

A complex, abstract background graphic consisting of a dense network of interconnected nodes and lines, resembling a molecular structure or a data network. The nodes are represented by circles of varying sizes and shades of blue, ranging from light to dark. The lines connecting them are thin and dark blue. The overall effect is a sense of intricate, interconnected complexity.

BREAKTHROUGH MEDICAL RESEARCH



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2016

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THE ORGANISATION

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- Prof John Eisman AO
- Prof Tuan Nguyen
- Prof Mike Rogers

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Faculty

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- Prof Vanessa Hayes
- Dr Tim Mercer

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Faculty

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- Prof Chris Ormandy
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Dr Jenny Kingham

Partnerships & Legal Affairs

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Finance & Accounting

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Human Resources

Mr Simon Hamilton

Information Technology

Mr George Constantinescu
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**CHIEF SCIENTIFIC OFFICER
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Student Programs

Dr Tracy Anderson



THE MISSION OF THE GARVAN INSTITUTE OF MEDICAL RESEARCH 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'S ULTIMATE GOAL IS PREVENTION, TREATMENT OR CURE OF MAJOR DISEASES.



WHO WE ARE, WHAT WE DO

Our researchers pioneer studies into some of the most widespread diseases affecting the community today. Research at Garvan is focused on understanding the role of molecular and cellular processes in health and disease as the basis for developing future preventions, treatments and cures.

Garvan is leading the nation in using genomic analysis to accelerate discovery and enable personalised or precision medicine.

For more than 50 years, significant breakthroughs have been achieved by Garvan scientists in the understanding and treatment of diseases.

OUR ASPIRATIONS

- To advance knowledge in our key areas of focus that will lead to better understanding, reduced incidence and improved treatments for cancer, osteoporosis, diabetes, obesity, and immunological, skeletal and neurological diseases, and influence health policy.
- To become the most advanced institute in the region in the adoption, application and integration of next generation genomic and computational approaches and technologies in investigative and translational research.
- To attract, develop and support exceptionally talented researchers with leading edge programs addressing key conceptual and practical questions in human biology, and the translation of new knowledge and technologies into clinical applications.
- To embrace and uphold a culture of collegiality, collaboration, inclusivity, consideration, safety, transparency, and high ethical standards.
- To engage stakeholders and the community with our achievements and research vision so that we attract the significant government and donor support needed to empower our transformative agenda.



CHAIRMAN'S REPORT

DR JOHN SCHUBERT AO, CHAIRMAN, GARVAN INSTITUTE OF MEDICAL RESEARCH

Under the visionary leadership of Professor John Mattick, 2016 has been a landmark year for Garvan. John and his world class leadership team have brought into being a number of initiatives that have cemented Garvan as a medical research institute operating at the leading edge internationally – in clinical genomics, epigenetics, cancer, diabetes, osteoporosis, immunology and neuroscience.

For me, the highlight of 2016 at Garvan was the launch of Genome.One. This wholly owned subsidiary of Garvan is Australia's first clinical whole genome sequencing service, and it offers clinicians a diagnostic service for individuals living with rare and genetic conditions. Its launch in July was a moving experience at which families affected by rare disease shared their stories and explained the practical and emotional significance of obtaining a diagnosis.

The establishment of Genome.One is a remarkable achievement that builds on many years of work in developing genomics and bioinformatics capability and infrastructure at Garvan's Kinghorn Centre for Clinical Genomics (KCCG). It is testament to the leadership both of Professor Mattick and of KCCG's Head, Associate Professor Marcel Dinger.

Another outstanding moment of 2016 has been the story of a special little boy – seven-year-old Alan, whose journey has touched us all at Garvan. Alan's rare and life-threatening immune disorder has been held at bay through the power of genomic information – generated and analysed at Garvan – which suggested a new treatment approach that has transformed his health. Alan's story is evidence of the remarkable potential of genomics to change lives.

Our researchers and leaders continue to build important relationships all over the globe, including a wide-ranging collaboration with Israel's renowned Weizmann Institute of Science, formalised in 2016.

Despite ongoing challenges in obtaining government funding throughout the medical research sector, our researchers, across all six Divisions, continued to attain substantial support from the National Health and Medical Research Council (NHMRC), as well as from other peer-reviewed funding bodies – a testament to the quality and clinical impact of their research. It was particularly pleasing that Garvan's immunologists received a major five-year NHMRC Program Grant to investigate antibodies in health and disease.

As ever, I thank the members of the Garvan Institute Board, all of whom give generously of their time and expertise to guide Garvan. I warmly thank the directors who retired in 2016, namely Mr Daniel Petre AO and Associate Professor Bernadette Tobin, for their contributions to Garvan – and I welcome our new directors The Hon. Dr Annabelle Bennett AO SC and Dr Paul Kelly.

Garvan in its current form would simply not exist without the work of the Garvan Research Foundation, chaired by Mr Geoff Dixon, and the many generous and forward-thinking individuals and organisations whose generosity enables Garvan's research.

We look forward to another year of achievement in 2017, as we continue to realise Garvan's mission of making a major impact on human health.



EXECUTIVE DIRECTOR'S REPORT

PROFESSOR JOHN MATTICK AO FAA, EXECUTIVE DIRECTOR, GARVAN INSTITUTE OF MEDICAL RESEARCH

This has been a remarkable year of leadership, and partnership, for Garvan.

More and more, Garvan is establishing itself as a key player in the drive towards personalised medicine through genomics. In 2016, we made significant progress, on several fronts, in bringing genomic information to centre stage in the clinic:

- Following accreditation by the National Association of Testing Authorities and with the assistance of NSW Health Pathology, Garvan launched Genome.One – Australia's first clinical whole genome sequencing service, and the only one outside North America.
- Garvan was instrumental in the launch of the patient-facing St Vincent's Clinical Genomics Unit, which will enable the integration of genomic testing into clinical practice across the St Vincent's Campus.
- Thanks to generous funding from the Lions Clubs International Foundation, Garvan launched the Lions Kids Cancer Genome Project in partnership with the Children's Cancer Institute and the Sydney Children's Hospital.
- Within our Cancer Division, we launched the Genomic Cancer Medicine Program. Led by Professor David Thomas, the program applies genomics to the understanding, early detection, prevention and management of cancer.
- We established a wide-ranging partnership with Israel's world-leading Weizmann Institute of Science, which will be anchored by the Garvan-Weizmann Centre for Cellular Genomics, a purpose-built, multidisciplinary research centre.

The year also saw strong research outputs across all of Garvan's Divisions. For me, particular highlights have been:

Bone Biology Division – demonstrated that genetic profiling can help predict whether an individual will sustain an osteoporotic fracture;

Cancer Division – made important advances in our understanding of genetic drivers of pancreatic cancer;

Diabetes and Metabolism Division – showed that brown fat reserves appear to help control blood sugar levels, suggesting new approaches to treating diabetes;

Genomics and Epigenetics Division – revealed major structural alterations of DNA in cancer cells;

Immunology Division – uncovered important new understandings of how the immune system avoids attacking 'self';

Neuroscience Division – showed that diagnosis of a common kidney disease is cheaper and more accurate when whole genome sequencing is used;

Kinghorn Centre for Clinical Genomics – launched the Medical Genome Reference Bank, a collection of thousands of genomes of healthy older Australians, to help researchers worldwide make sense of genomic information.

I extend my gratitude to our community for your steadfast support, without which we would not be able to undertake our vital work. Along with our long-term supporters, such as The Kinghorn Foundation and The Bill and Patricia Ritchie Foundation, your support has enabled Garvan to reach higher and achieve more than we have ever anticipated.

I also thank the outstanding Garvan team – researchers, support staff and the Garvan Research Foundation – who together make Garvan a dynamic, focused and outcome-driven research environment.

We are here to make an impact; to innovate for a better future; and to transform healthcare in Australia and beyond. We have strived to do so in 2016, and we look forward to new challenges and opportunities in 2017.



CHAIRMAN'S REPORT

MR GEOFF DIXON, CHAIRMAN, GARVAN RESEARCH FOUNDATION

I am pleased to report that 2016 was another successful year in the Garvan Research Foundation.

The ongoing generosity of many individuals and organisations, in particular our long-term supporters – The Kinghorn Foundation, Mr Len Ainsworth, Mrs Jane Hemstrich, The Bill and Patricia Ritchie Foundation, Mrs Margaret Rose AM, Mr and Mrs Alan and Lynne Rydge, The Walker Family Foundation, Mr John Roth and Ms Jillian Segal AM, Mr and Mrs Laurie and Di Sutton, Mr David Baffsky AO and Mrs Helen Baffsky – has been crucial to Garvan's success.

We continue to be grateful to our corporate and community partners, as these partnerships assist Garvan's medical research and contribute to public education and awareness of disease and the vital nature of medical research. These include Vodafone Foundation, Love Your Sister, Tour de Cure, Ridley Corporation, State Custodians, Paspaley, Cue Clothing Co and Delta Air Lines.

In a time when collaboration in research, funding and resources is becoming increasingly important, we have built upon the alliances that the Foundation has established with other like-minded organisations – such as the Pancreatic Cancer Alliance and the Bone Alliance. Both Alliances achieved strong outcomes in 2016: the Pancreatic Cancer Alliance had some members attend the World Pancreatic Cancer Coalition and the Bone Alliance spearheaded the development and launch of the 'Know Your Bones' online tool (see page 16) and the Osteoporosis National Action Plan.

The Foundation also led a Parkinson's Disease Collaborative Research Forum. Garvan, along with Parkinson's Australia,

The Cure Parkinson's Trust, The Michael J Fox Foundation for Parkinson's Research and Shake It Up Australia Foundation joined together to make Parkinson's disease a priority (see page 36).

We remain truly appreciative of the people who remember Garvan in their wills, ask for donations to research in memory of loved ones, contribute what they can on a monthly basis and invest in the future of human health. This generosity throughout 2016 has made a tangible impact on the organisation.

Mr Andrew Giles, the Chief Executive Officer of the Garvan Research Foundation has excelled in his leadership of the Foundation. His work, along with the rest of the Foundation staff, continues to strive for greatness in supporting the Garvan's broad streams of research.

The Garvan Research Foundation's Board of Directors is an experienced and committed group. Their ongoing support continues to be incredibly valuable. In 2016 we welcomed a new board member, Ms Helen McCabe. We also thank our retiring board members, The Hon. Bruce Baird AM, Mr Brad Rees, Mr John Landerer CBE AM and Dr Helga Neidhart RSC, for their important service to Garvan and to the Foundation.

Finally, a sincere thank you to all the people, groups and organisations who have donated funds, talent, time and interest to supporting researchers at the Garvan Institute, and their important work.



CHIEF EXECUTIVE OFFICER'S REPORT

MR ANDREW GILES, CHIEF EXECUTIVE OFFICER, GARVAN RESEARCH FOUNDATION

The vital work of Garvan's researchers, and our ability to share their efforts with the community, is only possible thanks to the incredible generosity of our Garvan community – the people, groups and organisations committed to the future of medicine.

This has been another positive year for Garvan. As you will read in this report, Garvan's research has continued to contribute to the advancement of medicine, and our understanding of some of the most complex diseases impacting society.

In 2016, the Garvan Research Foundation launched a series of national initiatives. These aimed to communicate the value of medical research across many different diseases; the importance of strong, focused leadership in research and the significance of philanthropic investment in our work.

We launched a second edition of the Garvan Rural Health Report, titled *A Rural Perspective: Cancer and Medical Research*. The report revealed alarming cancer incidence and mortality rates in rural Australia, showing that the further a cancer patient lives from a major city, the more likely they are to die within five years of diagnosis.

The DreamLab app, built in partnership with the Vodafone Foundation, went from strength to strength. With 100,000 downloads in 2016, the processing power of DreamLab has saved 18 months of research time in cancer genomics. We were delighted to collaborate with the Vodafone Foundation as they worked to add melanoma, lung cancer, brain cancer and sarcoma to the existing breast, ovarian, pancreatic and prostate cancer initiatives. These new initiatives will be launched in 2017.

Our commitment to partnering and collaborating with like-minded organisations has paid dividends throughout 2016.

Pancreatic Cancer Awareness Month saw a united effort from the Pancreatic Cancer Alliance – a collaborative group whose members include researchers, fundraisers and awareness advocates – to raise awareness about the disease and its alarming mortality rates. The Bone Alliance, a partnership between Garvan and Osteoporosis Australia, saw the launch of 'Know Your Bones', an interactive online tool offering a personalised assessment of bone fracture risk. A number of organisations united with Garvan to launch the Osteoporosis National Action Plan. This offered 20 recommendations to address the issues around bone health in Australians, and raise awareness, of these issues.

Working together has always been important in medical research, but never more so than today. Under Professor John Mattick's leadership, we continue to support and encourage scientific collaboration between our precinct partners, St Vincent's Hospital, Victor Chang Cardiac Research Institute and UNSW, as well as collaborators around Australia and the world.

The common aim of all the Foundation's activities is to help Garvan's researchers to achieve their goal of improving health outcomes for all. We do this by communicating and promoting Garvan's research to the community, who in turn provide financial support to allow this innovative research to continue.

I offer my most sincere thanks to all of Garvan's supporters. Whether you're an individual, a group or an organisation, we value and appreciate the generosity, vision and trust you have gifted to us at Garvan. I am particularly grateful to our Partners for the Future for their lasting legacy to our work.

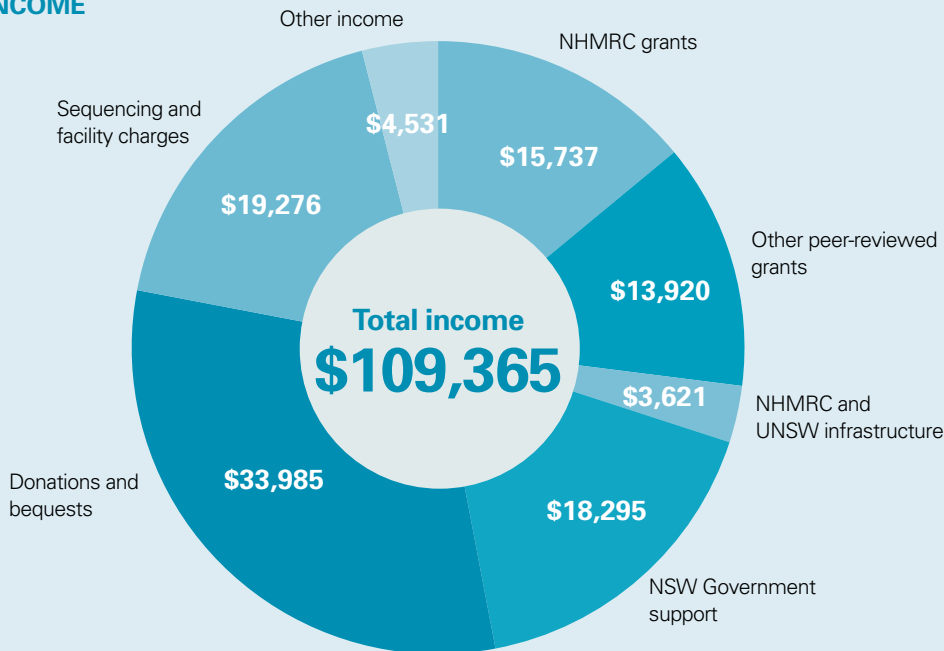
The past year had many defining moments for Garvan, and the next is shaping up to take us, and our ambitions, to new heights.

GARVAN AT A GLANCE

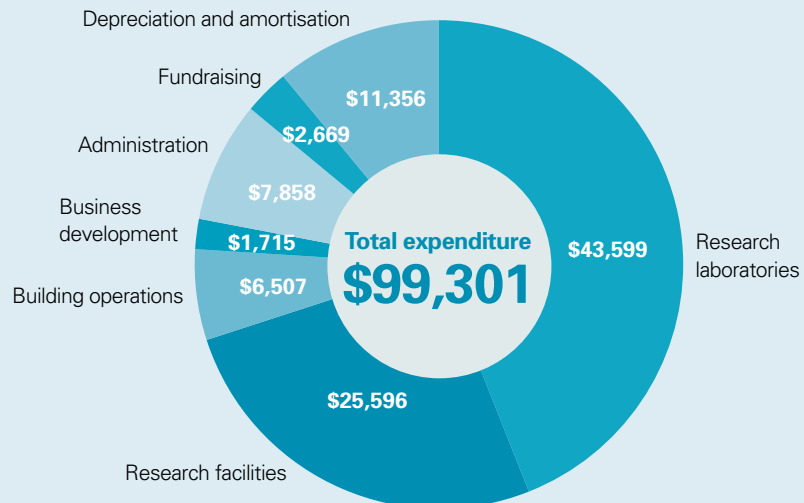
INCOME

All figures are A\$'000.

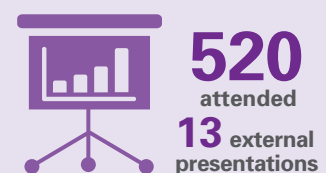
Figures have been rounded



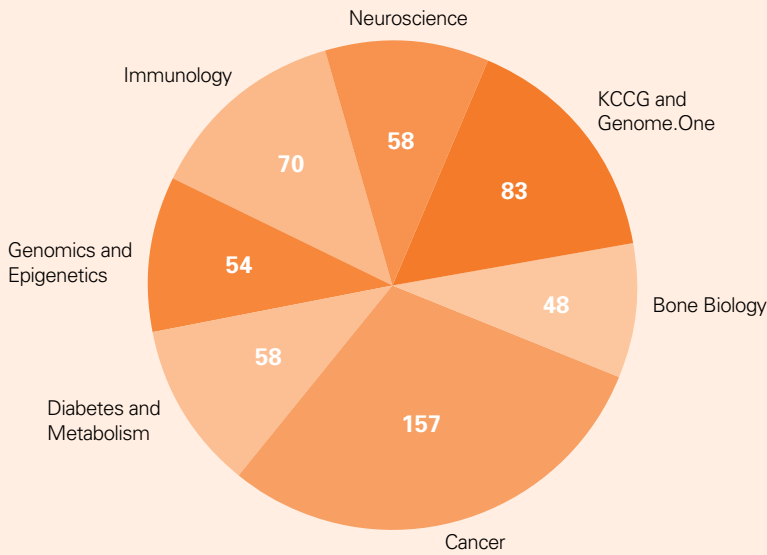
EXPENDITURE



PUBLIC AND COMMUNITY ENGAGEMENT AND EDUCATION 4,753 people engaged through:



RESEARCH STAFF BY DIVISION As at 31 December 2016



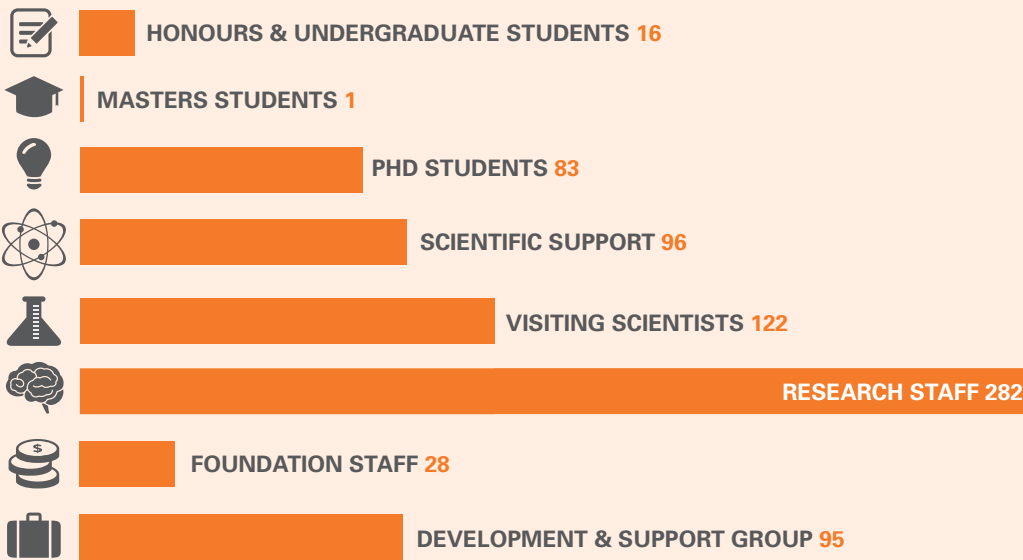
AVERAGE AGE
(All staff including honoraries)

40 YRS

TOTAL STAFF

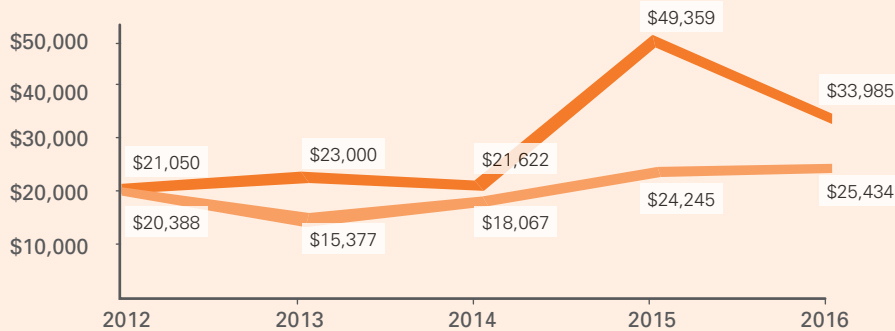
723

395 **328**

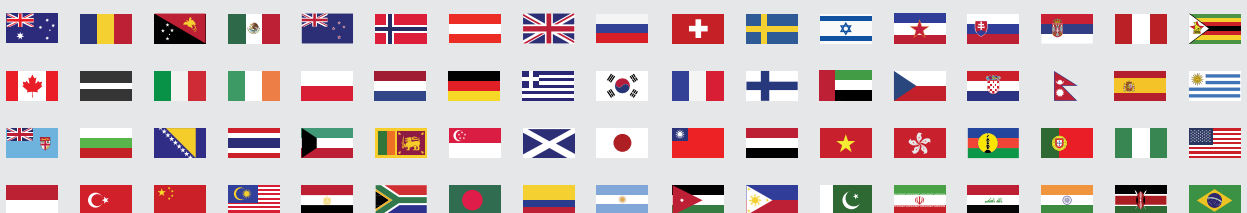


PHILANTHROPIC INCOME

All figures are A\$'000.



OUR STAFF ARE FROM AROUND THE GLOBE



PEER-REVIEWED FUNDING

12 successful Garvan-led research grants (32%) were written in collaboration with one or more partner institutions.

7 grants led by other institutions included Garvan as a partner.

See more about Garvan's key partnerships and collaborative endeavours in 2016:

Know Your Bones **page 16**

Osteoporosis National Action Plan **page 16**

Cancer Moonshot **page 20**

The DreamLab app **page 21**

Lions Kids Cancer Genome Project **page 25**

Garvan-Weizmann partnership **page 33**

Parkinson's Disease Collaborative Research Forum **page 36**

Partnership with the National Computational Infrastructure **page 40**



91% of Garvan's publications in 2016 (273 of 300) were authored in collaboration with researchers from other institutes – in Australia and beyond.

WORKING TOGETHER

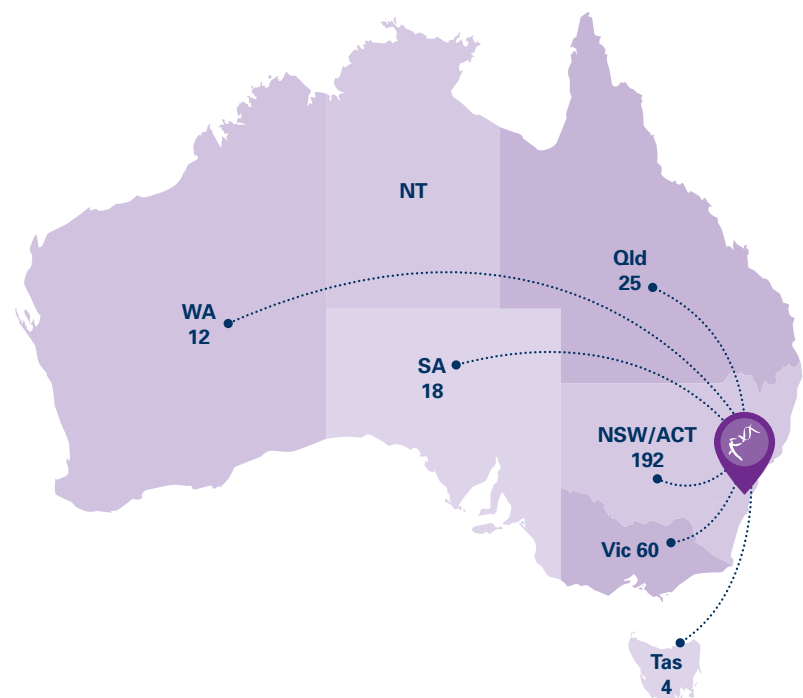
COLLABORATION BEYOND GARVAN

KEY PARTNERSHIPS AND JOINT ENDEAVOURS

2016 has been a year of partnership and collaboration at Garvan. Ambitious collaborative endeavours of many kinds – both on a national and international scale – began or were consolidated across most of Garvan's research Divisions.

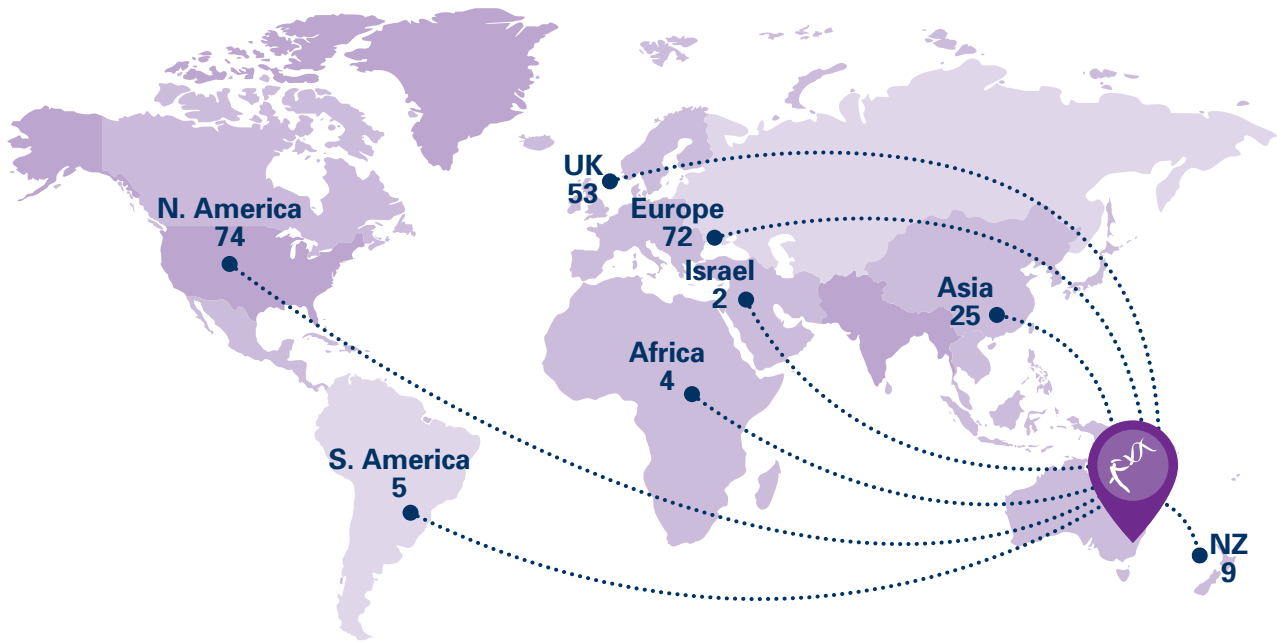
COLLABORATING WITHIN AUSTRALIA

Garvan's researchers collaborated widely with research institutes across Australia.



INTERNATIONAL COLLABORATION

Collaborations across the globe were a feature of Garvan's research output in 2016.



SCIENTIFIC PUBLICATIONS



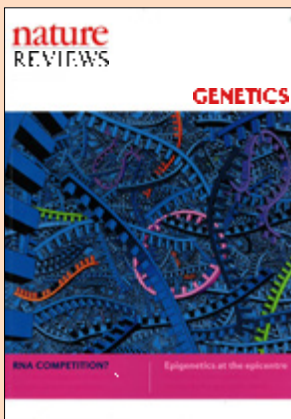
300 total publications in 2016, including: journal articles, reports, reviews, letters and book chapters

61 papers in journals with an impact factor greater than 8

230 original research papers



COVER ISSUES



Thomson DW and Dinger ME *Nat Rev Genet* 2016;17:272-83
Endogenous microRNA sponges: evidence and controversy



Croucher DR, et al. *Sci Signaling* 2016;9:ra69
Bimolecular complementation affinity purification (BiCAP) reveals dimer-specific protein interactions for ERBB2 dimers

PAPERS IN KEY JOURNALS

- | | | |
|---------------------------------|---------------------------------------|--------------------------|
| 2 <i>Lancet</i> papers | 2 <i>Nature Biotechnology</i> papers | 2 <i>Nature</i> papers |
| 1 <i>Cell</i> papers | 1 <i>Lancet Oncology</i> papers | 2 <i>Immunity</i> papers |
| 3 <i>Cell Metabolism</i> papers | 6 <i>Nature Communications</i> papers | |

LIST OF PUBLICATIONS

A full list of Garvan's 2016 publications is available here: garvan.org.au/about-us/annual-report-files/garvan-annual-report-2016-publications.pdf

DIVISION REPORT: BONE BIOLOGY

garvan.org.au/bone-biology



FROM THE DIVISION HEAD

Professor Peter Croucher

In Australia, a bone is broken every 3.4 minutes due to poor bone health. We in the Bone Biology Division seek to reverse this alarming statistic through finding better ways to diagnose and treat osteoporosis, alongside our parallel research strength of cancers of the bone.

The Division's major achievement of 2016 has not been a single discovery or project, but rather ongoing consolidation of our research excellence and leadership position. A number of partnerships and collaborations marked the year, including leading the development of the Osteoporosis National Action Plan, which was published on World Osteoporosis Day. The Bone Alliance partnership between Garvan and Osteoporosis Australia has taken an important step forward with the launch to the public of the Know Your Bones campaign. This is a web-based tool, which has seen the Garvan Fracture Risk Calculator linked to practical clinical recommendations, compiled in a web-based tool and made freely available to the public. This is a fantastic example of real research translation.

We also saw a number of cross-Divisional collaborations, particularly with the Immunology, Cancer and Genomics and Epigenetics Divisions, new linkages with the Weizmann Institute and the realisation of the 'Origins of Bone and Cartilage Disease' Wellcome Trust initiative, with Imperial College London and the Wellcome Trust Sanger Institute. Such multidisciplinary projects underscore our collegial atmosphere and visionary outlook, and are critical sources of discovery.

Finally, I would like to take this opportunity to acknowledge the amazing support of donors, who recognise the importance of our questions and the quality of our science. In particular Mrs Janice Gibson and the Ernest Heine Family Foundation. Sincere thanks.

– Professor Peter Croucher

RESEARCH HIGHLIGHTS

BISPHOSPHONATES: A HELPING HAND TO THE CRITICALLY ILL?

Garvan researchers uncovered a role for bisphosphonate drugs in survival in the critically ill. Bisphosphonates slow the breakdown of bone and are commonly used to treat osteoporosis and cancers that have spread to bone.

Almost half of all deaths happen in hospital, so Dr Paul Lee and Professor Jacqueline Center looked at whether bisphosphonates improved survival in a hospital setting – particularly as the breakdown of bone speeds up during critical illness. The research team looked at survival of thousands of individuals admitted to critical care – and saw that those who had previously received bisphosphonates had a strikingly higher survival rate.

Dr Lee says, "We can't yet say definitively that bisphosphonate treatment itself is protecting these patients from death – but these are intriguing results that show a profound increase in survival."

Lee et al., *J Clin Endocrinol Metab* 2016;101:1945-53. doi: 10.1210/jc.2015-3467

NEW INSIGHTS INTO THE BIOLOGY OF RARE AUTO-INFLAMMATORY DISEASES

A study led by Professor Mike Rogers broke new ground in understanding mevalonate kinase deficiency (MKD), a rare auto-inflammatory disease that causes recurrent fever, abdominal problems, joint pain and other symptoms.

The research team showed how genetic mutations can lead to changes in mevalonate kinase – an important enzyme in our cells. They went on to show that, when people with MKD carry out exercise or are under stress, the rise in body temperature 'destabilises' the mevalonate kinase enzyme so that it works less well. In turn, this affects the production of an important group of proteins called Rab proteins that carry out many key tasks in our cells.

Understanding MKD's molecular underpinnings is a crucial first step towards developing a new treatment for this disease.

Jurczyk et al., *Immunol Cell Biol*. 2016;94:994-999. doi: 10.1038/icb.2016.58



Prof Mike Rogers



Prof John Eisman, Prof Peter Croucher, Mr John Hewson AM (Osteoporosis Australia Chair), Prof Tuan Nguyen

RESEARCH HIGHLIGHT

CLUES IN OUR GENES COULD HELP PREDICT OSTEOPOROTIC FRACTURE

A team of Garvan researchers, led by Professor Tuan Nguyen, revealed that genetic profiling can help predict whether an individual will break a bone through osteoporosis.

Osteoporosis – a condition in which bones gradually become weak and brittle – affects 1.2 million Australians and causes more than 150,000 fractures per year in Australia, representing a major national public health problem.

Osteoporosis is dubbed ‘the silent thief’, because bone density worsens without obvious symptoms until a bone is broken, making it very difficult to predict who will or will not suffer a fracture. For this reason, a key goal of Garvan’s osteoporosis research is to identify those who have a high risk of breaking a bone – with the ultimate aim of preventing avoidable fractures.

Professor Nguyen and his team studied 62 genes, or variants of genes, in 1400 individuals, and looked at bone fractures over the course of a decade. They found that, when used together, the 62 genetic variants became a powerful predictive tool.

The new genetic analysis significantly improves the accuracy of the Garvan Fracture Risk Calculator, a tool developed by Garvan researchers from the data collected in the world-leading Dubbo Osteoporosis Epidemiology Study, which has been running for 27 years. The Fracture Risk Calculator uses clinical risk factors (age, sex, history of falls and fractures, and bone density) to assess an individual’s fracture risk. When a ‘genetic risk score’ from the new genetic variant research is added to the Fracture Risk Calculator, the result is a more accurate prediction of the likelihood of fracture.

These findings are likely to contribute to clinical decision-making in osteoporosis in the future, bringing us one step closer to personalised medicine for bone disease.

Ho-Le et al., *J Bone Miner Res* 2017;32:285-93 doi: 10.1002/jbmr.2998 (epub Oct 2016)

NEWS HIGHLIGHTS

KNOW YOUR BONES ASSESSMENT TOOL

Garvan and Osteoporosis Australia launched Know Your Bones (knowyourbones.org.au), an Australia-first, freely available online tool that helps consumers to understand their own risk of bone fracture.

Underpinned by key research findings from Garvan's Dubbo Osteoporosis Epidemiology Study, it provides a personalised estimate of bone fracture risk. Using age, gender, weight or bone mineral density, history of fracture, history of recent falls and lifestyle factors, the tool delivers a personalised assessment of fracture risk over five and 10 years.

OSTEOPOROSIS NATIONAL ACTION PLAN

Poor bone health is a serious burden to the healthcare system. In fact, musculoskeletal health care is one of Australia's highest health care costs. The Osteoporosis National Action Plan addresses the health issue of osteoporosis as a matter of urgency.

The Osteoporosis National Action Plan points the way to broadening awareness of the importance of bone health, improving the bone health of Australians and the outcomes for people with osteoporosis. It lists 20 recommendations that focus on prevention, treatment, impact and cure and calls for a national strategy for research into curing osteoporosis.

The Osteoporosis National Action Plan was developed in partnership with:



MRS JANICE GIBSON AND THE ERNEST HEINE FAMILY FOUNDATION

Osteoporosis and cancers of the bone take an enormous toll on the community in terms of years of life lost and the quality of life for those affected. Unfortunately funding for research into diseases of the bone has been limited and public awareness low.

Garvan is privileged to have the philanthropic support of Mrs Janice Gibson and the Ernest Heine Family Foundation, long-standing donors to Garvan's Bone Biology Division. In 2015 they extended their original grant to Garvan to underpin the work of the Bone Biology Division under the leadership of Professor Peter Croucher. Peter is the proud recipient of the Mrs Janice Gibson and Ernest Heine Family Foundation Chair of Osteoporosis.

Their multi-year pledge of funding will provide security to the Division to plan and grow strategically, to support our gifted scientists and direct research, as well as enabling Garvan to enhance public and GP awareness. This collaborative approach to long-term philanthropy will ensure Garvan maintains its position as a world class research institute providing solutions and improved outcomes for patients.



Dr Yvonne Selecki and Dr Mohammad Ali Moni with Megan Gourley (Ridley Corporation), Ms Helen Davies and Ms Melissa Pang (Ken Davies' wife and daughter)

NEWS HIGHLIGHT

THE RIDLEY KEN DAVIES AWARD

The inaugural Ridley Ken Davies Award of \$50,000 honours Mr Ken Davies, a Ridley employee of six years who sadly passed away from cancer.

The Ridley Ken Davies Award is an investment in the future, helping scientists to deliver breakthrough medical research through Garvan's Dubbo Osteoporosis Epidemiology study.

Drs Mohammad Ali Moni and Yvonne Selecki received the 2016 Ridley Ken Davies Award to develop a web-based data portal to help other researchers access the Dubbo study's remarkable dataset, which has been collected over 27 years.

OUR RESEARCH LABORATORIES AND GROUPS

Bone Biology Lab Head: Prof Peter Croucher

Bone Microenvironment Group Leader:
Dr Michelle McDonald

Bone Therapeutics Lab Head: Prof Mike Rogers

Clinical Studies and Epidemiology Lab Head:
Prof Jacqueline Center

Genetic Epidemiology of Osteoporosis Lab Head:
Prof Tuan Nguyen

Osteoporosis and Translational Research Lab Head:
Prof John Eisman

Skeletal Metabolism Lab Head: Dr Paul Baldock



ALAN'S STORY

Alan is a bright, affectionate seven-year-old boy with expressive brown eyes, but not long ago he was very sick indeed. Aged three, he began to experience serious symptoms that indicated that his immune system was attacking his own cells, but the underlying genetic driver of his condition remained unclear. As Alan's condition worsened, his genome was rapidly sequenced and analysed at the Kinghorn Centre for Clinical Genomics, leading to a genetic diagnosis.

On the basis of the new diagnosis, Alan's medical team fast-tracked approval at Sydney Children's Hospital, Randwick, to use a drug that had been effective in a handful of individuals in the USA with a similar genetic condition. The treatment transformed Alan, who is now an active, happy child who loves Lego, Star Wars and tap dancing. His medical journey is far from over but the improvement in his condition is immense.

Stories like Alan's underscore the power of genomic information to change lives. They also enable researchers to better understand how the immune system works and why some treatments are effective – knowledge that can be applied to other disorders and potentially help millions of people in Australia and around the world.

To read more about Alan, visit garvan.org.au/alan.

DIVISION REPORT: CANCER

garvan.org.au/cancer



FROM THE DIVISION HEAD

Professor David Thomas

Cancer remains one of the most complex health challenges facing our community and leaves few of us unaffected. Despite this, we have cause for optimism. The Australian Institute of Health and Welfare recently showed that the death rate from all cancers fell by an estimated 22% between 1982 and 2017. Five-year survival rates have also increased by 20% in that time. Behind such numbers are thousands of Australians whose lives have been saved or prolonged due to better ways to prevent, diagnose and treat cancer – resulting from ongoing medical research.

Garvan has always had a focus on cancers with particularly poor outcomes – exemplified by pancreatic cancer. Increasingly, we are moving to tackle the huge problem of rare cancers, which collectively account for 30% of all cancer deaths, but receive less than 15% of research or drug funding.

To address these challenges, we continue to build strong bridges to St Vincent's Hospital with the launch of two precision oncology initiatives: the Molecular Screening and Therapeutics trial and the Cancer Risk in the Young study. By the end of 2016, over 100 people with cancer had been enrolled into these studies, the first of their kind nationally.

Further projects came to fruition in 2016, notably the Lions Kids Cancer Genome Project, which undertakes whole genome sequencing for 400 Australian children with high-risk cancer. In November, Garvan was confirmed as the recipient of the inaugural Rebecca Wilson Fellowship in Breast Cancer Research, enabling Dr Christine Chaffer to join our Division. Both projects have been made possible through exceptional philanthropic support from Lions Clubs and The NELUNE Foundation respectively, to whom I extend Garvan's gratitude.

Our guiding principle is always to influence patient outcomes, and I am proud of the Division's unwavering hard work towards achieving this.

– Professor David Thomas

RESEARCH HIGHLIGHT

GENOMICS YIELDS A NEW UNDERSTANDING OF PANCREATIC CANCER

A breakthrough study of over 450 pancreatic cancer genomes has shown that pancreatic cancer can be divided into four distinct diseases. Importantly, the four forms of pancreatic cancer may respond differently to therapies – so the findings have important implications for how clinicians will assess and treat pancreatic cancer in the future.

Pancreatic cancer is the fourth most common cause of cancer death in Australia and has a very low five-year survival rate (6%). There is an urgent need to understand the underlying mechanisms of pancreatic cancer and to develop new therapies for patients.

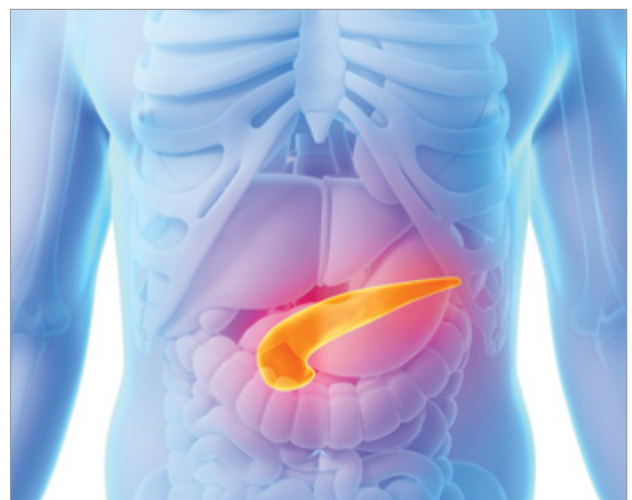
Published in the prestigious journal, *Nature*, the study was led by researchers from the Garvan-based Australian Pancreatic Cancer Genome Initiative (APGI), the University of Melbourne and the University of Queensland.

The research team carried out comprehensive genomic analysis, including whole genome sequencing and RNA expression profiling, on 456 pancreatic cancers of study participants.

The analysis identified four distinct tumour subtypes – 'squamous', 'pancreatic progenitor', 'immunogenic' and 'ADEX' (aberrantly differentiated endocrine exocrine).

This research is a major leap forward in understanding the genetic drivers of pancreatic cancers and a critical step towards the development of personalised medicine for pancreatic cancer.

Bailey et al., *Nature* 2016;531:47-52. doi: 10.1038/nature16965





Adelaide Young and Dr Samantha Oakes

RESEARCH HIGHLIGHT

UNCOVERING COMPLEX GENETIC SECRETS OF CANCER RISK

An international study led by Professor David Thomas has uncovered numerous new genetic risk factors for the bone and soft-tissue cancer, sarcoma.

Sarcoma is one of the three leading causes of disease-related death among children and young adults in Australia, and sarcoma survivors are at higher risk of developing a second cancer.

The landmark study of more than 1000 sarcoma patients is the first to quantify – in any cancer – the effects of multiple rare genetic mutations on cancer risk. It showed that carrying two or more genetic mutations markedly increases an individual's cancer risk, and has immediate implications for the clinical management of sarcoma and other cancers.

Ballinger et al., *Lancet Oncol* 2016;17:1261-71. doi: 10.1016/S1470-2045(16)30147-4

RESEARCH HIGHLIGHT

NEW COMBINATION APPROACH HALTS BREAST CANCER SPREAD IN MICE

Dr Samantha Oakes and her team have identified a new driver in the spread of breast cancer to other tissues. Their research, funded by the Mostyn Family Foundation and the National Breast Cancer Foundation, showed that blocking a protein called MCL-1 – known to control the life/death switch in cancer cells – can also prevent breast cancer cells from spreading throughout the body.

The researchers also showed that blocking MCL-1 can 'turbo-charge' the effects of dasatinib, an anti-metastasis drug that is currently used to treat several types of cancers.

This dual therapeutic approach has great promise for several cancers and the research team are exploring how best to develop it for clinical use.

Young et al., *Breast Cancer Res.* 2016;18:125. doi: 10.1186/s13058-016-0781-6

RESEARCH HIGHLIGHT

A 'BIOSENSOR MOUSE' THAT CAN PREDICT THE SPREAD OF PANCREATIC CANCER

The spread of pancreatic cancer to other organs in the body is the ultimate cause of death for those with the disease. To understand how the cancer spreads, Dr Paul Timpson and colleagues created a 'biosensor mouse' that makes it possible to watch – in real time and in a living tumour – pancreatic cancer cells as they prepare to spread to other organs.

The researchers showed that treating the mice with anti-invasive drugs stabilised the tumour, stopping the metastasis before it began.

This work, supported by Dr Timpson's Len Ainsworth Fellowship, establishes the biosensor mouse as a model for anti-invasive drug discovery in cancer – and the researchers are now using the mouse to investigate other aggressive cancer types.

Erami et al., *Cell Rep* 2016;14(1):152-67. doi: 10.1016/j.celrep.2015.12.020



NEWS HIGHLIGHTS

THE REBECCA WILSON FELLOWSHIP

Garvan is proud to be the recipient of the Rebecca Wilson Fellowship in Breast Cancer Research. The Fellowship, funded by The NELUNE Foundation, was awarded to Dr Christine Chaffer at Garvan, and is a lasting legacy to sports journalist, the late Rebecca Wilson.

Dr Chaffer is a highly regarded breast cancer researcher who will be returning to Australia from Canada to take up this important role.

COLLABORATING WITH THE CANCER MOONSHOT

Garvan and the Children's Medical Research Institute (CMRI) have received generous funding of \$6 million from the NSW Government. The funding, announced by then-NSW Premier Mike Baird, will support collaboration with the National Cancer Institute (USA), in support of the Obama administration's 'Cancer Moonshot' initiative.

The funding was announced in conjunction with the signing of a memorandum of understanding between the NSW Government and the National Cancer Institute. It will support a program in cancer genomics and cancer proteomics at Garvan and CMRI, with a focus on rare and children's cancers.

NEWS HIGHLIGHT

GENOMIC CANCER MEDICINE PROGRAM OPENS

Two clinical studies commenced recruiting participants in August 2016. The Genetic Cancer Risk in the Young Study aims to recruit 1000 individuals over four years, with the goal of identifying the genetic factors underlying the development of cancer in people under 40.

The Molecular Screening and Therapeutics (MoST) Program is supported by CanToo, ACCOR Hotels and Mr Paul Jeans and family. It will evaluate a new approach for testing the efficacy of different therapies in treating advanced rare and neglected cancers, with the overall goal of accelerating findings into the clinic.

Together, the studies form the NSW Genomic Cancer Medicine Program, a research program dedicated to applying genomics to the understanding, early detection, prevention and management of cancer. The program is led by Garvan's Professor David Thomas and funded by the NSW Government.

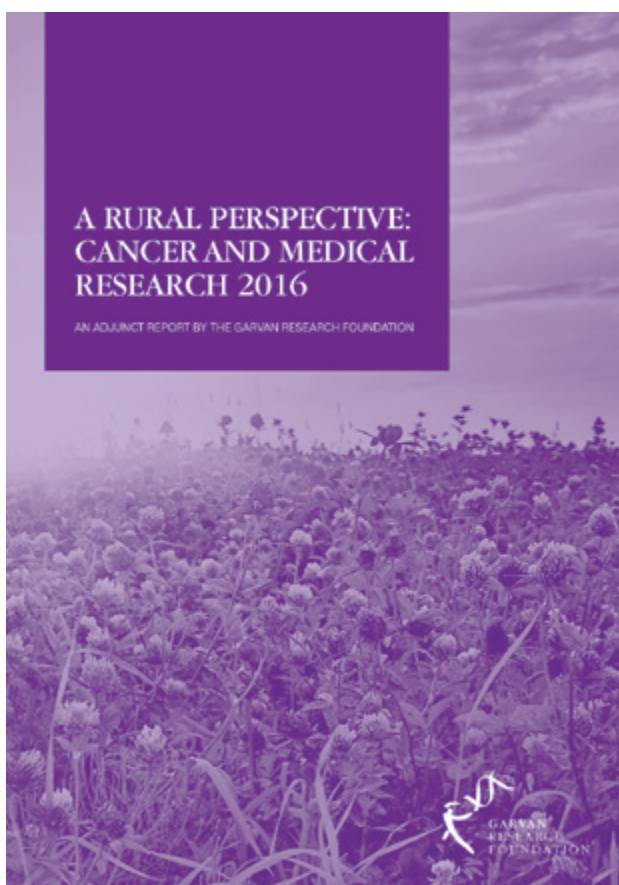
NEWS HIGHLIGHTS

A RURAL CANCER PERSPECTIVE

A new edition of Garvan's Rural Health Report, *A Rural Perspective: Cancer and Medical Research*, was launched in October 2016. The report paints an alarming picture of cancer incidence and mortality rates in rural Australia.

It supports evidence that improvements being experienced in major cities are not being seen in rural areas. In fact, the further a cancer patient lives from a major city, the more likely they are to die within five years of diagnosis.

The report offers an insight into the role medical research can play in transforming treatments of cancer and our understanding of the disease.



HELP SOLVE FOUR NEW CANCERS WHILE YOU SLEEP

The types of cancer you can help solve in your sleep now include brain cancer, sarcoma, melanoma and lung cancer, which join breast, prostate, ovarian and pancreatic cancer on the multi-award-winning app DreamLab.

Built in partnership with The Vodafone Foundation, DreamLab taps your smartphone's unused crunch power to speed up cancer research. It's as easy as download, plug in and nod off. DreamLab is available for download on Android smartphones and will soon be available for iPhones.

RESEARCH LABORATORIES AND GROUPS

CLINICAL CANCER RESEARCH

Coordinated by Prof David Thomas and A/Prof Elgene Lim

Connie Johnson Breast Cancer Research Lab Head: A/Prof Elgene Lim

Genomic Cancer Medicine Lab Head: Prof David Thomas

Immunobiology of Cancer Group Leader: Dr Maya Kansara

Molecular Screening and Therapeutics: Program Manager: Dr Dominique Hess

Genetic Cancer Risk Group Leader: Dr Mandy Ballinger

Ovarian Cancer Research Lab Head: Prof David Bowtell

Australian Pancreatic Genome Initiative Head: Prof Anthony Gill

Clinical Prostate Cancer Research Group Leader: Prof Lisa Horvath

Hormones and Cancer Group Leader: Dr Ann McCormack

TRANSLATIONAL CANCER RESEARCH

Coordinated by A/Prof Alex Swarbrick and Prof Sandra O'Toole

Colon and Lung Cancer Research Lab Head: A/Prof Maija Kohonen-Corish

Tumour Progression Lab Head: A/Prof Alex Swarbrick

Translational Breast Cancer Research Group Leader: Prof Sandra O'Toole

CANCER BIOLOGY RESEARCH

Coordinated by Prof Chris Ormandy

Cancer Biology Lab Head: Prof Chris Ormandy

Cell Survival Group Leader: Dr Samantha Oakes

Replication and Genome Stability Group Leader: Dr Liz Caldon

Tumour Development Group Leader: Dr David Gallego-Ortega

Cancer Developmental Biology Lab Head: Prof Neil Watkins

Network Biology Group Leader: Dr David Croucher

Cell Division Lab Head: Dr Andrew Burgess

Invasion and Metastasis Lab Head: Dr Paul Timpson

Matrix and Metastasis Group Leader: Dr Thomas Cox

Personalised Cancer Therapeutics Group Leader: Dr Marina Pajic

DIVISION REPORT: DIABETES AND METABOLISM

garvan.org.au/diabetes-metabolism



FROM THE DIVISION HEAD

Professor Mark Febbraio

In March 2016, the World Health Organisation (WHO) released a report that underscores why our Division's aims – to prevent death and disability from obesity and type 2 diabetes – are so important. The WHO reported that the world is facing an 'unrelenting march' of diabetes, which now affects nearly one in 11 adults. Cases had nearly quadrupled to 422 million in 2014 from 108 million in 1980. Moreover hyperglycaemia is linked to 3.7 million deaths around the world each year.

As the urgency for new insights into the diabetes epidemic increases, the Diabetes and Metabolism Division continues to make outstanding contributions to our field. Research highlights from 2016 included Dr Paul Lee and Professor Jerry Greenfield's finding that brown fat may be a means to address blood sugar levels, potentially as a new therapeutic target. In July, Garvan, in collaboration with Victor Chang Cardiac Research Institute, announced the surprising discovery that, in mice, a male's metabolic health can be passed from generation to generation, affecting not only his children but also his grandchildren. Such insights could have immediate real-world ramifications and reinforce our potential to transform people's lives.

Although I cite these research highlights, I am proud to say that each and every member of the Division is a solid contributor to our overarching goal and I am honoured to work alongside them. Thank you to the Division, to the Institute and its extended community of colleagues and supporters. I look forward to continuing to make real impacts in the community's health in the year to come.

– Professor Mark Febbraio

RESEARCH HIGHLIGHT

BROWN FAT KEEPS BLOOD SUGAR IN CHECK

The incidence of type 2 diabetes, which is characterised by high blood sugar, is reaching epidemic proportions worldwide. There is an urgent need for new insights into how blood sugar levels can be controlled.

Garvan researchers showed for the first time that brown fat – a special type of fat that burns energy to produce heat – may also help to keep blood sugar steady in adults.

Unlike white fat, which primarily stores energy, brown fat burns energy – often in remarkably large amounts. Most brown fat is lost by the time we reach adulthood, with the small amounts in upper chest and neck area acting like a heat generator, burning energy to help keep us warm.

Dr Paul Lee and Professor Jerry Greenfield measured brown fat activity and blood glucose levels in 15 healthy study participants continuously over 12 hours. They found that individuals with more brown fat had smaller fluctuations in blood sugar, and, importantly, that blood glucose fell after surges of brown fat activity.

The findings show that brown fat might act as a 'glucose buffer', helping to keep blood glucose levels more steady and possibly decreasing the risk of diabetes.

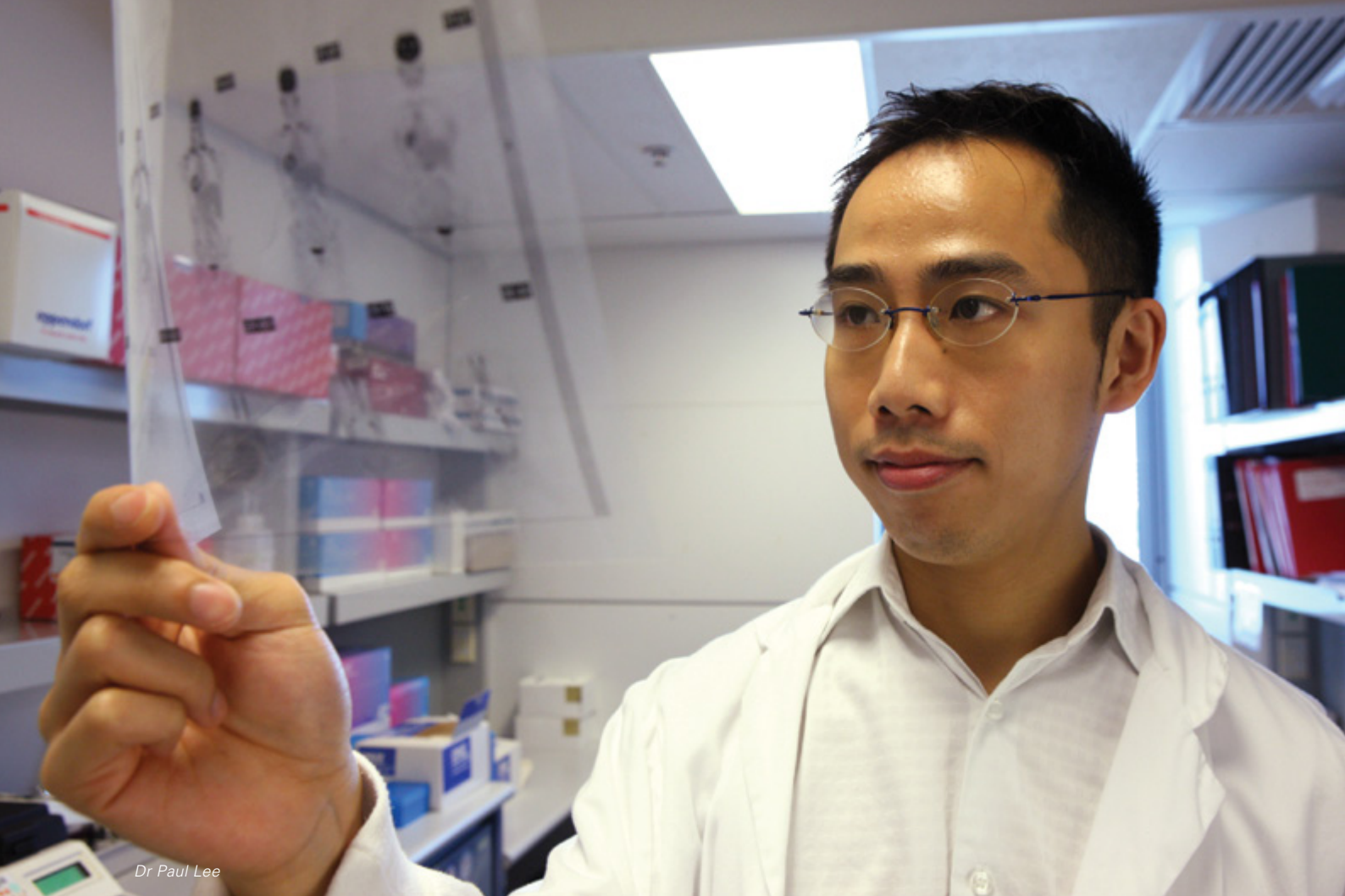
The researchers also found that the more brown fat an individual had, the more steady their blood glucose levels were. Conversely, individuals with no detectable brown fat had widely fluctuating blood glucose levels.

These findings suggest a protective role for brown fat against diabetes and opens new avenues for diabetes therapies that target brown fat.

Lee et al., *Cell Metab* 2016;23:602-9 doi: 10.1016/j.cmet.2016.02.007



Prof Mark Febbraio and A/Prof Catherine Suter



Dr Paul Lee

RESEARCH HIGHLIGHT

GRANDPA'S OBESITY AFFECTS GRANDCHILDREN

A research study led by Professor Mark Febbraio and Associate Professor Catherine Suter (Victor Chang Cardiac Research Institute) showed that male mice who are obese put their children and grandchildren at risk of developing metabolic disease.

The researchers found that both the children and grandchildren of obese male mice were predisposed to a variety of metabolic conditions – particularly if they consumed a high-fat, high-sugar diet.

It is still not clear how the multigenerational programming is happening, but there appear to be clues within the sperm of the mice.

While the effects of a mother's diet in the health of her offspring has long been recognised, evidence that a father's metabolic health can affect the metabolic health not only of his children, but his grandchildren too, is unprecedented and, if true in humans, will have a significant impact on public health advice.

Cropley et al., *Mol Metab* 2016;5:699-708 doi: 10.1016/j.molmet.2016.06.008

RESEARCH HIGHLIGHT

CHANGING OUR UNDERSTANDING OF METABOLIC DISEASE

In an investigation into the links between metabolic disease and the immune system, Garvan researchers overturned our understanding of a previously misunderstood protein.

Much research focuses on understanding how inflammation contributes to the development of metabolic diseases such as type 2 diabetes, and previous studies have suggested that an enzyme called PKR is an important link between inflammation and metabolic disease.

Professor Mark Febbraio's team systematically re-examined the role of PKR and concluded that, surprisingly, it does not mediate an inflammatory response. This important 'negative' finding has enhanced our understanding of inflammation in metabolic disease – an understanding that is vital to finding new ways to manage obesity and its associated metabolic complications.

Lancaster et al., *Nat Commun* 2016 doi: 10.1038/ncomms10626

NEWS HIGHLIGHT

DIABETES AUSTRALIA RESEARCH GRANT

Dr Dorit Samocha-Bonet received a 2016 Australian Diabetes Society, Diabetes Australia Research Grant for her research into body acidity and insulin resistance (a pre-diabetic condition) in July. The \$60,000 grant will support Dr Samocha-Bonet's investigation of the impact of body pH (acid-base balance) on the development of insulin resistance.

Dr Samocha-Bonet says, "Human bodies maintain pH balance within a narrow range – but within that range, it is becoming clear that a more acidic pH is related to insulin resistance and diabetes.

"Our study involves treating 15-20 obese individuals with sodium bicarbonate – baking soda, in other words. We will measure body acidity and insulin resistance before, during and after the month-long treatment, and we predict that we'll observe a decrease in insulin resistance – that is, a step backwards on the path to diabetes," said Dr Samocha-Bonet.

Dr Dorit Samocha-Bonet and Prof Lesley Campbell AM



NEWS HIGHLIGHT

MULTI-FACETED SUPPORT FOR DIABETES RESEARCH

Mrs Melissa Green and her son, Charlie both have type 1 diabetes. Mrs Green and Charlie manage their health through long- and short-acting insulin and a carefully crafted diet and exercise regime.

After receiving her diagnosis, Mrs Green was recommended a carbohydrate-heavy diet for the purpose of keeping her sugar levels steady – however, this was not the result. "I felt uncomfortable and put on a lot of weight, and the disease wasn't well controlled at all.

"With some trial and error, I've found a diet and exercise regime that works well for me. I am constantly thinking about food and doing calculations in my head, but I feel in control and healthy, which is wonderful," said Mrs Green.

Professor Katherine Samaras is leading a study which examines the effect carbohydrates have on insulin levels with type 1 diabetes. Mrs Green volunteers her time and skills to support this research, which will ultimately improve dietary recommendations for those with the disease.

OUR RESEARCH LABORATORIES AND GROUPS

Beta Cell Regeneration Lab Head: Dr Daniel Hesselson

Beta Cell Signalling Lab Head: Prof Trevor Biden

Cellular and Molecular Metabolism Lab Head:
Prof Mark Febbraio

Myokine Biology Group Leader: Dr Martin Whitham

Clinical Diabetes, Appetite and Metabolism
Lab Heads: Prof Lesley Campbell and
Prof Jerry Greenfield

Brown Fat Physiology Group Leader: Dr Paul Lee

Clinical Insulin Resistance Group Leader:
Dr Dorit Samocha-Bonet

Prader-Willi Syndrome and Genetic Forms of
Diabetes Group Leader: Dr Alexander Viardot

Clinical Obesity, Nutrition and Adipose Biology Lab
Head: Prof Katherine Samaras

Insulin Signalling Lab Head: A/Prof Carsten
Schmitz-Peiffer

Islet Biology Lab Head: A/Prof Ross Laybutt



Dr Marie Dziadek, Mr John Thorpe, Mr Rod Chignell, Mr Dennis Halpin, Mr Barry Palmer, AO, Mrs Anne Palmer, Dr Jitshiro Yamada, Prof John Mattick, Tony Benbow OAM, Dr Joe Collins and Prof David Thomas

LIONS CLUBS TAKE GENOME POWER TO KIDS CANCER

A landmark new partnership seeks to uncover the genomic underpinnings of children's cancer. Garvan has joined forces with the Children's Cancer Institute, the Kids Cancer Centre at Sydney Children's Hospital, Randwick, the Lions Clubs International Foundation (LCIF) and the Australian Lions Childhood Cancer Research Foundation (ALCCRF) to launch the Lions Kids Cancer Genome Project.

The three-year project funds whole genome sequencing of tumour and normal tissue for 400 Australian children with high-risk cancer, which will help clinicians to plan the best treatment for each child. In addition, this information will establish a database of genomic factors that predispose children to cancer and assist with prevention and treatment strategies into the future.

The Lions Kids Cancer Genome Project has been made possible through a generous award of \$2.7 million from LCIF and additional \$500,000 from ALCCRF – one of the largest single philanthropic gifts for children's cancer in Australia – with a commitment to raise an additional \$800,000 over the next three years.

The project is testament to the immense power of philanthropy and collaboration to make a genuine difference.

To find out more, visit genomepower.org.au.

DIVISION REPORT: GENOMICS AND EPIGENETICS

garvan.org.au/genomics-epigenetics



FROM THE DIVISION HEAD

Professor Susan Clark FAA

This time last year I reflected on the establishment of the Genomics and Epigenetics Division at Garvan in 2015. The 12 months since have been remarkably productive for a Division of any maturity, with an impressive number of high-impact papers and conference presentations far and wide. At the end of the year I was lucky enough to receive an award to enable me to spend an amazing three months on sabbatical visiting genome and epigenome institutes in Europe and the US, to establish critical contacts and assess our standing in the international arena. My time was also peppered with invited keynote talks to various international meetings, including BLUEPRINT (European Union) International Human Epigenome Consortium meeting in Brussels, Wellcome Trust meeting on Epigenomics of Common Diseases in Cambridge, 4D Genome: Dynamics of Genome Structure meeting in Barcelona and the Translational Medicine meeting on Epigenetics: Cancer and Beyond at the New York Academy of Sciences.

While the Division's research accomplishments have been excellent and the energy and enthusiasm generated from our PhD students and postdoctoral fellows is outstanding, I would also like to acknowledge our amazing talent in revealing the marvels of our field to lay audiences. Dr Sean O'Donoghue and his team produced animations for the FODMAP Grand Tour Down Under (youtu.be/Z_1Hzl9o5ic), while Dr Kate Patterson created a spectacular 360-degree light show in Garvan's Galleria, which came alive with genomes and epigenomes projected on the walls, ceiling and our iconic helical stairwell. Professor Vanessa Hayes was our very own media star with a full-length episode of *Catalyst* exploring her work. This was wonderful exposure for Garvan and demonstrates the impactful science of our Division. Best wishes for 2017 and may it be an even more successful year.

– Professor Susan Clark FAA

RESEARCH HIGHLIGHT

A 3D VIEW OF THE CANCER GENOME

A team of researchers, led by Professor Susan Clark, has shown for the first time that the three-dimensional (3D) structural organisation of a cell's DNA – its genome – is very different in cancer.

Line up the genome of a cancer cell and a normal cell, and it is clear that the differences are legion. The genomes of cancer cells contain many changes, from point mutations in genes, to deletions and large-scale rearrangements of sections of DNA and epigenetic alterations (changes to the chemical 'decoration' of DNA).

Although it is understood that these changes drive cancer progression, it is less clear how this happens. The growth of tumours is driven by the genes that are switched on and off in cancer cells – but the relationship between large-scale genomic changes and gene expression is still unclear.

The research team showed that the answer is likely to lie in the 3D DNA organisation in cancer cells. Using a state-of-the-art technique that involves chromosome conformation capture, called Hi-C, they compared the 3D genomes and epigenomes of normal prostate cells with prostate cancer cells.

The researchers found large-scale 3D reorganisation of the genome within the nucleus of cancer cells, with over 2000 changes in the way that DNA sequences interacted with each other. Importantly, the changes were often at DNA sites vital for turning specific genes on and off – which provides an important link between DNA organisation and gene expression in cancer.

Using a new visualisation tool developed by Dr Sean O'Donoghue's team, the researchers were able to build up a detailed interactive 3D picture of how DNA is arranged in the nucleus, how it is chemically altered, and where this changes in a prostate cancer cell.

The findings provide considerable new insight into the drivers of prostate cancer, and opens the door to 3D studies of the genome in other cancers.

Taberlay et al., *Genome Res* 2016;26:719-31 doi: 10.1101/gr.201517.115

RESEARCH HIGHLIGHTS

NAVIGATING THE HUMAN GENOME WITH 'SEQUINS'

Dr Tim Mercer, who holds the Paramor Family Fellowship, and his team developed an intuitive new technology called Sequins, which gives researchers insight into the sensitivity and accuracy of individual genome sequencing reactions.

When added to a DNA sample during sequencing, Sequins – small stretches of synthetic 'mirror-image' DNA – act as internal standards, giving a clear and nuanced sample-by-sample readout of the quality of the sequencing. In doing so, they help bring DNA sequencing to clinical standard, and they are likely to become an essential platform for genomic research and medicine.

The Sequins technology has been made freely available to the academic research community.

Deveson et al., *Nat Methods* 2016;13:784-91 doi: 10.1038/nmeth.3957
Hardwick et al., *Nat Methods* 2016;13:792-8 doi: 10.1038/nmeth.3958



NEW ROLE FOR OLD PROTEIN IN CANCER GENE SILENCING

A focus of Dr Clare Stirzaker and Professor Susan Clark's epigenetics research is DNA methylation – chemical tagging of DNA that affects how genes work.

The researchers and their team investigated how changes in the patterns of DNA methylation contribute to the progression of cancer. They found that alterations in methylation occur at key DNA sites across the cancer genome, leading to silencing of anti-cancer genes. Before this work, it was not known what caused these alterations.

They found that a protein called MBD2, which was long known to recognise or 'read' methylation on DNA, also plays a direct role in causing the cancer-specific methylation at specific DNA sites vital for turning genes on or off, thereby 'rewriting' the epigenome in cancer cells.

Stirzaker et al., *Oncogene* 2017;36:1328-38 doi: 10.1038/onc.2016.297 (epub Sep 2016)

RESEARCH HIGHLIGHT

EPIGENETICS IN PERSONALISED MEDICINE ARENA

An international team of researchers, including Professor Susan Clark's team, has shown that DNA methylation analysis is a mature technology that is ready for clinical use. The researchers' study highlights the robustness of DNA methylation and other epigenetic tests, and heralds an era in which epigenetics will be used in clinical diagnostics and personalised medicine.

In many diseases, including cancer, the epigenetic control of the genome is heavily distorted. By measuring these alterations, a detailed picture of disease-specific changes emerges, which can help distinguish disease subtypes or identify suitable treatments. To date, however, little epigenetic testing has been carried out in the clinic.

Nat Biotechnol. 2016 Jul;34(7):726-37. doi: 10.1038/nbt.3605.

NEWS HIGHLIGHT

THE MARROCCO FAMILY'S FUNDRAISING

Garvan first got to know the Marrocco family in 2015 when they, their friends and family made donations to Garvan in memory of their loving father Domenico Marrocco. After raising more than \$30,000 and learning more about Garvan and an innovative project led by Dr Tim Mercer, the family were inspired to continue to support and fundraise for Acute Myeloid Leukemia (AML) research.

In 2016, the family and Belmadar (the company founded by Domenico) employees participated in *Sun Herald City2Surf*, raising a further \$12,000. All funds raised by the family have supported Dr Mercer's efforts to develop a genetic test for faster, cheaper, earlier and more accurate diagnosis of blood cancers including AML.



NEWS HIGHLIGHTS

GENOME GAZING AT GARVAN

Garvan hosted the Genome Gazing event as part of Sydney Science Festival 2016. It was an evening of exploration into the science and art of human DNA.

Guests of Genome Gazing learnt about possible visions of the future based on what we know – and what we know we don't know – about the human genome. The evening considered the impact of genomic science on medical research and personalised patient care through connecting disciplines and removing roadblocks in medical research. Guests were taken on a journey to witness the molecular masterpiece of the genome and to see how scientific data can be transformed by blending storytelling with art and cinematography.

COMMUNICATING SCIENCE THROUGH VISUALISATION

Visual Science Communicator, Dr Kate Patterson developed a series of animations to transform the Garvan galleries into a biological wonderland of molecular imagery and moving picture. The series of animations were designed in line with Garvan's medical research.

The themes included: technology and innovation, human disease: the story of DNA and people and patients: our drive to improve human health.



Dr Kate Patterson

OUR RESEARCH LABORATORIES AND GROUPS

Epigenetics Research Lab Head: Prof Susan Clark

Epigenetic Deregulation Group Leader: Dr Clare Stirzaker

Histone Variants Group Leader: Dr Fatima Valdes-Mora

Genome Informatics Lab Head: A/Prof Marcel Dinger

Human Comparative and Prostate Cancer Genomics Lab Head: Prof Vanessa Hayes

Transcriptomic Research Lab Head: Dr Tim Mercer

Biodata Visualisation Lab Head: Dr Sean O'Donoghue



Dr Clare Stirzaker and Prof Susan Clark



Christine Salter, Dr Samantha Oakes, Jane Wiggers de Vries, Richard Reid, Alphia Sadsad and Kate Bielenberg

FASHIONLAB 2016 FOR BREAST CANCER RESEARCH

Fashion and beauty heavyweights joined forces for Garvan's breast cancer research at FashionLab 2016. Set in Paspaley's Martin Place boutique in Sydney, the event was MC'd by Hollywood commentator, Richard Reid. The night included a fashion show of looks from Cue Clothing Co., with Paspaley jewellery and Bobbi Brown makeup. Guests also enjoyed speeches from Garvan's Dr Samantha Oakes and 25-year-old breast cancer survivor Jane Wiggers de Vries.

FashionLab included a live auction of a Dion Lee dress and a 'locked box' lucky dip, with incredible prizes – Delta Air Lines flights, Estée Lauder hamper, Cue Clothing Co. gift voucher and Paspaley Kimberley Bracelet.

FashionLab was generously supported by Delta Air Lines, Paspaley, Cue Clothing Co., Bobbi Brown, Dion Lee, IMG Models, State Custodians, Pullman Sydney Hyde Park, Chello, Estée Lauder Companies, de Beaurepaire Wines and Young Garvan. All funds raised support Dr Oakes's breast cancer research.

DIVISION REPORT: IMMUNOLOGY

garvan.org.au/immunology



FROM THE DIVISION HEAD

Professor Stuart Tangye

The immune system is generally so effective that it is easy to forget how vulnerable we are until it malfunctions – whether through being under-active or over-active. In the Immunology Division, we aim to uncover insights into these processes and how they apply to a broad range of diseases.

The past year was one of notable success, with a number of exciting discoveries and high-impact papers. Among our achievements were a series of studies into rare genetic immune conditions, from the labs of Dr Elissa Deenick and Dr Cindy Ma, and my own lab. These ‘extreme cases’ are particularly valuable research subjects because they reveal the specific pathways that can go awry, and can extend to common conditions that affect us all.

It was particularly pleasing that a team from our Division received a major 5-year National Health and Medical Research Council (NHMRC) Program Grant to investigate antibodies in health and disease. I would also like to highlight our ongoing contribution to Garvan’s cross-Divisional research into cancer immunotherapy, not just as brilliant science but also as an exemplar of the lateral thinking and collegial spirit that underpins our work.

Special congratulations to Dr Cindy Ma and Dr Joanne Reed who were awarded Early-Mid Career Fellowships from NSW Health. This new initiative from the NSW Government was extremely competitive with 277 applicants and only 19 awarded. For Garvan’s Immunology Division to pick up two speaks volumes for our talent.

I am proud to acknowledge the contribution of everyone in the Division for the tireless hard work, passion, enthusiasm and energy they bring to Garvan. Their commitment speaks for the seriousness with which we undertake our foremost mission: making real differences to the health of the community.

– Professor Stuart Tangye

RESEARCH HIGHLIGHT

‘TRAITOR CELLS’ ARE LOCKED DOWN TO STOP AUTOIMMUNE ATTACK

A team of researchers, led by Professor Chris Goodnow, uncovered how our immune system strikes a balance between attacking invaders and leaving our own tissues alone.

The immune system is charged with the task of defending the body from overwhelming infection, and critically, must distinguish between invading pathogens that pose a threat and the cells of the body itself, which should be protected. Getting it wrong – and attacking ‘self’ – can lead to devastating autoimmune disorders such as rheumatoid arthritis or lupus.

The researchers revealed how the immune system can stop ‘traitor’ cells – which could otherwise make damaging antibodies against the body’s own tissues (auto-antibodies) – in their tracks.

They showed that a type of antibody called Immunoglobulin D (IgD), which sits on the surface of immune cells termed B cells, is responsible for stopping the ‘traitor’ cells from producing auto-antibodies. IgD keeps the cells in ‘lockdown’ – unresponsive to the body’s tissues, yet still capable of producing antibodies against invaders.

The studies, in mice, looked at gene expression and revealed a core set of over 200 genes, one third of which are controlled by IgD, that together keep the cells unresponsive to the body’s own tissues.

Importantly, however, the cells in lockdown are not removed from the immune system. Instead, they remain capable of taking part in ‘target training’ to make antibodies against invaders.

The findings provide a new depth of understanding of the human immune system and are also likely to help cancer researchers understand how B cells break out of their ‘holding pattern’ and multiply in common forms of leukaemia and lymphoma.

Sabouri et al., Nat Commun 2016;7:13381. doi: 10.1038/ncomms13381



Prof Chris Goodnow



Dr Elissa Deenick, Prof Stuart Tangye and Dr Cindy Ma

RESEARCH HIGHLIGHT

EXTREME IMMUNODEFICIENCY GIVES CLUES ABOUT COMMON INFECTIONS

By studying an extreme disorder in which antibody responses are severely impaired, Garvan's Dr Elissa Deenick and her team shed new light on how antibodies are produced. They investigated antibody responses in the rare primary immunodeficiency termed autosomal dominant hyper-IgE syndrome (Job syndrome), a condition associated with recurrent skin infections, pneumonia, eczema and many other infections.

Their research revealed a new understanding of how a protein called STAT3 helps in the secretion of antibodies from immune cells. These new insights provide a deeper understanding not only of this devastating disease, but also of the biological mechanisms underlying common infections – to which we are all susceptible.

Kane et al., *J Allergy Clin Immunol* 2016;138:14558 doi: 10.1016/j.jaci.2016.05.018

RESEARCH HIGHLIGHT

UNRAVELLING THE COMPLEXITY OF HUMAN IMMUNE DISEASE GENE BY GENE

A study led by Professor Stuart Tangye and Dr Cindy Ma revealed important insight into the different functions of T cells, which are vital immune cells that orchestrate the immune response. Different types of T cells provide immunity against specific infectious pathogens.

The researchers investigated 88 patients with distinct genetic mutations that predispose them to different immunological conditions – such as infections with viruses, bacteria or fungi, and allergic reactions – and looked at the role of different T cells in these conditions.

Their research identified genes that are responsible for the functioning of specific types of T cells, providing new insights into the biological pathways underlying these immune disorders.

Importantly, it also provides potential clinical targets for immunodeficiency and autoimmunity, and possibly to improve the immune response to vaccination.

Ma et al., *J Exp Med* 2016;213(8):1589-608. doi: 10.1084/jem.20151467

RESEARCH HIGHLIGHT

FINE TUNING T CELLS FOR A PRECISE IMMUNE RESPONSE

In an international study led by Garvan's Professor Jonathan Sprent, researchers provided a new depth of understanding of how the immune system mounts lasting responses to specific infections, involving T cell tuning.

T cells are the main conductors of the immune response and specific types of T cells are known to provide immunity against different infectious agents. After meeting an invading pathogen once, T cells mature into 'memory' T cells, which can mount a more rapid and vigorous immune response the next time 'their' pathogen is encountered. The new research described how mature T cells undergo tuning to ensure that they can retain their discrimination between non-self invaders and the body's own cells.

Cho et al., Nat Commun 2016;7:13373. doi: 10.1038/ncomms13373

NEWS HIGHLIGHT

CATALYTIC PHILANTHROPIC INVESTMENT FOR IMMUNOLOGY RESEARCH

Professor Chris Goodnow, an internationally respected immunologist, was attracted to Garvan by the vision of its leadership and unparalleled capabilities and expertise in genomics. Knowing that he had the generous support of The Bill and Patricia Ritchie Foundation as the inaugural recipient of The Bill and Patricia Ritchie Chair made the opportunity just too good to pass up.

"The secret to the success of any leading-edge medical research institute is its people. We need to attract, support and retain people who are gifted, ambitious and brave in the way they view the world and their approach to research. Professor Chris Goodnow is one such individual and thanks to The Bill and Patricia Ritchie Foundation, we were able to entice him to Garvan," said Professor John Mattick.

For the Ritchie family, supporting medical research is a family tradition: "Our parents were firm believers that the health of future generations rested on the advances we make in medical research today.

"Increasingly we understand that many of the chronic health conditions impacting the community have an immunological component or an opportunity for the immune system to be harnessed to treat disease such as with cancer. Chris and his colleagues at Garvan are leaders in both auto-immunity (an overactive immune system) and immunodeficiency (an underactive immune system) and their work is returning some exciting and clinically relevant results," said Julia and Ruth Ritchie.

Through the funding afforded by The Bill and Patricia Ritchie Foundation Chair in 2016, Professor Goodnow, along with colleagues, were able to rapidly investigate the genome of a young, critically ill boy and to identify a potential treatment, which transformed his health. Read more about this research on page 17.

NEWS HIGHLIGHT

ANTIBODIES ON THE AGENDA

Garvan's work on antibodies in health and disease received an important boost, with Division researchers being awarded a five-year Program grant from the National Health and Medical Research Council.

The research teams, led by Professors Chris Goodnow, Stuart Tangye and Robert Brink and Associate Professor Daniel Christ, will work together to understand why immunisation succeeds – and why it sometimes fails; to develop new approaches to the treatment of autoimmune disease; and to invent better strategies for producing new antibody-based therapies. Funding for the Program will begin in 2017.

Antibodies are able to recognise, and bind to, other molecules with exquisite specificity, specifically to non-self-molecules ('intruders' that do not belong within the body), making them a cornerstone of how the immune system functions.



A/Prof Daniel Christ, Prof Robert Brink, Prof Stuart Tangye and Prof Chris Goodnow

OUR RESEARCH LABORATORIES AND GROUPS

Antibody Therapeutics Lab Head: A/Prof Daniel Christ

B Cell Biology Lab Head: Prof Robert Brink

Genomic Engineering Group Leader: Dr David Zahra

Cellular Immunity Lab Head: Prof Jonathan Sprent

Immune Tolerance Group Leader: Dr Kylie Webster

Immunobiology of Cytokines Lab Head: Dr Marcel Batten

Immunogenomics Lab Head: Prof Chris Goodnow

Immunology and Immunodeficiency Lab Head:
Prof Stuart Tangye

Human Immune Disorders Group Leader: Dr Cindy Ma

Innate and Tumour Immunology Lab Head:
Dr Tatyana Chtanova

Intravital Microscopy Lab Head: Dr Tri Phan

Lymphocyte Signalling and Activation Lab Head:
Dr Elissa Deenick

Mucosal Autoimmunity Lab Head: A/Prof Cecile King

Transplantation Immunology Lab Head:
A/Prof Shane Grey

Immunopathology Group Leader: A/Prof William Sewell



The Garvan-Weizmann Centre for Cellular Genomics Coming Soon

Prof Chris Goodnow and Prof Ido Amit (Weizmann)

GARVAN AND WEIZMANN: A POWERFUL COLLABORATION

In April 2016, Garvan signed an important memorandum of understanding with Israel's Weizmann Institute of Science. The two Institutes agreed to work together to advance biomedical research, genomic medicine and genomic education.

At the heart of the partnership is the Garvan-Weizmann Centre for Cellular Genomics, a state-of-the-art collaborative research environment dedicated to the molecular genetic states of thousands of individual cells. Housed on the top floor of The Kinghorn Cancer Centre, the Centre will be Australia's only multidisciplinary centre for cellular genomics.

The strength of the two Institutes are truly complementary. Weizmann has outstanding expertise in single-cell genomics and other emerging technologies, while Garvan is a leader in the analysis of cancer genomes and is at the forefront of genome sequencing in Australia.

Together, Garvan and Weizmann will uncover entirely new insights into cancer, immune diseases, metabolic disorders and other conditions.

Like any far-reaching and ambitious medical research initiative, the Garvan-Weizmann partnership relies heavily on support and investment from generous and forward-thinking individuals and organisations. Vital initial investment from the NSW Government, Mr John Roth and Ms Jillian Segal AM, Mr and Mrs Laurie and Di Sutton and The Johnny Kahlbetzer Family has funded the construction of the Garvan-Weizmann Centre.

DIVISION REPORT: NEUROSCIENCE

garvan.org.au/neuroscience



FROM THE DIVISION HEAD

Associate Professor Antony Cooper

In the Neuroscience Division, we explore the complex nature and function of the brain and nervous system, and how it can become disordered in Parkinson's, Alzheimer's, schizophrenia, bipolar disorder, eating disorders, hearing loss and pain.

Among many highlights from 2016, our Division continued to pursue its ambition to become Australia's neurogenomics hub, for which we are actively recruiting faculty. This emerging field, which sits at the intersection of genomics and neurobiology, was the theme of Garvan's annual International Fellow Symposium, where Sten Linnarsson from Sweden's Karolinska Institute presented the Leslie Lazarus Oration.

We also made notable progress in taking our Parkinson's research to the next stage. Garvan consolidated its leadership in this area through co-hosting, with Shake It Up Australia Foundation, the Parkinson's Collaborative Research Forum. This was a roundtable that included international guests from the Michael J Fox Foundation (USA) and Cure Parkinson's Trust (UK), alongside key Australian researchers, neurologists and advocates. Participants discussed a number of opportunities relating to Parkinson's disease research around the globe, including an initiative to conduct clinical trials in Australia.

Alongside making a tangible impact on this challenging health problem, such projects deliver on the Division's objective to hasten translation of innovative therapies into clinics.

I hope you are as excited as I am by the promise of the coming year. May we all enjoy a successful 2017.

– Associate Professor Antony Cooper

RESEARCH HIGHLIGHTS

TAKING A 'DIET HOLIDAY' COULD IMPROVE WEIGHT LOSS

Professor Herbert Herzog leads the Eating Disorders laboratory. His research team participated in a study that revealed good news for those who struggle to stick to their diet: taking a break from dieting won't necessarily ruin your weight loss efforts, and it could actually improve them.

Conducted in mice and published in the journal *PLOS ONE*, the research found that taking a break from dieting could help weight loss by improving the efficiency of weight loss (the amount of weight lost for every kilojoule restricted). The researchers observed two groups of obese mice that were fed a calorie-restricted diet for 12 weeks, with one group on the diet continuously, and the second on the diet for five to six days at a time with unrestricted feeding for a number of days in between.

While overall the second group ate substantially more, surprisingly, there was no difference in body weight or fat mass at the end of the 12 weeks – indicating that taking a guilty break from dieting may actually help rather than ruin weight loss efforts.

Seimon et al., *PLoS ONE* 2016;11:e0145157 doi: 10.1371/journal.pone.0145157

IMPROVING GENETIC DISEASE DIAGNOSIS THROUGH WHOLE GENOME SEQUENCING

A collaborative study with St Vincent's Hospital has shown that whole genome sequencing has the potential to transform the diagnosis of a common inherited kidney disease. The research was led by Dr Amali Mallawaarachchi and Dr Tim Furlong of the Neuronal Stem Cells Laboratory, headed by Professor John Shine who has expanded the research interests of his team from neural stem cells into kidney disease.

Autosomal dominant polycystic kidney disease (ADPKD) is an incurable disorder in which cysts progressively expand and destroy the kidneys, eventually causing renal failure.

Drs Mallawaarachchi and Furlong sequenced the genomes of 28 study participants with ADPKD, they were able to accurately diagnose 24 individuals (86%). This is a substantial improvement on the current single-gene testing method which accurately diagnoses only 60% of cases.

This has potentially life-changing clinical implications: more accurate and earlier diagnosis could enable earlier clinical intervention, and possibly, prevention of complete renal failure.

Mallawaarachchi et al., *Eur J Hum Genet* 2016 ;24:1584-90 doi: 10.1038/ejhg.2016.48



Dr Kenny Ip, Jennifer Lee, Dr Nikki Lee, Prof Herbert Herzog and Dr Lei Zhang

RESEARCH HIGHLIGHT

THE ARTIFICIAL SWEETENER PARADOX

A study led by Garvan and University of Sydney researchers revealed why artificial sweeteners increase appetite and interfere with metabolism. This is an important finding given that a significant number of the population opt for products containing artificial sweetener as a means to limit their calorie intake, unaware that the artificial sweetener may be increasing their appetite.

The researchers identified a neuronal network in the brain involving a protein termed neuropeptide Y, or NPY, that senses and integrates the sweetness and energy content of food.

Studying fruit flies and mice, they found that the artificial sweetener sucralose caused a 'sweet/energy imbalance', hyperactivity and insomnia, and increased food intake. These effects were due to a recalibration in the brain, which triggered a starvation response and increased motivation to eat.

Wang et al., Cell Metab 2016;24:835-47 doi: 10.1016/j.cmet.2016.06.010

NEWS HIGHLIGHT

GARVAN STUDENT HONOURED BY NATIONAL COUNCIL OF WOMEN OF NSW

PhD student Tiffany Cole received a prestigious Australia Day award from the National Council of Women of NSW.

The award recognises young women of promise who have achieved highly in their chosen area of study, despite being disadvantaged by illness or hardship. Tiffany overcame a kick to the throat from a racehorse eight weeks before her Honours thesis was due. In spite of chronic pain, Tiffany completed her thesis and went on to study how neuropathic pain develops, first as a research assistant and then as a PhD student.

Tiffany has overcome significant obstacles and her achievements are nothing less than incredible.



Tiffany Cole (centre) with her mother Benedicte Esterman (left) and Linda Hurley (right)

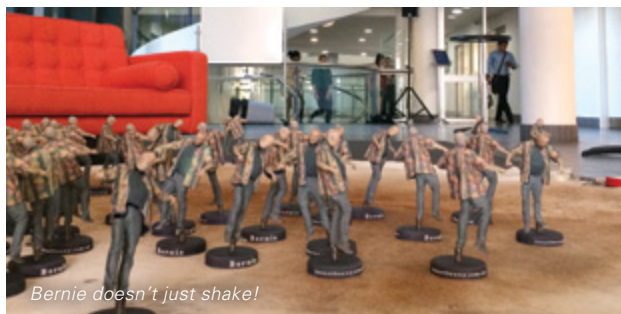
NEWS HIGHLIGHTS

POSITIVE OUTLOOK ON LIVING WITH PARKINSON'S DISEASE

'Bernie doesn't just shake!' was a four-day exhibition about people living with Parkinson's disease. Curated by community action group It's Not Funny and hosted by Garvan, the exhibition flipped the typically negative aspect of living with Parkinson's disease to a more positive approach.

The exhibition featured artworks by renowned artist Bernie McGrath and showcased how people have benefited from embracing a positive outlook living with the disease.

Diagnosed with early-onset Parkinson's disease in 1999 at 42 years of age, Bernie began painting in 2008. A self-trained artist, Bernie credits his newfound talents to Deep Brain Stimulation, a medical procedure to help treat the symptoms of Parkinson's disease.



Bernie doesn't just shake!

THE SUPPORT OF THE ROSEMARY PRYOR FOUNDATION

After spending her career teaching science to high school students, Ms Rosemary Pryor has always been passionate about the significance of science. Garvan first met Ms Pryor in 2008 and she has been supporting a number of research projects in our Neuroscience Division ever since.

"Neuroscience research has always been appealing to me. My mother suffered from dementia later in her life, and my older brother was a neurologist. I've also always been fascinated by genetics, so contributing to research that could help people who suffer from inherited diseases is satisfying," said Ms Pryor.

Garvan is truly appreciative of the generosity, and commitment to neuroscience research, of the Rosemary Pryor Foundation.

BRINGING INTERNATIONAL PARKINSON'S EXPERTS TOGETHER

There are around 80,000 Australians affected by Parkinson's disease in Australia. Despite ongoing research efforts, the cause of the disease is still unknown and treatments, while effective in addressing some symptoms of Parkinson's, do not slow or stop disease progression.

In an effort to bolster the international Parkinson's research effort, the Garvan Research Foundation led a Parkinson's Disease Collaborative Research Forum in October. Parkinson's Australia, The Cure Parkinson's Trust, The Michael J Fox Foundation for Parkinson's Research, NSW Government and Shake It Up Australia Foundation joined together to develop a strategy for making Parkinson's disease a priority in Australia. This strategy will be further developed and realised in 2017 and beyond.

THE WALKER FAMILY FOUNDATION AND HEARING LOSS RESEARCH

Hearing loss, while technically not life threatening, does threaten quality of life. Mr Lang Walker AO and Mrs Sue Walker, along with their family, generously support Garvan's hearing loss research, headed by Professor David Ryugo through The Walker Family Foundation.

The Walker Family Foundation has established The Walker Family Foundation Laboratory for Hearing Research at Garvan, where Mrs Walker also chairs the Hearing Research Committee. Previously, alongside Mr Charles Curran AC and the St Vincent's Curran Foundation, The Walker Family Foundation founded the Curran Foundation Chair in Neuroscience Research which was awarded to Professor Ryugo.

Professor Ryugo and his team assess the brain changes that occur as a result of hearing loss. By understanding more about how hearing loss causes the brain to change, the team hope to gain insight into how the brain might play a role in restoring hearing loss.



Prof David Ryugo

OUR RESEARCH LABORATORIES AND GROUPS

Eating Disorders Lab Head: Prof Herbert Herzog

Energy Expenditure Group Leader: Dr Lei Zhang

Neuroendocrinology Group Leader: Dr Yanchuan Shi

Functional Genomics Lab Head: Dr Greg Neely

Hearing Research Lab Head: Prof David Ryugo

Neuronal Stem Cells Lab Head: Prof John Shine

Neurodegenerative Disease Lab Head: Dr Bryce Vissel

Parkinson's Disease and Neurogenomics Lab Head:
A/Prof Antony Cooper

RNA Biology and Plasticity Lab Head: Prof John Mattick

Epitranscriptomics and RNA Dynamics Group Leader:
Dr Eva Maria Novoa Pardo



Grace Sadiki (nee Rizzo), Marina Rizzo, A/Prof Elgene Lim and Santina Rizzo

FUNDRAISING IS IN THE GENES FOR THE RIZZO FAMILY

When Rizzo sisters Marina, Santina and Grace, and Grace's daughter Yasmina, held a small fundraiser for breast cancer six years ago, they never imagined how successful they would be. Marina says, "We started in 2010 on the back verandah with a group of family and friends. We were thrilled when we raised \$2000." Two years later, they raised \$10,000 and the Rizzos were motivated to outdo themselves next time.

Preparations for the 2014 event, however, were tarnished by news that their cousin Aurora had been diagnosed with breast cancer. Then, only months later, Grace too was diagnosed. "Suddenly, these events took on a whole new meaning. It was now very real to us," says Marina.

This prompted the Rizzos to focus their efforts on medical research, donating proceeds from their 2016 event to Garvan's Connie Johnson lab, headed by Associate Professor Elgene Lim. Demanding of their guests "bring your dancing shoes and your wallet", their 'Let's Find a Cure!' fundraiser in October raised an impressive \$45,000.

CENTRE REPORT: KINGHORN CENTRE FOR CLINICAL GENOMICS

garvan.org.au/kccg



FROM THE CENTRE HEAD

Associate Professor Marcel Dinger

It has been an exciting year for the Kinghorn Centre for Clinical Genomics (KCCG), achieving major milestones in sequencing for research and clinical translation.

This year KCCG underwent its assessment from the National Association of Testing Authorities to provide whole genome sequencing as a medical test. In July we were advised of our clinical accreditation, which allows specialist physicians to order a whole genome sequencing test for a patient or patients. The service was made available through Genome.One, a newly established health information company that is owned by, and based at Garvan (see page 47).

We also celebrated sequencing more than 1000 genomes in a single month (in June) and more than 10,000 whole genomes since we installed the Illumina HiSeq X Ten platform in 2014. Our scaled-up sequencing and analysis operations allowed us to complete the first stage of the Medical Genome Reference Bank, releasing the first 1200 genome sequences of healthy, older people through a data portal to aid research and diagnostics. These achievements are a testament to the skills and hard work of our diverse team and the unwavering support of our funders and collaborators.

– Associate Professor Marcel Dinger

CENTRE HIGHLIGHTS

GENOME.ONE AN AUSTRALIAN FIRST

In July, we were thrilled to launch Genome.One, Australia's first clinical whole genome sequencing service. Powered by the genomic technology of KCCG, Genome.One has the potential to triple the rate of diagnosis for Australians living with rare and genetic conditions.

"Genome.One is the culmination of years of work, which started in 2012 with Garvan securing its first high-throughput sequencing capability and went right through to clinical accreditation to enable us to provide whole genome-based diagnostics," said Associate Professor Marcel Dinger, KCCG Head and Genome.One Founding CEO.

Read more about Genome.One: page 47.

GENOMES OF HEALTHY OLDER AUSTRALIANS TO ACCELERATE MEDICAL RESEARCH

Within our genome, each of us harbours millions of genetic variants – sites in our DNA sequence where we differ from others. A key challenge in genomic research is to work out which of those millions of variants act as drivers of disease, and which do not.

To address this challenge, Garvan and NSW Health launched the Medical Genome Reference Bank – the world's largest publicly available bank of genomes from healthy older people. The genome sequences are sourced from participants in two leading Australian research studies in older people: the ASPREE (ASPIrin in Reducing Events in the Elderly) study (Monash University, Melbourne) and the 45 and Up study (Sax Institute, Sydney).

Because it includes only the genomes of individuals over the age of 70 who have no history of major disease (cardiovascular disease, neurodegenerative disease or cancer), the Medical Genome Reference Bank is expected to be relatively free of genetic variants associated with disease. This makes it a powerful filter, or 'control', for accelerating genomic discovery in medical research. Additionally, it will aid in the diagnosis of genetic disease and may shed light on mechanisms of healthy aging.



A/Prof Marcel Dinger introduces Genome.One

CENTRE HIGHLIGHT

REALISING THE PROMISE OF PERSONALISED MEDICINE

Recognising the critical role genomics plays in making personalised medicine a reality, The Kinghorn Foundation, founded by John and Jill Kinghorn, has supported the launch of the KCCG with a multi-year commitment. The purpose-built facility for genome sequencing and analysis within KCCG is the largest and most sophisticated of its kind in the Southern Hemisphere, and one of the first in the world to have received clinical accreditation (the ability to return clinical reports to physicians for the direct benefit of patients).

According to Mrs Kinghorn, “We believe in medical research and its ability to improve health outcomes for all Australians. Personalised medicine is the future of health care and the team at Garvan are making exciting breakthroughs in the field – most recently, in clinical research trials for children and adults with advanced and rare cancers. [See more on the Lions Kids Cancer Genome Project on page 25, and the Molecular Screening and Therapeutics trial on page 20.]

“We are also proud of the fact that Garvan’s genomic capabilities are being used to investigate a wide range of diseases that impact the community such as intellectual disorders and cardiomyopathies; and that the service is available to scientists, doctors and patients right across the country. We are pleased to be involved and excited for what the future holds.”



Mrs Jill Kinghorn and A/Prof Marcel Dinger

CENTRE HIGHLIGHTS

10,000 GENOMES: JUST THE BEGINNING

In October, KCCG achieved a major milestone by sequencing 10,000 whole genomes. Most of the genomes were sourced from individuals who are part of research projects investigating the genetic components of human health and disease.

According to Professor John Mattick, KCCG's technology and analytical expertise has the power to accelerate discovery and ultimately transform medicine and health.

"The real power of sequencing comes from volume. It provides enormous interpretive power by being able to compare each newly sequenced genome with tens of thousands of other genomes, together with associated clinical information, and pinpoint the relevant variations," he said.

HANDLING BIG DATA IN GENOMICS: GARVAN PARTNERS WITH NCI

Garvan has become a collaboration partner of the National Computational Infrastructure (NCI), bringing together the Southern Hemisphere's largest genome sequencing centre and its most powerful supercomputing environment for data-intensive research.

The collaboration will mean that the large-scale genomic data generated at Garvan can be archived in a cost-effective and secure manner. Additionally, collaborating research partners will be able to analyse our genomic information by using the NCI's supercomputer or high-performance cloud computing infrastructure.



Dr Warren Kaplan, Prof Lindsay Botten (NCI) and Prof Chris Goodnow

CENTRE HIGHLIGHTS

ST VINCENT'S CLINICAL GENOMICS UNIT

Together with St Vincent's Hospital, Garvan has launched the St Vincent's Clinical Genomics Unit.

A patient-facing facility, the Clinical Genomics Unit is an important interface between the clinic and the laboratory for genetic and genomic testing. It will provide access to diverse genetic and genomic tests, including those offered by Genome.One, to diagnose the genetic basis of disease.

NSW HEALTH GENOMICS GRANTS ANNOUNCED

In April, then-NSW Premier Mike Baird and then-NSW Minister for Medical Research Pru Goward visited Garvan to announce substantial support from the NSW Government to investigate the genomic underpinnings of disease. The funding, which forms part of the 2015/16 NSW Health Genomics Collaborative Grants Program, was awarded to six projects across NSW, three of which are led by Garvan researchers.

See the details of the grants on page 60.



Prof Chris Semsarian (Centenary Institute), Prof Chris Goodnow, Minister for Medical Research Pru Goward, Dr Tony Roscioli, A/Prof Robyn Jamieson (University of Sydney) and Prof Andreas Zankl (Sydney Children's Hospital Network)

OUR TEAMS

- Translational Genomics Team Leader:
Dr Mark Cowley
- Phenomics Team Leader:
Dr Tudor Groza
- Genome Sequencing Team Leader:
Justin Stockmyer
- Clinical and Production Informatics Team Leader:
Aaron Statham
- Information Architecture Team Leader:
Dr Warren Kaplan
- Rare Disease Genomics Team Leader:
Dr Tony Roscioli
- Project Management Team Leader:
Dr Andrew Stone
- Engagement and Education Team Leader:
Bronwyn Terrill

FURTHERING THE OVARIAN CANCER CAUSE

More than 22 years ago, Mrs Margaret Rose AM was diagnosed with ovarian cancer. She is the first to admit that she is one of the lucky ones.

“My survival is a gift to me and my family, and a responsibility I bear,” said Mrs Rose. “As a mother to two daughters and grandmother to six granddaughters, I am entirely motivated by my desire to create hope for future generations of women and their families.”

Driven by personal experience Mrs Rose passionately supports ovarian cancer research at Garvan and her advocacy, along with daughters Marisa and Sacha, and the extended Rose family, has helped raise more than \$2.4 million for Garvan’s research.

In 2016, the Rose family and then-Minister for Medical Research, Pru Goward, hosted Garvan’s fourth Ovarian Cancer Awareness Day Leader’s Lunch. The lunch introduced newly appointed internationally renowned ovarian cancer genomicist, Professor David Bowtell.

Professor Bowtell leads Garvan’s Ovarian Cancer Research Program and holds a joint appointment with the Peter MacCallum Cancer Centre – demonstrating the importance of collaboration and the power of bringing together Australia’s leading cancer institutes.

Professor Bowtell is making significant progress in the genetic classification, improved treatment and prevention of ovarian cancer. His work is changing clinical guidelines and offering hope to thousands of Australian women.



LEADERS IN SCIENCE AND SOCIETY SEMINARS

Leaders in Science and Society seminars feature renowned speakers from all over the world, and a variety of organisations. Hosted at Garvan for the Darlinghurst precinct, the seminars aim to engage, educate and inspire our staff and students.

Thank you to those who presented Leaders in Science and Society seminars in 2016.

FEBRUARY

PROF YOSHIHIDE HAYASHIZAKI

Director, Omics Science Center,
RIKEN, Japan

"The recent progress of FANTOM omics, and its application to health care"

MARCH

HON. DR PETER BEATTIE AC

Former Queensland Premier

"Where to from here Australia?"

MR CHARLES CURRAN AC

Chairman, Trustees of the St Vincent's
Curran Foundation, former Garvan
Institute Chairman

"Reflections on economic and political developments in Australia over the last 50 years"

APRIL

PROF ANNE KELSO AO

Chief Executive Officer, National
Health and Medical Research Council

"NHMRC's agenda in 2016"

DR ROBERTO WEIGERT

Senior Investigator, Laboratory of
Cellular and Molecular Biology,
National Cancer Institute, USA

"Molecular mechanism of membrane remodelling in live animals by subcellular intravital microscopy"

PROF ANGEL LOPEZ

Director, Centre for Cancer Biology,
SA Pathology and University of
South Australia

"Signalling by the Beta c family of cytokines"

MAY

DAVID THODEY

Chairman, CSIRO

"Leadership and innovation in scientific research and business are necessary – but is it the same?"

PROF PETER VISSCHER

Co-Director, The Centre for
Neurogenetics and Statistical
Genomics, Queensland Brain Institute,
The University of Queensland

"The nature of genetic variation underlying complex traits and common disease"

DR ANTHONY JOSHUA

Director of Oncology, St Vincent's
Hospital Sydney/Garvan Institute

"What can medicine learn from the airline industry? Safety at 36,000ft"

PROF RICHARD GIBBS AC

Director, Baylor College of Medicine
Human Genome Sequencing Centre,
Houston, Texas, USA

"Precision medical research"

DR VIVIEN BONAZZI

Senior Advisor for Data Science
Technologies and Innovation Office for
the Associate Director for Data Science
National Institutes of Health, USA

"The data commons – changing the landscape for sharing and analysing large scale biomedical data"

JUNE

THE HON. PRU GOWARD, MP

Minister for Medical Research

"Reflections"

PROF LOUISA JORM

Director, Centre for Big Data Research
in Health, UNSW Australia

"Big data, small populations: unpacking health inequalities using linked data"



Former Queensland premier, Hon. Dr Peter Beattie AC, presents a Leaders in Science and Society seminar in March.

AUGUST

PROF CHRISTINA MITCHELL

Academic Vice-President and Dean,
Faculty of Medicine Nursing and Health
Sciences, Monash University, Melbourne

*"Regulation of phosphoinositide
3-kinase signaling by phosphoinositide
phosphatases"*

MR BILL FERRIS AC

Veteran of venture capital and private
equity in Australia, Chair of Garvan Board
from 2001-2013, and recently appointed
Chair of Innovation and Science Australia

*"Innovation and science in a future
Australia... so what for Garvan?"*

PROF JORGE FERRER

Chair in Genetics and Medicine,
Head of the Section of Epigenomics
and Disease, Imperial College London, UK

*"Non-coding genome function in
pancreatic islets"*

DR PAUL BOUTROS

Principal Investigator, Informatics and
Biocomputing, Ontario Institute for
Cancer Research, Toronto, Canada

"The three genomes of cancer"

SEPTEMBER

SIR PETER GLUCKMAN

ONZ KNZM FRNSZ FMedSci FRS

Chief Science Advisor to the Prime
Minister of New Zealand

*"Policy-making is messy – can
science make it any cleaner?"*

MS ANNA BLIGH

Chief Executive Officer, YWCA NSW

"Reflections"

PROF GEORGIA CHENEVIX-TRENCH

Senior Scientist, Cancer Genetics,
QIMR Berghofer Medical Research
Institute, Brisbane

*"The post GWAS challenge: 188
breast cancer susceptibility loci
and still counting"*

DR MARKUS ELSNER

Research Editor, Nature Biotechnology

"Publishing in Nature journals"

OCTOBER

DR KATE SCHRODER

Deputy Director, IMB Centre for
Inflammation Research, University
of Queensland

*"Inflammation control by
inflammasomes"*

SCIENTIA PROF KATHARINA GAUS

EMBL Australia Node in Single Molecule
Science, ARC Centre of Excellence in
Advanced Molecular Imaging, UNSW

*"T cell receptor clustering – a new
model of signal transduction"*

NOVEMBER

PROF GAIL RISBRIDGER, SYDNEY

Monash Biomedicine Discovery
Institute, Department of Anatomy
and Developmental Biology,
Monash University

*"Prostate cancer in BRCA mutation
carriers: small cohort study with
large impact"*

PROF HELEN CHRISTENSEN

Director and Chief Scientist,
Black Dog Institute, Sydney

"Detect and deliver"

PROF LIZ HARRY

Director, i3 Institute, UTS, Sydney

*"Knowing when and where to
divide: a bacterial perspective"*

DECEMBER

REV TIM COSTELLO

CEO World Vision Australia

*"Tackling our greatest global
challenges: hope for a fragile world"*

BOARD OF DIRECTORS

2016



JOHN SCHUBERT AO

Chair

Dr Schubert is Chairman of the Garvan Institute of Medical Research, Chairman of the Great Barrier Reef Foundation, and a director of the Garvan Research Foundation Board. He has held positions as Chairman of the Commonwealth Bank of Australia, non-executive director of BHP Billiton Limited, BHP Billiton Plc, and Qantas Airways Limited, Chief Executive Officer of Pioneer International Limited, Chairman of WorleyParsons Limited and G2 Therapies Ltd, Chairman and MD of Esso Australia Ltd, and non-executive director of Hanson Plc.



ANNABELLE BENNETT AO SC

(from April)

The Hon Dr Annabelle Bennett AO SC was until recently a Judge of the Federal Court of Australia. She is presently Chancellor of Bond University and on the Advisory Council for Qwestacon. Dr Bennett has extensive knowledge and experience in intellectual property arising from her position as a Judge, as a senior counsel specialising in intellectual property and as President of the Copyright Tribunal.



ANNETTE CUNLIFFE RSC

Sister Annette was the Sisters of Charity Congregational Leader. She has been President of the Conference of Leaders of Religious Institutes, President of Catholic Religious Australia, Inaugural Chair of the Stewardship Board of Catholic Health Australia, and a senior lecturer at the Australian Catholic University. She is one of two executive officers of the National Committee for Professional Standards of the Catholic Church in Australia.



GEOFF DIXON

Mr Dixon is the Chairman of the Garvan Research Foundation and also sits on the boards of Crown Resorts Limited, Adslot Limited and the Museum of Contemporary Art Australia. He is an Ambassador to the Australian Indigenous Education Foundation. He has worked in the media, mining and aviation industries, and was Chief Executive of Qantas Airways from 2001 to 2008 and Chairman of Tourism Australia from 2009 to 2015.



STEPHEN JOHNS

Mr Johns is Chairman of Brambles Limited and non-executive director of Goodman Group. He is a former chairman and non-executive director of Leighton Holdings Limited and Spark Infrastructure Group, and former executive and non-executive director of Westfield Group. He has a Bachelor of Economics degree from the University of Sydney and is a Fellow of the Institute of Chartered Accountants in Australia and the Institute of Company Directors.



ANNE KEATING

Ms Keating is a director of Goodman Group Ltd, Reva Medical Inc and GI Dynamics Inc. She is also Chairman of Houlihan Lokey, Australia, an investment bank, and is a governor of the Cerebral Palsy Research Foundation. She has served on many public company boards and was an inaugural director of the Victor Chang Cardiac Research Institute.



PAUL KELLY

(from April)

Dr Kelly is a founding partner of OneVentures and serves as a member of the Investment Committee and Risk Management Committee and is Managing Director of the Fund Manager. An Australian physician, serial entrepreneur and experienced biotechnology and life sciences executive, he currently has over 30 years experience in clinical medicine and medical science and 20 years experience in commercialising life science related technologies in Australia, Europe and North America.



THOMAS JOHN (JACK) MARTIN AO FAA FRS

Emeritus Professor Martin is a John Holt Fellow, St Vincent's Institute of Medical Research and Emeritus Professor of Medicine, University of Melbourne. He was previously the Director of St Vincent's Institute of Medical Research and the Chairman of the University of Melbourne Department of Medicine. A Fellow of the Royal Society and of the Australian Academy of Science, he was also President of the International Bone and Mineral Society.



JOHN MATTICK AO FAA

Professor Mattick is the Garvan Institute Executive Director and Conjoint Professor at UNSW Sydney / St Vincent's Hospital Clinical School. Previously he was foundation Professor of Molecular Biology and director of the Institute for Molecular Bioscience, University of Queensland. His many awards include the Australian Government Centenary Medal and the Human Genome Organisation's Chen Award for Distinguished Contributions to Human Genomic and Genetic Research.



HELEN NUGENT AO

Dr Nugent is the Chairman of the National Disability Insurance Agency, Ausgrid, and Australian Rail Track Corporation and a non-executive director of Insurance Australia Group Limited. She has been the Chairman of Veda Group, Funds SA, Swiss Re (Australia) and Sydney Airport and a non-executive director of Macquarie Group, Origin Energy Limited, Mercantile Mutual and the State Bank of NSW, among others. She is an Officer of the Order of Australia and a recipient of the Australian Government Centenary Medal.



PATRICIA O'ROURKE

Professor O'Rourke is the CEO of St Vincent's Health Australia's Public Hospitals Division. She also serves on the boards of St Vincent's Institute of Medical Research. She is a graduate of the Australian Institute of Company Directors and a member of the Harvard Business Club of Australia.



DANIEL PETRE AO

(until April)

Mr Petre is the founding partner at AirTree Ventures. Previously he was Chairman of Netus and Founder of Ecorp. He was the Managing Director of Microsoft in Australia, the Development Group Vice President of Microsoft in the US and ran the Asia-Pacific region for Microsoft. He serves on the Sydney Theatre Company Board, UNSW Sydney Business School and University of Sydney Medical School advisory boards.



RODNEY PHILLIPS

Professor Phillips, Dean of UNSW Medicine, is an immunologist whose research impacted the world's understanding of HIV/AIDS and other infectious diseases. He described, for the first time, how HIV evades the body's immune defences. Previously, Professor Phillips was Vice-Dean of Medical Sciences at Oxford University and Director of the Peter Medawar Building for Pathogen Research.



ANTHONY M SCHEMBRI

Associate Professor Schembri, CEO of St Vincent's Health Network, holds academic appointments with the St Vincent's Clinical Schools, of UNSW and Australian Catholic University. He is a director of the Central and Eastern Sydney Primary Health Network, St Vincent's Curran Foundation, co-chair of the Nursing Research Institute and a trustee of the Peter Duncan Neurosciences Unit.



RUSSELL SCRIMSHAW

Mr Scrimshaw is the non-executive Chairman of Sirius Minerals Plc and the Executive Chairman of Torrus Capital P/L, the Australian Philanthropic Fund, the Scrimshaw Foundation and Scrimshaw Nominees P/L. In addition, he is a non-executive director of Genome.One P/L. Previously, he held executive positions at Fortescue Metals Group Ltd (FMG), Commonwealth Bank, Optus and IBM. He was also a non-executive Board Director at Commonwealth Properties Ltd, EDS Australia, Mobilesoft Ltd, Telecom New Zealand Australia Pty Ltd, the Garvan Research Foundation and Athletics Australia.



JILLIAN SEGAL AM

Ms Segal is the Deputy Chancellor UNSW Australia, Chairman of AICC (NSW) and the General Sir John Monash Foundation, a member of the Australian War Memorial Council, a Trustee of the Sydney Opera House, and a director of the Grattan Institute. She has been a senior regulator, lawyer and a director of other listed and government organisations.



BERNADETTE TOBIN

(until April)

Dr Tobin is Director of the Plunkett Centre for Ethics at St Vincent's Hospital, and Reader in Philosophy at Australian Catholic University. Dr Tobin is an Honorary Ethicist at the Children's Hospital at Westmead, Conjoint Associate Professor in the Faculty of Medicine at University of Sydney and Conjoint Associate Professor in the School of Medicine at UNSW Sydney.



Prof John Mattick

GENOME.ONE OPENS ITS DOORS

Garvan's Kinghorn Centre for Clinical Genomics (KCCG) was proud to herald a new era in genetic diagnosis with the launch of Genome.One – Australia's first clinical whole-genome sequencing service. Owned by and based at Garvan, Genome.One could triple the diagnosis rates for Australians living with rare and genetic conditions.

Garvan's Executive Director, Professor John Mattick said that the launch marked a turning point in disease diagnosis and health care in Australia.

"This new service extends cutting-edge genomic technology beyond the research laboratory. We now have the ability to provide answers to many of the hundreds of thousands of Australians affected by genetic disease."

Associate Professor Marcel Dinger, Head of KCCG and CEO of Genome.One predicts that the impact of this new service will be significant.

"This one test puts an end to the long and complicated journey to diagnosis that, at the moment, many families endure. The value the test provides is not confined to benefits to the patient; it will have economic benefits to the health care system as well."

Genome.One is the result of a two-and-a-half year development at KCCG, in conjunction with NSW Health Pathology, the country's largest provider of public pathology services.

BOARD OF DIRECTORS

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JANE ALLEN

Ms Allen runs a Governance Advisory business. Previously she was a managing partner at Egon Zehnder, where she also held a leadership role across Asia Pacific. A member of Chief Executive Women, Ms Allen has an MBA from Harvard Business School and a Bachelor of Arts from Smith College. She has also worked for Procter & Gamble in the US and Australia.



BRUCE BAIRD AM

(until November)

The Hon Bruce Baird was a member of the Australian Trade Commission and parliaments of NSW and the Commonwealth from 1998-2007. Mr Baird is Chairman of the National Heavy Vehicle Regulator and sits on the boards of Sydney Theatre Company and Cubic International. He is also a patron of the Asylum Seeker Centre.



GABRIEL FARAGO

Mr Farago practised as a solicitor and barrister for over 30 years, specialising in commercial disputes in Australia and overseas, before becoming a full-time international thriller writer. His latest books – *The Empress Holds the Key* and *The Hidden Genes of Professor K* – were released in 2013 and 2016. In 1984, Mr Farago became a member of the Knightly Order of Vitez.



LOFTUS HARRIS AM

Mr Harris is a professional non-executive director and an advisor to industry and government. He has been chair and member of numerous national, state and industry bodies concerned with issues of economic development, international trade and investment, infrastructure, innovation and technology. He previously held various executive positions in the NSW, Queensland and Commonwealth public sectors.



JOHN LANDERER CBE AM

(until November)

Mr Landerer, CBE, AM, LLB (Syd), LLD, is a solicitor and director of a number of private companies. He is a Fellow of the University of Sydney, Honorary Doctor at Macquarie University, Fellow of Tel Aviv University, Member of the Order of Australia, Commander of the British Empire and Commander in the Order of the Star of Italian Solidarity.



JOHN MATTICK AO FAA

Professor Mattick is the Garvan Institute Executive Director and Conjoint Professor at UNSW Sydney / St Vincent's Hospital Clinical School. Previously he was foundation Professor of Molecular Biology and director of the Institute for Molecular Bioscience, University of Queensland. His many awards include the Australian Government Centenary Medal and the Human Genome Organisation's Chen Award for Distinguished Contributions to Human Genomic and Genetic Research.



HELEN MCCABE

(from December)

Ms McCabe is the Head of Lifestyle for Nine.com.au at Nine Entertainment Co. Prior to this she was Editor-in-Chief at the *The Australian Women's Weekly*, Deputy Editor of *The Sunday Telegraph*, Night Editor of *The Australian* and held key roles on *The Daily Telegraph*. She is also on the board of the Australian Indigenous Education Fund and an Ambassador for Adopt Change.



SIMON MORDANT AM

Mr Mordant is Executive Co-Chairman of Luminis Partners. He is also the Chair of the Museum of Contemporary Art Australia and Lend Lease Barangaroo Public Art Committee, a board member of the Australian Broadcasting Corporation, MOMA PS1 in New York, Wharton Executive Board in Asia, a Trustee of the American Academy in Rome and a member of the Executive Committee of Tate International Council and a member of the International Council of the Museum of Modern Art in New York.



HELGA NEIDHART RSC

(until November)

Dr Neidhart is an Australian Catholic University Senior Lecturer, Educational Leadership and a director of the Catholic Education Commission of Victoria and the Catholic Ladies' College, Eltham. She is a member of the Australian Bishops' Council for Pastoral Research, and the governing councils of Guildford Young College, Mount Carmel College and the Association of Catholic Colleges, Hobart. Dr Neidhart was the Principal of St Columba's College for approximately 20 years.



BRAD REES

(until October)

Mr Rees is involved in a number of charitable, arts and educational interests and is a director of a private investment company. He was a managing director and equity partner of Goldman Sachs JBWere. Mr Rees was with the firm for 23 years and provided financial and investment banking advice to corporations and governments in Australia and overseas.



JOHN SCHUBERT AO

Dr Schubert is Chairman of the Garvan Institute of Medical Research and Chairman of the Great Barrier Reef Foundation. He has held positions as Chairman of the Commonwealth Bank of Australia, non-executive director of BHP Billiton Limited, BHP Billiton Plc, and Qantas Airways Limited, Chief Executive Officer of Pioneer International Limited, Chairman of WorleyParsons Limited and G2 Therapies Ltd, Chairman and MD of Esso Australia Ltd, and non-executive director of Hanson Plc.



JEANNE-CLAUDE STRONG

Dr Strong graduated in Medicine, has a post graduate degree in Applied Finance and Investment, BA (literature), was on the Board of Blueearth, flew her Beechcraft Baron from California to Australia via Europe, and races Etchells yachts including recent wins in the Australasian, Queensland and Victorian state championships.



PETER YOUNG AM

(from July)

Mr Young formally joined Standard Life Investments in 2013 as their Australasia Chairman. He is also currently a non-executive director of the Sydney Theatre Company, and a member of the Barangaroo Delivery Authority Board. He is a recipient of the Centenary Medal and in 2008 was appointed a Member of the Order of Australia for his services to business and commerce.



Amit Lalwani, Amanda Khoury, Femi Ayemi, Alisa Kane and Robert Shearer

PHD COMPLETIONS

Congratulations to the students receiving PhDs in 2016.

At Garvan, we have close to 100 PhD students researching in almost every disease area across the Institute. In partnership with UNSW Sydney, through which most of our students are enrolled, Garvan is committed to supporting the important contributions our students make in the development of scientific knowledge and skills for the future.

CAROL TACTACAN

Supervised by Prof Roger Daly and Prof Andrew Biankin

"Tyrosine kinase signalling pathways in pancreatic cancer"

CATHERINE CONNELLY

Supervised by Prof David Ryugo and A/Prof Catherine McMahon

"Changes in the central auditory system with hearing loss"

DANIEL CHEN

Supervised by Prof Jerry Greenfield and Prof Don Chisholm

"Insulin-sensitive obesity"

FAHAD BENTHANI

Supervised by A/Prof Maija Kohonen-Corish, Dr Paul Timpson and Dr Laurent Pangon

"The role of MCC in regulating chemosensitivity, invasion and adhesion in colon cancer"

GIEDRE MILINKEVICIUTE

Supervised by Prof David Ryugo and Dr Michael Muniak

"Neuronal connections between the dorsal cochlear nucleus and the inferior colliculus in the mouse"

ISHITA BAKSHI

Supervised by Prof Gregory Cooney and A/Prof Nigel Turner

"Creating futile cycles to increase metabolism and improve insulin action in skeletal muscle"

JAMES ROBINSON

Supervised by Dr Adam Cole, Dr Greg Neely and Prof Herbert Herzog

"The discovery of novel GSK3 substrates and their role in the brain"

JEREMY HUMPHRIS

Supervised by Prof Andrew Biankin and Dr Scott Mead

"Inherited predisposition to pancreatic cancer in the era of next generation sequencing"

KA YAN (JACKIE) LAU

Supervised by Prof Herbert Herzog and Dr Yanshuan Shi

"CART in the regulation of appetite and energy homeostasis"

KATHERINE TONKS

Prof Jerry Greenfield and Prof David James

"Defining the insulin signalling defects in insulin resistance and type 2 diabetes mellitus"

MARK PINESE

Supervised by Dr Mark Cowley and Prof Andrew Biankin

"Molecular signatures of survival in pancreatic ductal adenocarcinoma"

MINA RASOULI

Supervised by Dr Andrew Burgess and Dr Darren Saunders

"Blocking mitotic exit is a potential target for combination therapy with anti-mitotic drugs"

RAPHAEL ZINN

Supervised by Dr Bryce Vissel and Dr Laura Corbit

"The precision of initial context fear memory encoding determines the behavioural, cognitive and molecular changes that occur following recall"

ROBERT SHEARER

Supervised by Dr Darren Saunders and A/Prof Alex Swarbrick

"Defining the role of the E3 ubiquitin ligase UBR5 in cancer"

RODRIGO VAZQUEZ LOMBARDI

Supervised by A/Prof Daniel Christ

"Molecular engineering of interleukin-2 for enhanced cancer immunotherapy"

AWARDS



Ira Deveson and Claire Vennin

STUART FURLER TRAVEL AWARDS

Two of Garvan's PhD students, Claire Vennin (Cancer Division) and Ira Deveson (Genomics and Epigenetics Division), were presented with Stuart Furler Travel Awards in December.

The award enables Claire to attend the Cancer Precision Medicine conference in Amsterdam, where she will discuss her research on improving therapeutic strategies for pancreatic cancer. Ira will attend annual meetings of the European and American Societies of Human Genetics, in Copenhagen and Orlando, where he will discuss his group's new 'Sequins' technology (see page 27 for more).

The Stuart Furler Travel Award was established by Mr and Mrs Paul and Judy Hennessy in memory of Dr Stuart Furler, a long-serving scientist in Garvan's Diabetes and Metabolism Division, who passed away from pancreatic cancer in 2007.

CHAMP YOUNG PIONEER AWARD

Dr Nenad Bartonicek from Garvan's Genomics and Epigenetics Division was awarded the 2016 CHAMP Young Pioneer Award in May. The award, presented annually by CHAMP Private Equity, aims to assist an early-mid career Garvan researcher to test an innovative research idea.

Dr Bartonicek will use the award to address the question of how parents transmit environmental information, such as response to specific odours, to their offspring. He has proposed the hypothesis that noncoding RNAs from the brain pass through the blood-placenta barrier during pregnancy, thereby influencing epigenetic events in early embryogenesis.

CHAMPION AWARDS

Garvan was delighted to honour exceptional support from community and corporate partners at the annual Champion Awards in February.

The 2016 recipients were:

- The Vodafone Foundation, which co-launched with Garvan the DreamLab app to provide additional computer power to cancer research.
- Rod Wills and the crew of *Great Xpectations*, who sailed the Sydney to Hobart Yacht Race to raise funds and awareness for Garvan's prostate cancer research.
- State Custodians, Young Garvan's platinum sponsor.
- Mr Gordon Eckel, the former chair and committee member of Young Garvan.
- The Intermedia Group, for their support to Garvan as the Hotel Management (HM) Awards chosen charity, with Love Your Sister.
- Tour de Cure, which has raised more than \$21 million for cancer research and support projects, including Garvan.

Thank you to the winners for your commitment to Garvan's research.



Dr Danyal Butt, Mr Scott Edmonds (Heliflite) and Dr Joanna Achinger-Kawecka

HELIFLITE YOUNG EXPLORER AWARDS

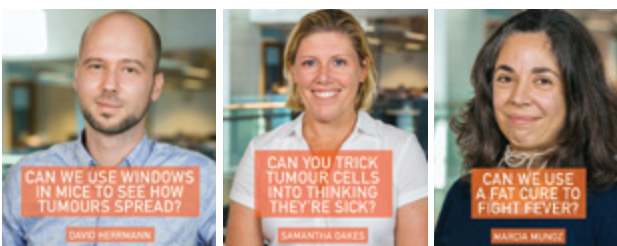
Each year, the Heliflite Young Explorer Award supports two of Garvan's most outstanding early career researchers by facilitating international travel to conferences and laboratories to foster career development. In 2016, the winners were Dr Joanna Achinger-Kawecka (Genomics and Epigenetics Division) and Dr Danyal Butt (Immunology Division).

Dr Achinger-Kawecka presented her research on the organisation of the cancer genome at The Chromatin Structure and Function Gordon Research Conference in Switzerland. Dr Butt attended the Keystone Symposia on B Cells and T Follicular Helper Cells in Canada to present his research, develop an international profile, learn from top international researchers and identify future opportunities for collaborations with international leaders in the field.

STATE CUSTODIANS YOUNG GARVAN AWARD

Dr Samantha Oakes, of Garvan's Cancer Division, was awarded the 2016 State Custodians Young Garvan Award at the inaugural 'Edgy Ideas' event at the Garvan Institute of Medical Research in June. Dr Oakes's winning edgy idea was to trick cancer cells into thinking they're infected with a virus such that they will be recognised by the immune system. Runners-up were Dr David Herrmann (Cancer Division) and Dr Marcia Munoz (Bone Biology Division).

Edgy Ideas is a unique forum for Garvan's young and early-mid career researchers to pitch an innovative and inventive idea to a 100-strong crowd of young professionals, who vote to choose the winner of a \$25,000 cash prize from sponsor State Custodians. The runners up were each awarded return flights to the US with Delta Airlines to further develop their research careers.



3 MINUTE THESIS AWARD

Third year PhD student Nancy Mourad (Bone Biology Division) was awarded second place in the UNSW Australia 3 Minute Thesis (3MT) interfaculty final for her presentation entitled 'Cancer: Bad to the Bone'. She also won the ASPIRE Prize, which is granted by school students in the UNSW ASPIRE program to the presenter whose talk they enjoyed the most.

Nancy's talk summarised in three minutes her research into breast cancer cells that remain dormant in bone – often for many years or even decades – before reactivating to form new tumours.

This achievement follows Mourad earning both second prize and People's Choice award at the St Vincent's precinct 3MT competition, held at Garvan in June, and the People's Choice award at the UNSW Faculty of Medicine heat.



Back: Shelley Yin, Holly Holliday, Navind Jayasooriah (Victor Chang), James Conway and Petro Ridone (Victor Chang) Front: Alice Tang, Nancy Mourad, Ishita Bakshi and Ann-Kristin Altekoester (Victor Chang)

PALMER INNOVATION PRIZE

Associate Professor Daniel Christ, Head of the Antibody Therapeutics Laboratory in Garvan's Immunology Division, is the inaugural recipient of the Palmer Innovation Prize. Joseph Palmer & Sons is Australia's oldest brokerage firm; its prize aims to encourage and support translational innovation arising from research at Garvan.

Associate Professor Christ, together with colleagues, developed a technology called StAbilize, which is being commercialised through a Garvan-owned startup company, Solvanix. StAbilize addresses the problem of aggregation (a type of impurity) in the development of therapeutic antibodies, a valuable new class of drugs for cancer, immune disease and more. The technology has the potential to increase yields, lower manufacturing costs and ease limits on how a product can be used in patients.



A/Prof Daniel Christ

PARTNERS FOR THE FUTURE

The Garvan Institute of Medical Research and the Garvan Research Foundation acknowledge our Partners for the Future, supporters who have chosen to leave a bequest to Garvan in their wills.

Mrs Margaret Adams	Dr Lynne Cook	Mr & Mrs William & Jacqueline Goodyear	Mr Barry Thompson and Ms Roberta Lauchlan
Ms Ronelle Adams	Mrs Philippa Croker	Mrs Helen Victoria Graham	Mr & Mrs Kevin & Virginia Leacy
Ms Heather Adie	Mr Alan Currie and Mrs Roslyn Currie	Dr Robert Gray & Mrs Jane Gray	Ms Elizabeth Lee
Ms Christine Allen	Mr Rodney F Darke	Ms Claire Greaves	Mr & Mrs Cyril and Benita Levene
Mr & Mrs V & E Annuk	Mr Kenneth Davies	Sharon Green & Marcel Skjald	In memory of Mrs Grace Shirley Lewis (Kit)
Mr Ian A N Armstrong	Mr Don and Mrs Christine Davison	Miss Flo Greene	Mrs Shirley Lindoy JP
Mr Peter Askew	Miss Clare Dawes	Dr W G Grigor	Mrs Nelis Loustrau
Miss Margaret Atkinson	Mr Michael Day	In Memory of Patricia Helen Guest	Ms Maria Lydaki
The Australian Ladies Variety Association Inc	Mr & Mrs Peter and Susanne de Beuzeville	Ms Angela Guildford	Mrs Gwenda Macdonald
Dr W. Michael Baker	Ms Susanne de Ferranti	In memory of Barbara Guy	Ms Moyra Maestros
Mr & Mrs Joseph and Elizabeth (Betty) Banhidi	Mrs Eileen De Lapp	Mr Hedley Hall	Dr Harry Marget
Mr Peter Bolton and Mr Alan Barnes	Mrs Luise de Longueville	Mr John Hall	Dr Norman Marshall
Mr & Mrs David and Robyn Barnett	Ms Peggy De Seriere	Mrs Ann Hanson	Mrs Doreen N.E. Martin
Mr Wal Barrett	Mrs Denise Debeck	Mrs Shirley Harding-Learmont	Mr Lance Matheson
Mrs Esther Bartram	Mr Tom Devitt	The Hayes Family	Mrs Nina Mavro
Ms James Belger	Mrs Marlene Dixon	Mr & Mrs W & V Haynes	Ms Sharon McAuliffe
Mrs Sheila Bell	Mr John Dobies	The Late Mr Philip Hemstritch	Mr Desmond J McCarthy
Mr & Mrs Peter and Pamela Binnie	Mr John Dowd	Mrs Frances Hession	Mr Stuart McCulloch
Mr Leslie Blackshaw	Ms Jennifer Duncan	Mr John Thomas Hill	Mr & Mrs Terry and Lynette McGarrigle
Mr Ken Bloxsom	Mrs Valda Eastment	Mr Kenneth Hillier	Mr John Robert McLure
Ms Linda Booth	Mrs Elizabeth Efinger	Ms Heather P Hindle	Mr & Mrs Warren J and Pamela A McNamara
Mr & Mrs Earle and Marlene Boutwell	Miss Moir Evans	Mr & Mrs Lionel & Gwen Hirning	Mrs Alice Miglionico
Ms Maree Bowman	The Evans Family	Mr Hilton Hollingdale	Mr & Mrs David and Renata Money
Mrs Meryl Bowman	Mrs Wai Chiew Fairley	Ms Ruth Holmes	Mr John Kelvin Moody
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			Mrs Margarita Rasink

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 Ms Julia Richardson
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 Ms Barbara Williams
 Ms Faye Margaret Williams
 In Memory of the Late Kathrin Nell A Wilshire
 Miss Vivienne Windsor
 Ms Roberta Withnall
 Mr & Mrs Karl & Madeline Wolf
 Diane Wright
 Mrs Dorothea Wright
 Ms Janet Wright
 Mrs Elizabeth Yates

SUPPORTING MEDICAL RESEARCH – IT'S IN THE FAMILY



Mrs Frances Hession, Mrs Alice Miglionico and Mr Scott Hession

“How many of us wouldn’t be here today if it weren’t for medical research?” asks Mrs Frances Hession.

She, along with her mum Mrs Alice Miglionico and son Scott are Garvan Partners for the Future, a special group of people who have chosen to support Garvan through leaving a gift in their wills. Like most families in Australia, they have been touched by cancer. Tragically, however, Frances and her family have been touched more than most. Frances lost her father to prostate cancer, her sister to breast cancer and husband to oesophageal cancer.

Of her family’s decision to each leave a legacy to Garvan, Frances says, “We’re motivated to make a difference because we know the impact that disease can have on a family. For us, leaving a bequest is important. We have brilliant researchers in Australia, but they need to be able to continue their research with funding for equipment and opportunities to collaborate, to meet and learn from each other and share knowledge. We can help them do that.”



Ms Josie La Spina

THE IMPORTANCE OF HEALTH INSPIRES A LEGACY

Ms Josie La Spina is not only a Garvan Partner for the Future but has also remembered a number of other Australian charities in her will. This generosity was driven by causes that are important to Ms La Spina, of which medical research is one.

“My dad passed away from complications of type 1 diabetes and my mum had dementia. One of my two sisters had bowel cancer – she’s all clear now thankfully. My other sister, who lives with me and I care for, has brain damage, epilepsy and mild type 2 diabetes.

Ms La Spina continues, “I decided to leave a gift to the Garvan Institute in my will because I want to help make a difference for people affected by disease, and their families. When thinking about my legacy contributing to new discoveries for treating disease, I feel really hopeful.”

GARVAN COMMUNITY

A big thank you to all those who supported Garvan in 2016

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Amadeus Energy Limited
Mr John Armati
ASX Group
ASX Thomson Reuters
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The Australian Lions Childhood
Cancer Research Foundation
Mr David Baffsky AO and Mrs
Helen Baffsky
Mr Charles P Curran AC
Mr & Mrs Geoff and Dawn Dixon
Mr & Mrs Peter and Val Duncan
The Late Mr Alan Elder
Mrs Janice Gibson & Ernest Heine
Family Foundation
Lady (Mary) Fairfax AC OBE
Ferris Family Foundation
Mr Laurence S Freedman AM
Elizabeth Fyffe
Miss Felicia D Garvan
Mr James Patrick Garvan
and Family
Mrs Agnes Ginges and The Late
Mr Berel Ginges
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Peer reviewed grants are selected in a highly competitive process. A panel of expert scientists assess all applications and rank them on scientific merit of the research and track record of the applicants. Only a small proportion of applications are funded in each round due to budget restrictions rather than the quality of the proposals.

GARVAN-LED GRANTS 2016

Funding body	Type of grant	Principal Investigator	Co-Investigators	Project Title	Amount awarded	Years of funding
Bristol Myers Squibb Australia	Project Grant	Anthony Joshua		Immuno-Oncology Research Program	\$250,000	2
Cancer Australia	Project Grant	David Thomas	Paul James (Peter MacCallum Cancer Centre), Mandy Ballinger, Kathy Tucker (Prince of Wales Hospital, NSW), Judy Kirk (Westmead Hospital, NSW); Mary-Anne Young, Phyllis Butow (University of Sydney)	A surveillance protocol for people at high risk of cancer using whole body magnetic resonance imaging	\$527,457	3
Cancer Council NSW	Project Grant	Alex Swarbrick	Sandra O'Toole, David Croucher, Kaylene Simpson (Peter MacCallum Cancer Centre, Vic), Vinod Ganju (Monash University, Vic)	Systematic analysis of the role for miRNA in breast cancer aetiology and treatment	\$450,000	3
		Chris Ormandy	Samantha Oakes	A new way of suppressing metastasis	\$446,751	
		Elgene Lim	Wayne Tilley (University of Adelaide, SA), Bruce Mann (Victorian Comprehensive Cancer Centre), Sandra O'Toole, Alan Coates, Carlo Palmieri (University of Liverpool, UK)	Progesterone as an anti-cancer agent in early breast cancer	\$450,000	
		Maija Kohonen-Corish	Jane Dahlstrom (Canberra Hospital), Stephen Clarke (University of Sydney)	Determine the role of MCC silencing in the promotion of colon cancer and how it can be targeted with anti-invasive therapy	\$450,000	
		Maya Kansara	David Thomas	Targeting IL-23 in osteosarcoma	\$440,391	
Diabetes Australia Research Trust	Research Grant	Yanchuan Shi	Herbert Herzog, Don Chisholm, Chin Kin Ip	NPY-Y1 receptor signaling in adipose tissue as target for anti-obesity treatment	\$60,000	1
		Trevor Biden		Novel roles for ER stress in beta cell failure	\$60,000	
		Ross Laybutt		Regulation of the β -cell unfolded protein response by chronic hyperglycaemia and islet hypoxia in type 2 diabetes	\$60,000	
Jeffrey Modell Foundation	Research Grant	Stuart Tangye		PID gene identification and elucidation of immune pathways underlying human disease	\$50,000	1
Juvenile Diabetes Research Foundation	Innovative Grant	Shane Grey	Gregory Korbutt (University of Alberta, Canada), C. Bruce Verchere (University of British Columbia, Canada)	Islet dependent tolerance for insulin independence without immunosuppression	\$128,611	1
National Breast Cancer Foundation	Innovator Grant	Paul Timpson	David Herrmann	Predicting breast cancer spread before it happens: using biosensor mice to take cancer targeting to new dimensions	\$199,983	2
		Simon Junankar	Alex Swarbrick	Understanding metastatic breast tumour evasion of immunotherapies at the clonal level in clinically relevant in vivo models	\$199,998	
		Susan Clark	Joanna Achinger-Kawecka, Elena Zotenko	Genetic perturbations to the 3D genome architecture: implications for endocrine resistance in breast cancer	\$192,829	

Funding body	Type of grant	Principal Investigator	Co-Investigators	Project Title	Amount awarded	Years of funding
National Health and Medical Research Council	Centre of Research Excellence	Tony Roscioli	Jozef Gecz (University of Adelaide, SA), Michael Field (Hunter Genetics), Deborah Schofield (University of Sydney), Michael Buckley (Prince of Wales Hospital, NSW), Kathryn North (Murdoch Children's Research Institute, Vic), Marcel Dinger, John Christodoulou (Murdoch Children's Research Institute), David Amor (Murdoch Children's Research Institute), Gareth Baynam (King Edward Hospital, WA)	Transforming the diagnosis and management of severe neurocognitive disorders through genomics	\$2,499,330	5
		Paul Timpson	Jennifer Morton (Beatson Institute, UK), Yingxiao Wang (University of California, San Diego)	Real-time optical window imaging of AKT-FRET biosensor mice to maximise PI3K/AKT drug targeting within the hypoxic microenvironment of pancreatic cancer	\$683,447	3
	Project Grant	David Thomas	Joseph Powell (University of Queensland), Mark Cowley, Mandy Ballinger	An international whole genome study to definitively map heritable risk in sarcomas	\$825,000	1
		Thomas Cox		Reversing the biomechanical dysregulation of cancer cell signalling to improve targeted therapies	\$663,447	3
		Susan Clark	Clare Stirzaker, Elgene Lim	Four dimensional epigenome remodelling: implications for endocrine resistance in breast cancer	\$828,560	3
		Tri Phan	Cindy Ma, John Zaunders (UNSW Sydney), Fabio Luciani (UNSW Sydney)	Determining the unique processes that control memory B cell-mediated secondary antibody responses	\$853,644	4
		Herbert Herzog	Greg (Graham) Neely	Neuronal integration of taste and energy	\$1,214,852	5
		Shane Grey	Esteban Gurzov (St Vincents Institute of Medical Research, Vic), Daniel Hesselton	Genetic control of islet inflammation in diabetes	\$730,793	4
		Mark Febbraio	Michael Karin (University of California San Diego), Nicholas Shackel (Centenary Institute, NSW)	NAFLD, NASH and hepatocellular carcinoma: mechanisms & potential treatments	\$692,992	4
		Stuart Tangye	Elissa Deenick, Cindy Ma, Tri Phan	Delineating aberrant adaptive immune responses due to germline mutations in the PI3K signalling pathway	\$975,476	4
Herbert Herzog		NPY coordination of energy balance and physical activity	\$844,596	4		
Development Grant	Neil Watkins	Vinod Ganju (Monash University, Vic), David de Kretser (Monash University, Vic)	Development of follistatin as novel cancer therapeutic	\$494,324	3	
NSW Office for Health and Medical Research	Genomics Collaborative Grant	Tony Roscioli	Rupinder Sachdev, Edwin Kirk, Elizabeth Palmer, Ann Bye, Deborah Schofield, Marcel Dinger, Mark Cowley	Drug resistant childhood onset epilepsy with intellectual disability: leveraging genomic sequencing to identify novel genes and neurodevelopment pathways and determine optimal diagnostic paradigm	\$180,000	
		Tony Roscioli	Michael Buckley, Marcel Dinger, Mark Cowley, Deborah Schofield, Lisa Ewans	Discovery of genes for mendelian disorders through whole genome sequencing: from the clinic to gene identification	\$200,000	1
			Stuart Tangye, Chris Goodnow, Paul Gray, Melanie Wong, Michael Buckley, Rob Brink	Whole genome sequencing in mendelian immunodeficiencies: novel gene identification and elucidation of immune pathways.	\$200,000	
Parkinson's NSW	Research Grant	Bryce Vissel	Sandy Statye	Activin A and neuroinflammation in L-Dopa induced dyskinesias	\$50,000	
		Antony Cooper	Louise Cottle	Evaluating pexidartinib to reduce /stop Parkinson's disease progression in a mouse model	\$20,000	1

GARVAN-LED GRANTS 2016 *continued*

Funding body	Type of grant	Principal Investigator	Co-Investigators	Project Title	Amount awarded	Years of funding
Roche Products Pty Ltd	Research Grant	Mun Hui		Establishment of a characterisation of triple negative breast cancer tissue biobank	\$30,408	2
Shire Australia Pty Ltd	Research grant	Leslie Burnett		Survey of attitudes of the Sydney Ashkenazi Jewish community in relation to inclusion of gaucher disease in community genetics screening	\$20,000	1
St Vincent's Clinic Foundation	Research Grant	Peter Manders	Jon Sprent, Dongbin Jin	Dendritic cell (DC) nanovesicles: novel highly active cancer immunotherapy	\$100,000	1
		Elgene Lim	Sara Wahroos, Mark Febbraio	Metabolic effects of exercise on breast cancer	\$50,000	
Yulgilbar Foundation	Research Grant	Clement Loy	Martin Smith	Using single cell transcriptomics to understand selective neuronal vulnerability in Alzheimer disease: a pilot study	\$30,000	1

COLLABORATIVE GRANTS LED BY OTHER INSTITUTIONS 2016

Funding body	Type of grant	Administering Institution	Garvan Investigator	Co-Investigators	Project Title	Amount awarded	Years funded
Australian Research Council	Discovery Project Grant	UNSW Sydney	Herbert Herzog	Denovan Begg	The mechanisms of insulin transport into the central nervous system	\$342,000	4
Juvenile Diabetes Research Foundation	Strategic Research Grant	Royal Adelaide Hospital, SA	Shane Grey	Patrick Coates, Thomas Kay and Thomas Loudovaris (St Vincent's Research Institute, Vic), Nico Voelcker (University of South Australia), Wayne Hawthorne (University of Sydney), David Torpy, John Greenwood, Philip O'Connell (University of Sydney), Greg Korbitt (University of Alberta, Canada), Mark Nottle (University of Adelaide)	Vascularised biodegradable temporizing matrix as an alternative site for islet transplantation	US\$740,151	3
National Health and Medical Research Council	Project Grant	Baker Heart and Diabetes Institute	Mark Febbraio	Julie McMullen, Melanie White, Andrew Carey	Identification of novel secretory factors from the heart as new targets for metabolic disease	\$864,012	3
		UNSW Sydney	Carsten Schmitz-Peiffer	Nigel Turner, Kyle Hoehn, Anthony Don, Jonathan Morris, Dorit Samocha-Bonet	Understanding sphingolipid mediators of insulin resistance	\$643,447	
	Program Grant	University of Sydney	John Mattick	Glenda Halliday, John Hodges, Matthew Kiernan, Olivier Pignety, Jillian Kril, Lars Ittner (UNSW Sydney), Michael Kassiou	Frontotemporal dementia and motor neurodegenerative syndromes	\$17,069,580	5
		QIMR Berghofer	David Thomas	Mark Smyth, Rajiv Khanna, Scott Burrows	Immunotherapy in cancer and virus infection	\$9,312,735	
National Institutes of Health USA	Research Grant	Oregon Health and Science University, USA	Tudor Groza	Melissa Haendel (OHSU) – Principal Investigator	The monarch initiative: linking diseases to model organism resources	\$40,619	1

EQUIPMENT GRANTS

Funding body	Project Title	Project Category	Principal Investigator	Co-Investigators	Amount Funded
Cancer Institute NSW	The Next Wave of Cancer Genomics: Resolving Complex Structural Variants and Tumour Heterogeneity with Linked Short-Read	Research Equipment Grants	Marcel Dinger	Mark Cowley, David Thomas, Glenn Marshall (Children's Cancer Institute), Susan Clark, Vanessa Hayes, Marc Wilkins (UNSW Sydney), Neil Watkins, Alex Swarbrick, David Gallego-Ortega	\$220,482

FELLOWSHIPS AND SCHOLARSHIPS

Funding body	Type of award	Awardee	Project Title	Amount Funded	Years of funding
Australian Research Council	Discovery Early Career Award	Eva Maria Novoa Pardo	Specialised ribosomes: an unexplored regulatory layer to tune the proteome?	\$372,000	3
Australian & NZ Bone & Mineral Society	Gap Fellowship	Nikki Lee	Osteoglycin, a novel regulator of bone mass and glucose homeostasis	\$20,000	1
Cancer Institute NSW	Career Development Fellowship	Marina Pajic	Immune modulators and anti-invasive treatments for pancreatic cancer: a new therapeutic partnership	\$150,000	3
		David Gallego-Ortega	The challenge of tumour heterogeneity, harnessing single cell molecular phenotype capacity	\$597,118	
	Early Career Fellowship	Angela Chou	Biomarker-driven preclinical trial of pancreatic cancer defines a CDK4/6 inhibitor responsive molecular subtype	\$480,000	
National Breast Cancer Foundation	Postdoctoral Fellowship	Niantao Deng	Modeling cancer evolution through multi-regional sequencing of metastatic patient derived xenografts and clinical rapid autopsy samples	\$400,000	4
	Career Development Fellowship	Liz Caldon	Genome evolution in recurrent breast cancer	\$680,000	
National Health and Medical Research Council	Senior Principal Research Fellowship	Herbert Herzog	New approaches for the discovery of the obesity causing genes	\$863,910	5
	Senior Principal Research Fellowship	Mark Febbraio	Toward a better understanding of the health benefits of physical activity: designing exercise mimetic for the treatment of disease	\$938,910	
	Postgraduate Scholarships	Sara Wahlroos Sara	Metabolic effects of exercise on breast cancer	\$142,676	3
	Postgraduate Scholarships	Angela Sheu	The relationship between osteoporosis and diabetes: exploring the bone-metabolism interface	\$124,676	
NSW Office for Health and Medical Research	NSW Health Early-Mid Career Fellowship	Mark Cowley	Bioinformatic approaches to uncover different aspects of genome biology and assess how these influence disease	\$361,000	4
		Joanne Reed	The objective of this research is to use cutting-edge genomic technology to characterise human autoantibodies to improve diagnosis and monitoring of disease. This approach traces the cellular source of autoantibodies revealing novel and specific therapeutic targets	\$328,217	
		Cindy Ma	This â from bedside to bench and backâ approach incorporating genomics and bioinformatics will identify novel gene mutations in PID patients and provide an explanation for disease pathogenesis	\$361,000	
Royal Australasian College of Surgeons	Paul Mackay Bolton Scholarship for Cancer Research	Penelope De Lacavalerie	Molecular basis of chemoradiotherapy responsiveness in rectal cancer patients	\$45,011	1
Royal Australasian College of Physicians	Research Entry Scholarships	Andrew Yam	Investigating the function of tumour egressing CD8+ T cells in anti-tumour response	\$20,000	1
	Jacquot Research Entry Scholarship in Nephrology	Amali Mallawaarachchi	Molecular pathogenesis of inherited kidney disease	\$45,000	
	Research Entry Scholarship	Angela Sheu	Osteoporosis Australia RACP research entry scholarship: the relationship between osteoporosis and diabetes: exploring the bone-metabolism interface	\$45,000	
Sydney Catalyst	PhD award and 'Top-up' Research Scholar Award	Sara Wahlroos	Top-up award: the effect of exercise in combination with chemotherapy on breast cancer tumour biology, immunology and vascularisation – a non-pharmaceutical approach to current oncology treatment?	\$39,400	1
		Claire Vennin	Preclinical targeting of the extracellular matrix to improve chemotherapy and reduce metastasis in patient-stratified models of pancreatic ductal adenocarcinoma using innovative imaging technologies	\$38,000	
	Top-Up Research Scholar Award	Ashleigh Morgan	From mice to men: biomarker driven classification of pancreatic cancer to define novel targetable molecular subtypes	\$38,000	2

FINANCIAL HIGHLIGHTS

Statement of financial position as at 31 December 2016

PROFIT AND LOSS STATEMENT

REVENUE	2016 \$'000	2015 \$'000	EXPENDITURE	2016 \$'000	2015 \$'000
Research income			Staff costs	49,505	46,315
NHMRC research grants	15,737	18,140	Sequencing consumables	7,724	2,073
Other peer-reviewed research grants	10,734	10,485	Research	12,875	12,103
Other grants	2,583	2,476	Depreciation and amortisation	11,356	12,594
Commercial partnerships	603	595	Administration	7,139	4,787
	29,657	31,696	Fundraising*	2,669	2,914
NHMRC and UNSW Infrastructure support			Building and scientific	7,045	5,528
NHMRC IRISS grant	2,953	3,320	Net loss on disposal of property, plant and equipment		4
UNSW contribution	668	551	Finance costs	988	1,083
	3,621	3,871	TOTAL EXPENDITURE	99,301	87,400
NSW Government support	18,295	5,844	TOTAL COMPREHENSIVE INCOME FOR THE YEAR	10,064	19,473
Donations and bequests	33,985	49,359			
Other income					
Sequencing and facility charges	19,276	10,472			
Investment/interest income	4,234	1,900			
Net gain on disposal of property, plant and equipment	38				
Net gain on interest swap derivative not qualifying as hedges	202	153			
Share of gain of associates accounted for using the equity method	57	3,577			
	23,807	16,103			
TOTAL REVENUE	109,365	106,873			

* Fundraising costs exclude employment expenses.

BALANCE SHEET

ASSETS	2016 \$'000	2015 \$'000	LIABILITIES	2016 \$'000	2015 \$'000
Current assets			Current liabilities		
Cash and cash equivalents	57,817	56,434	Trade and other payables	5,603	5,054
Trade and other receivables	5,937	5,862	Borrowings	15,357	3,359
Financial assets at fair value through profit and loss	36,813	26,322	Derivative financial instruments	245	
Sequencing consumables	3,724	2,895	Provisions	5,742	4,822
Biological assets	443	337	Other	7,102	6,470
	104,734	91,851		34,049	19,705
Non-current assets			Non-current liabilities		
Investments accounted for using the equity method	397	673	Borrowings	2,254	19,611
Property, plant and equipment	92,904	98,962	Derivative financial instruments		447
Intangibles and others	427	521	Provisions	944	1,155
	93,728	100,156	Other	1,257	1,195
				4,455	22,408
TOTAL ASSETS	198,462	192,007	TOTAL LIABILITIES	38,504	42,113
			NET ASSETS	159,958	149,894
			FUNDS		
			Reserves	104,046	71,042
			Retained surpluses	55,912	78,852
			TOTAL FUNDS	159,958	149,894

The Statement of Financial Position provided above, together with the attached Income Statement, have been extracted from the audited general purpose financial statements of Garvan Institute of Medical Research and its controlled entities. The summary financial information does not include all the information and notes normally included in a statutory financial report. The audited general purpose financial report can be obtained upon request to the Chief Operating Officer.

The statutory financial report (from which the summary financial information has been extracted) has been prepared in accordance with the requirements of the Corporations Act 2001, Australian Charities and Non-for-profits Commission Act 2012 and Regulations 2013, Australian Accounting Standards and other authoritative pronouncements of the Australian Accounting Standards Board.



POST-DOCTORAL DEVELOPMENT COMMITTEE

The Post-Doctoral Development Committee (PDDC) facilitates education and social events for post-docs and group leaders across the St Vincent's Precinct to come together, network, engage and collaborate.

The Committee members represent each research Division within Garvan, as well as the Victor Chang Cardiac Research Institute and St Vincent's Centre for Applied Medical Research. In 2016, the Committee organised:

- 20 lunches with speakers from Garvan's Leaders in Science and Society seminars to foster stimulating conversation between distinguished speakers, PhD students and early-mid career researchers.
- 5 educational seminars showcasing the facilities and expertise within the precinct.
- 2016 Annual Post Doc Symposium, which had more than 100 attendees from across the precinct.

2016 PDDC members:

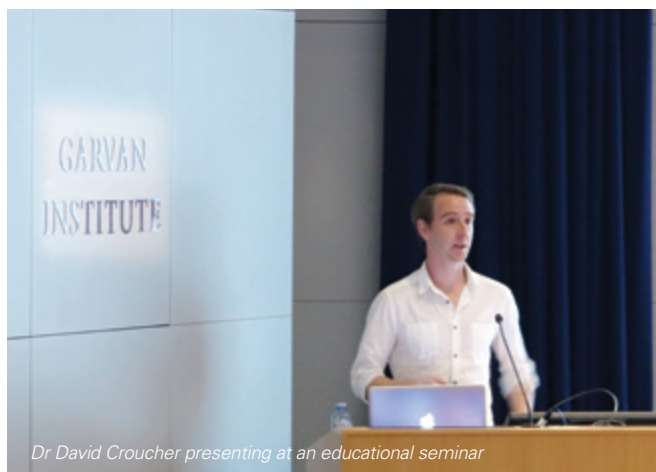
Co-Chairs Dr Samantha Oakes and Dr Martin Smith

Secretary Dr Emily Edwards

Members Dr David Hermann, Dr Joanna Achinger-Kawecka, Dr Brigid O'Gorman, Dr Niall Byrne, Dr Marcia Munoz, Dr Phuong Tran, Dr Martin Pal, Dr Amanda Wright, Dr Gonzalo del Monte (Victor Chang Cardiac Research Institute), Dr Matthew Perry (Victor Chang Cardiac Research Institute), and Dr Gayathri Sundaram (St Vincent's Centre for Applied Medical Research).



Some of the Committee members: Dr David Hermann, Dr Niall Byrne, Dr Marcia Munoz, Dr Samantha Oakes, Dr Emily Edwards, Dr Joanna Achinger-Kawecka and Dr Brigid O'Gorman



Dr David Croucher presenting at an educational seminar

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