Garvan’s mission is to make significant contributions to medical research that will change the directions of science and medicine and have major impacts on human health. Garvan strives to enhance and develop research programs that combine fundamental science with strong clinical interactions.
CONTENTS

_ 03 Who We Are, What We Do
_ 04 Research Highlights
_ 07 Garvan at a Glance
_ 10 Chairman’s Report
_ 12 Executive Director’s Report
_ 14 Garvan Research Foundation Chairman’s Report
_ 17 Organisational Chart

Research Programs
_ 19 Cancer
_ 27 Diabetes and Obesity
_ 33 Immunology and Inflammation
_ 39 Osteoporosis and Bone Biology
_ 43 Neuroscience
_ 47 Autoimmunity Research Unit
_ 51 Pituitary Research Unit
_ 55 Core Research Facilities
_ 57 Management Highlights
_ 59 Business Development

Garvan Community
_ 60 Life Governors
_ 60 Partners for the Future
_ 60 Volunteers
_ 61 Garvan Supporters
_ 63 Bequests

Governance
_ 65 Institute Governance
_ 67 Foundation Governance

_ 72 Publications
_ 81 Financial Highlights
The Garvan Institute of Medical Research is a world leader in its field, pioneering study into some of the most widespread diseases affecting our community today. Research at Garvan is focused upon understanding the role of genes in health and disease as the basis for developing future cures.

Significant breakthroughs have been achieved by Garvan scientists in the understanding and treatment of diseases such as:

- Cancer
- Diabetes and obesity
- Alzheimer’s and Parkinson’s disease
- Osteoporosis
- Arthritis and asthma
- Pituitary disorders

Garvan’s ultimate goal is prevention and cure of these major diseases.
Diabetes researchers found a significant missing link in our knowledge about insulin and how it helps cells absorb glucose. We showed that insulin activates a ‘motor protein’ that in turn drives glucose transport molecules to the cell surface.

Our Dubbo Osteoporosis Epidemiology Study demonstrated that low levels of testosterone in men double their risk of bone fracture; that men with prostate cancer face a 50% higher risk of fracture, which increases to nearly 100% if they are receiving androgen deprivation therapy; and that osteoporotic fractures increase a person's risk of dying, even after relatively minor fractures if that person is over 75. The Osteoporosis and Bone Biology Program also devised a web-based fracture risk calculator, which has been widely adopted by the medical community throughout Australia.

To remain healthy, we must maintain exactly the right number of B cells, the white blood cells that produce antibodies. Garvan immunologists identified two proteins made inside B cells, TRAF2 and TRAF3, that are essential for maintaining this important balance within our immune systems. When the balance fails, we become prone to developing certain cancers or autoimmune diseases.

An international team of scientists from Garvan, Harvard Medical School and the Max Planck Institute in Germany, identified processes that are heavily implicated in human multiple myeloma and other B cell cancers, moving us closer to developing quick tests and readouts that could help in the tailored treatment of patients.

Neuroscience researchers showed that a hormone released naturally from the gut after a meal could be used to treat obesity and Type 2 diabetes. The hormone peptide YY (PYY) acts on the brain, contributing to a feeling of satiety, suggesting the use of this hormone as a weight loss medication.

Researchers concluded that low levels of PYY could be used as a predictor for the development of Type 2 diabetes. Clinical studies showed that people with a family history of Type 2 diabetes, but not yet showing signs of insulin resistance themselves, produce lower levels of PYY after eating, a very early sign of pre-diabetes.

Cancer researchers found that by ‘switching off’ the Id1 gene, produced by the most aggressive forms of breast cancer, it is possible to induce a state of ‘senescence’, or permanent sleep, within a tumour, preventing it from growing or spreading.

Garvan and CSIRO signed a three-year collaboration agreement to investigate important cellular processes, including those impaired by diseases such as diabetes. They will be using a new computer vision system they developed jointly to watch intricate cellular processes in real time.

Immunology researchers working on Type 1 diabetes uncovered a process with the potential to alter the body’s response to anything it perceives as not ‘self’, by stimulating the production of a class of immune cells known as T regulatory cells. The finding gives us hope that one day it may be possible to alter the immune system to accept tissue transplants without the need for any immunosuppression.
_ Garvan epigenetics expert, Professor Susan Clark, was the Australian contributor to a Nature article about the global taskforce taking shape for the human epigenome project. Professor Clark is one of the founding members of the Australian Epigenome Alliance, formed in 2008.

_ Cancer researchers identified a way to ‘switch off’ Gab2, a key protein in the molecular processes that trigger breast cancer and certain forms of leukaemia. Gab2 operates downstream of a major breast cancer oncogene, HER2, the target of the drug Herceptin.

_ Teams from Garvan’s Diabetes Program and the Shanghai Institute of Materia Medica pulped roughly a tonne of fresh bitter melon, a Chinese vegetable, and extracted four very promising bioactive components that explain why it is has been used in Chinese medicine for hundreds of years. It now promises to be an effective treatment for Type 2 diabetes.

_ In collaboration with researchers from Canberra’s John Curtin School of Medical Research, Garvan immunologists worked out why people with Hyper IgE Syndrome, or ‘Job’s Syndrome’, are unusually susceptible to certain common infections. By revealing the exact molecular mechanisms involved, they were given clues as to why some ‘healthy’ people are more prone to these infections than others.

_ A study undertaken by researchers in our Pituitary Research Unit demonstrated the ‘placebo effect’ in sport. If athletes believe they are using a performance-enhancing drug, they may think their performance improves, and in some it can, even if they are actually taking a dummy drug.

_ Until now, it was thought that the processes leading to the death of insulin-secreting pancreatic cells were similar in both types of diabetes. Researchers in our Diabetes Program showed that the process is quite different in the two diseases. They also identified a promising therapeutic target for people with Type 2 diabetes.

_ Our bodies rely on the production of potent, or ‘high affinity’, antibodies to fight infection. The process is very complex, yet Garvan immunologists have discovered that it hinges on a single molecule known as IL-21, a growth factor, without which it cannot function. This finding suggests ways to strengthen the body’s natural defences.

_ Seminal work within the Cancer Program, correlating expression of certain functionally-related oestrogen-regulated genes with predictable clinical outcomes, should help clinicians decide which women with breast cancer will make good candidates for anti-oestrogen therapies, such as tamoxifen, and which will not.

_ Clinicians have known for some time that people treated for HIV also become much more susceptible to diabetes and heart disease. A study by clinical researchers in our Diabetes group, in collaboration with St. Vincent’s Hospital’s Centre for Immunology, showed some of the reasons why - enabling better patient management and monitoring.

_ Immunology researchers identified a process, a synergistic encounter between two molecules, IL-4 and IL-21, that may account for the extreme allergic reactions some people experience. By silencing at least one of these molecules, it may be possible to treat allergies.

_ The Osteoporosis and Bone Biology Program collaborated with the Icelandic genetics company, deCode, in an extensive multi-nation genome-wide search to find the genes linked to osteoporosis and fracture. Five regions of interest were identified that appear to warrant further scientific investigation.

_ Metabolic experts in our Diabetes Program, in collaboration with Melbourne’s Baker IDI Heart and Diabetes Institute made a finding that is likely to be an important milestone in understanding the mechanisms of obesity related insulin resistance, a precursor of Type 2 diabetes. They have manipulated one important protein to help muscle burn fats.
GARVAN AT A GLANCE

Research Collaborations
Scientific Publications

Impact factor of scientific publications
Each paper published constitutes a new piece of knowledge, and scientists aim to publish in the most highly regarded journal in their area of research. Each journal has an “impact factor” which is a common measure of its relative importance within a specific discipline. Research organisations use “average impact factor” measurements to determine the overall significance of their research output. For example, in 2008 Garvan achieved an “average impact factor” greater than 8 for the top 75% of its publications. This is a very respectable tally, well above the international benchmark.

Growth in Philanthropic Support

Total Income
(excluding bequests) received by Garvan Research Foundation
- $3,539,000
- $2,790,000
- $4,158,000
- $5,370,000
- $6,966,000

Donations are particularly important in two respects:
- They provide seed funding for novel work, which may not attract other support for several years
- They fund core items of equipment that are typically not covered by research grants
**Growth in Staff Numbers**

- Average age 38
- Researchers from 55 countries
- Research staff 61% female, 39% male

<table>
<thead>
<tr>
<th>Year</th>
<th>Researchers</th>
<th>Students</th>
<th>Scientific Facility Staff</th>
<th>Secretarial &amp; Administration</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>291</td>
<td>61</td>
<td>44</td>
<td>27</td>
<td>393</td>
</tr>
<tr>
<td>2004</td>
<td>308</td>
<td>68</td>
<td>62</td>
<td>35</td>
<td>433</td>
</tr>
<tr>
<td>2005</td>
<td>373</td>
<td></td>
<td>44</td>
<td></td>
<td>433</td>
</tr>
<tr>
<td>2006</td>
<td>403</td>
<td></td>
<td>62</td>
<td></td>
<td>479</td>
</tr>
<tr>
<td>2007</td>
<td>433</td>
<td></td>
<td>62</td>
<td></td>
<td>479</td>
</tr>
<tr>
<td>2008</td>
<td>479</td>
<td></td>
<td>62</td>
<td></td>
<td>479</td>
</tr>
</tbody>
</table>

**Operating Income**

2008 $47 Million

- Competitive grants 61%
- Other grants 10%
- Donations 10%
- NSW Government 9%
- Industry partners 2%
- Other income 8%

One of the major challenges facing successful research institutes around Australia remains the "gap" between the total costs of doing research and the funding provided by competitive research grants. For every dollar of research funding awarded, another 70 cents is required to carry out the research.

**Peer Reviewed Grant Income**

<table>
<thead>
<tr>
<th>Year</th>
<th>NHMRC $ Mil</th>
<th>Other $ Mil</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>8,465</td>
<td>5,636</td>
</tr>
<tr>
<td>2004</td>
<td>9,244</td>
<td>6,222</td>
</tr>
<tr>
<td>2005</td>
<td>12,080</td>
<td>8,685</td>
</tr>
<tr>
<td>2006</td>
<td>13,832</td>
<td>8,184</td>
</tr>
<tr>
<td>2007</td>
<td>16,682</td>
<td>8,530</td>
</tr>
<tr>
<td>2008</td>
<td>18,695</td>
<td>9,159</td>
</tr>
</tbody>
</table>

Our funding from the National Health and Medical Research Council (NHMRC) rose to a record $18.7m, up from $16.7m in 2007. Overall, peer reviewed grant funding increased to approximately $27.9m.
2008
Garvan continued its excellent record of research success in 2008, as measured by grants, publication impacts and international awards, and we are justly proud of our faculty and staff.

Several important strategic initiatives came to fruition during the year, including:
- completion of a major review of the Institute’s future directions by an international panel
- the opening of our major breeding and holding facility for experimental mouse models in the Southern Highlands (Australian BioResources), and
- rapid progress in development of plans for the new Garvan St Vincent’s Campus Cancer Centre.

Financial Performance
Garvan’s operating income grew to approximately $47m in 2008 from $42m the previous year, an increase that is testament to the quality of Garvan research. Philanthropic support through the Garvan Research Foundation, essential for providing critical equipment and facilitating new initiatives, continued to be strong, with over $4.7m in general and specific grants contributed to research programs and almost $4.0m into the long term endowment of the Institute.

Our People
Once again my sincere thanks and admiration are extended to Professor John Shine, his senior management team, faculty and staff.

I am also most grateful for the commitment and counsel of the Board of Directors. The only change to the composition of the Board during the year was the resignation of Ms Mary Foley, following her retirement from the position of Chief Executive of St Vincents & Mater Health. During her tenure on the Board, Ms Foley championed the close relationship between Garvan and St Vincent’s. We welcomed the new CEO of St Vincents & Mater Health, Mr Steven Rubic, to the Board in the latter part of 2008.

Strategic Review
In 2008, the Board commissioned an independent review of the Institute’s programs and directions, assembling a review panel of leading international scientists for this important task. Chaired by Professor Bruce Dowton, former Dean of the UNSW Medical School and now Senior Vice President at Harvard Medical International, the panel completed its work midway through 2008. This provided a valuable strategic framework for management and Board in setting future directions for the Institute. The Board endorsed the recommendations of the Review and I am pleased to advise that the implementation process is already well underway.
The Review confirmed the importance for Garvan of focusing its efforts on a few research themes where it can expect to remain internationally relevant and competitive. Cancer, diabetes/metabolism, neurobiological disorders and immunology all fell into this category. The Review encouraged an increasing emphasis on translational work and confirmed the importance of the proposed Garvan St Vincent’s Campus Cancer Centre.

The Review also urged Garvan to strengthen its Institute-wide culture by breaking down “research silos”. Accordingly, some important new governance and management structures have already been implemented and are outlined by the Executive Director in this report.

**Garvan St Vincent’s Cancer Campus Centre**

During 2008, the $100m Garvan St Vincent’s Campus Cancer Centre project gained significant momentum. Extensive work was completed on the development of the functional and design briefs and the appointment of architects. Importantly, we were also successful in attracting major philanthropic support of nearly $20m plus the commitment of the land from the Trustees of St Vincent’s Hospital.

The vision is to create a facility of international standing and world’s best practice in translational cancer research which will accelerate the rate at which new discoveries can be trialled in the clinic. The Centre will bring together clinicians, clinical researchers and biomedical scientists from across the campus, to improve patient outcomes via the detection, diagnosis and treatment of cancer.

**Business Development**

Garvan's success in basic research is being matched by progress in translating research “discoveries” into real outcomes for patients.

One important project involves a potential novel treatment for Type 2 diabetes. As this debilitating disorder develops, the beta cells of the pancreas fail to secrete enough insulin to regulate levels of blood sugar. Garvan’s diabetes researchers have discovered that the enzyme, protein kinase C epsilon (PKCe) plays a central role in this process and that inhibition of PKCe results in a marked improvement in insulin secretion. Accordingly, we have entered into an agreement with a US based pharmaceutical group to evaluate new potent PKCe inhibitors, already in clinical trials for another indication. If the results are as positive as we expect, the compounds should enter the clinic in a short timeframe.

**2009**

In the year ahead, we anticipate the ongoing challenges of expansion, particularly the continuing pressure on infrastructure. Important new initiatives, such as the cancer centre, will also require a major increase in financial and human resources.

The Board is confident that, with the support of government and the community, our research will continue to have a growing impact on human health, particularly as we integrate it even more closely with health care delivery.

**Bill Ferris AC**

Chairman

Garvan Institute of Medical Research
2008 was another outstanding year for Garvan in terms of significant research findings, success in obtaining competitive grants and growth in the number of papers accepted for publication in prestigious international journals. We published 185 peer reviewed research papers, the top 75% in journals with an average impact factor greater than 8. This remains above internationally accepted benchmark levels and is testament to the excellence and commitment of our researchers.

Research publication productivity was matched by success in applications for competitive grants. Our funding from the National Health and Medical Research Council (NHMRC) rose to a record $18.7m, up from $16.7m in 2007. Overall, peer reviewed grant funding increased to approximately $27.9m.

Of particular importance was our success with NHMRC Program grants for both the Cancer and Diabetes and Obesity Programs. Together with renewal of a similar Program grant for the Immunology Program in 2007, three of the Institute’s major research programs now have guaranteed high-level support for the next five years. This allows us to think more strategically long-term.

Staff numbers across the organisation continued to grow to a total of 479. Growth was particularly strong in our Cancer, Immunology and Diabetes and Obesity Programs, reflecting ongoing success in competitive grant applications for new and existing projects.

Australian BioResources (ABR)
The state-of-the-art holding and breeding facility for experimental mice lines at Moss Vale provides critical infrastructure for Australian innovation. Experimental mouse-based models underpin modern medical research and biotechnology, their use growing exponentially in recent years. As a result, medical research institutes and universities are increasingly challenged to find the resources to house and provide expert care and specialised breeding and laboratory services for the rapidly expanding colonies. This situation threatens to compromise our internationally competitive research and hold back innovation in the sector.

The facility is now fully operational and already proving to be a success, fulfilling the needs of Garvan and its initial partners across NSW. At the end of 2008, ABR held nearly 20,000 mice, a number expected to double over the next few years.

Campus Developments
An active member of the St Vincent’s Campus, Garvan values its historic and ongoing close association with St Vincent’s Hospital and its commitment to the values of the Sisters of Charity.

During 2008, the new Lowy Packer Building for Victor Chang and St Vincent’s research was officially opened, providing state-of-the-art research accommodation for over 200 researchers. Like the Garvan building, the new building will house several core research facilities shared by all research groups on the Campus. With the decanting of Victor Chang and St Vincent’s researchers from space previously occupied in Garvan, we have refurbished the area to increase available research space and accommodate new technologies.
Our joint venture with St Vincents & Mater Health to establish the Garvan St Vincent’s Campus Cancer Centre made major progress in 2008. Garvan researchers and St Vincent’s clinicians are united in their enthusiasm for this unique opportunity to translate our research “discoveries” into improved treatment and prevention of cancer.

2009
Last year a major review was carried out examining the future directions of Garvan’s science and optimal structure to facilitate ongoing success. This has helped shape our thinking and planning over the next decade. We have already implemented some important changes to our management structure to help address the challenges of growth and the increasing cross-Program nature of our research endeavours. Specifically, we have created an Executive Research Committee as the major policy and strategic advisory body of Garvan. Chaired by the Executive Director, the committee includes leading researchers at varying stages of their careers, allowing a broad spectrum of Garvan researchers to help chart our future.

Other important initiatives follow the Review, including the establishment of an Operations Committee, chaired by the Chief Operating Officer, charged with enhancing communication between our ever increasing research base and the professional support functions essential for the effective operation of the Institute. We have also reconstituted our Scientific Appointments and Promotions Committee to include additional external members as the breadth of our research activities expand. Similarly, we are appointing a Scientific Advisory Council of eminent international and national researchers to help advise the institute on current and future research directions.

I look forward to reporting on the detail and successful outcomes of these new structures in future years, as Garvan evolves to take maximum advantage of the enormous opportunities to improve quality of life that are evident in today’s medical research. Reinvigorated by the success of 2008 and strengthened by the outcomes of the Review, we will remain clearly focused on elucidating the fundamental basis of disease. We will also drive the translation of our research discoveries into new and improved ways to prevent and treat the major diseases that challenge our society.

John Shine AO FAA
Executive Director
Garvan Institute of Medical Research
I am delighted to report that the Foundation’s results have exceeded expectations in 2008 by over $2.0 million, with total income of $10.2 million – an exceptional performance, particularly in this economic climate.

Total gift income excluding bequests was $7.0 million, as against $4.2 million in 2006 and $5.4 million in 2007, continuing the growth trajectory initiated by our CEO when she took up the role three years ago.

Bequests this year totalled $3.1 million. It is impossible to overstate the significance of such gifts, often enabling us to put in place a ‘next generation’ program or core research infrastructure.

The Foundation grew its annual grant to the Institute to $926,000 and contributed $3.8 million to specific research programs or projects. We also added nearly $4.0 million to the Institute’s endowment fund.

**Major gifts**

We thank our major donors (some of whom choose to remain anonymous) for their loyalty and support of our research programs.

Ms Rosemary Pryor gave $1 million to fledging projects in Neuroscience (work that requires up to three years of philanthropic funding before it is possible to apply for competitive peer-reviewed grants). Mrs Virginia Kahlbetzer continued her crucial support ($200,000 per year) for our lung cancer research.

Stalwart corporate supporter, the MLC Community Foundation, pledged $1 million over five years, to support one of our core scientific facilities.

New corporate supporter, graysonline.com, committed $200,000, enabling the purchase of a key piece of scientific equipment. Graysonline.com also auctioned jewellery from the Drs Ryan’s estate, helping us raise nearly $60,000.

The John T Reid Charitable Trusts donated funds to support a new microscope for the Molecular Imaging Unit, accessed by researchers at Garvan, across the campus and at other research enterprises.

Mr Trevor and Mrs Christina Kennedy contributed the majority of their $1.0 million gift to hearing loss research in 2008. Lady (Mary) Fairfax also gave a further $500,000 to this research.

Mr Paul and Mrs Judy Hennessy established the Stuart Furler Travel Fund. Stuart was one of the longest-serving researchers at the Garvan until he died of pancreatic cancer. The Fund will support young researchers’ travel to international conferences and laboratories.
Events
The Foundation managed several events in 2008, including the AGM, the opening of Australian BioResources in Moss Vale and the Institute’s Open Day. On 17 August, Garvan opened its doors to over 900 visitors, showcasing disease-focused information booths manned by our researchers; presentations on diabetes and cancer; and a panel of distinguished guests discussing the future of science and medicine. Open Day feedback was excellent and we intend to run this event every second year.

Our Young Garvan Committee again delivered three forums for the 25–35 year old professionals of Sydney, helping to raise awareness of the importance of medical research.

The Garvan St Vincent’s Campus Cancer Centre
In addition to Garvan core business, the Foundation CEO accepted the challenge of leading the $100 million capital campaign for the new joint venture between Garvan and St Vincents & Mater Health Sydney, the Garvan St Vincent’s Campus Cancer Centre.

We appreciate the generosity of Ms Delta Goodrem who has accepted the role of Patron and assists with raising awareness and funds. Delta played a key role in the media conference and Gala Dinner held on 22 October. The Dinner raised approximately $240,000.

Prior to the Dinner, a few supporters approached privately pledged around $16 million in 2008. The Kinghorn Foundation, for example, gave $5 million to the Centre. These very generous gifts are greatly appreciated.

Board and staff changes
I wish to take this opportunity to thank my fellow Directors for their energy and vision, and to note several changes on the Board in 2008.

We gratefully acknowledge the contributions of retiring Directors: Mr Ross King, Mr Peter Wade, Mr Phil Clark AM, the Hon Warwick Smith AM and Mr Richard Warburton AO. A special thank you goes to Richard Warburton who served on the Board for 12 years. We also welcome Mr Loftus Harris AM, Mr Brad Rees, Mr Karim Temsamani and Mr Geoff Dixon to the Board.

There were several staff changes in 2008, with the Foundation continuing to grow. We thank Rachael Stewart, who left us after three years, and welcome Mona Saade as our new Supporter Services Coordinator.

We also welcome Dianne Lavender, Media Relations Manager, and Janice Lam, Data Entry Clerk. In her first year, Dianne achieved considerable media coverage, including two 7.30 Report stories, and a community service announcement about diabetes featuring Marcia Hines. With 2,094 new donors joining Garvan in 2008, in addition to 1,500 the previous year, Janice’s position is essential.

I thank each and every Garvan supporter and look forward to retaining and deepening our relationship with you in 2009.

Graham Bradley
Chairman
Garvan Research Foundation
DNA samples on chips for epigenetic analysis.
Program Overview

Although derived from normal cells, cancer cells have distinctive features that can be exploited to aid diagnosis, treatment, and prognosis. To do this, we need to know much more about the fundamental processes that govern cell behaviour: their division, their survival, their motility and their differentiation into complex tissue structures. With this knowledge we will be better able to stop the formation and early growth of cancers.

As well as basic research into cell and molecular biology, the Cancer Program has six translational research groups that study a number of the most commonly diagnosed and most lethal cancers: breast, colorectal (bowel), lung, ovarian, pancreatic and prostate.

Program Highlights

- Identified the anti-apoptotic protein, Bag-1, as a new molecular marker of tamoxifen sensitivity in hormone-responsive breast cancers
- Refined and extended our models of how oestrogen regulates the cell cycle (cell replication or proliferation) by showing that oestrogen regulation of the cell cycle gene, cyclin D1, leads to activation of cyclin E2
- Further defined mechanisms behind the action of the avocado toxin persin, which acts through the endoplasmic reticulum (the region of cells where complex proteins are formed) to kill breast cancer cells
- Characterised how the activity of Gab2, a signalling protein implicated in the development of some breast cancers and certain forms of leukemia, is 'switched-off' in cells
- In collaboration with Professor Sharad Kumar at Adelaide's Hanson Institute, determined that a regulatory protein, Nedd4, is required for the action of insulin-like growth factors and hence normal growth
- Showed that expression of the Elf5 protein is necessary for the development of breast tissue during pregnancy and that increased expression of Elf5 drives mammary development and milk production in non-pregnant animals
- Demonstrated that the cell signalling protein, integrin-linked kinase, controls normal mammary gland development and differentiation in mice, suggesting that altered levels of the gene may have a role in cancer progression
- Found that mammary cancers in mice can be put into an irreversible 'sleep' state by inhibiting the activity of the Id1 gene
- Identified the S100A2 calcium-binding protein as a predictive biomarker for response to pancreatectomy in pancreatic cancer
- Demonstrated that high levels of the transcription factor Gata2 are a feature of aggressive prostate cancer and may influence the action of the androgen receptor, suggesting Gata2 may be an important regulator of advanced prostate disease
- Identified the MIC-1 protein as a biomarker of resistance to the chemotherapeutic drug, docetaxel, in prostate cancer
- Showed that the developmental gene HOXA9 is methylated in almost all high grade serous ovarian carcinomas, representing a potential new diagnostic marker for these, the most common type of ovarian cancer
- Identified new prognostic biomarkers for lung cancer, in particular that concordant methylation of the chromosome 3p genes, DLEC1 and MLH1, is associated with poorer survival of patients
- Created a human epigenome map of normal prostate cells and cancer prostate cells that incorporates epigenetic modifications and gene expression levels - allowing us to identify novel genomic regions that are commonly deregulated in cancer
- Demonstrated that the tumour suppressor gene p16 is repressed (its expression, or conversion into proteins, reduced) before being methylated (shut down) in cancer cells
- Found that p16 methylation is initially 'seeded' in between the nucleosomes of its promoter region (the part of the genome that triggers the expression of the gene) and then spreads to consolidate epigenetic silencing
People Highlights

- Six senior investigators in the Cancer Research Program (Professor Roger Daly, Professor Liz Musgrove, Professor Rob Sutherland, Associate Professor Chris Ormandy, Professor James Kench and Professor Andrew Bankin) were awarded an NHMRC Program Grant worth $11,128,320 over five years to identify molecular markers of phenotype, therapeutic responsiveness and prognosis in human breast, prostate and pancreatic cancers.

- Professors Roger Daly and Susan Clark were awarded renewals of their NHMRC Principal Research Fellowships.

- Susan Clark and Liz Musgrove were promoted to Conjoint Professor at the University of NSW.

- Dr Alex Swarbrick received Early Career Development Fellowships from the Cancer Institute NSW and the National Breast Cancer Foundation.

- Dr Matt Naylor received an NHMRC Career Development Award and an Early Career Development Fellowship from the National Breast Cancer Foundation.

- Drs Alex Swarbrick and Sandra O’Toole, in collaboration with Professor Neil Watkins at the Monash Institute of Medical Research, were awarded an NHMRC Project Grant to study Hedgehog signalling in breast cancer progression.

- Dr Matt Naylor was awarded research grants from the Cancer Council NSW and the Prostate Cancer Foundation Australia to investigate the role of integrin signalling in prostate cancer and prostate development.

- Dr Pip O’Brien was awarded a priority-driven collaborative research grant from Cancer Australia to investigate DNA methylation alterations as detection markers for early stage ovarian cancer.

- Dr Alison Butt received a Research Innovation Grant from the Cancer Institute NSW to define novel molecular determinants of anti-oestrogen resistance in breast cancer and a research grant from Breast Cancer Australia to further develop and evaluate the therapeutic potential of persin as an anti-cancer agent.

- Dr Alex Swarbrick, Associate Professor Chris Ormandy, Professor Marie Dziadek, Professor Fabienne Mackay, Professor Sam Breit (St Vincent’s Centre for Immunology) and Professor Murray Norris (Children’s Cancer Institute Australia) were awarded a Cancer Institute NSW Equipment grant to purchase an in vivo Imaging System for live imaging of tumour growth and metastasis in mouse models of cancer.

- Professor Susan Clark was awarded a Cancer Institute NSW Equipment grant for purchase of a real-time cell analyser to dynamically monitor viability and proliferation of cancer cells in cell culture.

- Dr Toby Hulf, postdoctoral researcher, using a Sequenom mass spectrometer to analyse the epigenetic profile of cancer cells.

- Rebecca Hinshelwood was awarded the Cancer Institute NSW 2008 Premier’s Award for Outstanding Research Scholar.

- Dr Sandra O’Toole, Dr Catriona McNeil and Haley Bennett were awarded PhDs (University of NSW).

- Chehani Alles was awarded a Master of Science (University of NSW), Dr Ruban Thanigasalam a Master of Surgery (University of Sydney), Sarah Sutherland and Edwina Wing-Lun were awarded MBBS (Hons) (University of Sydney), and Gabrielle Matta a BMdSci (Hons) (University of NSW).

- Professor Rob Sutherland completed a 3 year term as a member of the Scientific Council of the International Agency for Cancer Research, Lyon, and a 5 year term as a Board member of the Cancer Institute NSW.

- Professor Susan Clark was appointed as the Australian representative on the ASIAN EPIGENOME ALLIANCE, initiated and appointed Convener of the Australian Epigenome Alliance, and continued as a member of the International Human Epigenome Task Force.

- Cancer Program senior scientists are members of several major national and international networks: Associate Professor Chris Ormandy in the Australian Phenomics Network, Associate Professor Sue Henshall and Professor Rob Sutherland in the Australian and Canadian Prostate Cancer Research Alliance, Professor Susan Clark in the Alliance for Human Epigenetics and Disease (AHEAD), and Dr Maja Kohonen-Corish in the International Human Variome Project.
Several members of the Cancer Program served on grant review panels: Professor Liz Musgrove for NHMRC, Associate Professor Chris Ormandy as Chair of the NHMRC CDA Review Committee, Professor Marie Dziadek for NHMRC CDA Awards and the Health Research Council NZ, Associate Professor Sue Henshall for the Prostate Cancer Foundation of Australia, and Professor Andrew Biankin for the Cancer Council NSW.

Senior staff members in the Cancer Program are members of 16 Editorial Boards, including Breast Cancer On-Line, Breast Cancer Research, British Journal of Cancer, Endocrine-Related Cancer, Endocrinology, Epigenomics, Molecular Biotechnology and World Journal of Gastroenterology.

Associate Professor Chris Ormandy was appointed Vice-Chair of the Gordon Research Conference on Mammary Gland Development in 2009, and Chair of this conference in 2010.

Professor Rob Sutherland and Associate Professor Chris Ormandy were members of the Organising Committee and Associate Professor Sue Henshall a member of the International Advisory Group for the 4th PacRim Breast and Prostate Cancer Meeting held in Whistler, Canada in August.

Dr Alison Butt was appointed President-Elect and Honorary Treasurer of the Australian Society for Medical Research, and was Convener of the 4th Australian Health and Medical Research Congress held in Brisbane in November.

Professor Susan Clark was presented with the WEHI Director’s Inaugural Women in Science Lecture Award.

Professor Andrew Biankin received the Hirshberg Award in Pancreatic Cancer from the American Pancreatic Association meeting in November.

Cancer Program PhD students and postdoctoral scientists received prizes for their conference poster presentations: Brian Gloss at the Australian Society for Medical Research NSW Scientific Meeting, Maria Gonzalez at the UNSW Faculty of Medicine Research Day, and Dr Toby Hulf at the 4th PacRim Conference on Breast and Prostate Cancer.

Dr Sandra O’Toole was awarded the Overall Conference Prize and Dr Ewan Millar and Sarah Zardawi were given Commendations at the Australasian Division of the International Academy of Pathology 33rd Annual Scientific Meeting.

Elizabeth Shelley, Simon Junankar, Dr David Chang and Vivien Ong were awarded Cancer Institute NSW Research Scholarships and Warwick Locke was awarded a National Breast Cancer Foundation Research Scholarship.
Basic Cancer Research

Cell Cycle Group
Group Leader Professor Liz Musgrove

Female steroid hormones like oestrogen and progesterone strongly influence cell reproduction in the breast. We are particularly interested in how these hormones act on the cell cycle machinery and how control over the cell cycle is lost in breast cancer cells. Our current work concentrates on the cell cycle genes c-Myc, cyclin D1 and cyclin E2, all of which are targeted by oestrogen and are overexpressed in breast cancer. In collaboration with the Steroid Hormone Action and Breast Cancer Translational Groups we are searching for new genes that might link oestrogen action with the cell cycle and so could be involved in resistance of certain breast cancers to the anti-oestrogen tamoxifen. We are collaborating with the Peter MacCallum Cancer Institute in Melbourne and the Diamantina Institute in Brisbane to undertake functional screens to identify genes involved in endocrine resistance.

Steroid Hormone Action Group
Group Leader Professor Rob Sutherland FAA

Our research aims to determine and characterise the genes that mediate the actions of the sex steroid hormones oestrogen, progesterone, and androgens in steroid-responsive cancers (breast, prostate, ovarian and endometrial). These constitute a third of all newly diagnosed cancers.

In collaboration with the Cell Cycle and Apoptosis Groups we have identified and are characterising a number of steroid-regulated genes involved in the control of cell proliferation, cell differentiation and cell death in breast cancer. In partnership with the Breast and Prostate Cancer Groups and the Cancer Development Laboratory we have demonstrated that some of these genes are new markers of cancer progression and response to therapy and candidate targets for the development of new cancer therapies.

Apoptosis Research Group
Group Leader Dr Alison Butt

Oestrogen not only causes breast cancer cells to proliferate but it also protects them from apoptosis (cell death). We are investigating how this occurs and are identifying the genes that regulate this process. Such studies will enable us to understand how these genes may influence the way anti-oestrogens such as tamoxifen can effectively kill breast cancer cells. In other projects we are examining how novel compounds derived from plants induce apoptosis in breast cancer cells. This could lead to their development as new therapies for the treatment of breast cancer as well as other cancers.

Signal Transduction Group
Group Leader Professor Roger Daly

Our research focuses on how signals regulating biological processes such as cell proliferation, survival and motility are transmitted within the cell, and how these signals are altered in cancer cells. We have determined that the activity of a key signalling
protein, Gab2, is regulated by a class of binding proteins termed 14-3-3 that ‘switch-off’ Gab2 and prevent it from transmitting signals within the cell. We have identified that Gab2 promotes cell motility as well as cell proliferation, and demonstrated that it is highly expressed at very early stages of breast cancer development. In other studies we have made important discoveries regarding the regulatory mechanisms inside the cell that modulate the action of insulin and insulin-like growth factors, with implications for the control of animal metabolism and growth. Finally, we have established new methodologies to characterise global alterations in protein phosphorylation associated with cellular signalling events, and are applying these to the identification of novel therapeutic targets and prognostic markers in cancers refractory to current treatment regimens, such as basal-type breast cancers.

**Epigenetics Group**

*Group Leader* Professor Susan Clark

Cancer cells can modify the expression of critical cancer genes independently of the DNA sequence, using two epigenetic biochemical processes called DNA methylation and histone modification. Our research focuses on understanding the mechanism that triggers abnormal methylation and histone modification between normal and cancer cells. We have developed different methods to detect methylation changes during early cancer development and have discovered that these epigenetic changes can take place not only in single genes, but can also occur across very large regions of DNA during the spread of cancer. These changes provide novel tumour ‘signatures’ for cancer diagnosis as well as potential targets for cancer therapy. We are now trying to determine which changes are specific to breast and prostate cancer and the sequence of events that trigger these changes so that we can try to reverse the process. This is a large and complex project and our work forms part of the international effort on unravelling the human epigenome.

**Development Group**

*Group Leader* Associate Professor Chris Ormandy

Development of the mammary gland occurs in defined stages that are governed by the hormones that regulate reproductive events. We hypothesise that genes controlling normal mammary development can become mutated or deregulated in breast cancer and thus contribute to the disease process. We have discovered that the transcription factor Elf5 controls the development of the mammary gland during pregnancy and also regulates the proliferation and function of breast cancer cells. We are investigating how Elf5 exerts these effects to provide a way to therapeutically target this mechanism.

**Tumour Progression Group**

*Group Leader* Dr Alex Swarbrick

Most aggressive cancers have two features in common: they proliferate endlessly (have high self renewal) and contain mostly unspecialised, poorly differentiated cells. We are investigating genes that control self renewal and differentiation in cancer, with a particular focus on breast cancer. Together with the Breast Cancer Translational Group and external collaborators we have discovered that several genes are key controllers of the growth and metastasis (spread) of poorly differentiated cancers. These include the transcriptional regulator Id1, the Hedgehog signalling protein, and also the non-coding microRNA-380. Understanding the contribution of these genes to cancer progression will help us predict the behaviour of aggressive metastatic cancers and may ultimately lead to the development of new drugs to stop their growth.

**Integrin and Cell Biology Group**

*Group Leader* Dr Matthew Naylor

Our research aims to understand the mechanisms that regulate cell fate decisions during the progression of cancer to metastatic disease. Integrins mediate the adhesion of cells to the extracellular matrix and provide cells with a positional identity in addition to coordinating growth factor and hormone signalling to control cell function. Modulation of integrin expression and function can alter the cancer phenotype. We are currently investigating integrin function during mammary and prostate gland development and in experimental models of carcinogenesis and metastasis. We are also investigating the role of several cell fate transcriptional regulators during mammary gland development, cancer and metastasis.
Translational Cancer Research

Breast Cancer

Group Leader Professor Rob Sutherland FAA

In association with clinicians at St Vincent’s and other hospitals in Sydney we have developed large tissue banks and patient databases that are being used to identify markers of disease subtype, disease progression and response to particular therapies. A major joint project with the Cell Cycle and Steroid Hormone Action Groups is identifying molecular markers of tamoxifen resistance, since loss of response to tamoxifen is a major reason for treatment failure. We are also conducting collaborative studies in-house and with other institutions to define the role of newly-discovered breast cancer genes in the disease process.

Lung and Colorectal Cancer

Group Leader Dr Maija Kohonen-Corish

Our area of expertise is colorectal and lung cancer genetics and epigenetics. We examine the gene profiles of resected tumour tissues and correlate them with patient clinical outcomes. The challenge is to work out which key gene alterations and biomarkers are the most useful for determining prognosis and treatment outcomes, in order to improve the clinical management of patients. We have identified new genes that are inactivated through epigenetic mechanisms in cancer. In lung cancer we have analysed genes on chromosome 3p, an area of the genome important in lung cancer development. We have shown that aberrant methylation may be synchronized in this region and that the presence of this defect in the cancer is associated with poor patient prognosis.
Ovarian Cancer
Group Leader Dr Philippa O’Brien

Our group works in collaboration with the Gynaecological Cancer Centre at the Royal Hospital for Women. Our major research goal is to use our combined expertise and knowledge to identify new ways to diagnose women with early stage curable ovarian cancer. To this end we utilise a number of different approaches to identify the genes involved in the development of ovarian cancer, particularly its early stages. Our primary focus is the identification of genes with altered methylation patterns that have potential as blood-based diagnostic markers for early stage ovarian cancer. We also aim to understand how such genes influence ovarian cancer development, which may additionally identify new treatment targets for women with advanced disease.

Prostate Cancer
Group Leader Associate Professor Sue Henshall

Our group is concerned with the identification of markers for therapeutic responsiveness, prognostic markers, and new markers of early prostate disease. We take a multidisciplinary approach that utilises expertise from a number of cancer researchers within and outside the Garvan, as well as clinicians and pathologists. We aim to identify genes and pathways whose expression changes can predict the development of aggressive life-threatening prostate cancer or resistance to chemotherapy used for the treatment of advanced stage prostate cancer.

Pancreatic Cancer
Group Leader Professor Andrew Biankin

Pancreatic cancer is the fifth leading cause of cancer death in Western societies, with a five year survival rate of less than 10%. The treatment and survival of patients with pancreatic cancer has not changed for over thirty years because there has been little research into the molecular and cell biology associated with it. Our projects focus on improving outcomes for patients by using biomarkers to guide therapeutic decisions to personalise therapies for pancreatic cancer. In addition, we are investigating molecular mechanisms of pancreatic carcinogenesis which may lead to the development of novel therapeutic strategies.

Cancer Therapeutics Development Laboratory
Research Director Professor Marie Dziadek

The Cancer Therapeutics Development Laboratory is investigating the potential for developing cancer therapeutic drugs against molecular targets expressed by cancer cells. Our current project aims to block the activity of a key enzyme that is highly expressed in many different types of cancer. This enzyme allows cancer cells to produce the energy that is essential for their growth. We developed and completed a high throughput screen (HTS) of a chemical library in collaboration with the WEHI/Bio21 HTS facility in Melbourne. This screen identified a number of potent inhibitor compounds that will now be evaluated for their efficacy in blocking cancer cell growth. We will determine which of these compounds will form the best lead for further drug development.
FROM TISSUE SAMPLE TO PROTEIN ANALYSIS

2D gel showing proteins in mouse liver
Program Overview

The growing incidence of obesity is driving a worldwide epidemic in Type 2 diabetes, a disease which already affects nearly 1 in 10 of the Australian population. Research in this program is focused on the molecular regulation of body weight and fuel metabolism, and obtaining a better understanding of Type 2 diabetes at multiple levels. There is a particular emphasis both on the release of insulin and its mode of action in normal and disease states. Research strengths include live cell microscopy, the use of mass spectrometry for the discovery of new molecules affected by metabolic disease, in vivo gene manipulation and metabolic studies in humans.

Our basic and clinical research efforts are closely linked. We ask ourselves the major questions about why diabetes develops and what other factors, including dietary and genetic, might be involved. Many of our studies focus on humans with a genetic risk for diabetes in an effort to identify factors that occur very early in the onset of the disease. Such studies have begun to identify blood factors that may be released from immune cells or blood vessels and are examining key differences in fat from different parts of the body.

Program Highlights

- Demonstrated that the cellular stress response known as ER stress (a disruption of the cell’s ability to create proteins) is not a major contributor to the death of insulin-secreting pancreatic cells in Type 1 diabetes, whereas it plays a significant role in Type 2 diabetes

- Improved insulin resistance of rodents fed a high fat diet by manipulating the levels of one key metabolic enzyme in leg muscle

- Showed that weight reduction in morbidly obese people with Type 2 diabetes reduces inflammation, which may be important in reducing insulin resistance

- Isolated four promising bioactive compounds in bitter melon, a vegetable and traditional Chinese medicine, helping us understand its potential for treating Type 2 diabetes

- Found that healthy weight, insulin-sensitive, relatives of people with Type 2 diabetes secrete less of an appetite-curbing gut hormone after meals than those without diabetes in the family, making them more prone to gain weight later in life

- Uncovered mechanisms, involving pro-inflammatory molecules, that may help explain why people being treated for HIV infection have high rates of diabetes and heart disease, similar to those who are very overweight and insulin resistant

- Showed that insulin regulates glucose entry into cells by activating a motor protein, known as myo1c, that helps move glucose transporters to the cell surface

- Reported novel insights into the intricate cell signalling mechanisms behind insulin resistance, a risk factor for Type 2 diabetes, in particular reviewing the importance of a molecule known as IRS1, previously thought to be critical
People Highlights

- The Diabetes and Obesity Program was awarded an NHMRC program grant worth $10.5 million over 5 years.
- Professor David James was invited to give the 2008 Novo Nordisk International Lectureship at the University of Toronto.
- Dr Kyle Hoehn was awarded the 2009 Viertel Fellowship from the Diabetes Australia Research Trust (DART).
- Dr Jiming Ye, Dr Bronwyn Hegarty, Professor David James, Dr Jerry Greenfield, Dr Carsten Schmitz-Peiffer and Associate Professor Trevor Biden were awarded NHMRC project grants.
- Dr Katy Raddatz was awarded a German Research Foundation (DFG) Post-Doctoral Fellowship.
- Amanda Preston and James Burchfield successfully obtained their PhD degrees.
- Associate Professor Katherine Samaras was invited to participate in the Australian Academy of Science's Theo Murphy High Flyers Think Tank and also the National Preventive Healthcare Summit for the National Preventative Health Taskforce, “Curbing the Obesity Epidemic: the role of the individual and the role of the State.”
- Professor Lesley Campbell was an invited plenary speaker at the IASO Stock Conference in March 2008 on “Hormones and Obesity”, as well as at an International Symposium on Obesity at the Institute of Preventative Medicine in Copenhagen.
- Dr Alex Viardot was awarded the inaugural Don Chisholm Fellowship for 2009.

Research Groups

Appetite and Adiposity in Pre-diabetes and Prader Willi Syndrome

**Group Leader** Professor Lesley Campbell AM

Our group studies the basic abnormalities in metabolism in people with disorders of prediabetes and obesity. One major focus is the study of a genetic disorder that occurs frequently in young children, known as Prader Willi Syndrome (PWS). This disorder is commonly associated with lower lean body mass, and with relentless childhood weight gain, and so is of great interest in our understanding of the genetics of human body composition. These studies, in collaboration with Royal Prince Alfred Hospital and Professor Herbert Herzog’s laboratory (Garvan Neuroscience), compare hormonal and metabolic differences to matched obese subjects as well as testing potential therapeutic options. Studies are underway to prepare a novel mouse model of PWS based on a very recent genetic discovery about the nature of PWS genes. A second major focus of our group is identification of the factors that predispose individuals to Type 2 diabetes. These studies have revealed a predisposition to eat more (low levels of PYY hormone), an increased innate immune and T cell activation (better at fighting primitive organisms but more tendency to inflammation and possibly atheroma) and a more active “fight and flight” response (but also more central fat, more hypertension and metabolic syndrome).

Fat and Insulin Resistance

**Group Leader** Professor Don Chisholm AO

We have been studying patients with hepatitis C because of their predisposition to insulin resistance and Type 2 diabetes. We have shown that the insulin resistance is present in muscle rather than in liver, contrary to common belief. We have also identified for the first time an elevation in glucagon in these patients, which may also contribute to Type 2 diabetes. The group continues their work on abdominal obesity and, in collaboration with the Cell Biology group, is undertaking studies of adipose tissue transplantation in mice.

Molecular Metabolism

**Group Leader** Associate Professor Greg Cooney

Fat accumulation causes problems with metabolism that can lead to Type 2 diabetes, heart disease and stroke. The major focus of the Cooney group is to understand factors (genetic and environmental) that control fat accumulation in muscle and liver and to use this information to devise strategies to reduce fat. When fat enters a cell from blood there are two major choices for its fate. It is either stored as an intracellular lipid or it is channelled into the mitochondria, where it is burned for energy. We are studying the regulation of glucose and fatty acid metabolism by mitochondria and the changes that occur in normal metabolic cycles when tissues are exposed to too much fat at different times of the day. This could help explain the contribution of increased food availability and altered eating habits to the rapid increase in obesity and metabolic disease.
ER Stress and Protein Misfolding

Group Leader Associate Professor Antony Cooper

Our group aims to understand how cells cope, or fail to cope, with the stress that can result from the over-production of proteins and misfolding of proteins within a cellular compartment called the endoplasmic reticulum (ER). ER stress is directly applicable to a growing number of diseases including diabetes, as well as many diseases of the brain like Huntington's, Parkinson's, Alzheimer's and motor neuron disease. Either the cell ‘burns out’, generates an excess of harmful products, or accumulates unmanageable amounts of unusable proteins, which ultimately lead to cell death. If the mechanism by which these stressors induce cell death can be elucidated, this may enable identification of potential points of intervention to help cells deal with extra demands.

Human Physiology

Group Leader Dr Jerry Greenfield

In collaboration with the Cell Biology group, we are undertaking a major study to identify defects in insulin signal transduction in skeletal muscle from at-risk individuals. We are also examining the possible role of the autonomic nervous system in the development of diabetes and obesity. Studies have also been established examining the effects of glutamine, an amino acid, on metabolism, both in isolation and in combination with a new diabetes medication. Glutamine appears to have a promising effect on glucose lowering in the post-meal state and may offer a simple, novel and effective treatment in Type 2 diabetes.
**Phospholipid Biology**

**Group Leader** Dr Will Hughes

Phospholipids are the basic building blocks of cell membranes but, as is becoming clearer, some are also dynamically regulated to enable control of many of the major functions of cells. Two such examples are the stimulated secretion of insulin from pancreatic beta cells after a meal, and the movement of glucose transporter GLUT4 to the plasma membrane in muscle cells to allow glucose uptake in response to insulin. We continue to use state-of-the-art live cell microscopy to see where and when in individual cells the dynamic changes in phospholipids occur to determine how they may regulate insulin release or GLUT4 movement. In collaboration with the Cell Biology and Molecular Metabolism groups, we aim to identify precisely which intracellular processes may be defective in diabetes.

**Cell Biology**

**Group Leader** Professor David James FAA

A major action of insulin that becomes defective in Type 2 diabetes is the regulated entry of nutrients into muscle and fat cells. The goal of our group is to use newly developed molecular imaging methods to study the insulin-regulated movement of the GLUT4 glucose transporter as well as other processes in insulin responsive cell types. Also using mass spectrometry, novel molecules involved in insulin action have been identified and these represent the focus of many future studies. These studies dovetail with a major investigation into the mechanism of insulin resistance in muscle and fat, with recent studies from the group highlighting an important role for oxidative stress.

**Diabetes and Metabolism**

**Group Leader** Professor Edward Kraegen

Understanding how too much fat causes insulin resistance in muscle and liver is the major thrust of our work. Various experimental models and state-of-the-art techniques are being used to identify and manipulate key proteins in muscle that link fat metabolism to insulin action. Important pathways under investigation are those activated by the newly discovered hormone adiponectin and involving the enzyme AMP-kinase. Studies using traditional Chinese medicines with collaborators in Shanghai to identify new insulin-sensitising agents that could be more useful than current therapeutics are also underway. Excitingly, some of these molecules modulate AMP-kinase, a major intracellular regulator of cellular energy status. Work is also ongoing in partnership with pharmaceutical companies to identify ways of reducing fat accumulation by influencing the rate of entry of fatty acids into mitochondria for oxidation.

**Obesity in Diabetes and Diabetes and HIV**

**Group Leader** Professor Katherine Samaras

Obesity is the major accelerating factor in the pathogenesis of Type 2 diabetes in humans. We have been studying the progress of obese diabetic patients in response to weight loss regimens, finding 60% will normalise glucose tolerance within 12 weeks after bariatric surgery. Early results show these rapid improvements in diabetes are not explained by weight loss, but associated with immune system changes. This work continues to dissect the role of circulatory and tissue-based inflammation in response to weight change, thus providing valuable insights into pathogenesis and potential therapeutic targets for treating the commonest form of diabetes. Work in people living with HIV infection, in collaboration with St Vincent’s Hospital and the National Centre for HIV Epidemiology and Clinical Research, showed treatment-induced metabolic syndrome, predicting subsequent premature development of Type 2 diabetes and heart disease. Studies of how these drugs affect glucose and lipid metabolism and vascular function are now underway. In particular, patients are being followed over a 10 year period, in one of the longest longitudinal cohorts internationally.
Diabetes Signalling Unit

Beta Cell Signalling

Group Leader Associate Professor Trevor Biden

Identifying and preventing the cellular mechanisms whereby fatty acids disrupt beta cell function is one of our major goals. These processes are fundamental to the progression of Type 2 diabetes, yet are poorly understood. We are piecing together the mechanism of action of protein kinase C epsilon (PKCe), an enzyme they found to be a key determinant of defective insulin secretion. Studies are underway to identify inhibitors of this enzyme as a possible future therapy for Type 2 diabetes. Another major project is examining the molecular links between fatty acids and beta cell death, with particular emphasis on ER stress. Most notably, with colleagues in the Islet biology group, we have recently shown for the first time that ER stress occurs in beta cells of human subjects with Type 2 diabetes.

Islet Biology

Group Leader Dr Ross Laybutt

Pancreatic beta-cell failure is fundamental to the development of diabetes. Our goal is to identify mechanisms responsible for the beta-cell destruction and the loss of insulin secretion that cause diabetes. The major hypothesis under investigation is that in Type 2 diabetes a gradual rise in blood glucose (hyperglycaemia) and lipid levels leads to a loss of the unique expression pattern of genes necessary for appropriate insulin secretion. This worsens hyperglycaemia, which causes further beta-cell dedifferentiation and eventually beta-cell death. In models of Type 1 diabetes, investigations into the role of endoplasmic reticulum (ER) stress as a mechanism responsible for beta-cell destruction are being conducted. Recent work from our group argues against a role for ER stress as a mechanism for beta-cell destruction in Type 1 diabetes, in contrast to the situation in Type 2 diabetes.

Insulin Signalling

Group Leader Dr Carsten Schmitz-Peiffer

We focus on the lipid metabolites that disrupt insulin signaling and how these contribute to insulin resistance. A new study area has been initiated by the discovery that di-linoleoyl phosphatidic acid is an important inhibitor of insulin signaling. In collaboration with industry partners, studies to block production of this metabolite are in progress followed by verification in human subjects. Another focus of our group is kinase C epsilon (PKCe), which exerts action on liver to decrease whole-body availability of insulin. This, in addition to its actions in beta cells, constitutes a second reason for inhibiting PKCe, as a potential therapy for Type 2 diabetes. In addition, a proteomics approach is being used to understand the mechanisms through which blocking of the lipid-activated inhibitory molecule PKCe improves glucose metabolism in insulin target tissues.
Decanting medium off adherent spleen cells.
Program Overview

Our researchers study aspects of immune function in normal and diseased situations. We hope to understand the basis for diseases such as rheumatoid arthritis, autoimmune diseases, diabetes and asthma, and also to develop new therapies to treat disease. We also collaborate with Garvan scientists in other programs on cross-discipline projects such as finding links between immunology and metabolic systems, cancer and the nervous system.

Program Highlights

- Showed that T follicular helper cells (a certain class of immune cell), which play a key role in triggering the production of antibodies, need the molecule IL-21 both to survive and to function
- Identified the basic biochemistry and structural features of IL-21, a key regulatory molecule of the immune system, with the aim of developing new drugs to treat certain cancers and autoimmune diseases
- Elucidated the molecular mechanisms behind the action of Stat3, a gene that works in all immune cell types to help keep fungal and bacterial infections at bay
- Human trials began in Europe of an antibody we developed to block C5aR - a molecule implicated in inflammatory conditions such as rheumatoid arthritis, autoimmune diseases, eye diseases and sepsis
- Established in mice that the cytokine GM-CSF, which has many different actions in various immune and inflammatory responses, plays an important role in asthmatic airway inflammation
- In collaboration with the CRC for asthma, developed a therapeutic antibody against GM-CSF
- Identified CXCR7 as a gene for heart development
- Identified IL-21 as an inducer of the production of IgE by B cells. IgE is responsible for many of the symptoms of allergy. This represented a novel understanding of the way IgE production is regulated
- Characterised the basic biochemistry and structural features of IL-21, a key regulatory molecule of the immune system, with the aim of developing new drugs to treat certain cancers and autoimmune diseases
- Demonstrated that raised levels of immunoregulatory CD4+ T cells can induce long-term acceptance of pancreatic islet allografts without immunosuppression
People Highlights

- Sandra Gardam was invited to present at the annual scientific meeting of the Russian Society of Immunology held in St Petersburg. Sandra was awarded an NHMRC Training Fellowship - Overseas Based Biomedical Fellowship
- Alexis Vogelzang was awarded New Investigator of the Year at the annual scientific meeting of the Australasian Society of Immunology held in Canberra
- Dr Daniel Christ was an invited speaker at the following meetings: the annual Protein Engineering Summit (Boston), CBSM (Perth) and at research institutions and companies (Monash, CSL). He was awarded a CDA Fellowship from the National Health and Medical Research Council (NHMRC)
- Kip Dudgeon received a postgraduate scholarship from the NHMRC
- Dr Tri Phan, NHMRC C J Martin Fellow from UCSF, returned to Garvan in Dr Rob Brink’s laboratory. Tri was previously working with Dr Jason Cyster on 2 Photon Microscopy
- Kylie Webster won a St Vincent’s Research Symposium Award for Oral Presentation and a TSANZ (Transplant Society of Australia and New Zealand) Young Investigator Award
- Emeritus Professor Antony Basten was an invited speaker at the following meetings. The Kunkel Society annual meeting on autoimmunity (Santa Margherita, Italy), International B cell Workshop on vaccination (Oxford, UK) and the 12th Australasian Autoimmunity Workshop (Sydney)
- Dr Stuart Tangye was invited to present seminars at conferences held in New Zealand, Brisbane, New York, and at research institutes in Bethesda (NIH), Melbourne (WEHI), New York (Rockefeller University), and California (DNAX Research Institute)
- Kendle Maslowski received an NH&MRC PhD Scholarship and received the following awards: Transplant Society of Australia and New Zealand (TSANZ) Travel Grant; Best Presentation Award, TSANZ ASM (for best oral presentation in the Cell Biology SIG), Australian Society for Immunology travel grant. He gave Oral presentations at the 2nd World Immune Regulation Meeting, Davos Switzerland; the Thoracic Society of Australia and New Zealand Annual Scientific Meeting in Melbourne; and the Australian Society for Medical Research, N.S.W. branch
- Stacey Walters received a Novartis Young Investigator Travel Award; Transplant Society of Australia and New Zealand (TSANZ) New Key Opinion Leader Best Abstract Award; TSANZ President’s Prize Award, and St. Vincent’s Symposium Poster Prize
- Stacey Walters, Rebecca Stokes, Kylie Webster and David Liuwantara received a Transplant Society of Australia and New Zealand Young Investigator Award
- Alexis Vogelzang, Helen McGuire and Santi Suriyani received an ASI Travel Award as well as FIMSA travel bursary to Taiwan
- Dr Sue Mei Lau received the Novartis Junior Scientist Prize at the Endocrine Society of Australia Annual Meeting and a Diabetes Australia Research Trust grant.
- David Liuwantara received a Merck Company Foundation Fellowship
- Dr Cecile King was invited speaker at the Australasian Diabetes Society Annual Meeting. CK received an Innovative grant from the Juvenile Diabetes Research Foundation and an NHMRC project grant
- Helen McGuire received the following awards: St Vincents & Mater Health Research Symposium Award for Excellence in Oral Presentation; ASI travel bursary to FIMSA Taiwan conference, and Castle Harlan Award - most outstanding early career PhD student
- Professor Jonathan Sprent gave invited presentations in Davos and Lausanne in Switzerland, Florence in Italy, Tokyo and Tokushima in Japan, and Havana in Cuba as well as meetings in Melbourne, Brisbane and Canberra
- Dr Di Yu was invited to the following conferences: The 10th International Workshop on Auto-antibodies and Autoimmunity, Mexico and the American College of Rheumatology Annual Scientific Meeting, San Francisco, The United States. He was also awarded a C.J. Martin Fellowship
- Dr Jenny Gunton was an invited speaker at the Endocrine Society of Australia/Australian Academy of Science rising star symposium; an invited speaker at the Endocrine Society of Australia Clinical Symposium weekend, is honorary secretary of the Australian Diabetes Society and is the chair of the program organising committee for the ADS annual scientific meeting. She was awarded a JDRF ITP research grant and a a Diabetes Australia Research Trust grant
- Professor William Sewell was an invited speaker at the Australian Dermatology Update Symposium in Sydney and the Frontiers in Otorhinolaryngology Conference in Noosa
- Dr Sue Lynn Lau won the dance your PhD competition, and was awarded a a Diabetes Australia Research Trust grant
Research Groups

Immunology and Inflammation

**Group Leader** Professor Charles Mackay FAA

Immunology lies at the heart of many human diseases. Poor immune responses can lead to the development of cancers or infections. Over-zealous immune responses lead to allergies, or autoimmune diseases such as Type 1 diabetes, rheumatoid arthritis and multiple sclerosis. We are trying to understand all of the cellular and molecular processes of immune responses, and what goes wrong to cause disease. Increasingly, we are discovering integral connections between the immune system and the metabolic system, the nervous system and cancer. One important activity of our program has been to translate discoveries into new treatments that will impact on the health of mankind. Our studies have led to development of antibodies that can intervene in the inflammatory process and these are being developed by Garvan spin-off G2 Therapies Ltd. We are studying the link between diet, fatty acid binding proteins and asthma; and looking more broadly at the links between inflammatory and metabolic diseases because we now know that inflammatory cells release factors that can affect various aspects of metabolism. We are also exploring a new hypothesis that gut microbes, and our diet, determine the nature of inflammatory responses.

Asthma

**Group Leader** Dr David Zahra*

*Part of the CRC for Asthma and Airways

Our group focuses on the development of a promising therapeutic that neutralises the function of the cytokine GM–CSF. GM–CSF has been linked to a number of inflammatory diseases including asthma and rheumatoid arthritis, and we have developed an antibody that blocks GM–CSF. This antibody has been successfully ‘humanised’ and the epitope that our antibody binds on GM–CSF has been defined. The potential therapeutic is protected by two provisional patents and is now ready for pre-clinical and toxicology studies. A feasibility study is being conducted in collaboration with a major pharmaceutical company with the aim of fully licensing the therapeutic for pre-clinical and clinical development by the end of 2009.
Cellular Immunity

**Group Leader** Professor Jonathan Sprent FRS FAA

Our team is interested in the development and fate of T cells - white blood cells that participate in a variety of immune responses but are able to somehow distinguish between self and foreign antigens. One of the unknown questions that is central to maintaining the immune system's homeostasis is how are these cells destroyed once their mission is complete and infections are overcome? We know that most self-destruct and a few live on to become memory T cells, which are activated by a re-infection, but we don't know the factors that determine their destiny. Application of our work lies in harnessing the immune system to boost its attack on cancerous tumours and, conversely, dampening down the immune response to treat autoimmune diseases.

Diabetes and Transcription Factors

**Group Leader** Dr Jenny Gunton

The causes of beta-cell failure are not well understood, but we know there are changes in these cells' gene expression that can yield clues about what is going wrong. Through the use of a variety of tissue-specific knockout and transgenic mice we hope to identify why beta cell failure occurs as well as ways to improve beta cell function and thereby treat human diabetes. We are currently focusing on a gene called ARNT, which is decreased by 90% in the beta cell containing islets of people with Type 2 diabetes. It seems to be a master gene that controls other genes involved in beta-cell function, including glucose breakdown and insulin production. We are now looking at ways to control ARNT.

Gene Therapy & Autoimmunity

**Group Leader** Dr Shane Grey

Our laboratory is interested in the how and why of the immune system's attack on the body's tissues as it occurs during the rejection of organ grafts and in autoimmune disorders like Type 1 diabetes where the insulin-producing beta cells are destroyed. Approaches include examining factors that regulate the immune attack on our own cells and investigating the molecular changes that occur in the tissue being attacked in the hope of, one day, being able to genetically engineer tissues that could withstand the assault. This strategy would alleviate the need for the toxic immunosuppressive drugs currently required to promote successful organ transplantation and, in the case of Type 1 diabetes, enable creation of a 'death-defying' beta cell as a novel cure.

Immunobiology

**Group Leader** Dr Stuart Tangye

Our focus is on understanding the development of B cells - the population of white blood cells responsible for the production of protective antibodies - and the regulation of antibody responses. We are particularly interested in understanding how the immune system responds to infections or vaccinations by providing us with a 'memory' of the response so that we cope faster and better with subsequent exposure from the same infectious agent. The development of immunological memory involves interactions between B cells and 'helper' T cells - another subset of immune cells. Thus, a major focus of our work is to understand exactly how helper T cells instruct B cells to produce antibodies. We also study several genetic conditions of the immune system, and corresponding mouse models, that result in immunodeficiencies - disorders whereby affected individuals are unable to mount appropriate immune responses following exposure to some infections or pathogens. These diseases include X-linked lymphoproliferative disease, common variable immunodeficiency and hyper-IgE syndrome. Overall, we hope to identify means to improve the immune response in individuals with immunodeficiencies and, conversely, ways in which the immune system of patients with autoimmune diseases could be attenuated.
Mucosal Autoimmunity

Group Leader Dr Cecile King

In Type 1 diabetes, the insulin-producing beta cells of the pancreas are destroyed by self tissue-destructive T cells. These cells express markers that help us to determine, for example, their dependence upon growth factors and where they have been in the body. We are particularly interested in the relationship between the cells that cause Type 1 diabetes and other autoimmune diseases that develop at the mucosal interface between our bodies and the environment. Broad-based immunosuppression is commonly used to treat autoimmune diseases and transplant recipients but it has an obvious drawback since we need a functioning immune system in order to thrive. The aim of our research is to identify target molecules for selective suppression of these self-tissue-destructive cells.

Antibody Engineering

Group Leader Dr Daniel Christ

Our laboratory is working on the development of novel antibody therapeutics. In particular, we are interested in the engineering of human antibody fragments, which are considerably smaller than current monoclonal antibodies. Human antibody fragments (such as domain antibodies) can be generated by genetic engineering technology, completely bypassing the use of animals. These fragments can be produced in large quantities in bacteria and open up promising new routes for non-intravenous applications, imaging and therapy. We are applying our technology to targets in cancer and inflammatory diseases.
FROM X-RAY TO TREATMENT

Spinal X-ray with fractures.
Program Overview

Osteoporosis affects older men and women. It brings with it major costs to the individual and community, serious impacts on being able to live productively and also premature mortality. As prevention is the best strategy for reducing this large human and financial burden, we need to improve our knowledge of the risk factors from fracture; find ways to better assess treatments; increase our understanding of bone biology; and help identify new treatment possibilities.

Program Highlights

- Participated in the first multi-nation genome-wide search to find genes linked to osteoporosis and fracture, resulting in the identification of several chromosomal regions that could harbour novel osteoporosis-risk genes.
- Showed, by combining our own study with studies by other research groups, that individuals with specific variants of a major bone regulating gene are at increased risk of reduced bone mass and fracture, information which can be included in fracture risk calculation.
- Demonstrated, through a study on more than 600 men, that those with levels of testosterone below specific levels are at greater risk of fracture.
- Demonstrated that men with prostate cancer, particularly those who received androgen deprivation therapy, had an increased fracture risk.
- Used a Bayesian (statistical) method to estimate the probability of sport doping, based on certain blood hormone levels (a collaborative study with colleagues from Garvan’s Pituitary Research Unit).
- Collaborated with several major international and national research teams all seeking to validate and use our risk calculator in their data.
- Developed prognostic models for predicting an individual’s fracture risk and incorporated them into a web-based calculator, at www.fractureriskcalculator.com, used by doctors and patients worldwide.
- Data from the Dubbo Osteoporosis Epidemiology Study demonstrated the association between fragility fracture and premature mortality in both men and women for all types of osteoporotic fractures.
- Demonstrated the central (brain) control of bone cell function, the relief (or reduction) of which leads to a doubling of bone volume.
- Further characterised the neural signalling pathway in bone that allows the brain to control bone mass and strength (a collaborative project with the Garvan Neuroscience Program).
- Further data from the Dubbo Osteoporosis Epidemiology Study demonstrated the association between fragility fracture and premature mortality in both men and women for all types of osteoporotic fractures.
**People Highlights**

Professor John Eisman chaired the development group for Guidelines for Osteoporosis Management supported by the Federal Department of Health through the Royal Australian College of General Practitioners. He was invited as a key opinion leader to the Department of Health and Ageing funded Quality Use of Medicines (QUM) in Osteoporosis, Osteoarthritis and Rheumatoid Arthritis (QUM OPORA) Workshops in Sydney (November 2007). He is chair of the Local Organising Committee for the International Bone and Mineral Society to meet in Sydney in 2009.

Professor Tuan Nguyen was promoted to full Professor at the University of New South Wales and was awarded a Senior Research Fellowship by the National Health and Medical Research Council. He successfully convened the international osteoporosis meeting Strong Bone Asia in Ho Chi Minh City, Vietnam, which attracted 500 participants from Asia and Pacific region. He was also invited to present his work in 3 symposia on osteoporosis in Hanoi, Ho Chi Minh City, and Can Tho (Vietnam), and with Dr Nguyen Nguyen was invited to conduct a workshop in epidemiological methods in Hanoi. He also presented his work on the individualisation of fracture risk at the 13th National Health Outcomes Conference in Canberra.

Dr Jackie Center was promoted to Associate Professor (Conjoint) at the University of New South Wales. She has pioneered the Dubbo study’s work on premature mortality after osteoporotic fractures in men and women. This work gained two prestigious oral presentations at the recent American Society for Bone and Mineral Research meeting in Montreal, Canada. She was also awarded a Novo Nordisk clinical grant examining effects of vitamin D.

Dr Paul Baldock was invited to join a review panel for NHMRC Project Grants, and to present to the Kings Cross Rotary Club, following from their Excellence in Workmanship Award. He was awarded a travel grant from the International Bone and Mineral Society to present at the exclusive Davos Workshop: Bone Biology & Therapeutics in Switzerland; invited to present at a Symposium to the Australasian Paediatric Endocrinologist Group (APEG) Annual Meeting in Broome and to give a Symposium Presentation at the 2008 European Society for Clinical Investigation. He has been invited to present in the opening symposium at the 2009 annual conference of the American Society of Bone and Mineral Research in Denver Colorado.

Osteoporosis and Bone Biology program students successes include: Steve Frost given best presentation award, UNSW Student Conference; Bich Tran awarded a Solander Program scholarship for collaborative work with Lund University, Sweden and a Harvey Carey Memorial Trust Scholarship, Ayse Zengin awarded an APA Scholarship; Iris Wong and Bich Tran awarded travel grants to attend the Australian and New Zealand Bone and Mineral Society Meeting, Melbourne and Bich Tran a UNSW travelling grant to attend the ASBMR Scientific Meeting in Montréal.

Dr Nina Emaus from Norway joined the Epidemiology group for six months and Dr Frank Driessler from Berlin joined the Baldock Group.
Research Groups

Population, Individual and Genetic Determinants of Osteoporotic Fracture Risk and their Outcomes

**Group Leaders** Professor Tuan Nguyen and Associate Professor Jackie Center

The Dubbo Osteoporosis Epidemiology Study (DOES) began in 1989 and is the world’s longest running large-scale epidemiological study of osteoporotic fractures in men and women. We are using the DOES data to develop predictive models, based on multiple risk factors, to identify men and women at high risk of fracture and to determine who would benefit most from preventative interventions. We are also continuing to search for new osteoporosis genes that may predict those who are at low risk of osteoporosis and fractures - taking into account environmental factors such as physical activity, falls-related, nutrition, medication and hormonal factors. Finding and understanding how clinical factors and genetic factors affect bone biology and how they interact with each other will help identify individuals for optimal use of existing therapies as well as identify targets for novel therapies.

Bone Regulation

**Group Leader** Dr Paul Baldock

The hallmark of osteoporosis is a reduction in bone density and therefore strength. It is caused by an imbalance between bone formation and bone loss. Our group is, primarily, investigating the role of brain hormones, which influence bone formation and strength. Much of this work makes use of transgenic mouse models and is carried out in collaboration with researchers in the Neuroscience Program. The effect of this pathway on bone is larger than any previously reported and this suggests a major approach to new treatment.

Fracture Prevention – Clinical Studies

**Group Leader** Professor John Eisman AO

Our clinical studies group continues to participate in multicentre international clinical trials evaluating potential osteoporosis treatments that are in the final stages of pharmaceutical development. Involvement in these studies helps ensure we remain at the cutting edge of knowledge of novel therapies and provides an entry pathway to pharmaceutical interest in our novel developments.
Program Overview

The Neuroscience Research Program aims to increase our understanding of the neuronal systems involved in Eating Disorders, neurodegenerative disorders such as Parkinson’s disease and Alzheimer’s disease as well as hearing loss. We aim to identify new therapeutic approaches for these diseases with a special interest in regeneration of the nervous system for therapeutic purposes with a specific emphasis on adult stem cells. A key focus is also the better understanding of the brain’s control of energy homeostasis (balancing energy intake and expenditure), which affects fertility, mood, and weight gain.

Program Highlights

- Discovered that a brain chemical Neuropeptide Y and its receptor are critical for the proliferation of olfactory stem cells, so by blocking Y1 receptors therapeutically, it may be possible to stimulate stem cells to differentiate into new tissue when required
- Demonstrated that mice genetically engineered to produce high levels of PYY, a hormone that subdues appetite after a meal, were protected against diet-induced and genetic obesity
- Discovered that people with low levels of PYY have a higher risk of developing Type 2 diabetes
- Demonstrated a critical interplay between Neuropeptide Y and sex steroids (oestrogen and testosterone), which both in turn regulate bone strength and body fat
- Showed that adult mouse tongue stem cells, an abundant and accessible source of stem cells, transplanted into the inner ear of mice, improved noise-induced hearing loss
- Identified that different sound processing neurons in the brain show different levels of excitation and inhibition, which affects how we hear sounds in a noisy room
- Demonstrated that a hormone called activin-A stimulates stem cell proliferation and repair to the neural damage in Parkinson’s disease, Alzheimer’s and spinal cord injury, which has important therapeutic implications
People Highlights

Professor Herbert Herzog was an invited speaker at the 9th International NPY Congress in Okinawa, Japan. He was also a presenter at the Keystone Symposia on Obesity, Fairmont Banff Springs, Alberta, Canada.

Dr Amanda Sainsbury-Salis was promoted to Associate Professor. She was an invited Conference Chair and speaker at the International Association for the Study of Obesity (IASO) Stock Conference 2008 on Gender Aspects of Obesity, Bangkok, Thailand. She was also invited to present at the Australian Health and Medical Research Congress in Brisbane.

Dr Sharon Oleskevich was an invited speaker at the international Adult Stem Cell–Biology and Clinical Applications Conference, Griffith University, Brisbane, and at the International College of Geriatric Psychoneuropharmacology at the University of NSW, Sydney.

Andrea Abdipranoto and James Daniel received their PhDs and Sandy Stayte completed her honors year.

Dr Bryce Vissel was a keynote speaker at the National Parkinson’s Conference and is a founding member of the Australian and New Zealand Spinal Cord Injury Network.

Dr Kharen Doyle, post-doctoral researcher, uses a ‘microtome’ to slice wax-embedded tissue samples. Kharen investigates the potential of adult neural stem cells for treatment of neurodegenerative diseases.
Research Groups

Adult Stem Cell Research

**Group Leader** Professor John Shine AO FAA

Neural stem cells can be isolated from the adult olfactory neuroepithelium (situated in the nose) and grown in the laboratory in the form of olfactory neurospheres. These structures are three-dimensional aggregates of cells that are able to grow into neuronal and non-neuronal cells. The identity of the cell type within the olfactory neuroepithelium that gives rise to these neural stem cells remains elusive. Our group studies the basic biology of adult olfactory stem cells with the aim of identifying, isolating and propagating these cells and in determining the conditions needed to transform them into the different types of nerve cells found in the brain, for example, those lost in Parkinson's or Alzheimer's disease.

Eating Disorders Research

**Group Leaders** Professor Herbert Herzog and Associate Professor Amanda Sainsbury-Salis

Imbalances in the normal regulation of food intake can lead to obesity or severe weight loss. One of our laboratory’s major goals is to understand how appetite and body weight are regulated. Defects in brain pathways that regulate these processes may be responsible for causing wasting conditions such as anorexia nervosa and cancer cachexia as well as the metabolic resistance to weight loss occurring in overweight or obese people.

Our main focus is on the role of the appetite stimulating molecule neuropeptide Y (NPY) and the satiety inducing hormone PYY and how these molecules coordinate the regulation of appetite and body weight. Our research findings have implications for the treatment of obesity, infertility, dwarfism, and osteoporosis, as well as anorexia nervosa and cancer cachexia.

Hearing Research

**Group Leader** Dr Sharon Oleskevich

Our research strives to understand the mechanisms of hearing from the inner ear to the brain. In the inner ear, degeneration of the hearing receptors (hair cells) leads to many forms of deafness. We are exploring whether stem cell transplantation can provide a potential therapy for the treatment of hearing loss. Adult stem cells from sensory organs (taste, balance, smell) are being transplanted into mouse models of congenital deafness, age-related deafness, and noise-induced deafness. Specialised techniques in stem cell biology, transplantation surgery, and hearing testing are combined to determine if transplantation results in functional recovery of hearing. Taste stem cells have shown a moderate effect on hearing levels following transplantation. Collaboration with the National Centre for Adult Stem Cell Research and St Vincent's Hospital extends our animal research to human tissue. An international collaboration is underway to determine the anatomy and physiology of this synaptic plasticity using electrophysiology and electron microscopy.

Neurodegenerative Disorders - Repair & Regeneration

**Group Leader** Dr Bryce Vissel

We are working on approaches to better understand and treat Parkinson's disease, Alzheimer's disease and spinal disorders, all of which are devastating neurodegenerative diseases. Our goal is to understand how to harness the brain's natural stem cells and/or modulate nerve cells' connections. We investigate approaches to block nerve cell loss and we work to utilize the nervous system's own repair systems, to stimulate the formation of new nerve cells and their connections. We have identified new mechanisms to stimulate brain repair and we discovered potential approaches to block neurodegeneration. Our research outcomes have significant implications for impacting the well-being of people with brain and spinal cord disorders.

Post-doctoral researcher, Dr Nae Shiozawa-West, examines tissue samples.
Pipetting spleen cells.
Program Summary

Autoimmune diseases affect approximately one in twenty people. For some unknown reason, they affect almost three times as many women as men. Almost all autoimmune diseases appear without warning and can have serious consequences on morbidity and quality of life. They are the result of our immune system mounting a response against our own body. More than forty human diseases are defined as having autoimmunity as their definitive or probable cause and many treatments can be ineffective. Examples include Type 1 diabetes, systemic lupus erythematosus (SLE), Sjögren’s syndrome, and Hashimoto’s disease - all of which our unit investigates.

Program Highlights

- Discovered a new form of lupus in mice, which may correspond to a treatment-resistant form of lupus in humans and suggests alternative kinds of treatment for some people.
- Identified a mechanism in the immune system (regulating the death of B lymphocytes activated by microbes) which is impaired in some autoimmune conditions, leading to the survival of activated harmful cells.
- Sequenced the CXCR7 gene of children born with congenital heart defects and identified a mutation which impairs the gene’s function, suggesting it is the likely cause of defects.
- Identified genetic regions containing diabetes susceptibility genes associated with the pathogenic action of B cells.
- Analysed new genes that determine the levels of NKT cells in mice, an important immune cell population that is able to prevent certain autoimmune diseases and cancers.
- Performed whole genome expression arrays on B cells from diabetic mice and non-diabetic mice to aid identification of new genes that may contribute to the pathogenic activity of B cells causing Type 1 diabetes.
People Highlights

_ Professor Fabienne Mackay was an invited plenary speaker at the Research Center for Allergy and Immunology - the Japanese Society for Immunology (RCAI-JSI) International Symposium on Immunology, in Yokohama, Japan. She was also an invited plenary speaker at the Keystone conference on chemokine in Aussois, France; the Tri-conference on Cytokines in San Francisco; and the annual American Immunology meeting in San Diego. She gave the Ian Mackay oration at the 12th Australian workshop on Autoimmunity, and was a Chair and invited symposium speaker at the Australasian Immunology (ASI) conference in Canberra

_ Dr Martijn Bijker was awarded a Rubicon post-doctoral fellowship from The Netherlands

_ Sandra Gardam was awarded the Garvan thesis prize

_ Tyani Chan won the NSW Flow cytometry prize for her work on early B lymphocyte responses

_ Jessica Stolp from Dr Silveira’s group was awarded the travel award to attend the Australasian Society Immunology Conference in Canberra. Dr Silveira co-organised the NSW branch Australasian Society Immunology Conference

Post-doctoral researcher Dr. Martijn Bijker undertakes flow cytometry analysis of spleen cells to determine the size of T cell populations. Dr Bijker researches the role of T cells in autoimmune diseases. He is particularly interested in how stress molecules affect the immune system and the potency of T cells.
Research Groups

Autoimmune Disease Mechanisms

**Group Leader** Professor Fabienne Mackay

One of our main areas of study concerns the unappreciated role of B lymphocytes in autoimmune diseases - uncovered from our work on the B cell activating factor (BAFF) - and how immune responses are affected by stress. When there is too much BAFF, harmful B cells live longer than they should and can damage healthy tissue. We want to know how the oversupply of BAFF corrupts immune defences to drive autoimmune disorders and why in other conditions it appears to be protective.

Our collaborative research on the link between stress, neuropeptide Y (NPY), and the immune system continues to work towards building a better understanding of the circumstances of NPY release and its effect on immune cells.

Unexpected data with some new B cell molecules had ramifications with heart research and also cancer, which are now new areas of focus in the group via collaborations.

B Cell Immunobiology

**Group Leaders** Dr Robert Brink and Emeritus Professor Antony Basten AO FAA

Autoimmune diseases such as lupus, myasthenia gravis and hemolytic anemia can arise when B cells produce rogue antibodies that attack the body. We aim to identify the specific genes and signaling pathways that regulate B cell survival, proliferation, and differentiation; as well as the molecules and cells that drive antibody production against foreign structures and prevent antibody responses against ourselves. By understanding how B cells function we hope to reveal new strategies for improving vaccines, controlling autoimmune disease, and treating B cell malignancies.

B Cell Tolerance & Autoimmunity

**Group Leader** Dr Pablo Silviera

Our ultimate goal is to prevent the immune system attacking the insulin producing beta cells of the pancreas, which leads to Type 1 diabetes. Our research aims to identify the faulty mechanisms that allow the B cells that recognise beta cell proteins to persist and thus activate the destructive T cells. We also aim to identify novel genes that control the generation and function of this aberrant population of B cells, findings that could form the basis for new therapies to prevent or reverse Type 1 diabetes in humans.
PET (Positron Emission Tomography) scan showing brown fat distribution in a person.
Program Overview

The pituitary gland produces key hormones that control body growth, strength, appetite, metabolism, mood and reproduction. An over or under active pituitary gland can lead to a range of diseases from dwarfism in children to infertility, mood disorders, muscle wasting, obesity and diabetes in adults. The Unit’s major focus is understanding the role of the pituitary gland in controlling body metabolism, composition and physical function. Its effects underlie the many key health problems such as obesity, osteoporosis and sarcopaenia (muscle wasting).

Program Highlights

- Showed that growth hormone can reverse the breakdown of protein induced by glucocorticoids and that this therapeutic potential is enhanced by co-treatment with an androgen
- Completed the first demonstration of a placebo effect in sport in an evaluation on recreational athletes who wrongly thought they had been given growth hormone
- Collected the first evidence that growth hormone enhances a selective aspect of physical performance, that of sprint capacity
- In collaboration with the Bone Program, developed a mathematical (Bayesian) model for a growth hormone doping test (although it could be applied to any diagnostic test) that incorporates biological and measurement variability of diagnostic markers
- Continued to explore the feasibility of a test for growth hormone doping based on the detection of gene expression in peripheral blood cells
- Showed that ß-blockers, medication used for treating blood pressure, may be adding to the burden of obesity through its effects on energy metabolism
- Demonstrated that the liver does not play a role in the burning of body fat induced by testosterone, a surprising finding given that it does play a role burning fat induced by the female hormone oestrogen
Professor Ken Ho was awarded the Asia-Oceania Medal by the British Endocrine Society, invited as Keynote Speaker by the Irish Endocrine Society, invited to serve on the Annual Meetings Steering Committee of the US Endocrine Society and joined the Editorial Board of Endocrinology.

Dr Paul Lee was awarded a Postgraduate Medical Scholarship by the NHMRC for studies towards a PhD on the metabolic effects of β-blockers. He was the recipient of the Wiley Blackwell Clinical Excellence Award from the Royal Australasian College of Physicians; the Young Investigators Award by the Internal Medicine Society of Australia and New Zealand, and received Travel Grants from Royal Australasian College of Physicians, The Endocrine Society of Australia and the Growth Hormone Research Society.

Dr Vita Birzniece received a Poster Prize from the US Endocrine Society, the Australasian Branch of Women in Endocrinology Award from The Endocrine Society of Australia and a travel award from the Growth Hormone Research Society.

Dr Udo Meinhardt, a Postdoctoral Fellow, was awarded a prize for the best Clinical Research at the International Growth Hormone and IGF Congress in Genoa.

Ms Jennifer Hansen's work was selected by the US Endocrine Society for Special Media Interest. The work was reported by a range of agencies including the Times, CBS News, Fox News, The Australian, Discovery and Forbes magazine.

Dr Akira Sata was awarded an Australian Government Endeavour Fellowship to undertake Postdoctoral studies on sex steroid modulation of Growth Hormone signalling.

Dr Jing Ting Zhao filled the position of Scientific Head, bringing strong molecular skills to the Unit.
Research Groups

Hormones, Metabolism and Health

Work from the Unit has shown that Growth Hormone (GH) plays a major role as a metabolic hormone throughout adult life. The ongoing work investigates how the GH system is controlled, what health problems arise from its disturbance and what disease states can benefit from the use of GH. We have discovered that sex hormones exert a major effect on the GH system and we postulate that these are likely to influence how GH controls the metabolic process. We have shown that the female hormone oestrogen blocks, while male hormone testosterone boosts, the action of GH. Under active investigation are the metabolic consequences of compounds called SERMs, which are synthetic oestrogen-like compounds, widely used for the treatment of osteoporosis and breast cancer. The work also explores the potential benefit of combining GH with male hormones to treat muscle wasting.

Complementary work in the laboratory addresses the cellular and molecular mechanisms by which sex steroids modify the action of GH action and identifying novel GH regulated genes. A parallel project extends our understanding of how female hormones interact with prolactin, a pituitary hormone that is structurally related to GH, in the regulation of lactation and mammary development in collaboration with the Development Group of the Cancer Program.

Growth Hormone (GH) Doping

We are aiming to develop new approaches for the detection of GH doping and studying its effects on performance.

We have evaluated the merits of GH responsive blood proteins and the different forms of GH, called isoforms, for detection of GH abuse. We have found that the most promising of these markers can detect GH for several weeks after GH is taken and that one marker is even more sensitive when testosterone is also used. This should enable more cheats to be detected using these tests. In collaboration with the CSIRO, we are utilising microarray gene profiling and gene pathway analysis aiming to develop a gene fingerprint test based on gene expression profiling of white blood cells. We have found for the first time that GH enhances performance but this benefit is confined only to sprint capacity and not strength, power or endurance.

The Unit has also received major funding worth over one million dollars over 3 years from the World Anti-Doping Agency for the gene expression study.

Sympathetic Nervous System, Drugs and Obesity

We are addressing the metabolic significance of therapeutic blockade of the sympathetic nervous system, which plays a major role in providing energy for vital functions. Stimulation of the sympathetic nervous system increases a host of cardiovascular and metabolic responses that lead to increased cardiac output and fuel utilisation. These actions are mediated by the beta-adrenergic stimulation. Our project tests the hypothesis that beta-blockers increase adiposity by reducing metabolic rate, fat oxidation and exercise capacity. Because of their widespread use, their actions on energy metabolism may worsen the burden of obesity in the community. Conversely, judicious use of agents that activate the system may cause weight loss.
Technology is an important component of being competitive in medical science. Garvan’s core research facilities contain state-of-the-art equipment that enables our scientists to perform the necessary experiments to better understand disease processes. A highly trained manager oversees the facilities which are also available to external researchers.

**Australian Cancer Research Foundation (ACRF) Facility for the Molecular Genetics of Cancer** houses equipment that can detect and analyse genetic sequence variations such as gene losses, mutations, expression, and methylation on a large scale. A diversity of platforms is available within the facility to facilitate research within and outside the Garvan Institute. The goals of the facility are aimed at high-throughput, sensitivity, accuracy and cost effectiveness. In addition to sequencing and methylation analysis services, there is now a mouse genotyping service available for all researchers in NSW.

**Gene Chip Facility** contains the Affymetrix Microarray System that is used to compare the levels of gene transcripts in tissue samples. It is used to find potential genes of interest, the subsets of which can then be further analysed in the ACRF Unit that can handle large numbers of samples. Garvan was the first in Australia to establish the system.

**Australian BioResources (ABR)** holds mouse production colonies under clean room conditions for Garvan and other medical research organisations in NSW. The Biological Testing Facility receives mice from ABR for holding in specialised experimental zones to enable quality animal-based research.

**Clinical Research Facility** runs Garvan clinical research projects such as those that look at the effect of hormones (e.g. growth hormone, sex steroid hormones, insulin) on different metabolic systems. Staff also monitor volunteers involved in pharmaceutical clinical trials, such as those for osteoporosis medications.

**Peter Wills Bioinformatics Centre** applies techniques derived from disciplines such as applied mathematics, statistics and computer science to understand, organise and analyse biological data. This includes the housing of both clinical and microarray data, and the building of computer programs for querying and analysing these datasets. Examples of these programs include CanSto for managing clinical cancer data, Stuart for animal records management and Garvan’s GeneSpring WorkGroup - a microarray archiving and analysis environment. CanSto is used across Australia by the Australian Prostate Cancer Collaboration for all their clinical information management. Garvan’s GeneSpring WorkGroup server houses microarray experiment results for researchers across Australia.
Flow Cytometry Facility encompasses instruments used for cell analysis and provides a cell sorting service to allow the separation of up to four populations of cell types from any body fluid or tissue suspension. Through the use of laser, optical and fluidics technology the pure population of cells can be separated on the basis of multiple phenotypic and functional characteristics, and then grown as pure cultures, used to extract RNA or DNA for genetic analyses, or implanted into animal models, for functional assays and therapeutics.

Pieter Huveneers Molecular Imaging Facility consists of a number of state-of-the-art microscopes which, using a variety of fluorescence based techniques, are capable of imaging tissue, cells, intracellular organelles and even multiple individual molecules in live cells. Using techniques such as Total Internal Reflection Fluorescence (TIRF) microscopy we are able to image events occurring on or near the surface of a cell. Using laser scanning confocal microscopy we can precisely image 'slices' of samples which can be reconstructed into a 3D representation for analysis. These provide our scientists with the best possible means of identifying where and when molecules of interest are in normal tissue and how this may differ in disease.
MANAGEMENT HIGHLIGHTS

- As an integral part of the development of the St Vincent’s Research Precinct, Garvan participated in the completion and occupancy of the Lowy Packer Building, housing the Victor Chang Cardiac Research Institute and several of St Vincent’s research groups.

- Developed a Precinct Management Agreement outlining the operation of various essential services, which will be shared between the Garvan and Lowy Packer Buildings, such as the loading dock, stores and emergency generators.

- Relocated and significantly enhanced Glass Wash and Media Prep facilities as integral facilities for the Precinct.

- Focused on energy saving initiatives to reduce our carbon footprint, including: upgrade of lighting to energy efficient fluorescent tubes; installation of movement detectors to activate lighting in irregular use spaces; and adjustment to the central air conditioning systems.

- Redeveloped space (vacated by Glass Wash and Media Prep) for various groups within Operations, including an expanded Engineering space, improved Instrument Repair Workshops and expanded desk space for other groups.

- Received two 90,000 vial capacity vapour phase cryogenic vessels in response to the demand from researchers for more secure and stable storage for biological samples. This leading edge technology is supported by a software application (for tracking and managing samples), designed and developed by Garvan IT.

- Developed and implemented an on-line Occupational Health and Safety induction system to ensure that Garvan remains a safe working environment, including: installation of two automated external defibrillator (AED) units to further enhance a safe working environment; development of a site specific emergency flip chart, which has been installed at key points; and completion of risk assessments for all chemicals on the Institute’s known chemical inventory.

- Opened our new animal facility, Australian BioResources, near Moss Vale, involving the staged relocation of 14 Garvan staff, 12,000 mice and miscellaneous equipment, as well as the co-ordinated receipt of another 1,500 mice from seven partner institutes. The building utilises state-of-the-art operating and caging systems.

- Helped support a growing, geographically dispersed research community by releasing new and upgraded versions of the Publications, Grants and Cryogenics storage systems. Additionally, Garvan’s own cancer research solution, CanSto, was installed at Royal North Shore Hospital, Concord Hospital and Charles Gardner Hospital in Perth.

- Completed several agreements with international biotech and diagnostic companies to develop therapeutic response tests for neurodegenerative disease and to discover novel cancer biomarkers.

- Submitted two funding proposals to the $30m pre-seed Medical Research Commercialisation Fund to advance a promising therapeutic and a diagnostic project in the area of Type 2 diabetes.

- Completed several agreements with international biotech and diagnostic companies to develop therapeutic response tests for neurodegenerative disease and to discover novel cancer biomarkers.

- Submitted two funding proposals to the $30m pre-seed Medical Research Commercialisation Fund to advance a promising therapeutic and a diagnostic project in the area of Type 2 diabetes.

- Continued training of Garvan researchers in intellectual property matters including patent searching and what is necessary to develop early stage findings into clinically attractive projects.

- Helped support a growing, geographically dispersed research community by releasing new and upgraded versions of the Publications, Grants and Cryogenics storage systems. Additionally, Garvan’s own cancer research solution, CanSto, was installed at Royal North Shore Hospital, Concord Hospital and Charles Gardner Hospital in Perth.

- Developed the technologies available to Garvan researchers by establishing applied collaborations with CSIRO in the area of molecular imaging and structural biology.

- Completed several agreements with international biotech and diagnostic companies to develop therapeutic response tests for neurodegenerative disease and to discover novel cancer biomarkers.

- Submitted two funding proposals to the $30m pre-seed Medical Research Commercialisation Fund to advance a promising therapeutic and a diagnostic project in the area of Type 2 diabetes.

- Continued training of Garvan researchers in intellectual property matters including patent searching and what is necessary to develop early stage findings into clinically attractive projects.

- Helped support a growing, geographically dispersed research community by releasing new and upgraded versions of the Publications, Grants and Cryogenics storage systems. Additionally, Garvan’s own cancer research solution, CanSto, was installed at Royal North Shore Hospital, Concord Hospital and Charles Gardner Hospital in Perth.

- Developed the technologies available to Garvan researchers by establishing applied collaborations with CSIRO in the area of molecular imaging and structural biology.

- Completed several agreements with international biotech and diagnostic companies to develop therapeutic response tests for neurodegenerative disease and to discover novel cancer biomarkers.

- Submitted two funding proposals to the $30m pre-seed Medical Research Commercialisation Fund to advance a promising therapeutic and a diagnostic project in the area of Type 2 diabetes.

- Continued training of Garvan researchers in intellectual property matters including patent searching and what is necessary to develop early stage findings into clinically attractive projects.
Overview

The Business Development team, under the leadership of Christina Hardy, engages with the pharmaceutical and biotech sector and partners with other academic organisations to take Garvan’s research discoveries one step closer towards the development of new treatments and diagnostic tests. Working closely with Garvan scientists, the Business Development team is responsible for all aspects of commercialisation from monitoring research activities to maximising early capture of intellectual property, identifying pharma/biotech market opportunities, and negotiating and managing commercial agreements. Importantly the Business Development team establishes applied collaborations with organisations who have additional technologies which greatly increase the potential for Garvan’s breakthroughs to be developed for clinical use.

The Garvan patent portfolio comprises 39 patent families covering treatment, diagnostics and screening categories.

G2 Therapies and Novo Nordisk

G2 Therapies is a private company, chaired by Dr John Schubert, which develops and commercialises antibody-based therapeutics for inflammation. Founded at Garvan in 2002, major investors include AMWIN and Baron Nominees.

In early 2006, G2 announced the signing of a major research, development and licensing agreement with Danish healthcare company Novo Nordisk. The terms of the agreement include an upfront payment, success-based milestone payments, and royalties on commercialised therapeutics.

Novo Nordisk and G2 Therapies have recently advanced the lead anti-C5aR monoclonal antibody to human clinical trials in late 2008. Anti-C5aR antibody treatment holds promise for a number of inflammatory conditions including lupus, rheumatoid arthritis and other autoimmune diseases.

Business Development Advisory Council

The Business Development Advisory Council (BDAC) includes several representatives from the biotech and pharmaceutical industries.

Dr Lisa McIntyre (Chair)
Director, L.E.K. Consulting

Bill Ferris AC,
Board Chairman, Garvan

Professor John Shine AO FAA,
Executive Director, Garvan

Dr George Moore
External Director

Dr Merilyn Sleigh,
External Director

Peter Carre,
CEO, Burrill Australia

Christina Hardy,
Director, Business Development & Legal Affairs, Garvan

John Dakin,
Chief Operating Officer, Garvan

Dr Robert Brink
Group Leader, Immunology Program, Garvan
GARVAN COMMUNITY

Life Governors
Allind Pty Limited
Amadeus Energy Limited
Mr John Armati
Australian Cancer Research Foundation
ASX-Reuters Charity Foundation
Australian Deafness Research Foundation
Australian Securities Exchange
The Blundy Family
Coca-Cola Amatil
Mr Charles P Curran AC
The Curran Foundation
Lady (Mary) Fairfax AC OBE
Ferris Family Foundation
Mr Laurence S Freedman AM
Miss Felicia D Garvan
Mr James Patrick Garvan & Family
George Patterson Pty Limited
Mr and Mrs B & A Ginges
Mr Paul & Mrs Judy Hennessy
HIH Insurance Ltd
Mr Pieter H Huveneers
Mrs Virginia Kahlbetzer
Mr T Kennedy AM & Mrs C Kennedy
Mr Ralph and Mrs Lorraine Keyes
The Kinghorn Foundation
Mrs Mabs Melville
MLC Community Foundation
National Australia Bank Ltd
Dr Graham O’Neill
Order of the Eastern Star Chapter No. 38
Mr K Packer AC
The Paramor Family
The Ritchie Family
Mr Tim and Mrs Sally Sims
Mr Robert Strauss MBE
Mr Laurie Sutton
The Lady Proud Foundation
The Petre Foundation
Westfield Holdings Ltd
E J Whitten Foundation
Mr Ray Williams

Partners for the Future
Mrs M Abercrombie
Mrs Margaret Adams
Dr W Michael Baker
Ms James Belger
Mr Peter Binnie
Ken Bloxsom
Ms Linda Booth
Mr Earle & Mrs Marlene Boutwell
Mr Alan & Mrs Anne Boyle
Ken & Betty Brown
Mrs Judith Clark
Mrs Madeline Coelho
Mr Jock Crooks
Mr Rodney F Darke
Ms Cristine Davison
Mrs Marlene Dixon
Mr John Dobies
Mrs Phillipa Dorin
Ms Dale Falconer
Mr Gabriel & Mrs Joan Farago
Ms Jan Foster
Mr Michael & Mrs Joy Foulsham
Elizabeth Fyffe
Mrs Carmel Gillett
Miss Flo Greene
Dr A N Gyory
Mrs Jean B Hale
Dr Brona Hatfield
Ms Heather Patricia Hindle
Mr J K L Hooton
Miss V Jenkins
Byram & Deborah Johnston
Miss V Jenkins
Mrs Florence Jones
Mrs Virginia Kahlbetzer
Ms Lili Koch
Roberta Lauchlan and Barry Thompson
Mr Keith Line
Mrs Adell Littlejohn
Ms Maria Lydaki
Denise Maddocks
WJ and PA McNamara
Mrs Mabs Melville
Mr John & Mrs Mary Miller
Miss Helen Morgan
Mr Peter Olive
Mrs Lesley Powell
Mr George Quigg
Mrs Judy Radecki
Tanya Roddan
In memory of Sonia Gabrielle Saba-Losey
Miss Vi Saint
Ms Coral Saunders
Miss Thelma Shepherd
Mrs Cynthia Southwell
Miss H Stockman
Mr Leonard Towers
Mrs Judith Wheeldon AM
Mrs Jean Whittaker
Dr Eva Wicki
Ms Faye Margaret Williams
Mary and Herbert Morris
Ms Jacque Cole
Dr Norman Marshall

Volunteers
Janet Barkell
Kaye Blaiklock
Deirdre Blakemore
Graham Curtis
Margarita Field
Lyndie Hemery
Mrs Edna Hutton
Lynne Jones
Juliet Kirkpatrick
Janice Lee
John Mclnerney
Margaret McInnes
Bob Neilson
Joan Neilson
Jean Pushong
Julie Reid
Philip Twigg
Bill Upton

A thank you also to the volunteers from
ASIC, MLC, NAB, and BNP Paribas who
assisted us with the 2008 Open Day.
Garvan Supporters

A W Edwards Pty Limited
Mr Chris M Abbott
Accenture
AGL Energy Limited
Michael Ahrens
Mr Len Ainsworth
Ake Ake Fund
Alcoa Australia Rolled Products
Alcoa Foundation
Allen & Unwin Pty Ltd
Amadeus Energy Limited
American Express
AMP Foundation
Mr Neil Anderson
Anti-doping Research Program of the
Australian Government Department of
Communications, Information
Technology and the Arts (DCITA)
ARC/NHMRC Network - FABLS Support
Scheme
Ascham School
Australian Cancer Research Foundation
Australian Deafness Research Foundation
The Australian Ladies Variety Association Inc
Australian Research Council
Australian Rotary Health Research Fund
Australian Securities & Investments
Commission
Australian Securities Exchange
Avalon Quilters
Bain & Company
Mr Klaus Bartosch
Professor Antony Basten
Mr Douglas Battersby
Mrs Marie Bennett
Miss Tania Betts
BHP Billiton Community Program
Mrs Kaye Blaklock
BNP Paribas
BNP Paribas Foundation
Mr Roy L Bockholt
Mrs Gay Boersma
Mrs Thelma Susan Bonner
Mrs D Bonser
Ms Margaret Bowers
Ms Louisa Boyle
Mr and Mrs G & C Bradley
Dr Ruth Bright & Dr Desmond Bright
Ken & Betty Brown
Mrs Kate Buchanan
Mr G Bushby
In Memory of Yvonne Buwalda
CAF Australia
Cancer Council NSW
Cancer Institute NSW
Mrs Helen Callander
Carol and Steve Rogers Memorial
Charity Day
Castle Harlan Inc
Mr Andrew Chapman
Mr Chris Chapman & Dr Cath Chapman
Mr Craig Chapman
Ms Janet Chester
Clive and Vera Ramaciotti Foundation
Ms Melinda Conrad
The Corio Foundation
Mr Stanley Costigan
Brett & Susan Courtenay
Mr Richard Croyde
CSR Limited
Cure Cancer Australia Foundation
Mr & Mrs R Cusick
Dairy Farmers Co-operative Limited
Employees' Provident Fund
Mr Rodney F Darke
Mr Peter David
Professor J G & Dr J R Davis
Mr Robert Davis
Mr & Mrs Tony & Coleen De Saxe
Department of Foreign Affairs and Trade
Department of Innovation, Industry,
Science and Research
Diabetes Australia Research Trust
Geoff and Dawn Dixon
Ms Rochelle Dixon
Dominion Private Clients
Mrs J Doyle
Mr Phil Dunney
Mr Andrew Eger
Eli Lilly Australia
Mr Patrick J Elliott
Ernest Heine Family Foundation and
Mrs Janice Gibson
Mr Andrew Evans
Mrs Margaret Evans
Lady (Mary) Fairfax AC OBE
Mr Jonathon A Feller
Mr Tom G Fenton
Ferris Family Foundation
Ms Jane Forster
Mr Michael & Mrs Joy Foulsham
Foundation for Prader–Willi Research
Elizabeth Fyffe
Gadens Lawyers Sydney Pty Ltd
Eric & Tonia Gale
Mr Justin H Gardener
Dr William Garrett
GlaxoSmithKline Australia
John Glennie
Cherie Glick and family for Joe
Mr Cyril Golding
Mrs Elizabeth Goldsmith
graysonline.com
The Greatorex Foundation
Sharon Green
Gresham Partners Limited
Mr J Grice
Mrs Enid Griffin
Mrs R A Gross
William A and Laura H Gruy
Mr & Mrs G F & B C Gschwenter
Dr Jenny Gunton
Gynaecological Oncology (GO)
Research Fund
Alan Helicar
H Kallinikos Pty Limited
Mrs Jean B Hale
The Jessica & Wallace Hore Foundation
Mrs Ann Hanson
Mr Loftus Harris AM
Ms Betty Haugh
Mr & Mrs Bill & Alison Hayward
Mr Alan Heggie
Meredith Hellicar
Mr Paul & Mrs Judy Hennessy
Dr G J Hiatt
Mr I Holmes
Dr & Mrs Francis & Marie Hooper
Mr J K L Hooton
Ms Jessica Hore
Mrs Sue Howieson
Mrs L A Hudson
Stanley Hunt OAM
Mr Robin & Mrs Beatrice Hutcheon
Mr Pieter H Huveneers
Mr & Mrs M Isaacs
Mr Phill Isaacs
The Hon Justice Peter M. Jacobson
Mr R Jarvis
John & Connie Kennedy Charitable Trust
John Lamble Foundation
John Reid Charitable Trusts
Mrs Sheila M Johnstone
Mr Alan Joyce
The Juvenile Diabetes Research Foundation (JDRF)
Mrs Virginia Kahlbetzer
Lady Catherine Kater AM
Mr & Mrs Patrick & Beryl Keane
Mrs Helen Keir
Professor Geoffrey Kellerman AO
The Ken & Alse Chilton Charitable Trust
Mr T Kennedy AM & Mrs C Kennedy
Mr Raymond Kent
Mr Ralph and Mrs Lorraine Keyes
The Kinghorn Foundation
Mrs A Kirby
Mr W Bruce Kirkpatrick & Mrs Juliet Kirkpatrick
Mr John T Kneeshaw
Mr Philip Knox
KPMG
Ms Josie La Spina
The Lady Proud Foundation
Mr Robert Landeros
In Memory of Michael Ison Large
Ms Nita Lavigne
Mr Jeremy Layman
Lions Club of Hawkesbury Bells Line Inc.
Lord Mayor’s Charitable Foundation (Melbourne)
Mr Michael Lowe
Mr Bramwell Lucas
Ms Maria Lydaki
Mrs Ann Macintosh
Macquarie Group Foundation
Malleons Stephen Jaques
Mr A J & Mrs S A Malouf
Mr Roy Manassen
The Mandarin Club
Mr R & Mrs S Maple-Brown
Dr Karen Mardel
Mr Philip Mason & Ms Alexandra Joel
The Hon John & Mrs Dympna Matthews
Mr Peter McGovern
WJ and PA McNamara
Medical Benefits Fund (MBF)
Medtronic Australasia Pty Ltd
Mtrs Mabs Melville
Merck Sharp & Dohme (Aust) Pty Limited
The Michael & Andrew Buxton Foundation
Mr Neill Miller
Mrs Wendy Millhouse
MLC Community Foundation
Mr & Mrs R & A Mole
Geoff & Jan Moles
Mr Warren Morley
Ms Lesley Morrison
Motor Neurone Disease Research Institute of Australia
MSM Milling Pty Ltd
Mr Peter Murphy
Mr S Murray
Mr J Muysken
National Breast Cancer Foundation
National Health and Medical Research Council
National Institute of Complementary Medicine
National Institutes of Health
The N E Pendergast Charitable Trust Fund
Mr James Nilson
Mr & Mrs Leigh & Binnie Norman
Novartis Pharmaceuticals Australia
The NSW Cancer Council
NSW Department of Health & Ageing
NSW Office for Science and Medical Research
Nuclear Medicine and Bone Densitometry, SVH
Mr Michael O’Dea AM & Mrs Marianne O’Dea
Mr J O’Farrell
Dr Graham O’Neill
Orange & District Breast Cancer Support
Order of the Eastern Star Chapter No. 67
Mr Wayne O’Toole
Pacific Equity Partners
Miss Winnie Pang
The Paramor Family
Park Hyatt Sydney
Ian Paul
Perpetual Trustees
Pfizer Australia
Pfizer Global Research and Development
Pfizer International
Prader-Willi Syndrome Association of NSW (Aust) Inc
Premier Media Group
Pricewaterhouse Coopers Foundation
Prostate Cancer Centre, St Vincent’s Hospital
Prostate Cancer Foundation of Australia
Public Trustee NSW
Qantas Airways Limited
Quota International
Mrs E Ramsden
Mr Roy Randall
Rebecca L Cooper Medical Research Foundation
Mr Jean Redman
Brad & Lisa Rees
Retire@Ease Financial Planning

Garvan Research Foundation
CEO, Ms Carole Renouf, with MLC CEO, Mr Steve Tucker and Manager of Garvan’s Flow Cytometry Facility, Mr Christopher Brownlee. The MLC Community Foundation has pledged $1 million to the facility over 5 years.
Mr George Risk  
Mrs Judy Roach  
The Rodney & Judith O’Neil Foundation  
Mrs Deanne Rooz  
Rosemary Pryor Foundation  
Ms Kelly Rosman  
Rotary Club of Hurstville  
Roth Charitable Foundation  
Mr Garry Rothwell  
Roy Young Chemist  
RT Hall Trust  
Mrs G Ryan  
Mr Martin Sachs  
Sanofi-aventis  
Mr D & Mrs A Saul  
Mr L Seaman  
Mr Graham See  
Jan Shaddock  
Mr & Mrs T & J Shanahan  
Mrs D Shannon  
Mrs Lindsey Shaw  
Mr David Shmith  
Mr Richard Simons  
Skipper-Jacobs Charitable Trust  
Joseph Skrynski AO and Roslyn Horin  
Mr M Slavich  
Mr Graham Smith  
Mr Barry Smorgon  
Mrs Shirley Smyth  
Mr Frank Snoeys  
Mr & Mrs George & Sabrina Snow  
Mr Neil Spitzer  
St Vincent’s Clinic Foundation  
Miss Alison Stephen  
Strategic Industries  
Ms Joyce Strong  
Professor Rob Sutherland FAA  
Swiss National Fund  
Sydney Ultrasound for Women  
Mr Nick Tait OBE & Mrs Mimi Tait  
Thomas Hare Investments Limited  
Mrs Margaret Turner  
Mrs A Udy  
University of NSW

Mr Peter Unwin  
Victor Chang Cardiac Research Institute  
Vittoria Coffee  
Voice & Data  
John & Megan Wade  
Wade Civil Engineering Pty Ltd  
Mrs Caroline Walder  
Dr JR Warneford  
Ms Alexandra Wedutenko  
Westpac Banking Corporation  
Mrs Judith Wheeldon AM  
Mr Alan Whitfield  
E J Whitten Foundation  
In Memory of the Late Kathrin Nell A Wilshire  
Mr William Wilson  
Witchery  
Emil Witton  
Wood Family Foundation  
Mr J & Mrs L Woolf  
Mr Andrew Wright  
Ms Pamela Wright  
Dr Stan J Wright  
XLP Research Trust (UK)  
Mr Ralph W Young  
Mr Stanley Young

**Bequests**

Estate of the Late Gloria M Backhus  
Estate of the Late Brenda M Bismire  
Estate of the Late Denzil de Ferrars Carrington  
Estate of the Late Milly Dinjaski  
Estate of The Late Charles Edward Lawn and Marjorie Grace Lawn  
Estate of the Late Leslie McAllister  
Estate of the Late Henry R McQuirk  
Estate of the Late Phyllis Maude O’Hanlon  
Estate of the Late Babette Josephine Ryan  
Estate of the Late George W Steed  
Estate of the Late Charlotte M Trunshnig  
Estate of the Late Betty A Williams  

Dr Nae Shiozawa-West discusses her research with Mrs Rosemary Pryor, who has donated $1 million to Garvan’s Neuroscience Program.
Garvan Institute Board

**Bill Ferris AC**
Chairman
Nominated by the Trustees of St Vincent’s Hospital

Bill Ferris is Executive Chairman of the CHAMP Private Equity Group, one of Australia’s leading private capital groups, providing venture capital, expansion capital and management buyout funding in Australasia. Mr Ferris is Chair of the Garvan Institute of Medical Research and recently appointed Chair of the Health and Hospitals Fund Advisory Board as part of the Federal Government’s Nation-Building Funds initiative. Former directorships include: Chairman, Australian Trade Commission (Austrade), Austr United Communications Limited and Bradken Resources Pty Ltd. Other current directorships include: Director, Garvan Research Foundation.

Mr Ferris was made an Officer in the Order of Australia in 1990 for services to the export industry and in 2008 was made Companion in the Order of Australia for his philanthropic activities and his role in the establishment of the private equity sector in Australia.

**Martin Hoffman**
Treasurer
Nominated by the Sisters of Charity

Martin Hoffman is the principal of Ulysses Ventures, a provider of advisory services and seed investment to early-stage digital media and technology companies. He was previously CEO of Loop Mobile Limited, a listed provider of mobile chat and community services internationally, and of NineMSN, Australia’s largest internet media company. He has also held senior management roles with Fairfax Media and Optus.

**Graham J Bradley**
Nominated by the Garvan Research Foundation

Graham Bradley is a professional company director. Mr Bradley is Chairman of Stockland Corporation Limited, HSBC Bank Australia Limited and Anglo American Australia Limited. From 1995 to 2003 he was Managing Director of Perpetual Australia. He is a former partner of McKinsey & Company, management consultants, and a former national managing partner of Blake Dawson. Mr Bradley was appointed Chairman of Garvan Research Foundation in June 1999 and joined the Garvan Institute Board in November 1999.

**Nicholas Curtis**
Nominated by the Trustees of St Vincent’s Hospital

Nicholas Curtis has a background in investment banking and the resources industry. He is Executive Chairman of Lynas Corporation Limited, an Australian public company specialising in rare earths. Mr Curtis was appointed as Chairman of the Board of St Vincents & Mater Health Sydney in August 2004 and also serves as a director of the Sisters of Charity Health Service.

**Mary Foley**
Nominated by the Sisters of Charity

Mary Foley held the position of the Chief Executive Officer, St Vincents & Mater Health Sydney until early 2008. Ms Foley is currently the National Health Practice Leader at PricewaterhouseCoopers. Previous positions include Deputy Head, NSW Department of Health and Executive Director, NSW Office of Health Policy and senior executive management positions for Mayne Nickless private health care business. Ms Foley is Deputy Chancellor and a member of the Board of Trustees, University of Western Sydney as well as a member of the Board of Governors of University of Notre Dame Australia. Ms Foley was NSW Telstra Businesswoman of the Year in 1998 and was awarded the Centenary Medal in 2003 for service to Australian society in business leadership. Ms Foley stepped down from the Boards of the Garvan Institute and Garvan Research Foundation in March 2008.

**Lisa McIntyre**
Nominated by the Federal Minister for Health

Dr Lisa McIntyre is a partner with the strategy consulting firm LEK Consulting and head of LEK’s Asia Pacific Life Sciences practice. She has over 15 years consulting experience for the biotechnology sector and has worked with over 100 different biotechnology and life sciences clients primarily focusing on the challenges associated with commercialisation innovation. Dr McIntyre relocated to Sydney in 2002 after nine years in the United States co-heading LEK’s Life Sciences practice where she advised many of the world’s leading biotechnology companies. She is also a director of Biotech Capital Ltd and AtCor Medical Pty Ltd.

**Greg Paramor**
Nominated by the Garvan Research Foundation

Greg Paramor has been involved in the real estate and property funds management industry for approximately 35 years. Mr Paramor was appointed Managing Director of the Mirvac Group following the acquisition of the James Fielding Group in January 2005. He is the past President of the Property Council of Australia and the Investment Funds Association of Australia. He is currently a
director of a number of companies, including the National Breast Cancer Foundation. He is a Fellow of the Australian Property Institute and a Fellow of The Royal Chartered Institute of Surveyors.

Sister Carol Pedersen RSC
Nominated by the Sisters of Charity
Sister Carol Pedersen graduated as a trained nurse at St Vincent's Sydney in 1963 and is a Sister of Charity. She holds a PhD from UNSW and a BSW (Hons 1) from the same institution. She also holds an Advanced Diploma from the Sydney College of Homoeopathic Medicine, and has completed postgraduate work, obtaining an Associate Diploma in Advanced Homoeopathic Medicine. For over 20 years Sr Carol was a member of various Human Research Ethics Committees, and was active at national, state and local levels in the development of Alcohol and Drug Services.

Warren Scott
Nominated by the NSW Minister for Health
Warren Scott is a director of Citigroup and is General Counsel and Managing Director in Australia. He is Chairman, Woolcock Institute of Medical Research, as well as a delegate to the Australian American Leadership Dialogue, the Law Society of New South Wales, the American Bar Association, the New York Bar Association and the California Bar Association. Warren is admitted as a solicitor in New South Wales and as a lawyer in New York and California.

John Shine AO FAA
Appointed by the Garvan Institute Board
Professor John Shine is Executive Director of the Garvan Institute of Medical Research and a board member of the Garvan Research Foundation. He is Professor of Molecular Biology and Professor of Medicine at the University of NSW, and a director of many scientific, research and medical bodies throughout Australia, including the recent ex-Chairman of the National Health and Medical Research Council (NHMRC) and until 2006 a member of the Prime Minister's Science, Engineering & Innovation Council (PMSEIC).

Peter J Smith
Nominated by the University of NSW
Professor Smith is Dean, Faculty of Medicine, the University of New South Wales. He specialised in cancer medicine and research following study in Australia, USA and Germany. He has held senior hospital management posts in Brisbane and Melbourne, and senior academic appointments at the Universities of Queensland, Melbourne and Auckland. He has served in a consulting role to Government, including as Chair of the recent Inquiry into Vietnam Veterans Cancer Incidence and Mortality. Professor Smith is currently a Director of St Vincent's & Mater Health Sydney, NewSouth Innovations, MedSys Assurance (NZ) and a number of research centres and institutes.

Bernadette Tobin
Nominated by the Trustees of St Vincent's Hospital
Associate Professor Bernadette Tobin is Director of the Plunkett Centre for Ethics at St Vincent's Hospital, Sydney, and Reader in Philosophy at the Australian Catholic University. Dr Tobin is Honorary Ethicist at the Children's Hospital at Westmead, Honorary Associate Professor in the Faculty of Medicine at the University of Sydney, and Conjoint Associate Professor in the School of Medicine at the University of New South Wales. She served for three triennia on the Australian Health Ethics Committee, a principal committee of the NHMRC. She also chaired the drafting group which prepared the first Code of Ethics for Catholic Health and Aged Care Services in Australia.

Ronald Trent
Nominated by the Federal Minister for Health
Ronald Trent is Professor of Molecular Genetics, University of Sydney and Head of the Department of Molecular and Clinical Genetics, Royal Prince Alfred Hospital. He is the Chairman of the Advisory Committee for the University’s recently formed Forensic Medicine & Science Network. He has been a member of the NHMRC Research Committee since 1997 and has been Chairman of the NHMRC Human Genetics Advisory Committee as well as a member of the NHMRC Council since 2006.
Garvan Research Foundation Board

Garvan Research Foundation was established in 1981 to provide the Garvan Institute with an additional source of research funds by attracting financial support from companies and individuals. Over the years, the Foundation has evolved to become Garvan’s marketing, communications and fundraising arm.

The Foundation’s Board is empowered as the governing body to determine the Foundation’s policy and control its affairs subject to the ultimate direction of the Garvan Institute Board.

Graham J Bradley
Chairman
Graham Bradley is a professional company director. Mr Bradley is Chairman of Stockland Corporation Limited, HSBC Bank Australia Limited and Anglo American Australia Limited. From 1995 to 2003 he was Managing Director of Perpetual Limited. He is a former partner of McKinsey & Company, management consultants, and a former national managing partner of Blake Dawson. Mr Bradley was appointed Chairman of Garvan Research Foundation in June 1999 and joined the Garvan Institute Board in November 1999.

Jane Allen
Jane is the Managing Partner of Egon Zehnder International’s Sydney office, and co-leader of their Australian Practice, where she focuses on CEO and Board appointments in Australia. Ezi is the world’s largest privately held search firm with more than 380 consultants located in 63 wholly owned offices in 38 countries. The firm specialises in senior level executive search, board consulting and director search, management appraisals, and talent management. Jane has been at Egon Zehnder International for 10 years. In addition to her local role she also holds a global strategy leadership role in one of the Firm’s core client practices, after leading the practice group in Asia Pacific for 3 years. Prior to joining Egon Zehnder International Jane worked at Procter & Gamble in sales and then marketing in both the US and Australia. Jane has an MBA from Harvard Business School and a Bachelor of Arts from Smith College. Ms Allen joined the Foundation Board in 2007.

Alec Brennan
Alec Brennan pursues a portfolio of business and not for profit interests. Until March 2007, he was CEO and Managing Director of CSR Limited. He is Chairman of publicly listed Emeco Limited, Chairman and co-investor in privately owned PPI Limited and Chairman of Tomago Aluminium Pty Ltd. He is a Fellow of the Senate of Sydney University and Chair of several of its committees. Mr Brennan joined the Foundation Board in 2000 and stepped down in 2008.

Philip Marcus Clark AM
Originally trained in law and management, Philip Clark has led the successful growth and development of two of Australia’s largest law firms, Minter Ellison and Mallesons Stephen Jaques as Managing Partner and CEO. Mr Clark is a member of the JP Morgan Advisory Council, Chairman of the Higher Education Endowment Fund Advisory Board and a director of ING Management Ltd, M+K Lawyers Holdings Ltd, St James Ethics Centre and two scholarship foundations. Mr Clark joined the Foundation Board in 2005 and stepped down in 2008.

Melinda Conrad
Melinda Conrad is former Managing Director and Founder of the retail store chain, Conrads Warehouse. Prior to her establishment of Conrads, she held management roles at Harvard Business School and Colgate-Palmolive. Ms Conrad is also a director of the Australian Brandenburg Orchestra. Ms Conrad joined the Foundation Board in 2003.

Geoff Dixon
Geoff Dixon is on the Boards of Consolidated Media Holdings Limited and Crown Limited. He is also Chairman of the Risk Committees of both Consolidated Media Holdings and Crown Limited. Mr Dixon stepped down in November 2008 after eight years as Managing Director and Chief Executive Officer of Qantas Airways Limited. Mr Dixon joined the Foundation Board in 2008.
Gabriel Farago
Gabriel Farago is a company director and consultant advising corporations on litigation management. Prior to establishing his consultancy, he practised as a solicitor and barrister for over 30 years, specialising in commercial disputes both in Australia and overseas. Mr Farago has extensive business interests, and has been involved in property development for more than 20 years. A passion for philanthropic and charitable causes also reaches back many years, and in 1984 he was made a member of the Knightly Order of Vitez. Mr Farago joined the Foundation Board in 2008.

Bill Ferris AC
Bill Ferris is Executive Chairman of the CHAMP Private Equity Group, one of Australia’s leading private capital groups, providing venture capital, expansion capital and management buyout funding in Australasia. Mr Ferris is Chairman of the Garvan Institute of Medical Research and recently appointed Chair of the Health and Hospitals Fund Advisory Board as part of the Federal Government’s Nation-Building Funds initiative. Former directorships include: Chairman, Australian Trade Commission (Austrade), Austar United Communications Limited and Bradken Resources Pty Ltd.

Mr Ferris was made an Officer in the Order of Australia in 1990 for services to the export industry and in 2008 was made Companion in the Order of Australia for his philanthropic activities and his role in the establishment of the private equity sector in Australia.

Mary Foley
Nominated by the Sisters of Charity
Mary Foley held the position of the Chief Executive Officer, St Vincents & Mater Health Sydney until early 2008. Ms Foley is currently the National Health Practice Leader at PricewaterhouseCoopers. Previous positions include Deputy Head, NSW Department of Health and Executive Director, NSW Office of Health Policy and senior executive management positions for Mayne Nickless private health care business. Ms Foley is Deputy Chancellor and a member of the Board of Trustees, University of Western Sydney as well as a member of the Board of Governors of University of Notre Dame Australia. Ms Foley was NSW Telstra Businesswoman of the Year in 1998 and was awarded the Centenary Medal in 2003 for service to Australian society in business leadership. Ms Foley stepped down from the Boards of the Garvan Institute and Garvan Research Foundation in 2008. Lyn Gearing
Lyn Gearing was appointed to the Garvan Foundation Board in 2005 as a representative of the Sisters of Charity. Ms Gearing has substantial experience in superannuation, funds management, corporate finance and management consulting. Ms Gearing joined the Foundation Board in 2005.

Loftus Harris AM
Loftus Harris is a non-executive director on boards in NSW, Victoria and Queensland, a national director of the Australian Institute of Export, and holds the appointment of Special Trade Representative to the Middle East and India for the Queensland Government. He previously held chief executive positions in the NSW and Queensland public sectors with responsibility for whole-of-government activities including international trade, investment, innovation, business and regional development. He also served extensively overseas as an Australian Trade Commissioner. Mr Harris joined the Foundation Board in 2008.

Meredith Hellicar
Meredith Hellicar is a company director and consultant in strategy and change. She is Chairman of AMP Life and a director of AMP Limited, AMP Bank, Amalgamated Holdings and the Sydney Institute. She was a member of the Advisory Board of the Marsh McLennan Group in Australia and of the Board of Governors of CEDA. Meredith was awarded a Centenary Medal for Business Leadership. Her former directorships include James Hardie Industries, HLA Envirosciences, Southern Cross Airports Group, NSW Treasury Corporation, AurionGold, HCS Limited and the NSW Environment Protection Authority. She was a member of the Takeovers Panel and the Foreign Affairs Council and her previous executive roles include Managing Director of InTech Financial Services, Chief Executive Officer of Corrs Chambers Westgarth and Managing Director of TNT Logistics Asia. Ms Hellicar joined the Foundation Board in 2002.
Byram Johnston OAM
Byram Johnston is the Chief Executive Officer of MainstreamBPO, a company providing back office processing and administration services to fund managers and superannuation funds. Prior to establishing this business he spent over 30 years as a management consultant. He serves on the board of a number of companies. Mr Johnston joined the Foundation Board in 1997.

Ross King
Ross King is a Managing Director at Goldman Sachs JBWere where he has spent the last 16 years providing investment banking and financing advice. He has worked across numerous product areas including investment banking, equity sales and research and was made a Partner in 1994. He fulfilled senior roles in both the New York and London offices before returning to Sydney in 2001 as Co-Head of the Healthcare, Consumer & Industrial Divisions of the Investment Banking department. Ross now has responsibility for the Natural Resources division. Mr King joined the Foundation Board in 2005 and stepped down in 2008.

John Koch
John Koch is Chief Representative of the Hong Kong based Forma Group of Companies, a former board member of St Vincent’s Hospital and Chair of its Finance Committee. He is also the former Chair of Woods Cottage Foundation which assists intellectually disabled young adults. He had a 32 year career with the Commonwealth Bank assuming a range of domestic and international responsibilities. Mr Koch joined the Foundation Board in 2000.

John Landerer AM
John Landerer is a solicitor specialising in corporate advisory work and is also a professional company director. He is currently Chairman of Goldsearch Limited and other private companies. He has served as Chairman of the Home Purchase Assistance Authority and is on the Board of Life Education Australia and the Royal Institute for Deaf and Blind Children as well as on the Boards of various charitable institutions. Mr Landerer was appointed a Visiting Professor at Macquarie University in Business and Commercial Law and holds an honorary doctorate from that University. He is also a Fellow of Sydney University. Mr Landerer is a Member of the Order of Australia and a Commander of the Most Excellent Order of the British Empire. He is also a Commander in the Order of the Star of Italian Solidarity. Mr Landerer joined the Board in 2007.

Sister Paulina Pilkington RSC AM
Sister Paulina has a broad background in health policy formation, having been a member of the Hospitals and Health Services Commission (Sax Commission) and Assistant Director General, Nursing Branch, Federal Department of Health. Sister Paulina resigned from the Garvan Institute Board in February 2000 and has been a member of the Foundation Board since 1994.

Brad Rees
Brad Rees is involved in a number of charitable, arts and educational interests. Until 2007, he was a managing director and equity partner of the investment banking firm Goldman Sachs JBWere. Brad was with the firm for 23 years and worked in the Melbourne, Sydney and London offices providing financial and investment banking advice to corporations and governments in Australia and overseas. Mr Rees joined the Foundation Board in 2008.

Steven Rubic
Steven Rubic was appointed CEO of St Vincents & Mater Health Sydney in April 2008. Prior to this he was Executive Director of St Vincent’s Private Hospital a position he held since 1997. He is currently a Board Member of SV&MHS, the Health Industry (Superannuation) Plan, the Garvan Research Foundation, a member of Australian Commission on Safety and Quality Health Care (Private Hospital Sector Committee) and is a past Chairman of the NSW Private Hospitals Association. He has completed an MBA and is a fellow of the Australian Institute of Company Directors.
John Shine AO FAA
Professor Shine is Executive Director of the Garvan Institute of Medical Research, Professor of Medicine and Professor of Molecular Biology at the University of NSW. He is also the recent ex-Chairman of the National Health and Medical Research Council, past president of the Australian Genome Research Facility, and a past Vice President of the Australian Academy of Science. He is an Officer in the Order of Australia and until 2007 was a Member of the Prime Minister’s Science, Engineering and Innovation Council.

Ian Smith
Ian Smith was until recently Chief Executive of Yahoo!7. He has more than 20 years experience as a company director and advisor in the advertising, marketing communications and media industries. Prior to leading the management buyout of the Communications Group in 2003, Mr Smith spent five years in New York as President International of Bates Worldwide and Director of the publicly listed Cordiant Communications PLC. He also led the development of Cordiant’s global e-business consultancy, which now operates in most major markets around the world. Mr Smith has served on a number of government and philanthropic advisory groups including the Whitney Museum in New York and the State Library of New South Wales. Mr Smith joined the Foundation Board in 2005 and stepped down in 2008.

The Hon Warwick L Smith AM
Warwick Smith is Chairman of the Advisory Board of Australian Capital Equity group of companies, as well as the ANZ Bank for NSW and the ACT, and of E*TRADE Limited. Formerly, Warwick was an Executive Director with Macquarie Bank. In a 15 year Parliamentary career he served as a Federal Government Minister and in a variety of public roles. He was Australia’s first Telecommunications Ombudsman. Warwick has a strong focus on international affairs. He is Chair of the Global Foundation, Immediate Past Chair of the Australia China Business Council and Deputy Chair of the Asia Society of Australia. Mr Smith joined the Foundation Board in 2007 and stepped down in 2008.

Karim Temsamani
Karim Temsamani manages Google’s domestic business and strategic partnerships in Australia and New Zealand. Karim joined Google from Fairfax Media, where he was most recently Group Director, Fairfax General Magazines (responsible for growing the profile and advertising revenue of Fairfax’s suite of inserted magazines) and Commercial Director for Newspapers (responsible for agency and group sales, trade marketing and business development). Prior to this he was the publisher and Vice President of Who Weekly at Time Inc South Pacific. He has previously served in a variety of senior capacities with Hachette, including the positions of regional business publisher in Hong Kong, associate publisher for Korea in Seoul, and managing director for Hachette in Sydney. Mr Temsamani joined the Foundation Board in 2008.

Peter Wade
Peter Wade is currently a consultant to a major financial services organisation and a company director. Peter previously spent over 25 years providing investment banking and financial advice with JBWere and its current form, Goldman Sachs JBWere; more recently he was with JPMorgan. He worked for nearly 15 years in Europe and the United States before returning to Australia. He is a Director of MMC Contrarian Limited, an ASX listed company. Mr Wade joined the Foundation Board in 2002 and stepped down in 2008.

Richard FE Warburton AO
Dick Warburton is currently Chairman of the Board of Taxation, Magellan Flagship Fund, and Tandou Limited. He is a director of Citibank, Chairman of the Commonwealth Studies Conference and a Member of the Advisory Council of the Centre for Social Impact. Mr Warburton is a former Chairman and CEO of DuPont Australia and New Zealand, whom he had worked with for 30 years. Mr Warburton joined the Foundation Board in 1999 and stepped down in 2008.


Gardam S, Sierro F, Basten A, Mackay F, Brink R. TRAF2 and TRAF3 signal adapters act cooperatively to control the maturation and survival signals delivered to B cells by the BAFF receptor. Immunology 2008; 28:391-401.


Guerrero-Bosagna CM, Sabat P, Valdovinos FS, Valladares LE, Clark SJ. Epigenetic and phenotypic changes result from a continuous pre and post natal dietary exposure to phytoestrogens in an experimental population of mice. BMC Physiol 2008; 8:17.


## Garvan Institute of Medical Research

### Income Statement

<table>
<thead>
<tr>
<th></th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>NHMRC Grants</td>
<td>9,244</td>
<td>12,080</td>
<td>13,832</td>
<td>16,682</td>
<td>18,695</td>
</tr>
<tr>
<td>Other Peer Reviewed Grants</td>
<td>6,222</td>
<td>6,865</td>
<td>8,184</td>
<td>8,530</td>
<td>9,159</td>
</tr>
<tr>
<td>Other Grants</td>
<td>481</td>
<td>200</td>
<td>655</td>
<td>1,068</td>
<td>4,811</td>
</tr>
<tr>
<td>NSW Government Grant</td>
<td>2,880</td>
<td>3,720</td>
<td>12,174</td>
<td>4,063</td>
<td>4,026</td>
</tr>
<tr>
<td>Commonwealth Government Grant</td>
<td>-</td>
<td>-</td>
<td>4,700</td>
<td>1,193</td>
<td>-</td>
</tr>
<tr>
<td>Commercial Collaborations</td>
<td>1,269</td>
<td>2,043</td>
<td>4,091</td>
<td>2,714</td>
<td>1,289</td>
</tr>
<tr>
<td>Garvan Research Foundation</td>
<td>1,671</td>
<td>2,343</td>
<td>2,562</td>
<td>3,817</td>
<td>4,689</td>
</tr>
<tr>
<td>Other Income</td>
<td>2,579</td>
<td>2,774</td>
<td>2,916</td>
<td>3,543</td>
<td>4,050</td>
</tr>
<tr>
<td><strong>Total Operating Income</strong></td>
<td><strong>24,346</strong></td>
<td><strong>30,025</strong></td>
<td><strong>49,114</strong></td>
<td><strong>41,610</strong></td>
<td><strong>46,719</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remuneration Costs</td>
<td>14,879</td>
<td>17,377</td>
<td>21,983</td>
<td>23,621</td>
<td>27,337</td>
</tr>
<tr>
<td>Research Expenditures*</td>
<td>4,935</td>
<td>4,571</td>
<td>5,879</td>
<td>7,640</td>
<td>9,377</td>
</tr>
<tr>
<td>Administration and Information Technology</td>
<td>2,394</td>
<td>2,931</td>
<td>3,913</td>
<td>3,771</td>
<td>5,331</td>
</tr>
<tr>
<td>Building and Scientific Operations</td>
<td>1,891</td>
<td>2,378</td>
<td>2,438</td>
<td>2,461</td>
<td>2,753</td>
</tr>
<tr>
<td><strong>Total Operating Expenses</strong></td>
<td><strong>24,099</strong></td>
<td><strong>27,257</strong></td>
<td><strong>34,213</strong></td>
<td><strong>37,493</strong></td>
<td><strong>44,798</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building Asset Amortisation</td>
<td>(1,171)</td>
<td>(1,171)</td>
<td>(1,171)</td>
<td>(1,180)</td>
<td>(1,189)</td>
</tr>
<tr>
<td>Property, Plant and Equipment Depreciation</td>
<td>(1,235)</td>
<td>(2,178)</td>
<td>(2,449)</td>
<td>(2,433)</td>
<td>(2,390)</td>
</tr>
<tr>
<td>Transfer from/(to) Building Reserve</td>
<td>1,047</td>
<td>1,047</td>
<td>(1,353)</td>
<td>1,047</td>
<td>1,047</td>
</tr>
<tr>
<td>Endowment Grants</td>
<td>1,250</td>
<td>745</td>
<td>10,965</td>
<td>2,210</td>
<td>3,953</td>
</tr>
<tr>
<td>Endowment Earnings</td>
<td>463</td>
<td>1,011</td>
<td>2,181</td>
<td>2,589</td>
<td>1,700</td>
</tr>
<tr>
<td>Donations &amp; Bequests direct to Endowment Fund</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>5,393</td>
</tr>
<tr>
<td>Unrealised loss on Endowment Fund Investments</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>(7,407)</td>
</tr>
<tr>
<td><strong>Net Income</strong></td>
<td><strong>601</strong></td>
<td><strong>2,222</strong></td>
<td><strong>23,074</strong></td>
<td><strong>6,350</strong></td>
<td><strong>3,028</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accumulated Surplus Brought Forward</td>
<td>1,486</td>
<td>922</td>
<td>308</td>
<td>9,914</td>
<td>11,109</td>
</tr>
<tr>
<td>Transfer from/(to) Research Program Reserve</td>
<td>(583)</td>
<td>(1,110)</td>
<td>(107)</td>
<td>(2,526)</td>
<td>380</td>
</tr>
<tr>
<td>Transfer from/(to) Endowment Reserve</td>
<td>(582)</td>
<td>(1,726)</td>
<td>(11,809)</td>
<td>(3,664)</td>
<td>1,847</td>
</tr>
<tr>
<td>Transfer from/(to) Infrastructure Expense Reserve</td>
<td>-</td>
<td>-</td>
<td>(1,552)</td>
<td>1,035</td>
<td>207</td>
</tr>
<tr>
<td><strong>Accumulated Surplus Carried Forward</strong></td>
<td><strong>922</strong></td>
<td><strong>308</strong></td>
<td><strong>9,914</strong></td>
<td><strong>11,109</strong></td>
<td><strong>16,571</strong></td>
</tr>
</tbody>
</table>

*The figures in 2006 and 2007 have been adjusted to improve the comparability with 2008.*
### Garvan Institute of Medical Research

#### Balance Sheet

<table>
<thead>
<tr>
<th></th>
<th>2004 $’000</th>
<th>2005 $’000</th>
<th>2006 $’000</th>
<th>2007 $’000</th>
<th>2008 $’000</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Current Assets</strong></td>
<td>3,672</td>
<td>5,632</td>
<td>18,236</td>
<td>19,405</td>
<td>30,012</td>
</tr>
<tr>
<td><strong>Property, Plant and Equipment</strong></td>
<td>41,540</td>
<td>40,022</td>
<td>40,903</td>
<td>45,160</td>
<td>60,085</td>
</tr>
<tr>
<td><strong>Investments at Market Value</strong></td>
<td>9,903</td>
<td>11,630</td>
<td>20,536</td>
<td>26,008</td>
<td>16,441</td>
</tr>
<tr>
<td><strong>Total Assets</strong></td>
<td>55,115</td>
<td>57,284</td>
<td>79,675</td>
<td>90,573</td>
<td>106,538</td>
</tr>
<tr>
<td><strong>Current Liabilities</strong>*</td>
<td>2,949</td>
<td>3,547</td>
<td>6,900</td>
<td>8,343</td>
<td>7,860</td>
</tr>
<tr>
<td><strong>Provisions</strong></td>
<td>2,061</td>
<td>2,457</td>
<td>3,069</td>
<td>3,042</td>
<td>3,545</td>
</tr>
<tr>
<td><strong>Borrowings</strong></td>
<td>6,000</td>
<td>6,000</td>
<td>-</td>
<td>4,179</td>
<td>18,144</td>
</tr>
<tr>
<td><strong>Total Liabilities</strong></td>
<td>11,010</td>
<td>12,004</td>
<td>9,969</td>
<td>15,564</td>
<td>29,549</td>
</tr>
<tr>
<td><strong>Accumulated Surplus</strong></td>
<td>922</td>
<td>308</td>
<td>9,914</td>
<td>11,109</td>
<td>16,571</td>
</tr>
<tr>
<td><strong>Reserves</strong></td>
<td>43,183</td>
<td>44,972</td>
<td>59,792</td>
<td>63,900</td>
<td>60,419</td>
</tr>
<tr>
<td><strong>Total Net Funds</strong></td>
<td>44,105</td>
<td>45,280</td>
<td>69,706</td>
<td>75,009</td>
<td>76,990</td>
</tr>
</tbody>
</table>

\*The figures in 2006 and 2007 have been adjusted to improve the comparability with 2008.
Garvan Research Foundation

<table>
<thead>
<tr>
<th>Statement of Funds</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$'000</td>
<td>$'000</td>
<td>$'000</td>
<td>$'000</td>
<td>$'000</td>
</tr>
<tr>
<td>Donations &amp; Pledges</td>
<td>3,276</td>
<td>2,524</td>
<td>3,826</td>
<td>4,961</td>
<td>6,861</td>
</tr>
<tr>
<td>Events</td>
<td>263</td>
<td>266</td>
<td>332</td>
<td>409</td>
<td>105</td>
</tr>
<tr>
<td>Bequests</td>
<td>4</td>
<td>928</td>
<td>10,315</td>
<td>1,847</td>
<td>3,132</td>
</tr>
<tr>
<td>Interest and Other income</td>
<td>17</td>
<td>42</td>
<td>21</td>
<td>25</td>
<td>55</td>
</tr>
<tr>
<td><strong>Total Income</strong></td>
<td>3,560</td>
<td>3,760</td>
<td>14,494</td>
<td>7,242</td>
<td>10,153</td>
</tr>
<tr>
<td>Fundraising Expenses</td>
<td>(642)</td>
<td>(607)</td>
<td>(1,018)</td>
<td>(1,184)</td>
<td>(1,114)</td>
</tr>
<tr>
<td>Public Awareness Program</td>
<td>(56)</td>
<td>(66)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Net Funds Raised</strong></td>
<td>2,862</td>
<td>3,087</td>
<td>13,476</td>
<td>6,058</td>
<td>9,039</td>
</tr>
<tr>
<td>Accumulated Funds Prior Years</td>
<td>189</td>
<td>130</td>
<td>129</td>
<td>78</td>
<td>109</td>
</tr>
<tr>
<td><strong>Funds Available for Grants to Institute:</strong></td>
<td>3,051</td>
<td>3,217</td>
<td>13,605</td>
<td>6,136</td>
<td>9,148</td>
</tr>
<tr>
<td>General Research</td>
<td>567</td>
<td>850</td>
<td>871</td>
<td>750</td>
<td>926</td>
</tr>
<tr>
<td>Specific Research</td>
<td>1,104</td>
<td>1,493</td>
<td>1,691</td>
<td>3,067</td>
<td>3,762</td>
</tr>
<tr>
<td>Endowment Funds</td>
<td>1,250</td>
<td>745</td>
<td>10,965</td>
<td>2,210</td>
<td>3,953</td>
</tr>
<tr>
<td><strong>Total Grants</strong></td>
<td>2,921</td>
<td>3,088</td>
<td>13,527</td>
<td>6,027</td>
<td>8,641</td>
</tr>
<tr>
<td>Accumulated Funds Carried Forward</td>
<td>130</td>
<td>129</td>
<td>78</td>
<td>109</td>
<td>507</td>
</tr>
</tbody>
</table>

Represented By:

| Assets | 197 | 182 | 251 | 311 | 1,391 |
| Liabilities | (67) | (53) | (173) | (202) | (884) |
| **Net Assets** | 130 | 129 | 78 | 109 | 507 |