clinical and pharmaceutical industry background.
   - The trial progressed quickly from a concept to reality with a rapid development of all trial documents and processes enabling the first patient to be recruited in early July 2006. The trial has now attracted subsequent funding from international sources which has lead to the successful expansion of the trial into five countries with close to 1200 patients registered.
MAKING SENSE OF OUR DATA

The Florey is home to an invaluable service in the Victorian research sector – dedicated statistics and informatics research expertise. Here, the leader of the team, Dr Leonid Churilov, describes the range of initiatives offered by this platform.

The Statistics and Informatics Research Platform provides expertise in data, quantitative, and statistical aspects of research projects. It serves the Florey's neuroscientists as well as some other external clients seeking sophisticated number crunching.

The Florey has developed some unique modelling methodology and promotes the use of high-standard, rigorous quantitative methods by scientists.

Advanced statistical and modelling methodology is of little use for real applications without the availability of appropriate computational and modelling tools. Therefore, adapting, extending and validating complex statistical and decision modelling software is another basic task for the platform. It serves as a hub for collaboration within the Florey and with other Australian and international research institutions in the areas of statistical, data, and decision modelling.

The platform is an important resource of statistical and data management support to a number of large international clinical trials including the Florey’s AVERT and EXTEND programs. It also provides statistical support for SCIPA: a unique, multi-disciplinary, multi-centre program of research to promote neurological recovery, maintain health and wellness, and optimise independence following spinal cord injury.

Consulting services are offered to Neuroscience Trials Australia and to a variety of clients both in government and in the health industry.

In addition to consulting and research collaboration activities, the team has developed and delivered experimental design and analysis training for the neuroscience component of a course offered to higher degree research students and the special certificate in clinical neurosciences course.

WELCOME

Dr Emily Sena

Dr Emily Sena completed her PhD in 2010 at the University of Edinburgh. In a fantastic career move, Emily splits her time equally between the Florey and the University of Edinburgh. She is no stranger to Melbourne - Emily spent a year of her doctoral studies with Associate Professor David Howells.

She is making a significant contribution internationally, having developed new ways of assessing data from animal studies in stroke. Her work has led to substantial new insights into the strengths and limitations of the way we conduct experiments and, as a result, important changes have been made to the way research into stroke is performed.

More recently Emily has been mentoring others who are studying neurological conditions including multiple sclerosis, Alzheimer’s disease, and Parkinson’s disease, and this work has resulted in innovative and influential publications.

Although at an early stage in her career, she has already been invited to advise both the UK government and the National Institutes of Health in the US about the use of systematic review and meta-analysis.

She plans to continue explaining the importance of experimental design and validity in basic research while undertaking her own research into ischaemic stroke.
Professor Richard Macdonell and Professor Robin McAllen head the Systems Neurophysiology division at the Florey. Prof McAllen’s group researches brain function in health and disease, with a particular focus on how the brain controls basic bodily functions such as blood pressure, temperature, body fluids and breathing. Prof Richard Macdonell heads the clinical arm at the Austin Hospital which researches the physiological changes underlying epilepsy.

**RESEARCH HIGHLIGHTS**

**Brain regulation of body temperature**

Humans and most other mammals maintain core body temperature at or close to 37°C. This remarkably constant temperature is probably the most obvious manifestation of homeostasis, the ability to keep the body’s internal environment as unchanged as possible in the face of a hostile environment. This is one of the main reasons that we have been able to populate and survive in many regions of the planet. Temperature homeostasis in mammals is achieved by a number of compensatory physiological and behavioural mechanisms that have evolved to respond to changes of environmental and body core temperature.

The main control of body temperature occurs in the brain, specifically in the neighbouring preoptic and hypothalamic regions. Within the preoptic region, nerve signals from temperature sensors in the skin are integrated with information from sensors of core body temperature, and this information is used to initiate thermoregulatory responses that will correct any deviations from normal body temperature. Compensatory responses to cold include constriction of skin blood vessels, shivering and generation of heat from brown fat tissue, whilst sweating, increased heart rate and skin vasodilatation are responses to overheating. During a fever, the balance of these thermoregulatory mechanisms is reset, while during heat stroke the regulatory mechanisms are overwhelmed. The consequences of failure in these mechanisms can be life-threatening: elderly people with impaired temperature regulation frequently die of heat stroke during heat waves.

Until recently, the way in which incoming neural signals from skin were integrated with signals from core temperature sensors within the preoptic region of the brain was largely unknown. In the past year, this laboratory has made new inroads into understanding how this works in the brain to regulate body temperature. The incoming neural signals from the skin are relayed to the preoptic region of the brain and then nerve signals are sent back to the skin via the raphe nucleus in the hind part of the brain (medulla) to regulate the flow of blood in the skin. Previously it has been thought that the output signals from the preoptic region to the medulla were inhibitory nerves. Contrary to this generally accepted wisdom, we have now shown that there are both excitatory and inhibitory signals being relayed from the preoptic region to the medulla and it is the balance of these excitatory and inhibitory signals that determines skin blood flow and therefore the amount of heat that is conserved or dissipated from the body. Indeed, the group has been able to electrophysiologically identify both the excitatory and inhibitory neurons in the preoptic region of the brain that regulate skin blood flow.

**Treatment of heart attack and heart failure**

Heart failure is a chronic disease that commonly follows myocardial infarction, a heart attack, leading to impaired heart function and poor perfusion of tissues. It is a serious problem in Australia with an estimated 300,000 people suffering from the disease. The Neurocardiovascular group lead by Assoc Prof Clive May is investigating how genetic, structural and chemical changes that occur in the brain contribute to the increased activity in sympathetic nerves that innervate the heart and kidney. Increased activity in these nerves causes a reduction in the function of these organs and contributes to the progression of heart failure.

Dr Song Yao has established a model of heart failure in rats and is using this model to study changes in the blood-brain-barrier in this disease. The blood-brain-barrier is important for keeping potentially harmful blood-borne substances from reaching brain cells. The team has discovered that the blood-brain-barrier of rats with heart failure is disrupted, allowing the infiltration of blood-borne inflammatory proteins into the brain. This affects brain function, increases nerve excitability and speeds up disease progression. Understanding the mechanisms causing this blood-brain-barrier disruption in heart failure is vital for the development of new therapies to treat this, and reduce the excessive increase in sympathetic nerve activity.
When the blood brain barrier is compromised in heart failure these brain blood vessels become ‘leaky’ and allow harmful blood-borne substances to affect the normal function of brain cells.

Another approach to understanding the influence of the brain in heart failure utilises a large animal model of heart failure already established at the Florey. Dr Rohit Ramchandra has been examining parts of the brain that regulate sympathetic nerve drive to the heart. The sympathetic nerves to the heart can affect heart function and a high level of activity in these nerves has been shown to worsen prognosis in patients. The team has found that the high levels of sympathetic drive to the heart during heart failure is dependent on the levels of a hormone angiotensin II in the brain. Blocking the actions of this hormone in the brain in heart failure animals led to a reduction in sympathetic drive back towards normal levels. This is a critical step towards understanding the mechanisms causing an increase in sympathetic drive and will be vital for the development of new therapies to treat heart failure disease progression.

Physiological changes in epilepsy

Over the past year the division has continued its physiological exploration of epilepsy. Scientists are researching the concept that the hyperexcitability of neurons in the cerebral cortex of the brain is a prime cause of epilepsy. Using a technique known as transcranial magnetic stimulation, we have been able to confirm the findings from animal models that hyperexcitability of cortical neurons in humans does indeed underly epilepsy. Using this technique to stimulate the area of the brain that controls hand movement, the team studies the size of involuntary movements. These are increased if the brain is hyperexcitable.

Stimulation limits us to studying hyperexcitability in the motor cortex, but scientists are currently extending this work to study other areas of the brain using fMRI. This aims to discover whether the distribution of hyperexcitability in the brain constitutes a network of interconnected neurons which form an abnormal electrical circuit.

There has been interest lately in implanting electrodes in the brain of patients with intractable seizures in the hope that brain stimulation may reduce seizure frequency, possibly by breaking this abnormal circuit. The group is currently investigating whether trains of high frequency transcranial magnetic stimulation pulses provided over the scalp can also reduce brain excitability and how long this lasts. If the group finds this to be the case it would provide further evidence to support the use of stimulation devices and a greater understanding of the physiological mechanisms which might bring this about.

Physiological changes in multiple sclerosis

(a) In the past year the group has studied changes in venous blood flow in patients with multiple sclerosis after a theory was published that the disease could at least in part be due to venous blood flow obstruction. In a study of over 50 mildly affected patients it was found there was no evidence to support this hypothesis (CCSVI).

(b) Nocturia or excessive urine production at night is a common complaint in patients with multiple sclerosis and is in most patients been put down to a low volume and poorly compliant bladder. In a pilot study patients with MS were asked to record urine volumes during the day and night. We found there was excessive production of urine at night compared with a normal control population. This suggests that nocturia is not explained by changes in the bladder alone. There may be an autonomic nervous system disturbance in PwMS affecting the control of blood pressure and kidney blood flow leading to a greater production of urine at night. This is an area of further study which may lead to alternative treatments for nocturia in PwMS.

(c) Olfaction in MS

In this study the team aims to compare changes in the sense of smell (olfaction) with changes in cognition (thinking and intellect) in PwMS to see whether a simple test of smell may be a biophysical means of screening for cognitive disturbance in PwMS in a busy outpatient clinic rather performing tests of cognition in all patients, which is time and labour intensive.
In 2010, the Florey established a Division of Neuro-ethics to broaden our scope and to complement our clinical and basic scientific investigations. The division promises to add a layer of philosophical rigor to our wide-ranging research.

The division is led by philosopher, Professor Neil Levy, who specializes in philosophy of mind and ethics. He focuses especially on how cognitive science – neuroscience, social and cognitive psychology – illuminate traditional philosophical questions, such as the nature of the control we have over our actions and the extent to which our common sense conception of ourselves needs to be revised. He is especially interested in self-control: how it is lost and how we can prevent such losses, both in pathological cases (e.g., addiction) and ordinary failures of the will (e.g., overeating).

These questions are tackled in a multi-pronged manner. Some of the work is traditional philosophy: argument and conceptual analysis. Some is empirical philosophy: bringing the details of work in cognitive science to bear on traditional philosophical questions such as the nature of free will. And some of the work is experimental, examining the ways in which the resources needed for self-regulation may be reduced in the short term when they are called upon for cognitively demanding tasks. This work is conducted in collaboration with University of Melbourne psychologists and Florey neuroscientists. Prof. Levy has a growing interest in the functional role of consciousness: how and to what extent does being conscious of information increase our control over our behaviour?

In 2010, Prof. Levy was awarded a prestigious Future Fellowship, an Australian Research Council award which funds four years’ full-time research. The fellowship was awarded to allow Prof. Levy to build on his work on the nature of self-control and the processes whereby it is undermined, with special reference to work in social psychology on self-regulation. The award provides funding for Prof. Levy to continue his successful collaboration with researchers at Oxford University, where he works with neuroscientists and philosophers on how the mind can be enhanced.

In 2011, Prof. Levy published *Hard Luck*, a new book on the nature of free will, with Oxford University Press. A review of *Hard Luck in Mind*, one of the most prestigious philosophy journals in the world, called the book “important and challenging”.

Intrepid cyclist Kieran Donlon left Cairns in September last year on an epic 4000km bike ride to raise money for the Florey’s research into Parkinson’s disease. He arrived back to his hometown of Warrnambool in South Western Victoria, after 25 days on the saddle.

Kieran set out to raise money for our Parkinson’s research team but achieved so much more.

A morning tea in Kieran’s honour was held in Canberra’s Parliament House when he helped promote the work of Florey scientists and the need for a cure to be found for Parkinson’s disease. Over an eventful day in Canberra, Kieran and Florey staff met with 23 members of parliament and advisors, discussing our work and the ongoing need for research funding. A team of parliamentarians from all sides then rode Kieran out of town as he headed for Melbourne.

Cheers and whistles welcomed Kieran as he rode up to the Florey’s Parkville labs in an emotional return a few days before he reached Warrnambool. Drs Clare Parish and Lachlan Thompson thanked Kieran for his brave ride and said they felt highly motivated to get back into the labs, inspired by Kieran’s efforts.

Kieran’s wife Julie lives with Parkinson’s and Kieran is her principal carer. The Florey thanks Julie for getting by without Kieran for a few weeks while he raised our profile across the country and brought in thousands of dollars to support the scientists working to find a cure. We also thank his mate and long-suffering roadie John Stafford, whose family has also been affected by Parkinson’s.
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<tr>
<td>Professor Kerin O’Dea</td>
<td></td>
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<tr>
<td>Mr Simon Parker Bowles</td>
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<tr>
<td>Sr Stanley W Peart</td>
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<tr>
<td>Professor David G Penington AC</td>
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<tr>
<td>Mr Robert Pirie</td>
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<tr>
<td>Lady ‘Primrose C Potter AC</td>
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<tr>
<td>Professor John R Poynter AO OBE</td>
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<tr>
<td>Mrs Jeanne Pratt</td>
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<tr>
<td>Mr Ian A Renard AM</td>
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<tr>
<td>Mr Geoffrey Ripper</td>
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<tr>
<td>Mrs Eda N Ritchie AM</td>
<td></td>
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<tr>
<td>Professor P John Rose AO</td>
<td></td>
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<tr>
<td>Professor F Sherwood Rowland</td>
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<tr>
<td>Professor Graeme B Ryan AC</td>
<td></td>
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<tr>
<td>Mr Philip H Scanlan AM</td>
<td></td>
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<tr>
<td>Mrs Lodi Smorgon AO</td>
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<tr>
<td>Dr Gail Trevaks AM</td>
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<tr>
<td>Mr Dale Turnbull</td>
<td></td>
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<tr>
<td>Professor James D Watson</td>
<td></td>
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<tr>
<td>The Right Hon Mr E Gough Whitlam AC OQ</td>
<td></td>
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<tr>
<td>Professor Torsten Wiesel FRS</td>
<td></td>
</tr>
<tr>
<td>Professor Marelyn Wintour-Coghlan</td>
<td></td>
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<tr>
<td>The Honourable Dr Michael Woodbridge</td>
<td></td>
</tr>
<tr>
<td>Sister Marie Bernadette Wunsch</td>
<td></td>
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<tr>
<td>Professor John R O’Keefe</td>
<td></td>
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<tr>
<td>Prof Brian Homes</td>
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<tr>
<td>Mr C Norman Geschke OBE</td>
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<td>Mr I Stanyard</td>
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<tr>
<td>Professor John R O’Keefe</td>
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<tr>
<td>Mr I Stanyard</td>
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</tr>
</tbody>
</table>
BOARD COMMITTEES

COMMERCIALISATION COMMITTEE:
Mr Robert Trenberth (Chair)
Dr Henry De Aizpurua
Prof Geoffrey Donnan
Dr Ergad Gold
Mr Gary Gray
Mr Ross Macdonald
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A/Prof Steve Petrou

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Mr Gary Gray
Prof Graeme Jackson
Mr Mark Jones
Prof Richard Larkins

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Prof Geoffrey Donnan
Prof Andrea Hull
Prof Graeme Jackson

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Prof Geoffrey Donnan
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Dr Mark Nelson

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Prof Graeme Jackson
Prof Richard Larkins
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Mr Charles K Allen AO (Ex officio)
Mr Andrew Darbyshire AM
Professor Geoffrey Donnan
Ms Michelle Jablko
Mr Simon Peck
Mr Nicholas A Terry

FLOREY NEUROSCIENCE INSTITUTES ANNUAL REPORT 2011

KEY POSITIONS:

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Mr Craig Drummond (Honorary Treasurer)
Professor Geoffrey Donnan (Scientific Director)

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Mr Andrew Abercrombie
Professor Andrea Hull
Professor Graeme Jackson
Mr Mark Jones
Professor Anne Kelso
Professor Richard Larkins
Dr Brendan Murphy
Professor James McCluskey
Dr Thomas Schneider
Mr Stephen Spargo
Mr Robert Trenberth

Florey Deputy Directors
Dr Henry De Aizpurua
Professor Graeme Jackson
Professor Malcolm Horne

Florey Associate Directors
Professor Alan Connelly
Assoc Professor David Howells
Professor Andrew Lawrence
Assoc Professor Steve Petrou

Chief Operating Officer
Mr Gary Gray
DONORS

HE WHO ALLOWS HIS DAY TO PASS BY WITHOUT PRACTISING GENEROSITY AND ENJOYING LIFE’S PLEASURES IS LIKE A BLACKSMITH’S BELLOWS - HE BREATHES BUT DOES NOT LIVE.

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DONORS

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Jeremy Goldring
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D Grbin
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D F Hough
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Jessica Huynh
Joan Ikin
Samantha Ingall
Injelectronics Australia
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William Irving
Terese Ivanyi
Arnold Izzard
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Masumi Jackson
Robert Jackson
Jo Jacobs
David Jacobson
Arkaor Jain
Raman Jajo
George James
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Darren Jenat
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John Kear
Kelvin Kellett
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Jane Kennedy
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Mary Kentish
W A Kerr
Janice Keysterton
Fen Kho
Joseph Kies
Pamela Kiler
Kilsyth Scottish Country Dance Group Inc
Cornelia Kinsma
Margaret King
Robyn Kingston
Ellen Kinkel
Terry Kinsella
Val Knaggs
Betty Knight
Peggy Knight
Rod Knight
Allan Knight
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David V La Fontaine
Elizabeth Lalor
Thu Lam
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Doug Lane
James Lang
Gina Langlands
Fay Langstaff
Vek Laptev
Peter Launister
Peter Lausch
Clare Lawrence
Karen Lawson
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Anna Layton
Graeme Layton
LeasePlan Australia
J Lederman
Helen Ledlin
Anthony Lee
Lois Lee
Maxwell Lee
Daren Leishman
Geoff Levy
Simon Lewis
Linda Liu
Antonio Linossi
Lions Club of Queenscliff Point Lonsdale Inc
Edith Lipka
Bruce Linhgow
Bran Little
Lei Liu
Algidas Lubinas
Margaret Miermore
Winfred Livingstone
Nick Lolatgs
P Long
Elisabeth Loomah
Elisabeth Lord
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The Eirene Lucas Foundation
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Michael Macgeorge
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MacKinnon Trust
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The MAC Services Group
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Warren Madsen
Patrick Maguire
Janet Mahaffey
L G Maidment
D Mann
Marjory Mar
Ambre Manning
Bridget Mar
Margaret March
Reg Marlow
Jack Martin
Marjory-Dore Martin
Heather March
Kathleen Mason
Stephen Mason
Janet Mather
Carol Matthews
Mike Matthews
Peter Matthews
Raymond Matthews
Tom Matthews
Christine Mavrodoglos
David McAllister
M McAllister
Rex McConchy
Naomi McConchie
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Gillian McDermott
Lisa McDonald
Lois McDonald
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Wanda McDougall
Zina McNally
Emmeline McFadyen
Albert McGill
Katherine McGlin
Joan McHady
Bers McKenzie
Bruce McKenzie
Judith McKenzie-McHarg
Gordon McKirk
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Lawrence Melgaard
Norma Mella
Jean Melzer
Frederick Mendelsohn AO
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John Meyer
Judith Middlemass
Roslyn Miele
Etheh Mirmas
Harold Mitchell Foundation
Helen Mitchell
Kerry Mitchell
Lyn Mitchell
Heather Mitchener
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Graham Moore
Judith Moore
Mooroopna Urban Fire Brigade
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Patricia Monroe
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N B Mower
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Ann Muffatti
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t Edward Munz
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Rosemary Neilsen
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Lousie Nield
Anthony Nigro
John O’Brien Smith
Raimond Ngoe
Clint Norquay
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Richard Noorssam
Elizabeth Oakley
Joy Oaten
Aileen Oberegger
Doris O’Brien
Sara O’Connor
Michael O’Keeffe
Merrilyn Oldfield
Lisa Olive
Lois Oliver
Sue O’Neill
**FINANCIAL STATEMENTS**

**STATEMENT OF COMPREHENSIVE INCOME**

FOR THE YEAR 1 JANUARY 2011 TO 31 DECEMBER 2011

<table>
<thead>
<tr>
<th>CONSOLIDATED GROUP $’000</th>
<th>FLOREY NEUROSCIENCE INSTITUTES $’000</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INCOME STATEMENT</strong></td>
<td></td>
</tr>
<tr>
<td>Revenue from ordinary activities</td>
<td>28,770</td>
</tr>
<tr>
<td>Salaries and employee benefits</td>
<td>(20,728)</td>
</tr>
<tr>
<td>Raw materials and consumables used</td>
<td>(3,794)</td>
</tr>
<tr>
<td>Conferences and collaborations</td>
<td>(1,372)</td>
</tr>
<tr>
<td>Building maintenance</td>
<td>(1,723)</td>
</tr>
<tr>
<td>Research support services</td>
<td>(263)</td>
</tr>
<tr>
<td>General administration</td>
<td>(1,403)</td>
</tr>
<tr>
<td>Other expenses from ordinary activities</td>
<td>(209)</td>
</tr>
<tr>
<td>Distribution of grant funds</td>
<td>(1,884)</td>
</tr>
<tr>
<td><strong>Net operating (deficit) before depreciation</strong></td>
<td>(2,606)</td>
</tr>
<tr>
<td>Depreciation and amortisation</td>
<td>(3,544)</td>
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<tr>
<td><strong>Net operating (deficit) after depreciation</strong></td>
<td>(6,150)</td>
</tr>
<tr>
<td>Revenue contributed for building costs and project activities</td>
<td>39,338</td>
</tr>
<tr>
<td>Expenses related to building costs</td>
<td>(12,779)</td>
</tr>
<tr>
<td>Allocation of building space to third parties</td>
<td>(4,506)</td>
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<tr>
<td><strong>Net surplus for the year</strong></td>
<td>15,903</td>
</tr>
<tr>
<td><strong>Other comprehensive income:</strong></td>
<td></td>
</tr>
<tr>
<td>Net (loss) on revaluation of financial assets</td>
<td>(969)</td>
</tr>
<tr>
<td><strong>Other comprehensive income for the year</strong></td>
<td>(969)</td>
</tr>
<tr>
<td><strong>Total comprehensive income for the year</strong></td>
<td>14,934</td>
</tr>
<tr>
<td><strong>Total comprehensive income attributable to members of the entity</strong></td>
<td>14,934</td>
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</tbody>
</table>

The Florey Neuroscience Institutes consolidated group includes: Florey Neuroscience Institutes, Howard Florey Institute, Brain Research Institute, National Stroke Research Institute, Howard Florey Institute Foundation, Genvartec Pty Ltd

**STATEMENT OF FINANCIAL POSITION**

AS AT 31 DECEMBER 2011

<table>
<thead>
<tr>
<th>CONSOLIDATED GROUP $’000</th>
<th>FLOREY NEUROSCIENCE INSTITUTES $’000</th>
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<tr>
<td><strong>ASSETS</strong></td>
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<tr>
<td>Current Assets</td>
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<td>Cash and short-term deposits</td>
<td>36,496</td>
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<td>Trade and other receivables</td>
<td>5,665</td>
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<td>Available for sale financial assets</td>
<td>10,905</td>
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<td>Prepayments</td>
<td>164</td>
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<td>Inventory</td>
<td>53</td>
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<tr>
<td><strong>Total Current Assets</strong></td>
<td>53,283</td>
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<tr>
<td>Non-Current Assets</td>
<td></td>
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<tr>
<td>Property plant and equipment</td>
<td>13,989</td>
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<tr>
<td>Assets under construction</td>
<td>79</td>
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<tr>
<td>Other Assets</td>
<td>81,356</td>
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<tr>
<td><strong>Total Non-Current Assets</strong></td>
<td>95,424</td>
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<td><strong>TOTAL ASSETS</strong></td>
<td>148,707</td>
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<td><strong>LIABILITIES</strong></td>
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<td>Current Liabilities</td>
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<tr>
<td>Trade and other payables</td>
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<tr>
<td>Provisions</td>
<td>4,774</td>
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<tr>
<td>Unearned revenue</td>
<td>45</td>
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<tr>
<td><strong>Total Current Liabilities</strong></td>
<td>7,190</td>
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<tr>
<td>Non-Current Liabilities</td>
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<tr>
<td>Provisions</td>
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<tr>
<td><strong>Total Non-Current Liabilities</strong></td>
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<tr>
<td><strong>TOTAL LIABILITIES</strong></td>
<td>7,730</td>
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<tr>
<td><strong>NET ASSETS</strong></td>
<td>140,977</td>
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<tr>
<td>Funds</td>
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<tr>
<td>Retained surplus</td>
<td>115,763</td>
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<tr>
<td>Unrealised investment reserve</td>
<td>(980)</td>
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<tr>
<td>Merger/reorganisation reserve</td>
<td>26,194</td>
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<tr>
<td><strong>TOTAL FUNDS</strong></td>
<td>140,977</td>
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</tbody>
</table>

**FLOREY NEUROSCIENCE INSTITUTES ANNUAL REPORT 2011**

*The Florey Neuroscience Institutes consolidated group includes: Florey Neuroscience Institutes, Howard Florey Institute, Brain Research Institute, National Stroke Research Institute, Howard Florey Institute Foundation, Genvartec Pty Ltd*
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Cristian Bustos
Craig Thomson
Embryo Services
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Taryn Knight
Ryan Mackenzie
Mouse Facility
Krista Brown
Leah Catalano
Blair Dowding
Daniel Dreberg
Ana-Kiwa Hudson
Kim Schafers Ryan
Nerida Taylor
Kylie Williams
Rat Facility
Maria Bastias
Gregory Thomas
Thomas Vale

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Animal Services
Jacqueline House

**BRAIN DEVELOPMENT & REGENERATION**
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Anh Doan
Vicki Hammond
Jason Howitt
Ean Lee
Alison Macintyre
Ullrich Putz
Seong Tan
Michelle Tang

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Building Management
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Peter Ward
Corporate Services
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Gary Gray
Finance
Christine Corbett
Ross Humphreys
Irina Kouchnireva
Patricia Lee
Anita Pajic
Bill Ristevski
Li Wan Tan
Fundraising and Marketing
Jennifer Elliott
Amanda Place
Jade Sama
Margot Simondson
Astrid Sweers
Human Resources
Cara Cortese
Rodi Neri
Information Technology
Timothy Brewer
Kenny Jao
Simon Miller
Occ Health and Safety
Damian Carroll
Frances Tait
Operations Management
Rita Alampi
Krysten Donaldson
Connie Jacobbs
Carmel Jacobson
Hannah Soulaiman
Purchasing
Christine Johnston-Balls
Heather Madsen
Jeremy Musolino
Mile Petrovski
Reception Parkville
Margaret Black
Sarah Fisher
Ihiaa Hosken
Matthias Koerning
Ting Ting Lee
Zhi-Ming Ma
Christina Mo
Kathryn Munro
Vera Phipps
Philipp Roth
Jennifer Sabo
Annabel Short
Jo Stratton
Boon Siang Tan
Upasna Varna
Agnes Wong
Luz Yevanes-Ugarte

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**EXECUTIVE DIRECTOR**
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Steven Fleming
Xiaoyun Liang
Donna Parker
David Raffelt
Famoosh Sadeghian
Jacques-Donald Tournier
Lisa Willats
Interception Lab
Michael Farrell
Neuroimaging
Leigh Johnston
Hong Wang
David Wright

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Ion Channels & Human Diseases
Alison Clarke
Lyneil Cordoiro
Elena Gazina
Bajun Gu
Steven Petrou
Alison Phillips
Christopher Reid
Kay Richards
Evan Thomas
Chantel Trager
Ernesto Vargas Delgado
Verena Wimmer
Purinergic Signalling
Kelsy Dalton
Michelle Kovacevic

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Michele Binder
Holly Cate
Ben Emery
Judith Field
Rex Huang
Laura Johnson
Trevor Kilpatrick
Daniel Merlo
Tobias Merson
Jerome Staal

**NEURO ETHICS**
Ayla Banutchi
Neil Levy

**GENOMIC DISORDERS RESEARCH CENTRE**
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Richard Cotton
Asha Herten-Crabb
Heather Howard
Alexandra Klis
Ourania Poulis

**INTERNATIONAL JOURNAL OF STROKE**
Carmen Lahiff-Jenkins
Swee-Lian Low

**FLOREY NEUROSCIENCE INSTITUTES ANNUAL REPORT 2011**
OUR PEOPLE

NEURO-DEGENERATION

Adult Neurogenesis Lab
Timothy Aumann
Doris Tomas

Molecular Neuropharmacology Lab
Phil Beart
Chew Lau
Linda Mercer

Neurodegeneration
Malcolm Horne
Katya Kotschet
Rebecca Sheean
Davor Stanic
Bradley Turner

Neurogenesis & Neural Transplantation
Lachlan Thompson
Mong Tien

Stem Cells & Neurodevelopment Lab
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Clare Parish

Steroid Neurobiology Lab
Weh Boon
Hui Kheng Chua
Lee Ng

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Timothy Hast
Sharon Layfield
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Feng Lin
Fazel Shabanpoor
John Wade

Peptide Neurobiology Lab
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Qian Sang
Craig Smith
Melanie White

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Alan McDonald

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Leonid Churilov
Li Quang

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Karen Borschmann
Jan Chamberlain
Janice Collier
Toby Cumming
Cecilia Li
Tara Purvis
Anne Rohrer
Sally Speare

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Q Li
Renee Lichter

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Gemma Lamp
Christine Marsh
Susan Mary Palmer
Anne Marie Tan
Tamara Tse

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David Carey

Natasha Moloczij
Karen Moss
Kate Paice
Nicole Wallis

Stroke
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Kwai Ho
David Howells
Henry Ma
Anna Marcon
Victoria O’Collins
Sandra Petrolo
Sarah Rewell
Liem Vo
Lisa Walker

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Anthony Dornorn
Sally Hood
Clive May
Rohit Ramchandra
Song Yao

Systems Neurobiology
Melinda Goga
Lesley Walker
Frank Weissborn

Systems Neurophysiology
Bradford Bratton
Mathias Dutschmann
Robin McAllen
Stuart McDougall
Hari Subramanian
Mutsumi Tanaka
David Trevaks
# PHD Students

## Behavioural Neuroscience
- Elizabeth Claire Cahir
- Rose Chesworth
- Sarah Gibbs
- Luning Jiang
- Heather Bronwyn Madsen
- Karlene Scheller
- Alec Dick

## Behavioural Neuroscience / Neural Plasticity
- Christina Mo
- Xin Du
- Annabel Short

## Brain Development & Regeneration
- Hui-Xuan Ng
- Paul Eleftheriou
- Choo Peng Goh
- Yija Li
- Ley Hian Low

## Brain Injury & Repair
- Yea Seul Shin

## Imaging
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- Bob Tran

## Ion Channels & Human Diseases
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- Tae Hwan Kim
- Bryan Leaw
- Melody Li
- Megan Oliva
- Robert Hatch
- David Kaplan

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- Curtis Hay
- Agnes Wong

## Multiple Sclerosis
- Anna Jonas
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- Brett Fisher
- Zhi Ming (Gerry) Ma
- Philipp Thomas Roth
- Jennifer Sabo
- Matthias Koenning

## Neurodegeneration
- Brette Blakely
- Shoshanah Longmuir
- Paniniage Nirma Dim Perera
- Rebecca Sheean
- Yi Sui
- John Tran
- Ting-Yi Wang
- Jordan Wright

## Neurodegeneration / Steroid Neurobiology
- Kristina Vacy

## Neuroimaging
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- Hamed Aklaghi
- Ayaka Ando
- Hamed Asadi
- Susan Ilic
- Jennifer Leech
- Camille Shanahan
- Haochang (Chris) Zheng

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- Linda Chan
- Bryna Chow
- Despina Ganella
- Iliaa Hosken
- Hanna Kastman
- Philip Ryan
- Andrew Walker
- Natalie Witteveen
- Su Ee Wong
- Holly Yeatman

## Neuropeptides / Relaxin
- Roy Chze Khai Kong

## Neuropeptides / Peptide Chemistry
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## Systems Neuroscience
- Karen Hill
- Kayte Jenkin
- Lannie O’Keefe
- Anna Roy
- Katie Astell
- Paolo Calzavacca

## Stroke Basic Science
- Kathryn Susanti Ardipradja
- Candace Loy
- Sarah Rewell

## Stroke Neuro-Rehabilitation
- Michaela Pascoe
- Isobel Hubbard
- Tamara Tse

## Stroke Avert
- Louise Craig
- Natalie Fini
- Heidi Janssen
- Julie Luker
- Karen Borschmann

---

**Florey Neuroscience Institutes Annual Report 2011**
Dr Clare Parish, the head of the Stem Cell and Neurodevelopment laboratory, has been made a senior medical research fellow through the Sylvia and Charles Viertel Charitable Foundation. The fellowship is valued at $975,000 over five years and provides salary and project grant support to outstanding Australian medical researchers.

THE FLOREY NEUROSCIENCE INSTITUTES ACKNOWLEDGES THE TRADITIONAL OWNERS OF THIS LAND, THE WURUNDJERI PEOPLE AND THE KULIN NATIONS. WE PAY OUR RESPECTS TO THEIR ELDERS, PAST AND PRESENT. WE WOULD LIKE TO ACKNOWLEDGE THAT OUR TWO NEW BUILDINGS REST ON THIS PRECIOUS LAND.