



Garvan Institute
of Medical Research

Annual Report 2019

2019

Strength through collaboration

Our vision

We see a future where everyone lives a longer, healthier life.

Our mission

We will harness all the information encoded in the genome to better diagnose, predict, treat and prevent diseases that have the deepest impact on society.

Our values

Excellence

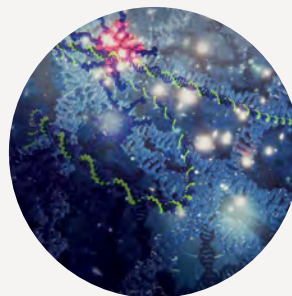
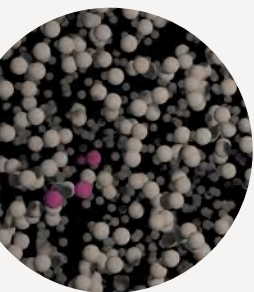
Innovation

Collaboration

Community

Integrity

Respect





Who we are, what we do

The Garvan Institute of Medical Research brings together world-leading clinicians and basic and translational researchers. We are patient focused. Our researchers break down barriers between traditional scientific disciplines to find solutions to disease.

Founded in 1963, Garvan's researchers have made significant advances in genome, epigenome, protein and cell analysis technology. We have revealed causes and developed treatments for diseases including diabetes, osteoporosis, cancer, immune deficiency and autoimmunity.

Today, Garvan's mission builds on those advances, harnessing all the information encoded in our genome, from DNA to complex organ systems, to better diagnose, treat, predict and prevent disease.

Garvan's research has global impact. World-leading people pioneer discoveries across four intersecting research themes. We lead the field in medical genomics, epigenetics, and cellular genomics; cancer; diseases of immunity and inflammation; and diseases of ageing affecting bone, brain and metabolism.

Our goal is to translate discovery into meaningful health benefits for those living with disease and their family. Patients, clinical trial cohorts and population cohorts are at the centre of Garvan's research. We are focused on addressing the unmet needs of those living with disease – where better understanding, new treatments and more effective diagnosis can have the biggest impact.

Through cutting-edge technology, facilities, local and international collaborations, Garvan researchers strive, every day, to create a future where everyone lives longer, healthier lives.

Garvan's research is funded through a crucial combination of peer-reviewed government grants and generous philanthropic investment from the community.

Garvan is affiliated with St Vincent's Hospital Sydney and UNSW Sydney.

The organisation *As at 31 December 2019*

Garvan Institute of Medical Research

Board of Directors

Chair: Dr John Schubert AO

Executive Leadership Team

Executive Director: Prof Christopher Goodnow FAA FRS
Deputy Director: Prof Peter Croucher
Chief Scientific Officer: Prof Marie Dziadek
Theme Leaders: Prof Susan Clark FAA, Prof Peter Croucher, Prof Stuart Tangye, Prof David Thomas
Chief Operating Officer: Ms Kate Gunn (until December)
Acting Chief Operating Officer: Ms Samantha Malone and Ms Amanda Brindley (from December)
Director of People & Culture: Cleo Rowley
Director of Garvan Research Foundation: Mara-Jean Tilley

Healthy Ageing

Theme Leader:
Prof Peter Croucher
Faculty:
A/Prof Paul Baldock
Prof Jacqueline Center
Prof Tuan Nguyen
Prof Mike Rogers
A/Prof Antony Cooper
Prof Trevor Biden
Prof Jerry Greenfield
A/Prof Ross Laybutt
Prof Katherine Samaras
A/Prof Carsten Schmitz-Peiffer
Prof Herbert Herzog
Prof David Ryugo
Emeritus Fellow:
Prof Lesley Campbell AM
Emeritus Fellow:
Prof Don Chisholm AO
Emeritus Fellow:
Prof John Eisman AO
Emeritus Fellow:
Prof Ted Kraegen AO

Cancer

Theme Leader:
Prof David Thomas
Faculty:
Dr Christine Chaffer
Dr David Croucher
A/Prof Elgene Lim
Prof Chris Ormandy
Dr Marina Pajic
A/Prof Joseph Powell
A/Prof Alex Swarbrick
A/Prof Paul Timpson
The Kinghorn Cancer Centre Director:
Prof David Thomas

Genomics & Epigenetics

Theme Leader:
Prof Susan Clark FAA
Faculty:
Dr Ozren Bogdanovic
Prof Vanessa Hayes
Dr Timothy Mercer
Prof Seán O'Donoghue
Dr Robert Weatheritt
Emeritus Fellow:
Prof John Shine AC FAA

Immunity & Inflammation

Theme Leader:
Prof Stuart Tangye
Faculty:
Prof Robert Brink
Prof Daniel Christ
Dr Tatyana Chtanova
A/Prof Elissa Deenick
Prof Christopher Goodnow
FAA FRS
A/Prof Shane Grey
A/Prof Cecile King
A/Prof Cindy Ma
A/Prof Tri Phan
Prof Jonathan Sprent FAA FRS
Emeritus Fellow:
Prof Antony Basten AO FAA

Kinghorn Centre for Clinical Genomics

Clinical Head: Mary-Anne Young
Scientific Head: A/Prof Sarah Kummerfeld

Garvan-Weizmann Centre for Cellular Genomics

Head: A/Prof Joseph Powell

Garvan Research Foundation

Board of Directors

Chair: Mr Russell Scrimshaw

Executive

Director: Ms Mara-Jean Tilley
Deputy Director: Mr Brad Timms

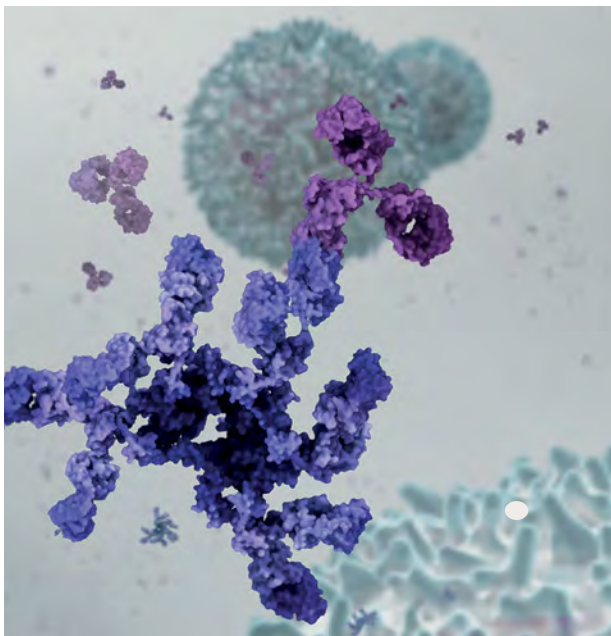
The Services Team

Chief Operating Officer: Ms Kate Gunn (until December)
Acting Chief Operating Officer: Ms Samantha Malone and Ms Amanda Brindley (from December)
Australian BioResources: Dr Jenny Kingham
Business Development & Innovation: David Barda
Facilities Business: Amanda Brindley
Finance & Accounting: Ms Samantha Malone
Internal Audit & Business Improvement: Ms Carolyn Loughnan
Technology Services: Mr Esteve Mayolas
Legal Office: Ms Nancy Campisi
Building Services: Ms Lynn Croft
Building Operations: Mr Ryan Kolster
People & Culture Director: Ms Cleo Rowley
WHS and Compliance: Ms Abril Rojas-Crisostomo

Chief Scientific Officer: Prof Marie Dziadek
Grants Administration: Ms Sonja Bates, Ms Grainne Mullen (until May) and Ms Mariette Le Roux (from May)
Human Research Governance: Ms Therese Yim
Research Ethics and Compliance: Dr Rayson Tan
Animal Welfare: Dr Sarah Leonhard
Student Programs: Dr Tracy Anderson

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We acknowledge the Gadigal and Gundangara peoples, the traditional owners and custodians of the lands on which the Garvan Institute and the ABR are located. We pay respects to Elders, past, present and future, and recognise the continuing connection and contribution to this land.

A digital version of this report is available at garvan.org.au/annual-reports

Garvan Institute of Medical Research Report



Dr John Schubert AO
Chairman



Professor Chris Goodnow FAA FRS
Executive Director

What a year 2019 has been. Garvan continued to successfully lead and participate in pioneering research collaboration, enabled by cutting-edge genomics and imaging technologies, and celebrated numerous outstanding scientific achievements. Our focus is squarely on using all the information encoded in our genome to predict, prevent and treat disease, so that people can live life to the fullest.

In 2019, our research provided new hope for devastating conditions, advanced our understanding of health and disease, rewrote the textbooks on human evolution and quite literally changed lives. Behind every genome is a person – and behind them, a family and loved ones. An example of the power of Garvan’s research is Stella, a young girl whose rare life-threatening immune condition was diagnosed through our CIRCA research program (see page 19). Stella used to spend one week each month in hospital, but today she is a happy, playful and carefree toddler – the way it should be. Through our clinical collaborations and more than 30 clinical trials, we are fortunate to be involved intimately with remarkable patients across the globe.

However, before research can progress to the clinic, there is the hard science required – tireless discovery, proof of concept and validation to reveal the unknown about health and disease. Garvan researchers published more than 300 research articles to advance humanity’s understanding of cancer, immune diseases, osteoporosis, brain diseases, endocrine diseases and human genome biology, among others. Many of our studies were published in prestigious scientific journals, a crucial measure of Garvan’s success and standing within the global scientific community, but will also lead to benefits for patients in Australia and worldwide.

Garvan is a world-leader in medical applications of genomics – the study of all the information in our DNA. Our strategic research centres – The Kinghorn Cancer Centre, the Garvan-Weizmann Centre for Cellular Genomics, the Centre for Targeted Therapy and the Kinghorn Centre for Clinical Genomics – ensure the research of Garvan scientists can be translated to clinical practice. We continue to build on our strengths by recruiting researchers of the highest global standard.

A century ago, breakthroughs were made by scientists working alone with a Pasteur pipette. But today, paradigm-shifting discoveries are only possible through extensive collaboration at the intersection of disciplines, laboratories, the community, industry and the clinic. Recognising this is a major strength of Garvan, in 2019 the Institute focused its research priorities to leverage the expertise of our best scientific minds to collaborate across four intersecting research themes – Genomics and Epigenetics, Immunology and Inflammation, Cancer and Healthy Ageing.

Garvan’s expertise in genome sequencing and analysis, single cell genomics, immunology and antibody development, all of which were enhanced during 2019, placed us in the position to be currently playing a critical role in the global research effort against COVID-19.

This year, Garvan’s leadership was strengthened by the appointment of Professor Peter Croucher as Deputy Director, and thanks to the guidance of the executive leadership team, the Institute continues to thrive.

Garvan’s success, as always, is totally dependent on our 748 incredibly smart, passionate and dedicated staff under the leadership of Professor Marie Dziadek as Chief Scientific Officer, Kate Gunn as Chief Operating Officer (followed by Nat McGregor in 2020), Mara-Jean Tilley as Director of the Garvan Research Foundation, and our research theme leaders: Professor Susan Clark, Professor Peter Croucher, Professor Stuart Tangye and Professor David Thomas.

We are immensely grateful to our Boards of Directors, who offer their extensive expertise and valuable time to Garvan on a voluntary basis.

We also acknowledge the generosity of the individuals, groups and organisations that form the Garvan family. Without your foresight and support, our visionary research simply wouldn’t be possible, and it is thanks to you that Garvan researchers are achieving more than we could have ever anticipated.

Our vision is to make the discoveries that improve quality and longevity of a healthy life and to prevent avoidable suffering. In 2019, we worked to provide better, safer, more effective and personalised diagnosis and treatment, and prevention for everyone. In 2020, we look forward to again making a real difference.

Garvan Research Foundation Report



Russell Scrimshaw
Chairman



Mara-Jean Tilley
Director

The marketing and fundraising arm of the Garvan Institute, the Garvan Research Foundation, exists to support Garvan's mission to better diagnose, treat, predict and prevent disease, in order to create a healthier future for everyone. We are inspired every day by our talented scientists, and by the immense and enduring support of our remarkable donors and supporters.

Over the course of 2019, we are proud to say that the Garvan Research Foundation was the beneficiary of more than \$54 million dollars in donations to directly support the Institute's brilliant scientists, strategic programs and innovative research projects. We cannot emphasise enough the impact this philanthropic investment had on our research, and we thank you, our Garvan family, for your vital support.

Our Foundation team is dedicated and driven. We are passionate about promoting our researchers and their work, and joining with like-minded individuals and organisations to accelerate research discoveries from the laboratory to the bedside. Our approach is dynamic and considered; with a particular focus on supporting the Institute's current and emerging scientific leaders who will make the discoveries that will change the future of healthcare.

The continued philanthropic investment of individuals and organisations remains absolutely crucial to Garvan's success. We are very fortunate to have many, many individuals, families and organisations who support our wonderful Institute. Please accept our heartfelt thanks.

In particular we would like to mention and thank the following long-term members of the Garvan family, including The Kinghorn Foundation, Mrs Janice Gibson and the Ernest Heine Family Foundation, The Bill and Patricia Ritchie Foundation, Mr David Baffsky AO and Mrs Helen Baffsky, Mr and Mrs Geoff and Dawn Dixon, Mr John Roth and Ms Jillian Segal AO, The Petre Foundation, Mr & Mrs Laurie and Di Sutton and Suttons Motors, Mr & Mrs Alan and Lynne Rydge, Lions Clubs International Foundation, Australian Lions Childhood Cancer Research Foundation, Vodafone Foundation, The Paramor Family, Ms Lysia O'Keefe, John Brown Cook Foundation, Mr Len Ainsworth AM, Mr John McMurtrie AM and Mrs Deborah McMurtrie, Ms Nelune Rajapakse AM and Ms Anna Guillan AM from The NELUNE Foundation, Miss Rosemary Pryor, Mr John Holden, Mrs Jane Hemstrich, The Petersen Family, Mr Bob Magid OAM and Mrs Ruth Magid, Paspaley, Mr & Mrs John and Megan Wade, Accor and Mr Trevor Guest. We are very grateful for all that you do for us.

We are also humbled and moved by the individuals who have so thoughtfully left a gift to Garvan in their Will, our visionary *Partners for the Future*. Their generosity plays a major role in our work and ensures their legacy lives on in medical research advancements in perpetuity. Additionally, we would like to recognise the generous individuals who donate to Garvan's research in memory or celebration of a loved one, or contribute what they can each month as *Partners for Discovery*. All of you invest in the future of human health and your generosity throughout 2019 has been invaluable in advancing Garvan's world-class research.

We sincerely thank our Boards of Directors for their generous commitment, passion and extensive contributions throughout 2019 and warmly welcome Mrs Wallis Graham and Mr Geoff Raby AO. We farewell Ms Helen McCabe from the Garvan Research Foundation Board and look forward to welcoming her back again soon.

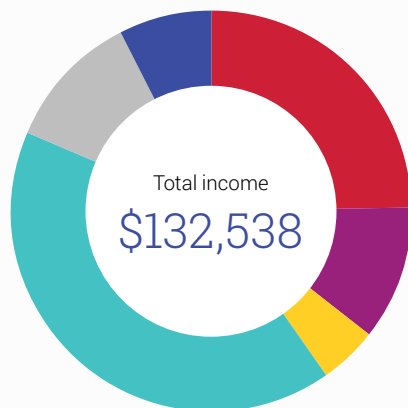
Thanks to your support and the determination of our researchers, we see a future where health is transformed – where an individual's DNA is used to better diagnose, treat and prevent disease.

The year at a glance

The Garvan Research Foundation continued to receive generous support from a wide cross section of the community during 2019 and fundraising revenue increased by \$13 million compared to 2018. The Institute continued to make significant investments in startup research support and underwriting of Garvan's scientists. The Institute repaid \$7.5 million of bank loans in April 2019 and a further \$4.5 million in August 2019, discharging the bank loan in full.

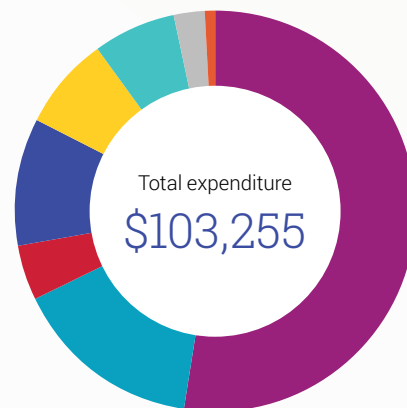
As at 31 December 2019 **All figures are A\$'000**

Total income



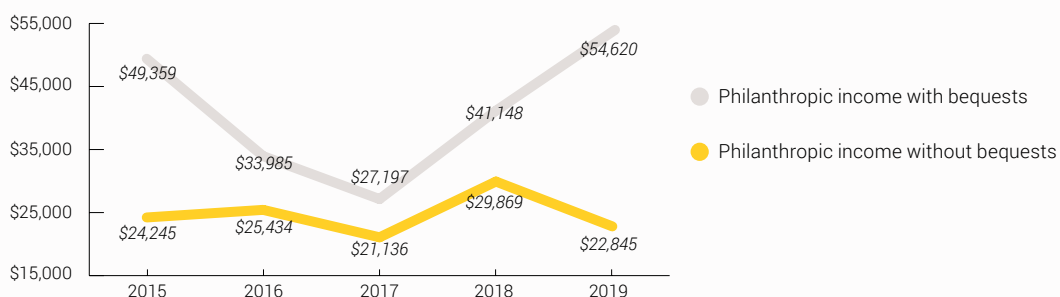
- Peer-reviewed research grants **\$32,973**
- NHMRC fellowships, scholarships and other grants **\$14,303**
- NSW government grants **\$6,201**
- Donations received **\$54,620**
- Revenue from contracts with customers **\$14,579**
- Other Income **\$9,862**

Total expenditure



- Employee salary and benefits **\$54,266**
- Other research expenses **\$15,901**
- Sequencing consumable expense **\$4,603**
- Building and scientific expenses **\$10,463**
- Depreciation and amortisation expense **\$7,869**
- Administration expense **\$6,744**
- Fundraising expenses **\$2,600**
- Finance costs **\$809**

Philanthropic income



Garvan at a glance

 **748**
Total staff

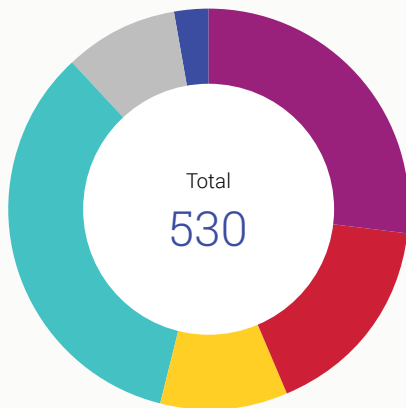
 **437**
Female







 **311**
Male

39
Average age in years

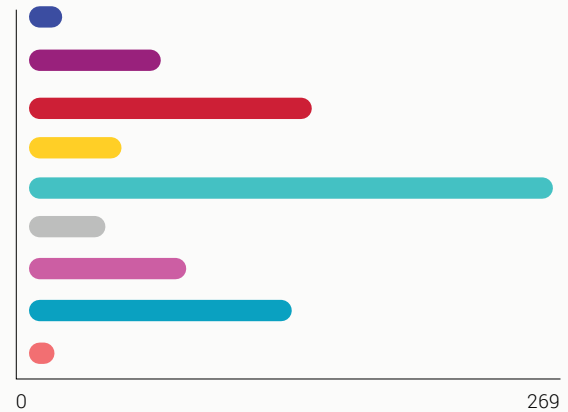
As at 31 December 2019










Garvan researchers




-  Healthy Ageing **143**
-  Immunity & Inflammation **89**
-  Genomics & Epigenetics **55**
-  Cancer **180**
-  Kinghorn Centre for Clinical Genomics **49**
-  Garvan-Weizmann Centre for Cellular Genomics **14**


Total staff



-  Honours and Masters students **9**
-  PhD students **60**
-  Visiting scientists **134**
-  Visiting students **40**
-  Research staff **269**
-  Foundation staff **33**
-  Scientific services team **72**
-  Operations services team **124**
-  Executive leadership team **7**

Public community engagement and education

 **1200**
Attended 6 public seminars

 **290**
Attended 12 external presentations

 **120**
Attended 8 public tours

 **240**
Attended 16 small group tours

 **65**
Teachers attended career development

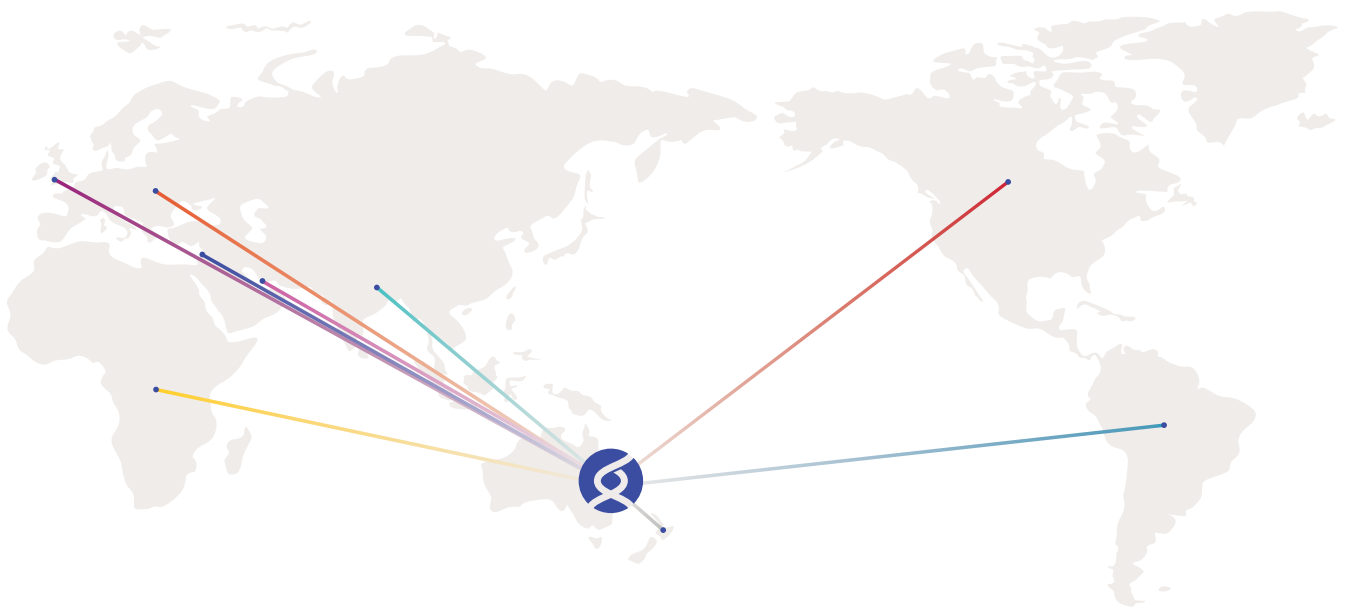
 **632**
Attended genomics showcases

Collaborations

Collaboration is in our DNA

Today's most paradigm-shifting research questions will not be solved by scientists working alone. World-leading excellence requires an assembly of multi-disciplinary teams that are uniquely placed to tackle the next big challenges in medical research.

In 2019, Garvan was proud to foster such world-leading collaboration in Australia and around the world, to advance our research discoveries. The graphic below demonstrates the wide-reaching scope of Garvan's research network, with numbers referring to joint publications with international institutions.



Key

- UK **71**
- Europe **106**
- Asia **58**
- Africa **14**
- Israel **14**
- Middle East **10**
- NZ **10**
- North America **110**
- South America **5**



Publications



362

total publications in 2019, including journal articles, reports, reviews, letters, books and book chapters



304

original research papers



96

publications in journals with an impact factor greater than 8

Cover Issues



Nature Immunology

Denisovan, modern human and mouse TNFAIP3 alleles tune A20 phosphorylation and immunity.



Cold Spring Harbor Molecular Case Studies

Genomic stratification and liquid biopsy in a rare adrenocortical carcinoma (ACC) case, with dual lung metastases.



Nature Reviews Genetics

Autism spectrum disorder: insights into convergent mechanisms from transcriptomics.



Trends in Immunology

Subcapsular Sinus Macrophages: The Seat of Innate and Adaptive Memory in Murine Lymph Nodes.

Papers in key journals

- 1 New England Journal of Medicine
- 2 Nature
- 1 Science
- 2 Cell
- 1 Nature Genetics
- 1 Cancer Discovery
- 3 Nature Immunology
- 1 Cancer Cell
- 3 Cell Metabolism

See page 63 for a full list of Garvan's 2019 publications.



Healthy Ageing



From the Head

Professor Peter Croucher

As medical advances allow us to live longer, degenerative diseases are emerging as a major health issue – with profound impacts on quality of life.

Age-related conditions come in many forms. They may affect our nerves, brain and cells that control metabolism, leading to Parkinson's disease, dementia, hearing loss, eye diseases and diabetes. They also include osteoporosis, which causes one in two women and one in three men over 50 to have a bone fracture because of a decline in quantity or quality of bone.

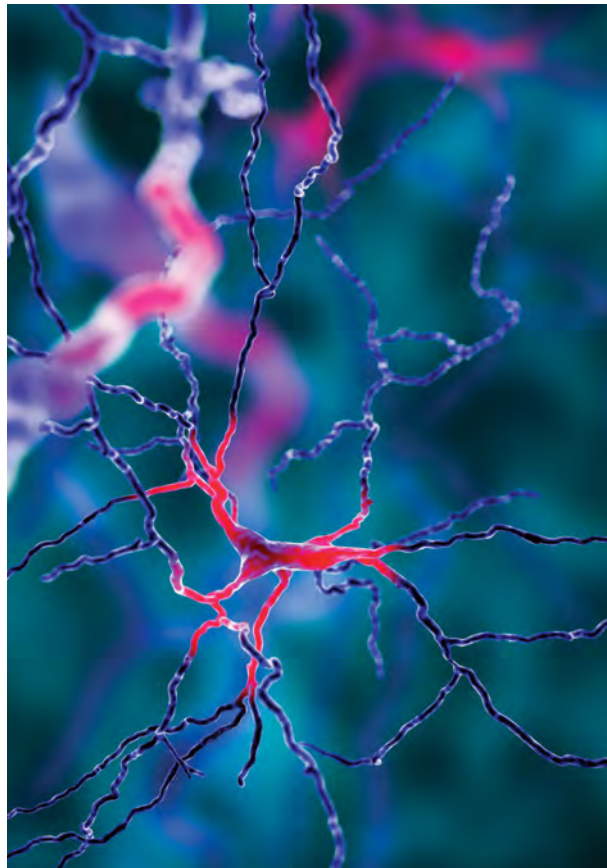
Our researchers are at the forefront of ageing research, using some of the most advanced techniques to investigate degenerative diseases.

We are world-leading in predicting and understanding diseases of bone and employ advanced techniques including genomics, cellular genomics, advanced imaging technologies, and patient epidemiology. We are also bringing together different disciplines to identify explanations of the underlying mechanisms, new diagnostic tests and treatments for Parkinson's disease, diabetes, deafness and conditions that affect memory.

Much of Garvan's research concentrates on strategies to intervene in disease progression early. With our close clinical collaborators, we are conducting and preparing trials in diabetes, osteoporosis, dementia, Parkinson's and muscle maintenance, with the aim of improving clinical outcomes and enabling a healthier life.

Collaboration is at the heart of Garvan's research. In 2019, our organisation's structure changed to better reflect our collaborative nature, with a number of research divisions coming together under the umbrella of the new Healthy Ageing research theme at Garvan, placing the focus on improving outcomes for patients.

This has set us on the doorstep of new strategic opportunities for our research, and we look forward to seeing our research excellence go from strength to strength in years to come. Much of our work is being made possible through the outstanding support of Mrs Janice Gibson and the Ernest Heine Family Foundation.



Research highlight

Researchers reveal no link between statin use and memory loss

Statins are among the most widely prescribed medications to treat people with heart disease or high cholesterol. However, isolated case reports of cognitive decline in statin users have concerned some consumers, with many not filling their prescription.

A six-year study, led by Professor Katherine Samaras, has revealed no links between statin medication and cognitive decline such as memory loss. In fact, the collaborative study between Garvan and the Centre for Healthy Brain Ageing (CHeBA) at UNSW Sydney, revealed that statin use is even protective against memory decline in some individuals at risk of dementia.

The study assessed changes to the brains of 1000 elderly individuals, measuring five areas of cognition, that showed no difference in those that used statin medications and those that did not.

"We carried out the most comprehensive analysis of cognition in elderly statin users to date, and found no results to support that cholesterol-lowering statins cause memory impairment," says Professor Samaras.

Samaras et al., Journal of the American College of Cardiology. 2019; 74:25542568. DOI: 10.1016/j.jacc.2019.09.041

Healthy Ageing



Research highlight Osteoporosis drugs reduce risk of premature death

Garvan researchers have revealed that nitrogen bisphosphonates, drugs commonly prescribed for osteoporosis, reduced the risk of premature mortality by over one-third in a study of over 6000 individuals.

Osteoporosis affects around 200 million people worldwide, and is a progressive disease in which bones become more porous and fragile, often without symptoms until the first fracture occurs.

The Garvan study, led by Professor Jacqueline Center, presents new evidence of the significant benefits of taking approved osteoporosis medicine for those with, or at risk of, the disease.

The researchers analysed data from participants aged over 50 and showed that individuals treated with nitrogen-bisphosphonates had a 34% reduction in mortality risk over the subsequent 15 years, compared to non-treated individuals.

Currently fewer than 30% of women and 20% of men with fragility fractures take approved treatments for osteoporosis. This study provides evidence that the recommended nitrogen-bisphosphonate treatment reduces the risk of further fractures in patients and also decreases the risk of mortality long-term.

*Bliuc et al., Osteoporosis International. 2019; 30:817-828.
DOI: 10.1007/s00198-018-4806-0*

Research highlight Comfort foods lead to more weight gain during stress

A team led by Professor Herbert Herzog discovered that a high-calorie diet, when combined with stress, may result in more weight gain than the same diet in a stress-free environment.

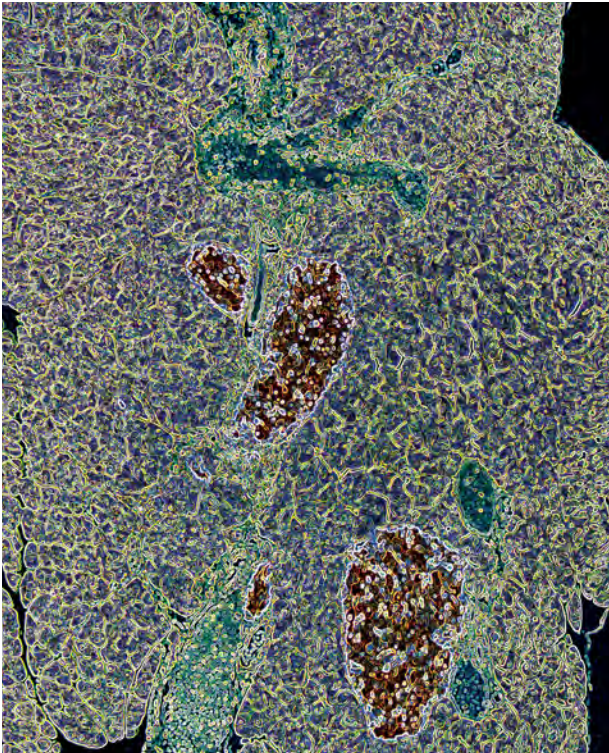
The researchers revealed a molecular pathway in the brain, controlled by insulin and a molecule called NPY, which drives the additional weight gain. NPY stimulates eating and is produced naturally in the brains of both mice and humans in response to stress. In mice, the scientists discovered that chronic stress and a high-calorie diet raised the blood insulin levels to 10 times higher than in mice that were stress-free and received a normal diet.

“Our findings revealed a vicious cycle, where chronic, high insulin levels driven by stress and a high-calorie diet promoted more and more eating. This really reinforced the idea that while it’s bad to eat junk food, eating high-calorie foods under stress is a double whammy that drives obesity,” says Professor Herzog.

While insulin imbalance is at the centre of a number of diseases, this research indicates that insulin has more widespread effects in the brain than previously thought.

Ip et al., Cell Metabolism. 2019; 30:111-128. DOI: 10.1016/j.cmet.2019.04.001





Research highlight

The key to targeting dormant cancer cells

Garvan researchers, led by Associate Professor Tri Phan and Professor Peter Croucher, in collaboration with the Weizmann Institute of Science in Israel, identified what keeps some cancer cells dormant – a finding that could lead to new approaches to preventing the spread of cancer.

Dormant cancer cells, hiding undetected in niches such as the inner lining of bones, pose a great risk to patients as they cause cancers to reoccur years after seemingly successful treatment of the initial disease. The research team developed a method to isolate dormant cancer cells from the bones of a mouse model of multiple myeloma (a blood cancer that arises in bone). They then analysed the dormant cells' transcriptome – a snapshot of all the genes that are switched on in the cell and control dormancy. Unexpectedly, the dormant myeloma cells had a similar transcriptome signature to immune cells, but only when the cells were located next to osteoblasts, specialised cells found in bone. This reveals how crucial the crosstalk between the tumour cells and the tumour microenvironment is for cancer dormancy.

The team's findings may lead to new therapeutic targets for multiple myeloma and other cancers that spread to bone, such as breast and prostate cancer.

Khoo et al., Blood. 2019; 134:30-43. DOI: 10.1182/blood.2018880930

Research highlight

A driver of inflammation in a rare childhood condition

A team led by Professor Mike Rogers and Dr Marcia Munoz revealed crucial insight into the process that leads to 'inflammatory flares' in patients with mevalonate kinase deficiency (MKD) – a rare immune disorder that affects several hundred individuals worldwide, most of whom are children. Individuals with MKD often experience high fevers, or inflammatory flares, that can last for days and can be accompanied by other symptoms such as skin rash, pain in the joints, muscles or abdomen.

In their study, the researchers investigated inflammasomes – molecules that assemble into larger structures within cells, to trigger an inflammatory response. They discovered that an inflammasome called NLRP3 likely plays a role in the imbalanced inflammation that occurs in patients with MKD. Patients suffering from MKD are currently treated with anti-inflammatory therapies, which are not effective in many patients. The research findings could lead to the development of more effective treatments that target NLRP3 inflammasomes.

With inflammation fast becoming understood as an underlying process across many diseases, including diabetes and cancer, the researchers say that understanding how inflammation occurs in one disease context may ultimately shed light on the cause in other, more common diseases.

Skinner et al., Journal of Allergy and Clinical Immunology. 2019; 143:2315-2317 e3. DOI: 10.1016/j.jaci.2019.02.013

Celebrating giving

Abey-Perera Family Foundation

"We see medical research as a core investment in social infrastructure which is a key element underpinning community wellbeing. The importance of this has been tragically reinforced by the COVID-19 pandemic," says Mr Arun Abey AM. The Abey family, through the Abey-Perera Family Foundation, have been generously donating to Garvan since 2008.

"The attraction of supporting Garvan includes its scale, integration of fundamental research with clinical practice and its international partnerships. Annual visits to Garvan over the past 12 years have been a highlight for our family and an inspiration for our two sons to see young people working hard and using their great talents to make a difference to people. So much so, our eldest son, after a rewarding stint as a volunteer in one of Garvan's labs, is pursuing a career in neuroscience and has recently been awarded a scholarship position at Oxford University to complete his PhD. We hope he will come back to Garvan in the future, joined by his younger brother."

Healthy Ageing

Research Laboratories and Groups

Beta Cell Regeneration Lab

Head: Dr Daniel Hesselson

Beta Cell Signalling Lab

Head: Prof Trevor Biden

Bone Biology Lab

Head: Prof Peter Croucher

Bone Microenvironment Group

Group Leader: Dr Michelle McDonald

Bone Therapeutics Lab

Head: Prof Mike Rogers

Imaging and Inflammation Group

Leader: Dr Marcia Munoz

Cellular and Molecular Metabolism Lab

Mitochondrial Metabolism and Ageing Group

Leader: Dr Andy Philp

Clinical Diabetes, Appetite and Metabolism Lab

Head: Prof Jerry Greenfield

Clinical Insulin Resistance Group

Leader: Dr Dorit Samocha-Bonet

Prader-Willi Syndrome and Genetic Forms of Diabetes Group

Leader: A/Prof Alexander Viardot

Brown Fat Physiology Group

Clinical Obesity, Nutrition and Adipose Biology Lab

Head: Prof Katherine Samaras

Clinical Studies and Epidemiology Lab

Head: Prof Jacqueline Center

Eating Disorders Lab

Head: Prof Herbert Herzog

Energy Expenditure Group

Leader: Dr Lei Zhang

Genetic Epidemiology of Osteoporosis Lab

Head: Prof Tuan Nguyen

Hearing Research Lab

Head: Prof David Ryugo

Brain Circuits for Hearing Group

Insulin Signalling Lab

Head: A/Prof Carsten Schmitz-Peiffer

Islet Biology Lab

Head: A/Prof Ross Laybutt

Osteoporosis and Translational Research Lab

Head: Prof John Eisman

Parkinson's Disease and Neurodegeneration Lab

Head: A/Prof Antony Cooper

Skeletal Metabolism Lab

Head: A/Prof Paul Baldock

Neuroendocrinology Group

Leader: Dr Yanchuan (Yan) Shi



New hope for Parkinson's

The Australian Parkinson's Mission received \$30 million in Federal Government funding in 2019, the most significant investment in Australian Parkinson's research to date.

The funding, announced by Federal Minister for Health, The Hon. Greg Hunt MP, will enable the Australian Parkinson's Mission to undertake work to identify and fast track effective treatments for people with Parkinson's, increase access to repurposed and new drugs and identify potential diagnostic tools for Parkinson's to enable early disease detection and intervention.

In Australia, approximately 100,000 individuals are living with Parkinson's, but currently there are no treatments that can slow, stop or cure the disease, and no tests that can definitively diagnose the disease.

The Australian Parkinson's Mission will conduct innovative clinical trials integrated with genomic and biomarker approaches to identify genetic targets for repurposed drugs and drug discovery in Australia. This world-first in Parkinson's clinical trial design aims to establish the first step towards a genomic-based personalised medicine framework for patients. The APM has received catalytic donations from Mr and Mrs Geoff and Dawn Dixon and Mr David Baffsky AO and Mrs Helen Baffsky. We are grateful for their foresight and generosity in supporting this program.

The Australian Parkinson's Mission is an Australian-led international collaboration between the Garvan Institute of Medical Research, Shake It Up Australia Foundation, The Cure Parkinson's Trust (UK), Michael J Fox Foundation (USA), Parkinson's Australia and the University of Sydney.

theapm.org.au

"The Australian Parkinson's Mission employs an entirely new design for Parkinson's. The findings from these innovative research approaches and clinical trials will help us identify the right drug for the right patient to halt this disease."

– Associate Professor Antony Cooper, Head of the Parkinson's Disease and Neurodegeneration Lab, Garvan Institute

"This five year program includes multiple clinical trials of potentially disease modifying drugs and treatments across Australia and will include many hundreds of patients. It's going to have a substantial impact on identifying effective treatments and fast tracking them to people with the disease."

– Clyde Campbell, CEO of Shake It Up Australia

"Despite substantial efforts, we're still no closer to better treatments against disease progression or diagnostics for Parkinson's. This is a multifaceted approach with international experts to address the primary unmet need in Parkinson's globally."

– Professor Simon Lewis, National Trials Lead, University of Sydney



Left: Marion Kumanovski, David Cox, Andrew Urquhart and Larissa Richards are living with Parkinson's and joined the launch of the APM.

Right: Federal Minister for Health, The Hon. Greg Hunt MP

Immunity and Inflammation



From the Head
Professor Stuart Tangye

The immune system is incredibly complex. While some health conditions may affect a single organ, diseases of the immune system often affect many of the body's tissues and organs, and are notoriously difficult to diagnose and treat.

Garvan researchers are tackling this challenge head on.

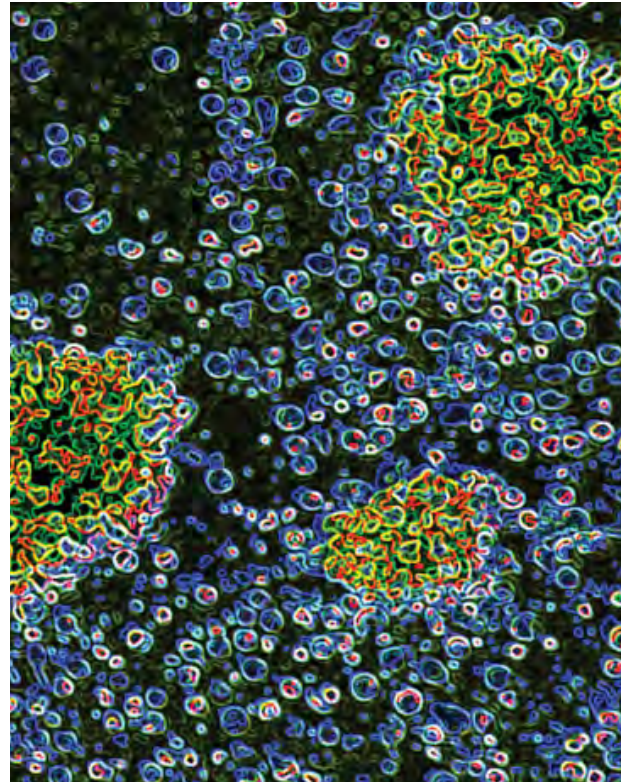
Our fundamental discoveries are contributing to a vast body of knowledge that is setting the foundations for better diagnoses and treatments for the most devastating immune conditions, including rheumatoid arthritis, type 1 diabetes and immunodeficiencies.

In 2019, we have untangled molecular interactions of the immune system in rare and common diseases to inform better treatment strategies, and have revealed crucial insight into how the immune system has adapted over human evolution.

Given its central role in health and disease, the immune system also holds great promise for a range of other health conditions. We are investigating new strategies for modifying the immune system to improve the success of organ transplantation, and develop better forms of cancer immunotherapy that are designed to activate the immune system to better target a tumour.

Now more than ever, it is an exciting time to be an immunologist at Garvan. Few scientists have the opportunity to witness the impact of their research in patients that have exhausted conventional treatment options.

We are using genomics technologies to not only make groundbreaking basic research discoveries, but to translate those discoveries to patients in the clinic. We are a dynamic example of the immense benefits that lie in researchers, clinical immunologists, major hospitals and international research organisations collaborating to benefit patients.



Research highlight **Extinct human species gave modern humans an immunity boost**

In a breakthrough study published in *Nature Immunology*, Garvan researchers showed that modern humans acquired a gene variant from an extinct human species that heightened their immune reactions. The findings shed new light on how the human immune system adapted to changing environments through history.

The researchers, led by Associate Professor Shane Grey and Professor Chris Goodnow, analysed the genomes of families in which one child presented with a severe or unusual autoimmune or inflammatory condition. They found that four of the families had a variant in their TNFAIP3 gene. The same variant was also found in the DNA of Denisovans, an extinct human species related to Neanderthals that interbred with modern humans ~50,000 years ago.

To determine the effects of the Denisovan gene variant on the human immune system, the researchers replicated the gene variant in a mouse model. They found that when exposed to a pathogenic Coxsackie virus strain, mice with the Denisovan variant resisted the infection better than mice without the Denisovan gene.

The study revealed the TNFAIP3 gene as a 'temperature control' dial in the immune system, able to turn up the immune system's response to different microbes.

*Zammit et al., Nature Immunology. 2019 Sep 18; 20: 1299-1310.
DOI: 10.1038/s41590-019-0492-0*

Research highlight

A genomic barcode tracker for immune cells

Garvan researchers have developed a new method to spot rare immune cells that are reactive against cancer cells, from within a patient's own immune system.

The patented 'RAGE-seq' method enables scientists to track how immune cells evolve inside tumour tissue for the first time, revealing unprecedented insight into how to better arm the immune system to target cancer. The technique can be likened to a barcode tracker, able to scan detailed information from thousands of immune cells at a time.

Development of the method, co-led by Professor Chris Goodnow, Associate Professor Alex Swarbrick and Dr Martin Smith, gives the most detailed view yet of how immune cells behave in the human body. The ability to find and barcode these rare cells of the immune system has the power to guide personalised treatment strategies, the researchers say.

The researchers are now applying their RAGE-seq technique to samples from melanoma patients undergoing immunotherapy, to understand why half of all patients receiving the treatment have a poor response, and how therapy may be improved.

Singh et al., Nature Communications. 2019 July 16; 10, 3120(2019). DOI: 10.1038/s41467-019-11049-4

Research highlight

Altering an immune pathway to treat autoimmune disease

An international team, led by Associate Professor Elissa Deenick and Professor Stuart Tangye, has discovered a crucial pathway that helps the immune system discriminate between the body's own cells and pathogens that are foreign.

The research team discovered that a signalling protein called PI3K is central to a process that immune cells called B cells undergo in autoimmune disease to become tolerant to the body's own cells.

The researchers first began investigating the PI3K protein in 2013 after it was discovered that patients with rare genetic variants of the PI3K gene presented with a range of unusual clinical symptoms, including infection, autoimmunity and malignancy.

The researchers revealed that genetic variants in PI3K in some patients cause B cells to become overactive, leading them to produce high levels of autoantibodies that then damage tissues and organs.

The finding provides hope for the treatment of autoimmune disease since existing drugs that switch off PI3K could be

useful in turning off the immune system's harmful response early enough to prevent damage in the body.

Lau et al., Journal of Experimental Medicine. 2019 Dec 16; 2020; 217(2). DOI: 10.1084/jem.20191336

Research highlight

CIRCA solves rare disease mystery in siblings

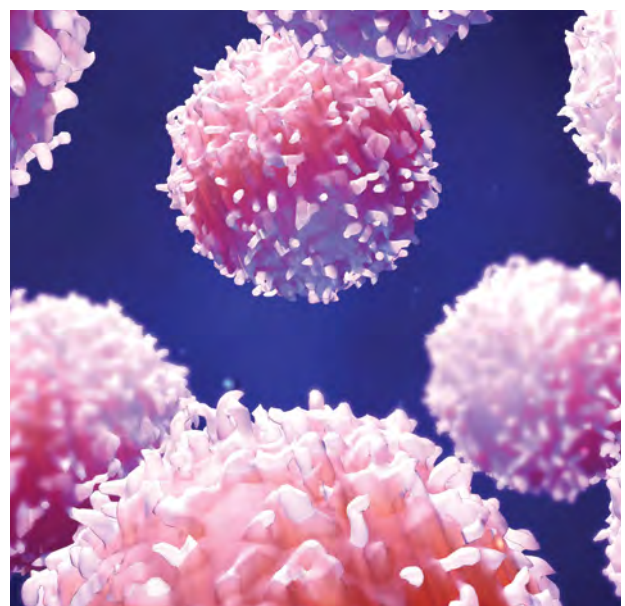
A study led by Associate Professors Tri Phan, Cindy Ma and Professor Stuart Tangye helped diagnose and successfully treat a young boy's severe immune condition after years of inconclusive tests.

The boy began suffering symptoms from the age of 18 months old, including a stroke after contracting chicken pox, however doctors were unable to find the cause of his symptoms.

As part of the Clinical Immunogenomics Research Consortium Australasia (CIRCA) program, Garvan researchers analysed the boy's genome in an attempt to find clues for the cause of his symptoms. They discovered a variant in the STK4 gene was the underlying cause of his symptoms, causing a direct deficiency of immune cells called B cells.

Further, the boy's younger sister had also developed immune symptoms, including food allergies, eczema and anaemia. The team discovered the same STK4 gene variant in her DNA, which put her at risk of developing the severe life-threatening symptoms her brother had endured. The diagnosis led to life-changing bone marrow transplants for the siblings, who now have a positive prognosis for the future.

Moran et al., Journal of Allergy and Clinical Immunology. 2019 Jun; 143 (6): 2302-2305. DOI: 10.1016/j.jaci.2019.02.010



Immunity and Inflammation

Research highlight

New insight into a rare immune condition

A team of Garvan researchers has revealed crucial new insights into a rare immune condition.

They analysed the immune cells of patients that had presented with a range of common clinical symptoms, including enlarged lymph nodes and spleens, poor responses to vaccines and microbes, and an inability to control viral infections. The individuals all had variants in the PIK3CD gene and were diagnosed with 'activated PI3K δ syndrome', however the driver behind their imbalanced immune response remained unclear.

Led by Associate Professor Elissa Deenick and Professor Stuart Tangye, the research team showed that the PIK3CD variants caused immune cells called CD4+ T cells to become dysfunctional and less able to help the immune system mount an antibody response. The CD4+ T cells also elevated the levels of Th2 cells, linked to a range of other symptoms in the patients, including eczema and asthma.

The findings are an example of the vast complexity of the human immune system. Through such studies, the researchers aim to help develop more specific treatments for rare immune conditions.

Bier et al., Journal of Allergy and Clinical Immunology. 2019 Jul; 144 (1): 236–253. DOI: 10.1016/j.jaci.2019.01.033



Research Laboratories and Groups

Antibody Therapeutics Lab

Head: Prof Daniel Christ

Centre for Targeted Therapy

B Cell Biology Lab

Head: Prof Robert Brink

Genomic Engineering Group

Leader: Dr David Zahra

Cellular Immunity Lab

Head: Prof Jonathan Sprent

Immunogenomics Lab

Head: Prof Christopher Goodnow

Rheumatology and Autoimmunity Group

Leader: Dr Joanne Reed

Immunology and Immunodeficiency Lab

Co-Heads: Prof Stuart Tangye & A/Prof Cindy Ma

Innate and Tumour Immunology Lab

Head: Dr Tatyana Chtanova

Intravital Microscopy Lab

Head: A/Prof Tri Phan

Lymphocyte Signalling and Activation Lab

Head: A/Prof 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

How medical research changed a young girl's life

Thanks to the Garvan-led research program CIRCA, people like Stella living with critical, rare immune conditions are receiving life-changing treatment.

Collien thought her newborn, Stella, was just a colicky baby. But at only three weeks old, Stella started presenting with signs of what would later be diagnosed as a life-threatening immune disorder.

At first, doctors thought Stella was suffering from severe eczema or baby acne. With worsening symptoms, Stella spent one week out of every month in the hospital, completely wrapped in bandages. Repeatedly, Stella's family was told her skin was one of the worst cases of eczema they'd seen. Stella became extremely underweight and at 11 months of age was given a feeding tube to treat her failure to thrive – all without a proper diagnosis.

At age one and a half, Stella's doctors at the Children's Hospital at Westmead and Sydney Children's Hospital Randwick referred her case to the Clinical Immunogenomics Research Consortium Australasia (CIRCA) – a research network of scientists and clinicians with diverse backgrounds that come together to understand the causes of disease in patients with rare immune conditions.

"I'm really interested in understanding why the immune system works well in most individuals, but not so in others," says Professor Stuart Tangye, who leads CIRCA. "We're working out what it takes to make a really productive and robust immune response and are quickly identifying the underlying genetic causes in people with faulty immune systems, and finding therapies for patients who need our help right now."

Through whole genome sequencing at Garvan, as part of the CIRCA program, it was discovered that Stella had a rare genetic variation in a molecule called DOCK8, which impairs the function of immune cells by preventing them from reaching and clearing pathogen infections in the skin.

DOCK8 immunodeficiency syndrome, only discovered in 2009, leads to recurrent bacterial, viral and fungal infections of the skin and respiratory system. Many patients with DOCK8 immunodeficiency syndrome have to undergo bone marrow transplants in order to survive, with many losing their lives. Stella is one of only five people in Australia to be diagnosed with the disorder.

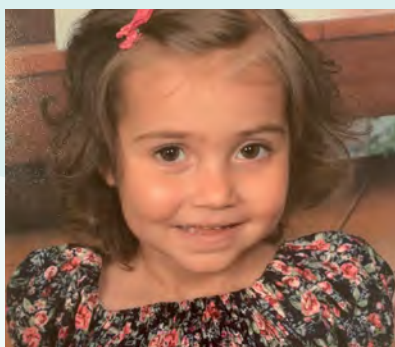
Following the early, life-changing diagnosis through the CIRCA program, Stella received a bone marrow transplant at age two and a half – and her prognosis is now good. While there's still much ahead for Stella's family, they are optimistic.

"It's almost been a year since the transplant. I hope she's got a full life ahead and would be able to have a normal life expectancy," says Collien, Stella's mum. "Thankfully we were able to get a diagnosis and know what we are facing. If the genetic testing was done later in her life, her outlook may have been so different. With a diagnosis and bone marrow transplant, we're hopeful."

We thank the John Brown Cook Foundation for its philanthropic support of the CIRCA program.

"We're working out what it takes to make a really productive and robust immune response and are quickly identifying the underlying genetic causes in people with faulty immune systems."

– Professor Stuart Tangye



After receiving a bone marrow transplant Stella's prognosis for the future is good, thanks to her early diagnosis and the life-changing research by Garvan and the CIRCA program.

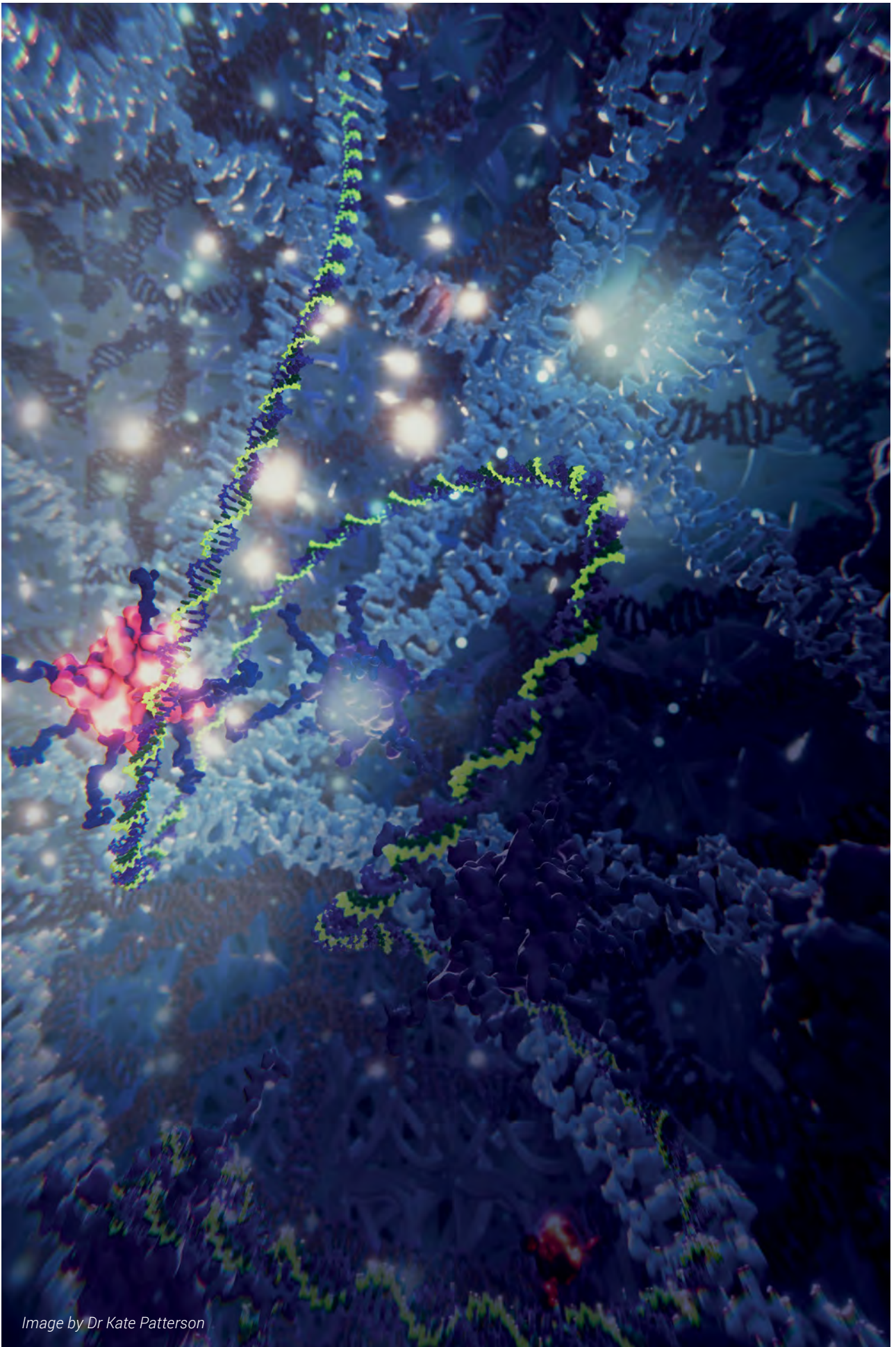


Image by Dr Kate Patterson

Genomics and Epigenetics



From the Head
Professor Susan Clark FAA

The science of our DNA is fascinating and research in the field is accelerating. The Human Genome Project took 20 research organisations and 13 years to complete. Today, we can map a human genome in just a few days.

But we are still only at the tip of the iceberg in our understanding of how our DNA is interpreted. Most cells in our body have the same DNA – a six billion-letter code – that gives rise to a vast variety of tissues and organs we need to function.

At Garvan, we are world leaders in epigenetics, the study of the chemical modifications of DNA that determine how DNA is read. We are investigating how changes to DNA control cell development and how alterations to epigenetic patterns, which we refer to as the epigenome, contribute to some of the most devastating diseases, including cancer.

To study the epigenome, we are using and developing high-performance visualisation and computational tools to reveal an unprecedented level of detail in our understanding of how alterations to DNA can change cell behaviour.

In 2019, we uncovered new fundamental mechanisms of the epigenome, which have given us new ways to study the differences that underlie healthy and diseased cells. These exciting new insights are giving us a new lens with which to peer into human biology, and how it has evolved over millions of years.

At the heart of Garvan's genomics and epigenetics research are scientists that are collaborating to unlock a much deeper understanding of our DNA. Our vision is to translate our discoveries into a new generation of tools that enable better prediction, diagnosis and detection of disease.



Research highlight

Ancient epigenetic changes silence cancer-linked genes

An epigenetic change, a form of DNA control, that deactivates some genes linked to cancer late in human development has been conserved for more than 400 million years, research from Garvan suggests.

Dr Ozren Bogdanovich and his team studied epigenetic changes in the DNA of zebrafish embryos at four stages of development and discovered 68 genes that were turned off within just hours of fertilisation. Some of these genes code for so-called cancer testis antigens (CTAs), which are usually only active in the male testis but for unknown reasons turn on again in some cancers, including melanomas.

The study suggests just how important it is to human health to keep these genes silenced.

It sheds new light on how our epigenetics can regulate genes, some of which are linked to cancer development later in life, over large evolutionary distances.

Skvortsova et al., Nature Communications, 2019 July; 10(1): 3054. DOI: 10.1038/s41467-019-10895-6

Research highlight

The homeland of modern humans

A landmark study, published in the prestigious journal *Nature*, pinpoints the birthplace of modern humans in southern Africa and suggests how past climate shifts drove their first migration.

Led by Professor Vanessa Hayes, the researchers collected blood samples from individuals living in Namibia and South Africa today. By establishing a comprehensive catalogue of the individuals' mitochondrial DNA, which acts like a time capsule, the researchers refined the evolutionary tree of modern human's earliest ancestral branches.

The study concludes that modern humans emerged in a southern African 'homeland' and thrived there for 70 thousand years. The study then uniquely combined the disciplines of genetics, geology and climatic physics to propose that changes in Africa's climate triggered the first human explorations, initiating the development of humans' genetic, ethnic and cultural diversity.

Chan et al., Nature. 2019 Oct 575 (7781): 185-189. DOI: 10.1038/s41586-019-1714-1

Genomics and Epigenetics

Research highlight New clues from cancer DNA

Garvan researchers have discovered a new pattern of chemical tags on DNA which reveals new insights into how cancer develops.

A team led by Professor Susan Clark and Associate Professor Clare Stirzaker investigated the DNA of prostate cancer cells, analysing all 28 million methyl tags, which are chemical tags that can attach to DNA and change how the DNA is read.

After comparing the distribution of methyl tags in prostate cancer and normal cells, the team discovered a surprising pattern of methyl tags that are commonly altered in different cancer cell types. This discovery provides new insights into how our DNA is changed in cancer not just by base sequence alterations but also by shifting the pattern of methyl tags above the DNA sequence.

By better understanding the precise DNA changes that take place when normal cells become cancerous, the researchers hope to uncover new ways to treat or prevent cancer from developing.

Skvortsova et al., Cancer Cell. 2019 Feb; 35: 297-314.
DOI: 10.1016/j.ccell.2019.01.004

Research highlight Cancer DNA's bad timing

Professor Susan Clark and her team revealed, for the first time, a link between the timing of when DNA is copied in a dividing cell and changes to the chemical tags found on DNA which may lead to cancer development.

The team's study also revealed an interesting relationship between the replication timing of DNA and the stability of chromosomes – the positioning of the microscopic X or Y shaped DNA-carrying structures in the nucleus of cells. They found that DNA located closer to the centre of the nucleus is replicated earlier in the cell cycle, while DNA closer to the edge of the nucleus is replicated later.

Late-replicating regions in normal DNA may be more susceptible to DNA damage, the researchers say. This unprecedented view into the pattern of replication timing in cancer cells may contribute to new approaches for cancer therapy or prevention.

Du et al., Nature Communications. 2019 Jan 10 (1): 416.
DOI: 10.1038/s41467-019-08302-1

Research highlight Genomic 'map' reveals not all fat is equal

Researchers at the Garvan Institute and the CSIRO lead by Professor Susan Clark and Dr Peter Molloy have revealed significant new insight into the development of fat, which can be harmful or harmless depending on where it is located in the body.

To discover the underlying factors of health risks in different kinds of fat cells, the researchers took cells from benign fat underneath the skin and from the harmful fat inside the abdomen, and compared the epigenome – the secondary code on DNA that controls how genes are read.

By comparing the epigenome in cells of different types of fat, the researchers created the first comprehensive genomic map that reveals unique features, which appear to 'hard-wire' different types of fat early in cell development. The findings may guide future research to uncover the drivers of harm arising from fat build-up in different parts of the body.

Bradford et al., Scientific Reports. 2019 Jul 9 (1): 9511.
DOI: 10.1038/s41598-019-45777-w

Celebrating giving Petre Foundation

Since January 2014, Professor Vanessa Hayes has held the Petre Chair of Prostate Cancer Research at the University of Sydney. She holds a joint position at Garvan and undertakes all her research here. The Petre Foundation is a long-standing and generous supporter of Garvan.

"The only way to cure a disease is through research. Painstaking, long term, incremental progress through collaborative research towards a cure takes a special kind of person and a special kind of organisation. Having an organisation with the deep and scaled research support infrastructure that the Garvan provides allows researchers like Professor Hayes to accelerate their work towards a cure," says Mr Daniel Petre AO.

Professor Hayes, Laboratory Head for Human Comparative and Prostate Cancer Genomics has made significant contributions to our understanding of the differences in the genomes of males with aggressive prostate cancer in Africa and Australia, as well as what may be her most significant research achievement to date - pinpointing a human 'Homeland' where our modern human ancestors thrived 200,000 years ago. This paper captured worldwide public imagination and although it was only published in mid-November, made the Global Top 100 (Altmetric) and Australian Top 10 (Australian Science Media Centre) most influential scientific breakthroughs for 2019.



Genomics and Epigenetics

Genomics and Epigenetics Research Laboratories

BioVis Centre

Head: Dr Seán O'Donoghue

Epigenetics Research Lab

Head: Prof Susan Clark

Epigenetic Deregulation Group

Leader: A/Prof Clare Stirzaker

Histone Variants

Leader: Dr Fatima Valdes Mora

DNA Methylation Biomarkers Group

Leader: Dr Ruth Pidsley

Human Comparative and Prostate Cancer Genomics Lab

Head: Prof Vanessa Hayes

Molecular Genetics of Inherited Kidney Disorders Lab

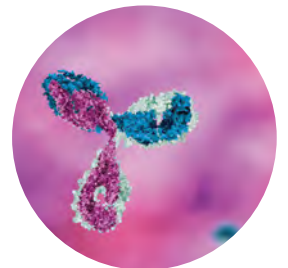
Head: Prof John Shine

Neurotranscriptomics Lab

Head: Dr Robert Weatheritt

Transcriptomic Research Lab

Head: Dr Timothy Mercer



White Butterfly spreads its wings

The Juresic family, in memory of their beloved sister and daughter Vanessa, are raising money to help find a cure for triple negative breast cancer.

Vanessa Juresic was only 36 when she was diagnosed with triple negative breast cancer. Tragically, just 15 months later in 2018, she lost her life to the disease.

While undergoing treatment, she learnt about the work of Garvan through her oncologist, Associate Professor Elgene Lim – an oncologist at St Vincent’s and breast cancer researcher at the Garvan Institute.

In 2019, Vanessa’s family and friends, led by her sister Sophie launched The White Butterfly in Vanessa’s memory to fulfil her wish of supporting Garvan’s triple negative breast cancer research.

In October 2019, White Butterfly hosted its inaugural fundraising event at the Woolwich Pier Hotel in Sydney, raising almost \$200,000 for Garvan’s breast cancer research. More than 500 people purchased tickets to the White Butterfly Garden Party to raise funds for Garvan in honour of Vanessa. Guests were joined by guest speaker, Elle Halliwell, MC, Edwina Bartholomew and Garvan’s Associate Professor Alex Swarbrick who explained the current breast cancer research programs underway at the Institute.

Breast cancer is the most commonly diagnosed cancer in Australia claiming the lives of 8 women every day. Thanks to decades of research, the five-year survival rate for women who are diagnosed is now at 91%, however, for women diagnosed with triple-negative breast cancer, the five-year survival rate is far lower. Triple-negative breast cancers, which make up 15-20% of all breast cancer diagnoses, lack any of the three receptors (oestrogen, progesterone or HER2) that would make them responsive to targeted treatment. Overall, patients with triple-negative breast cancer have a higher risk of disease recurrence and shorter survival than those with other breast cancers.

Speaking about her sister at the 2019 Breast Cancer Symposium at Garvan, Sophie said, “Vanessa was strong, tenacious, beautiful and my intelligent big sister. She made it her mission to be kind to anyone that walked into her life, even if it was the ones that were giving her the bad news that she had a year to live. She brought cupcakes for the nurses, she befriended other patients on their first day of chemo or radiology, letting them know it was going to be okay. She did all she could to become best friends with her oncologists and knock down the walls of those patient-doctor relationships. She created partnerships and friendships with anyone that crossed her path.

“What Vanessa has done for the Garvan Institute, for her family and for the world is selfless, and what this means for us, what this gives us the opportunity to do, is to make that love stronger than death. No one is protected from this disease. Together we can research, operate, nurse, fundraise, but most of all care, and take a stab at finding a cure for triple negative breast cancer.”

We extend our sincere thanks to Sophie, the Juresic family, and the White Butterfly committee for their support and dedication in helping to fund Garvan’s critical triple negative breast cancer research.

“Together we can research, operate, nurse, fundraise, but most of all care, and take a stab at finding a cure for triple negative breast cancer.”

– Sophie Juresic, Vanessa’s sister



Vanessa’s family and friends, led by her sister Sophie, raised over \$197,000 at the first ever White Butterfly event in her honour.



Cancer



From the Head

Professor David Thomas

A few decades ago, the idea that changes to DNA could drive cancer development was just a hypothesis. Today, we not only know that cancer is fundamentally a genetic disease – our remarkable advances in research are allowing us to analyse the DNA of a patient's tumours to personalise their treatment.

Cancer research at Garvan is in a unique and pioneering position.

We are leveraging world-leading research expertise in different cancers – from the rarest to the more common – and combining this with cutting-edge genomics and imaging technologies. Like a new microscope, these technologies allow us to study cancer biology, previously thought to be incomprehensibly complicated, through an entirely new prism.

Above all, our cancer program is patient-focused. Whether taking part in clinical trials or donating samples to our world-leading biobanks, patients are at the heart of the work we do.

The Kinghorn Cancer Centre is realising the promise of personalised, person-centred approaches to cancer treatment by aligning the research of the Garvan Institute, housing many of its research groups, with cancer services of St Vincent's Hospital under one roof.

Our researchers continue to discover crossovers and relationships between different cancers, and this highlights how crucial our collaborative approach is to developing new ways to target tumours from all directions.

Our vision is to innovate new detection methods and better strategies for cancer treatment.

In 2019, we made breakthrough discoveries that will contribute to better outcomes for cancers, including breast cancer, pancreatic cancer and osteosarcoma. Through our findings, and our local and international collaborations, we are poised to help develop new treatments and repurpose existing medication for cancer therapy, ultimately improving outcomes for all patients.

Research highlight

Psoriasis drug target offers potential for osteosarcoma

A Garvan study suggests that a common treatment for psoriasis could be repurposed to treat a rare but aggressive form of youth cancer.

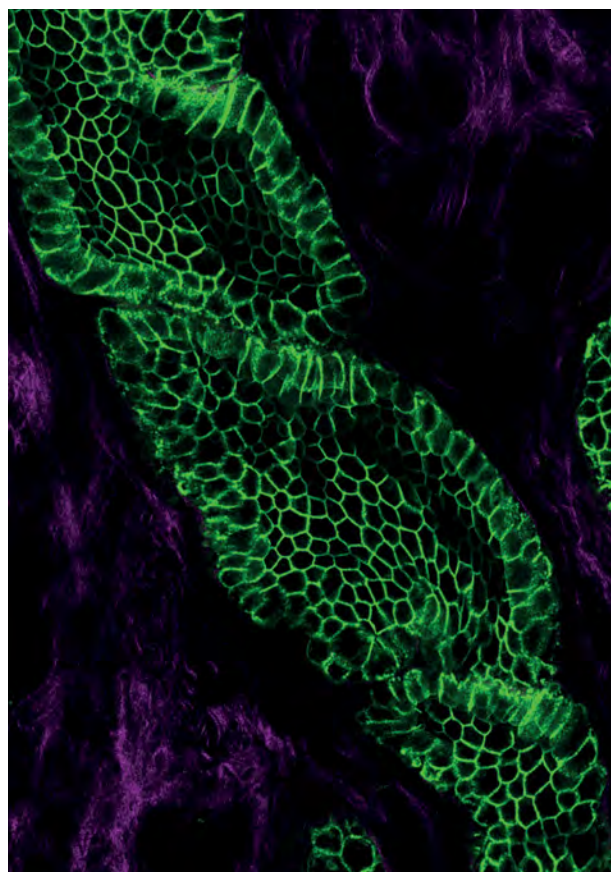
By targeting an immune molecule known as IL23, a research team led by Professor David Thomas and Dr Maya Kansara successfully shrank osteosarcoma tumours in mice, demonstrating that the IL23 molecule is central to the development of the cancer.

Osteosarcoma is among the most common cancers affecting males between the ages of 15 to 29, in Australia. Symptoms of the disease are often overlooked as growing pains or injuries, and in many cases only detected after it has spread to other parts of the body.

Drugs that block the IL23 molecule already exist and are safely used in the treatment of patients with psoriasis – an autoimmune condition that affects the skin – suggesting the same drugs could be used to treat patients with osteosarcoma.

The researchers are now designing clinical trials that will test the effectiveness of these drugs in osteosarcoma patients.

*Kansara et al., Cancer Discovery. 2019; 9 (11): 1151.
DOI: 10.1158/2159-8290.CD-19-0154*



Cancer

Research highlight

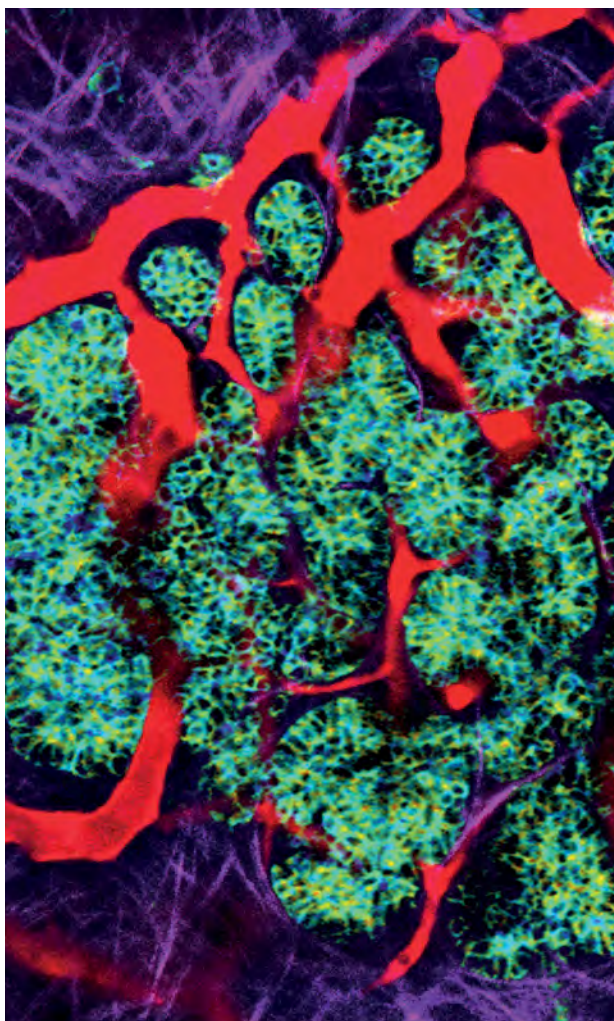
Slowing the spread of pancreatic cancer

An international team led by Garvan researchers Professor Paul Timpson and Dr Thomas Cox has revealed how aggressive pancreatic cancer cells change their environment to enable easy passage to other parts of the body (or metastasis) – the main cause of pancreatic cancer related death.

The researchers discovered that some pancreatic tumours produce more of a molecule called 'perlecan' to remodel the environment around them, which helps cancer cells spread more easily to other parts of the body, and also protects them against chemotherapy.

The study revealed a two-pronged approach for improving the efficiency of chemotherapy, which may help reduce tumour progression and spread. The researchers hope their findings will provide a path to more effective treatment options for individuals with pancreatic cancers, as well as other cancers.

Vennin et al., Nature Communications. 2019; Aug 10 (1)
DOI: 10.1038/s41467-019-10968-6



Research highlight

Combination treatment shows promise for pancreatic cancer

In an animal model, Garvan scientists have discovered that they can significantly slow down the spread of pancreatic cancer by combining an existing treatment with a drug currently involved in a Phase I clinical trial.

A team led by Dr Samantha Oakes reduced the spread of pancreatic adenocarcinoma in mice by more than 60% by using a combination treatment of the drug dasatinib with a second drug S63845.

S63845 is one of a group of drugs currently undergoing clinical trials as a treatment for multiple myeloma and other cancers. It targets the protein MCL-1 that is present in high levels in cancer cells of different types, promoting their survival.

Global survival rates for pancreatic adenocarcinoma, the most common form of pancreatic cancer, are low, with 94 deaths recorded for every 100 cases diagnosed. The researchers will next determine whether the approach is effective when used in combination with standard chemotherapy to stop cancer metastasis in pre-clinical models.

Castillo et al., Oncogene. 2019 Nov; 39: 1821-1829
DOI: 10.1038/s41388-019-1091-0

Research highlight

A more accurate method to diagnose cancer subtypes

Garvan researchers have developed a new method for detecting the products of 'fusion genes', estimated to drive one fifth of all human cancers.

Fusion genes occur when genes from different sections of DNA, often from different chromosomes, break and rejoin in an aberrant way. These fusion genes can produce abnormal proteins which contribute to tumour formation.

Led by Dr Erin Heyer and Dr Jim Blackburn, the team's new diagnostic method takes a broad view of the genes known to be involved in fusions across all cancer subtypes, instead of focusing on where in the body the cancer is located. The researchers' approach identified 20 percent more fusion genes from patient samples than the current diagnostic tests.

Once clinically accredited, the researchers hope their test will help connect cancer patients more quickly to personalised, targeted treatments.

Heyer et al., Nature Communications. 2019; Mar 10 (1338)
DOI: 10.1038/s41467-019-09374-9

News highlight

Precision cancer medicine program goes national

The Australian Genomic Cancer Medicine Program matches therapies to individuals with rare and uncommon cancers on the basis of their unique genetic information.

An innovative clinical trial program developed at the Garvan Institute is bringing personalised therapies to more individuals with rare and uncommon cancers, which together account for over 50% of cancer deaths every year.

In 2019, a \$50 million Federal Government grant enabled the program to expand from NSW to all states and territories, bringing access of potentially life-saving treatment closer to the homes of patients, many of whom have exhausted all other treatment options. The program has since recruited its 2000th patient.

Partnering organisations within the program network are the Peter MacCallum Cancer Centre (VIC), the Garvan Institute of Medical Research (NSW), NHMRC CTC (NSW), Canberra Hospital (ACT), the Central Adelaide Local Health Network (SA), Linear Clinical Research (WA), Sir Charles Gairdner Hospital (WA), Princess Alexandra Hospital (QLD), Royal Darwin Hospital (NT) and Royal Hobart Hospital (TAS).

Celebrating giving NELUNE Foundation

The NELUNE Foundation, a Life Governor of Garvan, has been supporting the Institute's cancer research since 2017, when they generously established The Rebecca Wilson Fellowship in Breast Cancer Research, awarded to Dr Christine Chaffer.

With the support of the fellowship, which celebrates the life of the late Rebecca Wilson who was a dear friend of the NELUNE Foundation, Dr Chaffer has established a laboratory at Garvan and is focused on determining how cell plasticity (a process that enables cancer cells to switch between aggressive and non-aggressive states) drives breast cancer development and metastasis, and ways to prevent this from occurring. The NELUNE Foundation has also been philanthropically supporting the Molecular Screening and Therapeutics program, a clinical trial program for people with rare or less common cancers who have exhausted all other treatment options, which personalises treatment based on an individual's unique personal and cancer genetic profile.

"The NELUNE Foundation is proud to support the important work of the Garvan Institute of Medical Research. The stated mission of the NELUNE Foundation is to help patients fight cancer with dignity and the work of Garvan embraces this in every way. We support their efforts, cheer their success and commit to our continued support." Nelune Rajapakse AM, Co-Founder NELUNE Foundation and Anna Guillan AM, Co-Founder NELUNE Foundation.

Cancer Research Laboratories and Groups

Australian Pancreatic Genome Initiative Lab

Head: Prof Anthony Gill

Cancer Biology Lab

Head: Prof Chris Ormandy

Tumour Development Group

Leader: Dr David Gallego-Ortega

Replication and Genome Stability Group

Leader: Dr Liz Caldon

Cancer Cell Plasticity Lab

Head: Dr Christine Chaffer

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

Genetic Cancer Risk Group

Leader: Dr Mandy Ballinger

DNA and RNA Methodologies Group

Leader: Dr James (Jim) Blackburn

Invasion and Metastasis Lab

Head: Prof Paul Timpson

Matrix and Metastasis Group

Leader: Dr Thomas Cox

Network Biology Lab

Head: Dr David Croucher

Personalised Cancer Therapeutics Lab

Head: Dr Marina Pajic

Single Cell and Computational Genomics Lab

Head: A/Prof Joseph Powell

Tumour Progression Lab

Head: A/Prof Alex Swarbrick

Translational Breast Cancer Research Group

Leader: Prof Sandra O'Toole

Clinical Prostate Cancer Research Group

Leader: Prof Lisa Horvath

Hormones and Cancer Group

Leader: Dr Ann McCormack

Cell Survival Group

Leader: Dr Samantha Oakes

Research Services at Garvan

The Garvan Institute has assembled and grown a wide range of research services and capabilities over the years. These specialist services and state-of-the-art technologies are also available to researchers from Australia and around the globe.

As we are collaborative by nature, we want our facilities to help foster cutting-edge biomedical discoveries for industry partners. Some of our services are set up as core facilities that can be used by internal and external researchers on a pays basis. Other services are provided through the technical expertise of our scientists through advice, training and collaborative know-how.



Clinical and research genomics

Garvan is home to one of the largest genome sequencing facility in the Southern Hemisphere, the Kinghorn Centre for Clinical Genomics. Our internal focus is on realising the clinical value of the genome and enabling precision healthcare. These sequencing and analysis technologies are also available for external studies at any scale.

Our sequencing experts offer a range of services including clinically accredited whole genome sequencing, transcriptomics, advanced informatics and software solutions, all enabling genomic exploration at scale.



Single cell genomics

The Garvan-Weizmann Centre for Cellular Genomics is one of the few sites internationally where state-of-the-art technologies in cell handling, genomics and bioinformatics, along with the experts to make best use of them, are brought together under one roof. We now have the ability to generate genomic or proteomic information from a single cell, in large quantities and quickly.

The Centre also houses Garvan's Flow Cytometry equipment alongside a cellular genomics facility with cutting edge capabilities. The team develops new technologies for solving critical problems, and its research programs focus on both fundamental and translational cellular genomics.



Preclinical models and genotyping

Our Australian BioResources facility is NATA-accredited and specialises in the breeding of genetically modified mouse lines as refined avatars to investigate human conditions closely.

Garvan's Molecular Genetics team offers a NATA-accredited mouse genotyping service for researchers that prefer a national provider with over 10 years of experience and cost efficient, high-throughput automation.

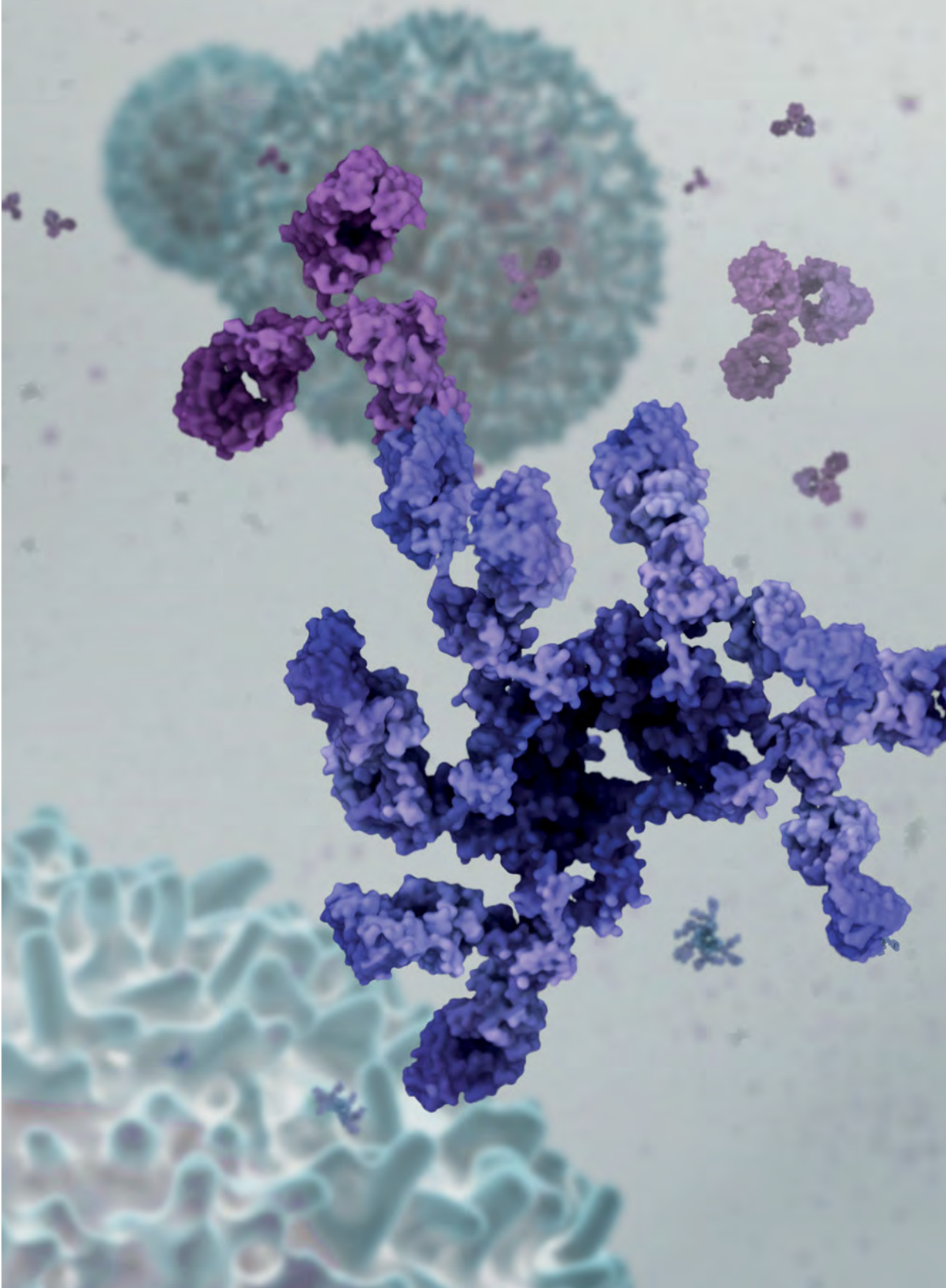
Find out more: garvan.org.au/research/services

Garvan research services

- Whole genome sequence analysis
- Organ and cell imaging
- Biodata visualisation
- Bioinformatics
- Clinical research services
- CRISPR/cas9 mice
- Flow cytometry
- Genomics
- Histology and histopathology
- Microscopy
- PDX models
- Antibody engineering
- Mouse genotyping
- Transcriptomics
- Nanopore and long-read sequencing
- Sanger sequencing



A molecular illustration of the antibody proteins called 'rheumatoid factors' bearing mutations identified by Garvan researchers as the cause of the autoimmune disease, cryoglobulinemic vasculitis. Image by Dr Ofir Shein-Lumbroso, Biomedical Animator through the Garvan-Weizmann Partnership. Ofir's secondment to Garvan has been generously funded by Mr Bob Magid OAM and Mrs Ruth Magid.



Kinghorn Centre for Clinical Genomics



From the Heads
Mary-Anne Young



A/Prof Sarah Kummerfeld

Genome sequencing is being utilised more as a way to diagnose disease and prevent medical conditions. To support this exciting transition, the Kinghorn Centre for Clinical Genomics (KCCG) is helping lay the groundwork to most effectively translate genomic information to healthcare.

KCCG is focused on our strategic goal: accelerating and translating genomic discoveries, and closing the gap between genomic research and patient benefit. A primary example of this in 2019 was the accreditation and implementation of 'Orrery', a software pipeline to accelerate clinical genomic diagnoses.

Our main research focus is to establish the OneProgram, a framework for implementing the life-long use of genomic information, to provide the most benefit possible to an individual's health. This crucial program brings together genomic technologies and genomic testing, for new disease areas.

We continue to collaborate with and support world-leading clinical research programs including the Clinical Immunogenomics Research Consortium Australasia (CIRCA), the Australian Genomics Health Alliance KidGen 'HIDDEN' Renal Genetics Flagship, the Lions Kids Cancer Genome Project, the Molecular Screening and Therapeutics (MoST) clinical trials and the Australian Parkinson's Mission.

Further, we are helping lead a national conversation on the implementation of polygenic risk scores – health risk scores based on variation in many locations of the genome, by bringing together researchers, clinicians, educators and industry. We see significant potential for this emerging application of genomics to benefit community health.

Our educational resources remain an important element of translating high-level genomics research into healthcare. In 2019, we upskilled more than 300 general practitioners who enrolled in our online learning module on genomic testing in clinical practice, supported more than 200 science teachers who accessed our high school genomics resources, and collaborated with lead teachers in NSW, helping them bring molecular animations and videos into contemporary science classrooms.

We are grateful to The Kinghorn Foundation for their catalytic and ongoing philanthropic investment in the Centre and look forward to taking our research, translation and productive collaborations to new heights in 2020.

Research highlight On-the-spot genome analysis

The ability to read the genome – all the information in our DNA – has vast potential for understanding human health and disease. By fine-tuning how algorithms organise DNA data, our researchers have made it possible to do genomics analysis on a smartphone.

The genomic technologies team led by Dr Martin Smith developed the method to take genome analysis 'offline', by adapting a computer algorithm that can perform accurate analysis to reduce the amount of memory necessary to align genomic sequences from 16GB to 2GB.

The researchers' new approach, which provides similar accuracies as current standard genomic analyses, makes it possible for genome analysis to be done on-the-spot, using the memory available in a typical smartphone. The scientists' algorithm may make it possible to identify infectious diseases in remote locations, or at the hospital bedside.

*Gamaarachchi et al., Scientific Reports. 2019; 9: 4318.
DOI: 10.1038/s41598-019-40739-8*



Research highlight

A new diagnostic approach for neurodegenerative disorders

Our researchers have discovered that next-generation sequencing methods can diagnose hereditary cerebellar ataxia (HCA), a degenerative genetic disorder, with greater accuracy than routine tests.

HCA affects the part of the brain responsible for coordinating movement, causing a gradual decline in motor function over time. Researchers know that gene variants can cause the disorder, but as a large number of variants are linked to the disease, it is difficult to diagnose in its early stages.

The team was led by KCCG researcher Dr Kishore Kumar and collaborators at the University of Sydney and Royal North Shore Hospital. They analysed the DNA of 34 patients who had clinical signs of HCA but had tested negative in routine tests, which screen for the most common subtypes of HCA.

Using next-generation sequencing methods, including whole genome sequencing, the researchers successfully identified disease-causing variants for 12 of the 34 patients.

The research brings new hope to those affected by the condition – receiving a diagnosis is valuable not only for patients with HCAs, but for family members who may also be affected.

Kang et al., Cerebellum. 2019; 18: 137–146. DOI: 10.1007/s12311-018-0969-7

Research highlight

New path forward for a rare cancer

By analysing the genomic information found in a cancer patient's blood samples, researchers have revealed new leads for treatment options.

Adrenocortical carcinoma, a rare but aggressive cancer of the adrenal glands, is currently treated with chemotherapy, which has a low response rate and significant side effects for patients.

The team, led by Dr Mark McCabe in KCCG, performed an extensive genomic analysis of blood samples of one patient with adrenocortical carcinoma, collected over two years. The researchers traced a series of complex changes in the tumours back to a number of molecular pathways, including a deletion in the gene MSH2, which is involved in the repair of errors in DNA.

The pathways uncovered in the study present a number of potential options for targeted therapies, which may help improve the outcomes for patients with this cancer.

McCabe et al., Cold Spring Harbor Molecular Case Studies. 2019; 5: a003764 DOI: 10.1101/mcs.a003764



Celebrating giving

Inspiring the next generation of researchers

Summer 2019/2020 saw KCCG welcome 10 Scholarship Students, currently enrolled in an undergraduate course, into the centre to receive hands-on research experience in a range of fields. This included detecting and interpreting genomic structural variants in a cohort of 4000 'welllderly' Australians, clinical diagnosis using whole genome analysis, and more.

The internship culminated in an event that brought together Garvan and KCCG leaders, scientists and guests to celebrate the work of the Genomics Summer Scholarship students, where the students presented the exciting research they had been undertaking over the period at a poster session with their peers and mentors.

"As much as possible, it's important for us to give back to the community and inspire talented individuals where we can. It was an absolute pleasure being able to offer a group of passionate students the chance to get hands on experience in a world-class facility," says Associate Professor Sarah Kummerfeld, scientific lead of KCCG.

Garvan-Weizmann Centre for Cellular Genomics



From the Head

Associate Professor Joseph Powell

We are at a pioneering new frontier in medical research.

Like the scientists that took the first glimpse at cancer cells under the light microscope, we are today peering into the genome of the individual cells that cause disease, for the first time.

The cell is the fundamental unit of life – and a crucial basis for understanding the human biological processes that allow us to diagnose, monitor, and treat disease. Cellular genomics is letting us reveal the role of individual cells in disease through a scope of projects that would have been inconceivable only years ago.

Since its creation in 2017, the Garvan-Weizmann Centre for Cellular Genomics has firmly secured its place as one of the world-leading cellular genomics research centres, uniquely poised to accelerate research from the lab to the bedside.

We are studying a broad range of conditions, including those diseases that are among the most devastating in the world and affecting millions globally, including cancer, autoimmune disease, diseases of the kidney, eye and lung, as well as cardiovascular disease.

Through our clinical collaborations with hospitals and doctors in Australia and overseas, we are connecting our latest platforms in cell isolation, analysis, high-performance computing and bioinformatics with clinical cohorts and patients. We have formalised local strategic partnerships with UNSW, launching the UNSW Cellular Genomics Futures Institute, and the Innovation Centre at the Victor Chang Cardiac Research Institute.

In 2019 we saw research at Garvan reach new heights. Through the Centre, we enabled breakthrough discoveries and made significant advances in both new cutting-edge techniques and global research initiatives. We are now in the exciting position to realise our vision of translating single cell techniques into new diagnostic tests, precision treatment, and launch new initiatives to start identifying new therapeutic targets.

Through our Garvan-Weizmann Partnership, we are privileged to work closely with the Weizmann Institute of Science in Israel and Weizmann Australia, whose support and research collaborations are crucial to this work.

Research highlight

'Fingerprinting' human cells

By combining single cell analysis techniques with machine learning algorithms, a team led by Associate Professor Joseph Powell and José Alquicira-Hernández developed a method to 'fingerprint' human cells.

The new method, called scPred, analyses transcripts of individual cells – a measure of which genes are active in different cells, which provides extensive information of what makes cells unique. The method 'trains' a statistical model on patterns of transcript data to test what features make a certain cell type most different from another cell – which can be thought of as a unique fingerprint.

Identifying individual human cells with a unique genomic profile from a tissue sample could be a step-change for diagnosing some of the most devastating diseases, including cancer and autoimmune disease, and help personalise treatments to individual patients.

The researchers are now working to translate the method to diagnostic tests for clinical use.

Research highlight

Pioneering lung cancer research

Dr Venessa Chin is undertaking crucial research to change the management of lung cancer.

Immunotherapy is a cancer treatment designed to activate the immune system to better target tumours, but less than 50% of lung cancer patients respond well to the therapy and a test to predict which patients will benefit from the treatment, and which will not, is urgently needed.

In a research project supported by a two-year Lung Foundation Fellowship, Dr Chin will analyse biopsy samples collected from patients with advanced lung cancer from St Vincent's Hospital Sydney and the Nepean Cancer Research Biobank.

Using cellular genomics technology at the Garvan Institute, Dr Chin aims to identify immune and tumour cell biomarkers – unique cellular signatures – to predict which lung cancer patients will respond to different immunotherapies.

Through this research, Dr Chin is hoping to categorise patients into broad groups that will enable doctors to tailor treatment to the individual patient.

Research highlight

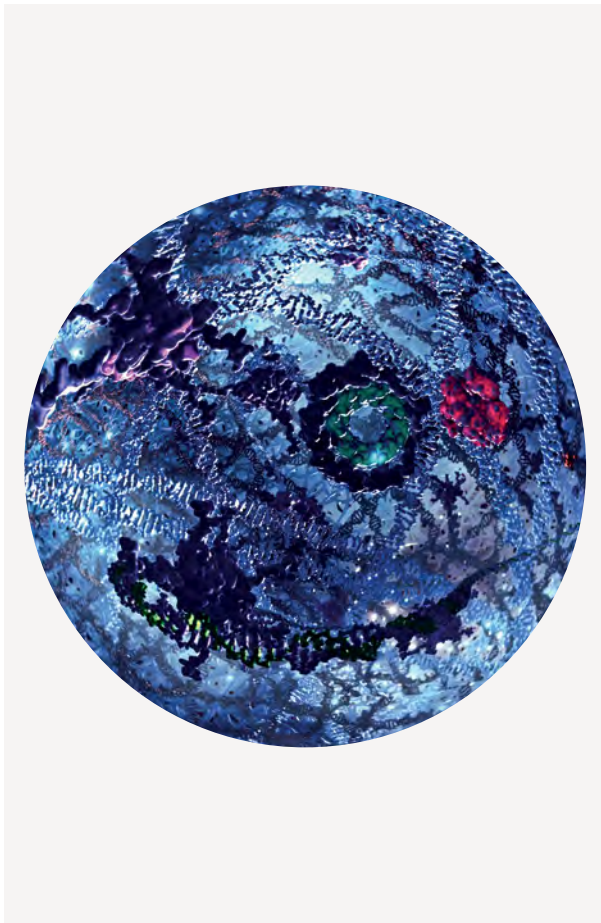
Garvan researchers lead gene map of the retina

Australian researchers, co-led by Associate Professor Joseph Powell, have developed a detailed gene map of the human retina, providing new insights which will help future research to prevent and treat vision loss and blindness.

The team used cutting-edge cellular genomics technologies to examine the complex genetic information of more than 20,000 individual cells, to develop a profile of all major cell types in the retina and the genes they 'express' to function normally.

The retinal cell atlas would benefit researchers investigating inherited retinal diseases, which occur when gene variants cause retinal cells to stop functioning, leading to vision loss and blindness.

The retinal cell atlas is the first Australian contribution to the Human Cell Atlas – a global project to create reference maps of all human cells to better understand, diagnose and treat disease. The project was a collaboration between the Garvan Institute, the Centre for Eye Research Australia, the University of Melbourne and the University of Queensland's Institute for Biomolecular Science.



Celebrating giving

A Family Foundation represented by Mr Richard Scheinberg AM & Mrs Jacqui Scheinberg

A remarkably generous philanthropic donation from a family foundation represented by Mr Richard Scheinberg AM and Mrs Jacqui Scheinberg has been applied to support a large-scale Immune Profiling initiative being led by the Garvan and Weizmann Institutes. The gift will primarily fund three Fellowships in the labs of Professor Stuart Tangye (Theme Leader: Immunology and Inflammation, Garvan Institute), Professor Ido Amit (Principle Investigator: Immunology Department, Weizmann Institute) and Associate Professor Joseph Powell (Head, Garvan-Weizmann Centre for Cellular Genomics, Garvan Institute). This exciting new initiative will drive collaborative projects that engage widely with Weizmann and Garvan scientists using the latest cellular genomics technology to identify how immune cells contribute to disease, or how they can build immunotherapies.

Awards and accolades

We congratulate all Garvan scientists who were recognised for their significant contributions to research and for pioneering new discoveries to create a future where everyone lives longer, healthier lives.

NSW Premier's Prize honours epigenetics expert

For her pivotal contributions to the field of epigenetics, Professor Susan Clark was awarded the 2019 NSW Premier's Prize for Excellence in Medical Biological Sciences.

Professor Clark, Genomics and Epigenetics Research Theme Leader at Garvan, witnessed the advent of epigenetics in the 1970s – the discovery that modifications to DNA can control how genes are read. She published one of the first research papers to show the significance of epigenetic silencing in cancer and has pioneered the field of cancer epigenetics ever since.

Professor Clark has helped revolutionise the understanding of how epigenetics influences early development and disease, and her team's ongoing research has wide implications for epigenetic therapy. A Fellow of the Australian Academy of Science and Senior Principal Research Scientist of the NHMRC, Professor Clark has made seminal contributions to a field whose implications are only beginning to be realised.



Professor Susan Clark FAA

Clinical Immunology Society Presidential Award

Professor Stuart Tangye, Leader of the Immunity and Inflammation Research Theme at Garvan, was awarded the Clinical Immunology Society's 2019 Presidential Award.

The Clinical Immunology Society Presidential Award is presented to researchers for outstanding long-term, high-impact contributions to the science and/or practice of clinical immunology.

For more than 20 years, Professor Tangye has been dedicated to understanding what makes the human immune system work, and what can derail it. Working closely with clinicians and patients with rare immune disorders, Professor Tangye has been breaking down the complexities of the immune system to explain immune and inflammatory diseases and define promising therapeutic targets, particularly in the area of adaptive immunity.

Thomas E. Starzl Prize

In recognition of his substantial contributions to the field of immunology, Professor Jonathan Sprent was awarded the 2018 Thomas E. Starzl Prize in Surgery & Immunology. The prize is presented annually to a 'national or international leader in the field of organ transplantation and immunology'.

Over the course of his prolific research career, Professor Sprent, Head of the Cellular Immunity Laboratory at Garvan, has made seminal discoveries in the field of immunology, which laid some of the foundations for what immunologists around the world are studying today. He advanced the field's understanding of immunological memory and tolerance, transplantation immunity and cancer immunotherapy.

Professor Sprent established a research group at the Garvan Institute in 2006 after a prestigious career abroad and over recent years, has focused his research on immunotherapies, aimed to harness the body's own immune system to target cancer cells.

Queen's Birthday honours for diabetes research leader

For his distinguished service to medicine, and medical education, in the areas of type 1 and type 2 diabetes, obesity and glucose metabolism research, Professor Ted Kraegen AO was awarded the Officer of the Order of Australia.

Spanning a career of over 50 years at the Garvan Institute, and as an author of over 250 academic papers, Professor Kraegen AO has made significant discoveries to understand the physiology and biochemistry of the hormone insulin and the metabolic factors that underlie diabetes.

Among his many achievements, Professor Kraegen AO was one of the first in the world to develop an artificial pancreas, to study type 1 diabetes. He also made significant contributions to a team that initiated low dose intravenous insulin infusion for treatment of human ketoacidosis, a life-threatening complication in people with diabetes.



Professor Ted Kraegen AO

Estée Lauder Breast Cancer Award

Estée Lauder Companies presented one research award to a talented young breast cancer researcher at Garvan in 2019, Dr Joanna Achinger-Kawecka. The award supports researchers to progress their projects to a stage where they have sufficient data to ensure they are competitive for peer-reviewed funding.

Dr Achinger-Kawecka is a Senior Research Officer in Garvan's Epigenetics Research Laboratory and with her Estée Lauder Breast Cancer Award will investigate an innovative new approach to studying hormone resistance in breast cancers, a major cause of cancer relapse following treatment. The award will help her continue her pioneering work to develop a new tool to identify the key epigenetic drivers of hormone resistant breast cancer.

Cancer Institute NSW Fellowships

Six new Cancer Institute NSW Fellowships were awarded to Garvan researchers to support innovative new

cancer research projects. Announced by the NSW Minister for Health and Medical Research, the Hon. Brad Hazzard MP, the Fellowships will enable the researchers to investigate new methods to better understand a range of cancers, and potential therapeutic approaches.

The projects will be led by Dr André Minoche, who was awarded an Early Career Fellowship, and Dr Mark McCabe, Dr Fatima Valdes Mora, Dr Ozren Bogdanovic, Dr Christine Chaffer and Dr Michelle McDonald who were each awarded Career Development Fellowships.

NHMRC Funding Grants

Garvan researchers were awarded Ideas and Investigator Grants from the National Health and Medical Research Council (NHMRC), giving them the opportunity to continue their pioneering research.

Ideas grants were awarded to Associate Professor Shane Grey, Dr Joanne Reed, Dr Christine Chaffer, Dr Max Nobis and Professor Chris Ormandy. Investigator grants were awarded to Prof Stuart Tangye, who received the NHMRC Peter Doherty Investigator Grant Award for submitting the highest ranked application in the Leadership level, as well as A/Prof Joseph Powell, Dr Deborah Burnett and Dr Qian Du. A MRFF Investigator grant was awarded to Dr Ira Deveson. Dr Jennifer Snaith was awarded an NHMRC Postgraduate Scholarship, to carry out research in type 1 diabetes.

Cancer Council NSW grants for innovative cancer research

Professor Chris Ormandy and Dr Thomas Cox have been awarded three-year Project Grants from Cancer Council NSW to explore innovative research projects in breast and pancreatic cancer. The grants were awarded based on the projects' high scientific merit and value to the community.

Professor Ormandy will explore how to overcome endocrine resistance in breast cancer, which is the second most

common cause of cancer-related death in women. Dr Cox will investigate new therapeutic strategies for targeting pancreatic cancer, which has a five-year survival rate of ~9% in Australia.

The Palmer Innovation Prize

Provided by Joseph Palmer & Sons, this annual prize encourages research innovation at Garvan and recognises the development of a product, process or technology. It was presented to Ghamdan Al Eryani, Dr Mandeep Singh, Shaun Carswell, and Dr Katherine Jackson. The researchers will use the prize to leverage current technologies to obtain a comprehensive description of gene expression in a large number of cells, which will have applications in many areas of research, including cancer and autoimmune disorders.



Ghamdan Al Eryani, Dr Mandeep Singh, Shaun Carswell, and Dr Katherine Jackson.

NBCF Research Project Grants

The National Breast Cancer Foundation (NBCF) awarded six Research Project Grants to Garvan researchers, for up to three years of funding.

The grants provide the opportunity for Garvan researchers to continue their ground-breaking work to find new breast cancer treatments. The projects aim to help further understand risk factors, develop new ways to treat and monitor breast cancer, improve quality of life for breast cancer patients and improve treatment outcomes.

The projects are led by Dr Liz Caldon, Dr Tatyana Chtanova, Dr Christine Chaffer, Professor Sandra O'Toole, Dr Neil Portman and Associate Professor Alex Swarbrick.

The 2019 Pathfinders Award

Garvan's Dr Omid Faridani, Group Leader at the Garvan-Weizmann Centre for Cellular Genomics, received the 2019 Pathfinders Award for his research to personalise pancreatic cancer treatment. Pathfinders is a Sydney-based collective group with a mission to support cancer research at Garvan.

The Award will assist Dr Faridani in kick-starting the innovative new project, developing a new device that can isolate these spreading cancer cells from a patient's blood, and look for signatures that could indicate how effective cancer treatment is.

Research funding for World Pancreatic Cancer Day

Announced on World Pancreatic Cancer Day (21st of November), the Avner Pancreatic Cancer Foundation awarded Associate Professor Shane Grey and Dr Tatyana Chtanova Innovation Grants to develop new treatment options for one of the most devastating cancers.

The grants support Associate Professor Grey and Dr Chtanova's project, which will investigate how immunotherapy – cancer therapy designed to activate a patient's own immune system to target cancer – could be effective at treating the disease.

Sony Foundation Grant and Tour de Cure grant

The Sony Foundation and Tour de Cure have awarded Professor Seán O'Donoghue a research project grant to develop a 3D visualisation tool that helps young cancer patients better understand their condition and gives researchers new insight into the molecular changes that drive cancer growth.

Professor O'Donoghue will be working with fellow chief investigators Professor David Thomas (Garvan Institute of Medical Research), Dr Matt Adcock (CSIRO's Data61), as well as Dr Mark Cowley (Children's Cancer Institute) and Start VR to deliver the project.

Garvan Institute of Medical Research Board of Directors 2019



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.



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. Until the end of 2018 she was one of two executive officers of the National Committee for Professional Standards of the Catholic Church in Australia.



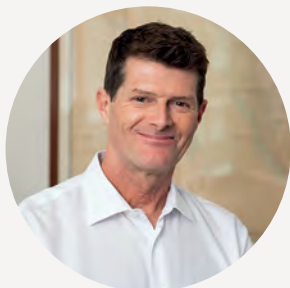
Stephen Johns

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.



Annabelle Bennett AC SC

The Hon Dr Bennett was formerly a Judge of the Federal Court of Australia. She is presently Chancellor of Bond University, President of the Anti-Discrimination Board of NSW, Arbitrator with the Court of Arbitration for Sport, and Chair of the Australian Nuclear Science and Technology Organisation (ANSTO). 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.



Chris Goodnow FAA FRS

Professor Chris Goodnow is an internationally renowned immunologist. He has been Garvan's Executive Director since May 2018. Professor Goodnow has had an extensive international research career. He has been a faculty member at Stanford University and the Australian National University. He is best known for integrating molecular genetics and genomics with immunology, for which he received numerous awards and election to the Australian Academy of Science, the UK Royal Society, and the US National Academy of Science.



Paul Kelly

Dr Kelly is a founding managing partner of OneVentures, a leading Australian venture capital firm, and serves as Chair of the Investment Committee of its Healthcare fund, and on the Risk Management Committee. An Australian physician, serial entrepreneur and experienced biotechnology and life sciences executive, he currently has over 35 years' experience in clinical medicine and medical science, and 25 years' experience in commercialising life science related technologies in Australia, Europe and North America.



Thomas John (Jack) Martin
AO FAA FR S

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.



Patricia O'Rourke

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



Rodney Phillips (to Sept)

Professor Phillips was the Dean of UNSW Medicine until October 2019. He 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.



Helen Nugent AO

Dr Nugent is the Chairman of the National Disability Insurance Agency and Ausgrid, and a non-executive director of Insurance Australia Group Limited. She has been the Chairman of Veda Group, Australian Rail Track Corporation, 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.



Vlado Perkovic

Professor Perkovic is the Dean of the Faculty of Medicine at UNSW Sydney. Prior to this, he was the Executive Director of The George Institute since 2011, President of the Association of Australian Medical Research Institutes and on the Board of the Australian Clinical Trials Alliance. He is Chair of the International Society of Nephrology Advancing Clinical Trials (ISN-ACT) group; and is a Fellow of the Royal Australasian College of Physicians, and of the Australian Academy of Health and Medical Sciences.

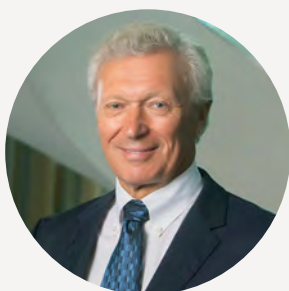


Anthony Schembri AM

Associate Professor Schembri is the CEO of St Vincent's Health Network Sydney, is an Adjunct Professor in Health Sciences at the Australian Catholic University, Adjunct Professor at the School of Medicine, University of Notre Dame and Associate Professor of the Faculty of Medicine at UNSW Sydney. He is a director on the boards of Central & Eastern Sydney Primary Health Network, the National Centre for Clinical Research for Emerging Drugs, and the St Vincent's Curran Foundation, and is co-chair of Australian Catholic University/St Vincent's Nursing Research Institute. He has held a range of volunteer appointments in youth services, human rights and anti-violence organisations.

Garvan Institute of Medical Research

Board of Directors 2019 *continued*



Russell Scrimshaw

Mr Scrimshaw is the Garvan Research Foundation Board Chair. He was until recently the Non-Executive Chairman of UK listed Sirius Minerals Plc, and is currently Non-Executive Chairman of Tech Project Group P/L and the Executive Chairman of Torrus Capital P/L, the Australian Philanthropic Fund, the Scrimshaw Foundation and Scrimshaw Nominees 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 for Commonwealth Properties Ltd, EDS Australia, Mobilesoft Ltd, Telecom New Zealand Australia P/L, and Athletics Australia.



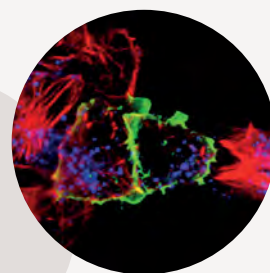
Ronald Trent

Professor Trent is a graduate of the University of Sydney and University of Oxford. He is a fellow of the Royal Australasian College of Physicians, the Royal College of Pathologists of Australasia, and of the Australian Academy of Technology and Engineering. He was Foundation Professor of Medical Molecular Genetics at the University of Sydney, and is Head of the Department of Medical Genomics at the Royal Prince Alfred Hospital. He is Director for the Institute of Precision Medicine & Bioinformatics at the Sydney Local Health District. His contributions to the development of medical molecular genetics in Australia are extensive including inaugural Chief Examiner for Laboratory Genetics for the RCPA, and the inaugural Chair of the NHMRC's Human Genetics Advisory Committee. He is President of the School Council for the Sydney Boys High School, and Secretary of the Sydney Girls High School Foundation.



Jillian Segal AO

Ms Segal is the former Deputy Chancellor UNSW Sydney. She is the chairman of AICC (NSW), General Sir John Monash Foundation and the Independent Parliamentary Expenses Authority (IPEA). She is President of the Executive Council of Australian Jewry (ECAJ), a Trustee of the Sydney Opera House, a director of the Grattan Institute and a member of the International Board of the Weizmann Institute of Science. She is a director of Rabobank Australia Limited. She has been a senior regulator, lawyer and a director of other listed and government organisations.



Garvan Research Foundation

Board of Directors 2019



Russell Scrimshaw Chair

Mr Scrimshaw is the Garvan Research Foundation Board Chair. He was until recently the Non-Executive Chairman of UK listed Sirius Minerals Plc, and is currently Non-Executive Chairman of Tech Project Group P/L and the Executive Chairman of Torrus Capital P/L, the Australian Philanthropic Fund, the Scrimshaw Foundation and Scrimshaw Nominees 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 for Commonwealth Properties Ltd, EDS Australia, Mobilesoft Ltd, Telecom New Zealand Australia P/L, and Athletics Australia.



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.



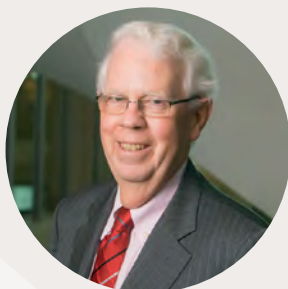
Hamish McLennan

Mr McLennan is a media and marketing industry executive. He is Chairman of REA Group, Chairman of HT&E and a non-executive director of Magellan Financial group. He was Executive Chairman and Chief Executive Officer of Ten Network Holdings until July 2015 and prior to this he was Executive Vice President, Office of the Chairman, at News Corp (formerly News Corporation). In 2017, Mr McLennan joined technology start-up Tiger Pistol in an advisory capacity.



Chris Goodnow FAA FRS

Professor Chris Goodnow is an internationally renowned immunologist. He has been Garvan's Executive Director since May 2018. Professor Goodnow has had an extensive international research career. He has been a faculty member at Stanford University and the Australian National University. He is best known for integrating molecular genetics and genomics with immunology, for which he received numerous awards and election to the Australian Academy of Science, the UK Royal Society, and the US National Academy of Science.



Michael Cannon-Brookes

Mr Cannon-Brookes is a director of Cannon-Brookes Consulting Pty Ltd, and a CEO level executive coach with Foresight Global Coaching. He established Citibank in Australia in 1985. He retired from IBM in July 2012, where he was IBM's Vice President, Global Strategy for Growth Markets. Mr Cannon-Brookes graduated with honours in law from Cambridge University. In 2013, he was elected a Global Board Member of Advance and a Fellow of the Australian Institute of Company Directors.



Nick Abrahams

Mr Abrahams is the Global Head of Technology and Innovation at Norton Rose Fulbright. He is non-executive director of ASX300 software company, Integrated Research and a director for the Sydney Film Festival. Mr Abrahams is the founder of successful online legal site, LawPath. He is also past President of the Australian Communications and Media Law Association and writes regularly on technology and future trends for The Australian Financial Review.

Garvan Research Foundation

Board of Directors *continued*



Helen McCabe (to December)

Ms McCabe is the Founder and Managing Director of Future Women. Prior to this she was the Digital Content Director at Nine Entertainment Co., Editor-in-Chief at 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 on the board of the Australian Indigenous Education Fund and an Ambassador for Adopt Change.



John Schubert AO

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 and Chairman and MD of Esso Australia Ltd.



Peter Young AM

Mr Young is currently a principal for The Adelante Group, and a board member of the Australian Haydn Ensemble. He was previously Chairman of Standard Life Investments Australia, Aberdeen Standard Investments Australia, Barclays Australia, Queensland Investment Corporation (QIC), Transfield Services Infrastructure Fund and of the board of the Australian Federal Government-owned Export Finance and Insurance Corporation (EFIC). He is a recipient of the Australian Federal Government's Centenary Medal.



Cav. Simon Mordant AO

Cav. 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 Museum of Contemporary Art in Los Angeles, 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.



Jeanne-Claude Strong

A Doctor of Medicine, Dr Strong also has a postgraduate degree in applied finance and investment and also holds a Bachelor of Arts in literature. She was formerly a board member of Bluearth. Among her many achievements, Dr Strong has flown her Beechcraft Baron aeroplane from California to Australia via Europe. She also races Etchells yachts and has had recent wins in the Australasian, Queensland and Victorian state championships.



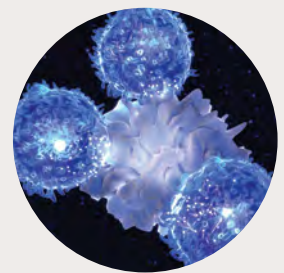
Wallis Graham (from July)

Ms Graham is a finance industry professional, with experience in funds management, corporate finance, private equity and investment banking. She is currently a director of Servcorp Limited, a member of the Board of Governors of the Wenona School, a director of the Wenona Foundation, a director of the Sydney Youth Orchestras, and a director of the John Brown Cook Foundation. She also holds a Senior Consulting role with Energy Capital Partners.



Geoff Raby AO (from July)

Mr Raby is Chairman and Founder of Geoff Raby and Associates and an Independent non-executive director of Yancoal and OcenaGold. He was Australian Ambassador to China (2007–11), DFAT Deputy Secretary responsible for North Asia and for Trade Negotiations (2003–07), APEC Ambassador, and Ambassador to the WTO. He was Head of the Trade Policy Issues Division at the OECD in Paris and Head of DFAT's Trade Negotiations Division. He also founded and led DFAT's East Asia Analytical Unit.



PhD Completions 2019

Congratulations to all Garvan students awarded PhDs in 2019.

At Garvan, we have 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.

Deborah Burnett

Supervised by Prof Chris Goodnow, Prof Robert Brink
"Investigation into immune tolerance"

Weiwen Chen

Supervised by Prof Jackie Center
"Fracture incidence and post fracture mortality in the 45 and Up Study"

Kee Ming Chia

Supervised by A/Prof Elgene Lim
"Targeting the androgen receptor in breast cancer"

Qian Du

Supervised by Prof Susan Clark, A/Prof Clare Stirzaker
"DNA replication timing: impact on the cancer genome and epigenome"

Alastair Duly

Supervised by A/Prof Antony Cooper
"Dysregulated miRNA Expression in Parkinson's Disease Results in Impaired Endocytosis, Mitochondrial Dysfunction and Lysosome Dyshomeostasis"

Katherine Giles

Supervised by Prof Susan Clark, Dr Phillipa Taberlay, Dr Joanna Achinger-Kawecka
"BRG1 ATP-Dependent Chromatin Remodelling in Prostate Cancer: Epigenetic Consequences"

Alisa Kane

Supervised by Prof Stuart Tangye, A/Prof Elissa Deenick
"Dissection of T-dependent B cell responses using novel mouse models of Primary Immunodeficiency"

Tomas Kavanagh

Supervised by A/Prof Antony Cooper
"The role of alternative splicing and long non-coding RNAs in Parkinson's disease"

Amali Mallawaarachchi

Supervised by Prof John Shine, Dr Mark Cowley
"Molecular Diagnosis in Inherited Polycystic Kidney Disease"

Priya Nair

Supervised by Prof Jackie Center
"Vitamin D in critically ill adult patients"

Simon Pelham

Supervised by Prof Stuart Tangye, A/Prof Elissa Deenick
"STAT3 Mediated Regulation of Human Antibody Responses"

Bethany Pillay

Supervised by Prof Stuart Tangye, A/Prof Cindy Ma
"The Role of DOCK8 in Human Lymphocytes"

Bethany Signal

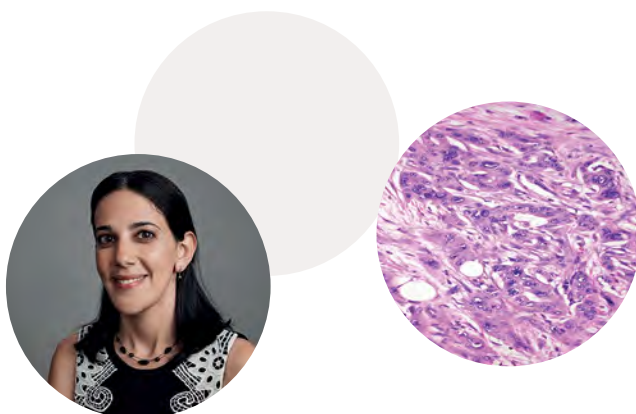
Supervised by Prof Marcel Dinger, Dr Brian Gloss
"Computational methods for annotation and analysis of RNA splicing in development and disease"

Scott Youten

Supervised by Prof Peter Croucher
"Defining the transcriptome of the osteocyte network"

Luxi Zhang

Supervised by Prof Roger Daly
"Global characterization of oncogenic kinase signalling"



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.

The Committee provides practical support, professional development and advice to members as a way of helping them network and collaborate with other post-doc researchers.

Members come from within Garvan's four main research themes as well as from the Victor Chang Cardiac Research Institute and St Vincent's Centre for Applied Medical Research. The committee meets once a month and holds a number of other events. In 2019 the Committee held:

- 2019 Annual Post Doc Symposium: More than 50 members in the St Vincent Precinct attended the gala event that brings together the brightest minds to share their research highlights with peers.
- 2019 Careers Forum, which attracted more than 80 attendees. Keynote speakers included respected academic researchers, as well as industry professionals.
- Educational seminars and skills development workshops, including a statistics education workshop and a series of information seminars for familiarisation with Precinct facilities.
- Social get-togethers and networking events.

2019 Post Doc Development Committee Members

Co-Chairs: Simon Junankar (Garvan, Cancer), Jeannette Villanueva (Victor Chang)

Secretaries: Jessica Chitty (Garvan, Cancer), Melissa Mangala (Victor Chang)

Treasurer: Simon Junankar (Garvan, Cancer)

Members: Sandy Stayte (St Vincent's Centre for Applied Medical Research), Aurélie Cazet (Garvan, Cancer), Jeng Yie Chan (Garvan, Healthy Ageing), David Herrmann (Garvan, Cancer), Aude Dorison (Victor Chang), Phuc Loi Luu, (Garvan, Genomics and Epigenetics), Niantao Deng (Garvan, Cancer), Jin Yan Yap (Garvan, Immunity and Inflammation), Yanchuan Shi (Garvan, Healthy Ageing).



From left to right: Jessica Chitty, Simon Junankar, Melissa Mangala, David Herrmann, Aude Dorison, Jeanette Villeneuve, Sandy Stayte, Jeng Yie Chan, Aurélie Cazet, Jin Yan Yap, Phuc Loi Luu, Niantao Deng (Yanchuan Shi absent)

Leaders in Science and Society seminars

We're grateful to the many insightful and inspiring speakers who presented at Garvan in 2019.

February

Prof Matthew Ellis, Baylor College of Medicine, US

March

Prof David Thomas, Cancer Research Theme Leader; Director of The Kinghorn Cancer Centre, Garvan Institute

Mr Robyn Williams AO, Journalist and Broadcaster, ABC

April

Prof John Rasko AO, Centenary Institute of Cancer Medicine and Cell Biology

Dr Tim Mercer, Lab Head, Transcriptomic Research, Garvan Institute

Prof Anushka Patel, Chief Scientist, The George Institute for Global Health

Prof Edward Holmes, Marie Bashir Institute for Infectious Disease & Biosecurity, Charles Perkins Centre, University of Sydney

May

Prof Bryan Williams, Research Group Head, Cancer and Innate Immunity, Hudson Institute of Medical Research

Prof Anthony Kelleher, Immunovirology and Pathogenesis Program, Kirby Institute, UNSW Sydney

June

Prof Vanessa Hayes, Lab Head, Human Comparative and Prostate Cancer Genomics, Garvan Institute

A/Prof Daniel MacArthur, Co-Director, Medical and Population Genetics, Broad Institute of Harvard and MIT, US

Prof John Shine, Lab Head, Molecular Genetics of Inherited Kidney Disorders, Garvan Institute

July

Mr Aiden Sarsfield, Head of Production Technology, Animal Logic

August

A/Prof Shane Grey, Lab Head, Transplantation Immunology, Garvan Institute

Prof Séan O'Donoghue, Lab Head, BioVis Centre, Garvan Institute

Prof Donna Farber, Chief, Division of Surgical Sciences and Professor of Microbiology and Immunology, Columbia University New York, US

Dr Robert Weatheritt, Lab Head, Neurotranscriptomics, Garvan Institute

September

Dr Axel Timmermann, Director, IBS Center for Climate Physics (ICCP), Pusan National University, South Korea

Prof Fiona Wood, Director, Burns Service of WA

Dr Vishva Dixit, Genentech, US

Dr Ozren Bogdanovic, Lab Head, Developmental Epigenomics, Garvan Institute

October

Prof Nalini Joshi, School of Mathematics and Statistics, Faculty of Science, University of Sydney

Prof Bruce Neal, Deputy Executive Director, George Institute Australia

Dr Marina Pajic, Lab Head, Personalised Cancer Therapeutics, Garvan Institute

November

Dr Christine Chaffer, Lab Head, Cancer Cell Plasticity, Garvan Institute

Dr Drew Berry, Biomedical Animator, Walter and Eliza Hall Institute





In Memoriam



In honour of the late Mr Pieter Huveneers (1925-2017)

In 2019 Garvan gratefully received a very generous bequest from the late Mr Pieter Huveneers. Pieter was a revolutionary and world renowned pioneer of design. Born in Utrecht in 1925, he established a successful career in Europe and the UK, then migrated to Australia in the 1960s. His passion and brilliance for impactful corporate identity transformed Australian design culture and our visual landscape. As the head of Huveneers Pty Ltd, Pieter delivered inspiring corporate identity projects for over 70 major Australian companies including the enduring icons of Australia Post, Dulux, Westpac and Telecom (now Telstra), to name just a few. His success was driven by his enduring curiosity to find innovative and artistic solutions that combined organisational and behavioural psychology into fluid, cohesive commercial systems.

As an entrepreneur and innovator himself, Pieter was fascinated by the breakthrough medical research being undertaken at Garvan and spent many hours with our then Executive Director, Professor John Shine AO, exploring and later investing in our leading edge technologies. Pieter was a very loyal and active member of our Garvan family; not only did he give generously during his lifetime; he went a step further by including a significant bequest in his Will to Garvan's research.

Pieter passed away at 92 years of age in June 2017 after living with Alzheimer's disease and he is very much missed by his beloved family, friends and peers around the world.

Garvan is proud to have known Pieter and will always be grateful to him and his family for his curiosity, creativity and his farsighted generosity.



In celebration of the life of the late Neville Holmes Grace (1928 - 2017)

The Garvan Institute, along with the St Vincent's Curran Foundation, was the beneficiary of a remarkably generous bequest from Sydney lawyer, company director and philanthropist, the late Neville Holmes Grace, in 2019.

During his life, Neville was known for his formidable intellect, his deep love for the artistic endeavour, and his unwavering dedication and kindness to his friends and family. But it is his brilliant wit and mischievous sense of humour that his loved ones speak of most.

Neville's deep love of nature was nurtured by time split between his Eastern Suburbs apartment and his Leura hideaway, where he was regularly joined by his partner and close friends. An adventurous and frequent traveller, Neville was particularly fond of New Zealand, and of Scotland. As a fifth generation Australian, whose forebears had emigrated as shepherds from Skye at the time of the 'Highland Clearances', Neville remained closely connected to his Scottish roots.

Neville leaves behind long-term partner, Tom Longford, a large group of life-long friends, and a phenomenal philanthropic legacy that spans medical research, health, the arts and his proud Alma Mater, the University of Sydney.

Garvan is remarkably privileged to have benefited from Neville's philanthropic investment. His generous foresight has left an invaluable legacy to the Institute, and to the future of healthcare.

Vale Neville Holmes Grace.



*Neville with his partner
Tom Longford at the
Glyndebourne Opera 2017*

Mr Rick Stevens

The future of medical research is in good hands.

Rick Stevens has spent more than 50 years as an educator. Now, as a Garvan *Partner for the Future*, he is leaving a legacy for future generations.

Rick remains active in a number of professional organisations, supervises undergraduate student teachers, tutors mathematics, is a volunteer special religious teacher and chaired the Council of a Sydney Anglican school for 20 years. To say he is passionate about education is an understatement.

Rick first became acquainted with Garvan's work through an association with the late Professor Rob Sutherland's family (head of Garvan's Cancer Program for 27 years, and inaugural Director of The Kinghorn Cancer Centre). The more he learnt about Garvan's work and breakthroughs, the more he wanted to contribute. So, Rick decided to start making an annual donation. He said, *"I was impressed by the way Garvan kept donors informed about its research and discoveries. I also found the seminars to be very informative. I particularly appreciate the way Garvan scientists can speak about their highly complex research, but make it simple and easy to understand."*

When the time came for Rick to review his Will, he decided to leave a bequest to some medical charities, of which Garvan is one. Since then he has been impressed by the way Garvan embraces its *Partners for the Future* (those who have left a lasting legacy to medical research by including a bequest in their Will).

Due to experiences of family, friends and even some of his students, Rick has an interest in a number of the disease areas researched at Garvan: from cancer, type 2 diabetes and obesity, to osteoporosis, arthritis, and dementia. Rick is pleased to be playing a role in helping to unlock the secrets to these devastating diseases.

"Every time I visit Garvan, I am reminded of what an amazing place it is. What really strikes me is the age range of the scientists. From those who have recently graduated through to world-class senior scientists. It is encouraging to know that the future of medical research will be in good hands, and that I am playing a small part."

– Mr Rick Stevens



Mr Rick Stevens

Partners for the Future

We extend our gratitude to all of these wonderful supporters who have chosen to leave a bequest to Garvan in their Will.

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Ms Ronelle Adams
Mr Ray Addison
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 Dr Harry Marget
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 Miss Margaret J Martin
 Miss Denise Martin
 Mrs Doreen N.E. Martin
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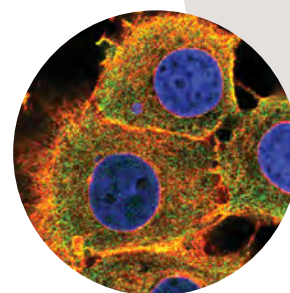
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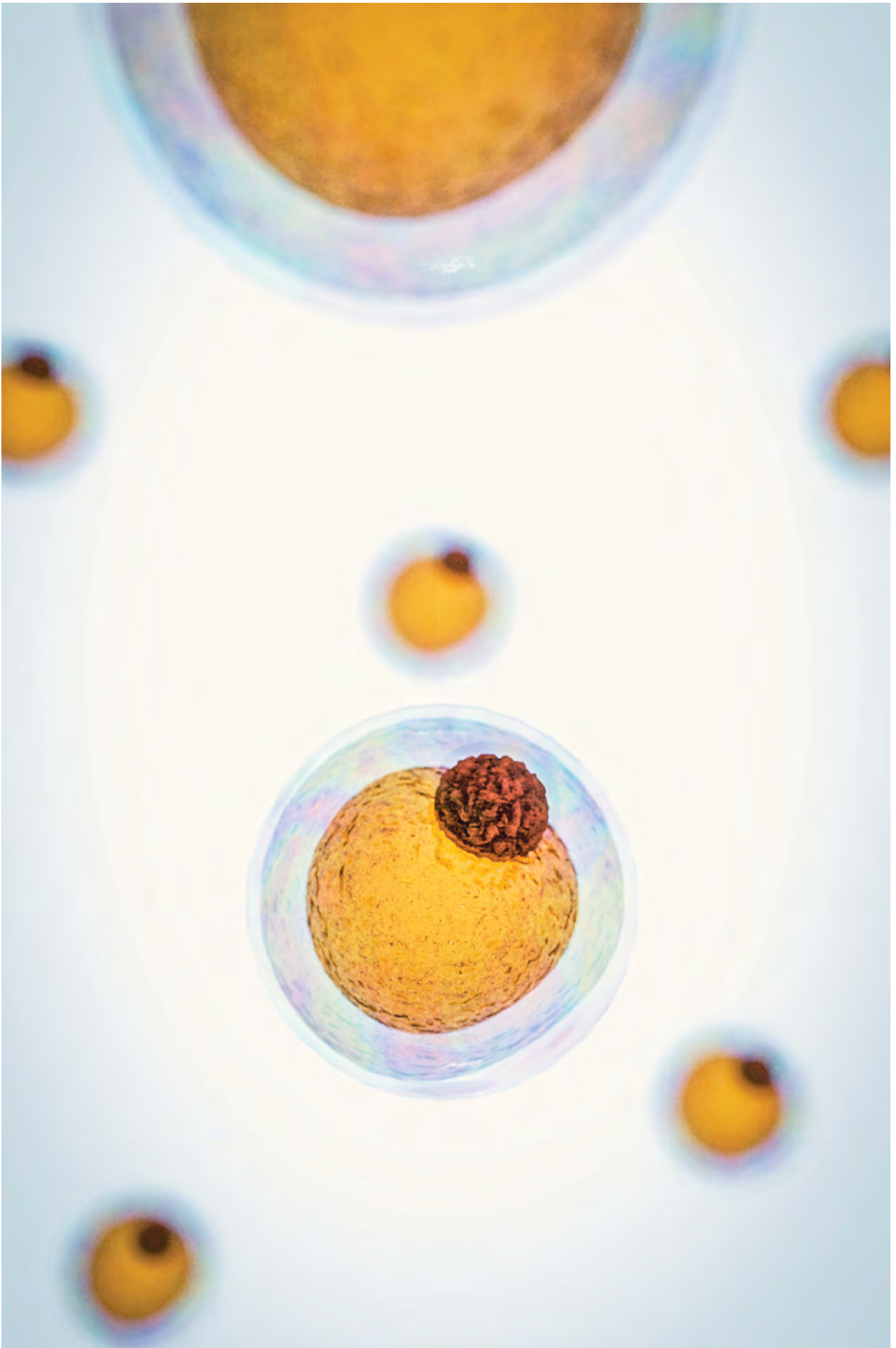
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Our generous supporters come from all walks of life and give in various ways. They have different reasons for supporting Garvan, but they're all committed to helping achieve our vision.

Our heartfelt appreciation goes to all those who supported Garvan in 2019.

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 Estate of the Late Sandra Turbull
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 Estate of the Late Nola Wagner
 Estate of the Late William Wood

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 Dr Elissa Deenick
 Mr Lindsay Leeser
 Miss Lucia Robson
 Miss Natasha Shah



Celebrating pioneering partnerships

Garvan's corporate partners are passionate about accelerating innovative medical research, helping to create a healthier future for everyone.

Fast tracking cancer research globally

For the past six years, the Vodafone Foundation have been supporting Garvan's cancer research. In 2015, Garvan and Vodafone launched DreamLab, a multi award-winning app, which uses the processing power of idle smartphones to crunch necessary data for research projects – all while a user sleeps. Since launching in Australia, DreamLab has gone global – launching in New Zealand, the UK, Romania and Italy.

Vodafone's support of Garvan has since expanded to a deep partnership, spanning multiple projects including support for the Australian Genomic Cancer Medicine Program, and the Molecular Screening and Therapeutics program.

"Garvan's research is at the forefront of innovation and technology – with the potential to dramatically improve the landscape of Australia's health. We are hugely proud to have partnered with the Institute for more than six years, enabling exploration of ways technology can power and drive genomic cancer medicine. We are excited about the future of Australia's health with Garvan at the helm."

– Alyssa Jones, Head of the Vodafone Foundation Australia.

Jewellery with purpose

In support of the Garvan Institute, Paspaley created the exclusive Kimberley Bracelet – inspired by the rugged beauty of Australia's north-west, featuring sandalwood and hand-selected Australian South Sea pearls unique to the Kimberley. Since 2016, Paspaley has generously donated a percentage of the proceeds from the sale of each bracelet to Garvan's MoST program.

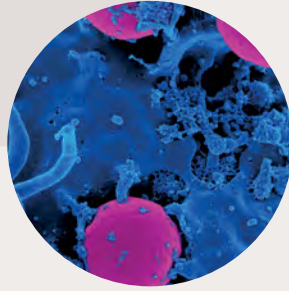
Garvan's Molecular Screening and Therapeutics (MoST) program matches patients with rare and less common cancers who have exhausted all other treatment options, to therapies based on their DNA. The findings from the MoST program will inform future models of personalised medicine as well as more efficient, successful evaluations of new treatments.

"Garvan's program has the potential to significantly improve the survival rate of cancer sufferers globally, now and for all future generations. This is world-changing and exciting. We feel privileged to be able to be part of it."

– Chris Paspaley, Director of Merchandise, Retail at Paspaley.



PASPALLEY



Driving pancreatic cancer research

The Sutton family, both personally and through Sutttons Motors, have been generously supporting Garvan's research for over 28 years. This long-term investment in medical research first began with the late Sir Frederick Sutton OAM, and continues today with Laurie and Di Sutton – Life Governors of Garvan and Visionary Donors of the Garvan-Weizmann Centre of Cellular Genomics.

To mark World Pancreatic Cancer Day on 21 November 2019, Sutttons announced their funding for Professor Paul Timpson's innovative pancreatic cancer research. Professor Timpson and his team are using cutting-edge imaging technology to pinpoint the molecular drivers of pancreatic cancer progression and the factors in the tumour environment that cause resistance to the therapy. The treatment and survival of patients with pancreatic cancer has barely changed for more than 30 years due to the complexity and molecular variation of pancreatic cancer. With a five-year survival rate of only ~9%, the work undertaken by Professor Timpson is critical.

"As a family, pancreatic cancer is a disease that unfortunately is very close to our hearts, and we are honoured to support this ground-breaking research. As a company, Sutttons is incredibly proud of our long-standing relationship with Garvan, and their inspirational people, who are making a profound impact on the future of healthcare."

– Lauren Sutton, Charity Partnerships Manager at Sutttons.

Sutttons

Race to Survive 2019

Accor's Community Fund is committed to investing in building healthy families across Australia, focusing on three key areas of community investment – youth, health & wellbeing, and inclusion. As part of Accor's focus on health in the community, they have been supporting Garvan's Molecular Screening and Therapeutics (MoST) program, focusing on its Doublet Immunotherapy sub-study.

Accor's employees are highly engaged with their fundraising efforts, with a number of staff-led activities, culminating in their largest bi-annual fundraising event 'Race to Survive', which took place in October 2019. Accor's partnership with Garvan has enabled an additional 48 patients to be included in the MoST program. Positive outcomes from the sub-study, could allow thousands of Australians with rare or less common cancers access to further treatment options.

"Accor fundamentally believes that Garvan can help in our quest to help build healthy families across the country. As the pre-eminent medical research institute in the country, Accor has chosen to support MoST, to focus our energy and resources in a less prominent area of research, and we've seen some very promising results during our partnership."

– Marc Bennie, General Manager, Indigenous Programs & Community Investment.





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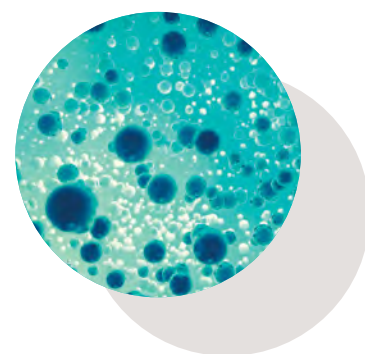


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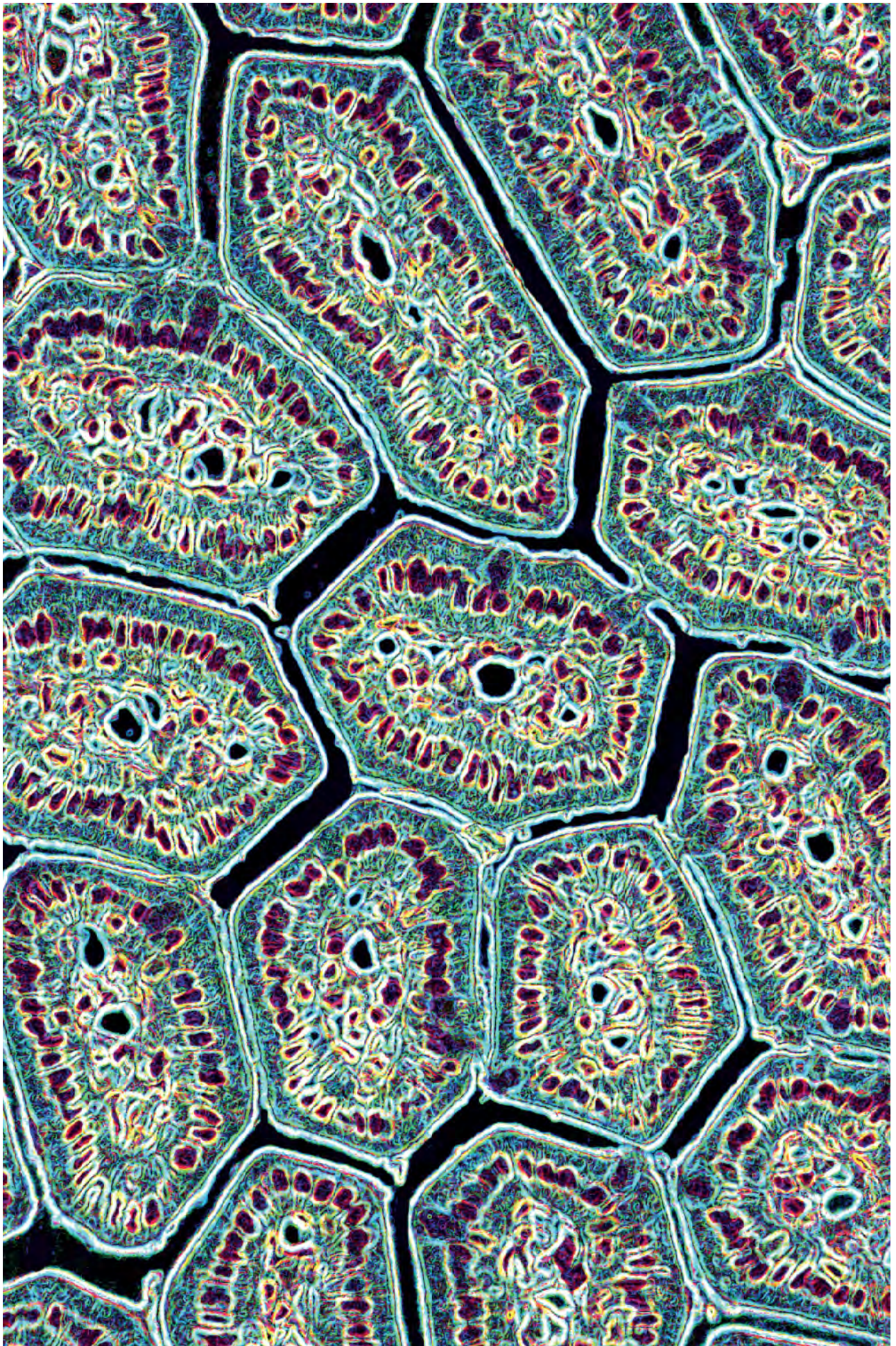
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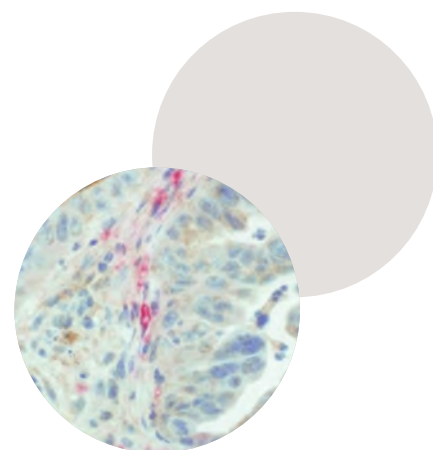
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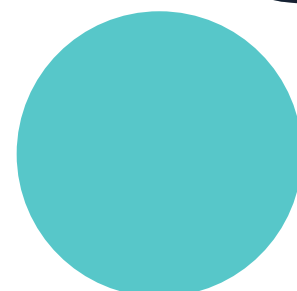
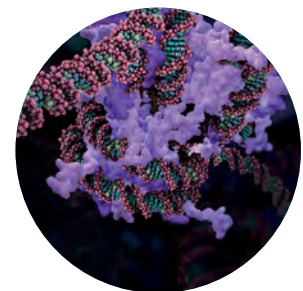
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Peer-reviewed funding



From the Chief Scientific Officer
Professor Marie Dziadek

To support their own salaries and research work, it is essential for our researchers to receive competitive fellowship and grant funding from the National Health and Medical Research Council (NHMRC) and other funding bodies.

Peer reviewed grants are selected in a highly competitive process. Panels of expert scientists assess applications and rank them on scientific merit and the innovative nature of the research and its potential impact, as well as the track record of the investigators.

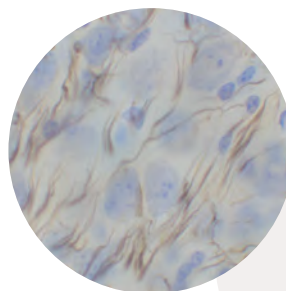
If successful, these grants demonstrate how highly the applications are regarded by our peers in the medical research sector. However, competition for the available money is extremely high and only a small proportion of applications are funded in each round due to budget limitations.

Garvan researchers had a strong year in 2019 with a 20% success rate for NHMRC Investigator Grants, compared to the national average of 13%, and a success rate of 13.9% for Ideas Grants compared to the national average of 11%.

With researchers spending many months preparing their grant applications, it is always a hard time when outcomes are announced and many high quality proposals remain unfunded.

Community support, fundraising and the contributions of Garvan's donors are absolutely crucial to supporting all of our researchers' in their excellent work. Philanthropy enables our researchers to both continue their important research and embark on new innovative research paths until they are able to acquire competitive grant funding.

Garvan researchers had a strong year in 2019 with a 20% success rate for NHMRC Investigator Grants, compared to the national average of 13%, and a success rate of 13.9% for Ideas Grants compared to the national average of 11%.



Garvan-led grants 2019

Peer-reviewed funding

Funding Body	Type of Grant	Principal Investigator	Co-Investigators	Project Title	Amount Funded	Years of Funding
Allergy and Immunology Foundation of Australasia	Primary Immunodeficiencies Clinical Research Grant	Tri Phan	Stuart Tange Leslie Burnett Warren Kaplan	Using machine-learning to improve the diagnostic accuracy and genotype-phenotype correlations in Primary Immunodeficiency Diseases	\$25,000	1
Amgen Inc	Sponsored Research Project	Dana Bliuc		The impact of osteoporosis treatment in the full spectrum of "real world" patients	\$140,114	1
	Sponsored Research Project	Tuan V. Nguyen		Development of a clinico-genetic model for predicting fracture and post-fracture mortality	\$146,887	1
Avner Pancreatic Cancer Foundation Ltd	Innovation Grant	Shane Grey	Megan Barnett Simon Barry (University of Adelaide)	Next steps in harnessing a novel 'tuneable' immune check point to enhance the immunogenicity of anti-pancreatic ductal adenocarcinoma	\$99,642	1
	Innovation Grant	Tatyana Chtanova	Paul Timpson Andrew Yam Shane Grey	Developing new immunotherapies for pancreatic cancer	\$99,962	1
Cancer Australia (funded by Cure Cancer)	Priority-driven Collaborative Cancer Research Scheme: Early Career Researcher Project Grant	Niantao Deng		Understanding breast cancer patients' response to neoadjuvant chemotherapy at single-cell resolution	\$200,000	3
Cancer Council NSW	Project Grant	Alex Swarbrick	Sandra O'Toole	New immunotherapies for metastatic breast cancer	\$448,718	3
	Project Grant	Michelle McDonald		Live tissue imaging reveals insight into bone and tumour cell communication: Implications for bone targeted therapeutic control of cancer growth in bone	\$447,548	3
	Project Grant	Joanna Achinger-Kawecka		Using epigenetic therapies to overcome endocrine resistance in breast cancer	\$434,310	3
Diabetes Australia Research Trust	General Grant	Yanchuan Shi		Turning up the heat on obesity and diabetes, the role of Y1 receptors in brown fat activity	\$60,000	1
	General Grant	Trevor Biden	Kazunori Imaizumi (Hiroshima University, Japan)	A novel mechanism for co-ordinating insulin secretion and biosynthesis in pancreatic beta cells	\$60,000	1
Ipsen Pty Ltd	Research Grant	Ann McCormack	Lydia Lamb	Pituitary tumours and the immune system: Investigating the role of immunotherapy for aggressive pituitary tumours	\$40,000	3
National Breast Cancer Foundation	Investigator Initiated Research Scheme	Mun Hui	Niantao Deng Alex Swarbrick Simon Junankar	Understanding breast cancer patients response to neoadjuvant therapy at single-cell resolution	\$149,930	2

Funding Body	Type of Grant	Principal Investigator	Co-Investigators	Project Title	Amount Funded	Years of Funding
National Breast Cancer Foundation	Investigator Initiated Research Scheme	David Croucher	Paul Timpson Peter Mace (University of Otago, New Zealand) Chiara Pantarelli Thomas Cox Sharissa Latham	Preventing relapse of triple-negative breast cancer through targeting oncogenic JNK	\$387,118	3
National Foundation for Medical Research and Innovation	Research Grant	Jim Blackburn	Luke Hesson	Improving sarcoma cancer diagnostics through implementation of a novel fusion gene test	\$144,865	2
National Health and Medical Research Council	Boosting Dementia Research Grant: Implementing Dementia Risk Reduction and Prevention Research	Katherine Samaras	Perminder Sachdev (UNSW Sydney) Maria Fiatarone Singh (University of Sydney) Henry Brodaty (UNSW Sydney) Richard Day (UNSW Sydney) Peter Macdonald (St Vincent's Hospital Sydney) Wei Wen (UNSW Sydney) Nicole Kochan (UNSW Sydney) Steve Makkar (UNSW Sydney) Jose Luchsinger (Columbia University Medical Center, USA)	Preventing cognitive decline with metformin: a randomised controlled trial.	\$1,998,025	5
	Ideas Grants	Chris Ormandy		Building the first mouse model of ER+ breast cancer.	\$567,543	3
	Ideas Grants	Max Nobis		Cdk4/6 and Cdk1 inhibition in breast cancer: intravital insights to overcome Cdk4/6 Palbociclib resistance <i>in vivo</i> using Cdk1-FRET biosensor mice technology	\$596,520	3
	Ideas Grants	Shane Grey	Tatyana Chtanova	A20: a key immune regulator of homeostasis, protective immunity and autoimmune disease	\$609,968	4
	Ideas Grants	Christine Chaffer		Targeting cellular plasticity to treat triple-negative breast cancer	\$723,856	3
	Ideas Grants	Joanne Reed		Do somatic genetic events drive autoimmune disease pathogenesis?	\$889,710	4
Sony Foundation Australia and Tour de Cure	Sony Foundation Virtual Reality Cancer Research Grant	Séan O'Donoghue	Mark Cowley (Children's Cancer Institute Australia) David Thomas	Visualizing cancer mechanisms in VR	\$240,000	1

Garvan-led grants 2019

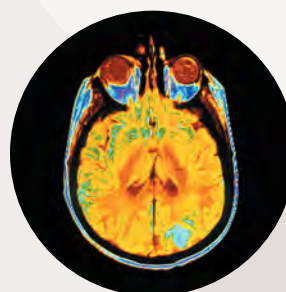
Peer-reviewed funding

Funding Body	Type of Grant	Principal Investigator	Co-Investigators	Project Title	Amount Funded	Years of Funding
SPHERE: The Sydney Partnership for Health, Education, Research and Enterprise	Infection, Immunity and Inflammation Group Grant Scheme	Elissa Deenick	Alisa Kane (St Vincent's Hospital)	Secondary immunodeficiency in autoimmune disease - identifying novel immune signatures and improving patient outcomes	\$75,000	1
St Vincent's Clinic Foundation	Research Grant	Mike Rogers	Marcia Munoz Mark Danta (St Vincent's Hospital)	KAVAN RESEARCH GRANT: New approaches to understand and treat bowel inflammation in a childhood autoinflammatory disease	\$50,000	1
	Research Grants	Tri Phan	Kathy Wu (St Vincent's Hospital) Alisa Kane (St Vincent's Hospital) Jerry Greenfield Mark Danta (St Vincent's Hospital) Stuart Tangye	Mechanism-based precision medicine of diseases of immune dysregulation	\$40,000	1
	Research Grant	Max Nobis	Liz Caldon Paul Timpson Sandra O'Toole Elgene Lim	THELMA GREIG CANCER GRANT: Imaging CDK4/6 and CDK1 inhibition live <i>in vivo</i> to overcome Palbociclib resistance in breast cancer.	\$50,000	1
	Research Grant	Ann McCormack	Maya Kansara Lydia Lamb	Pituitary tumours and the immune system: Investigating the role of immunotherapy for aggressive pituitary tumours	\$40,000	1
	Research Grant	Jerry Greenfield	Jennifer Snaith Dorit Samocha-Bonet Deborah Jane Holmes-Walker (Westmead Hospital) Christian Girgis (Westmead Hospital)	TANCRED RESEARCH GRANT: INTIMET - Insulin resistance in Type 1 Diabetes managed with metformin	\$50,000	1
	Research Grant	Elysse Filipe	Miguel Santos (University of Sydney) Thomas Cox Steven Wise (University of Sydney) Elgene Lim	K&A COLLINS CANCER GRANT: Drug-carrying nanoparticles as the future of metastatic breast cancer treatment	\$50,000	1
	Research Grant	Jacqueline Center	Simon Ghaly (St Vincent's Hospital) Dana Bliuc	Predicting bone loss in patients with inflammatory bowel diseases	\$25,000	1
	De Angeli Cancer Research Grant	Venessa Chin		Using the power of single cell sequencing to change the management of lung cancer	\$300,000	3
Sydney Catalyst	Pilot and Seed Funding Grant	David Herrmann		Intravital imaging to overcoming pancreatic cancer resistance to immunotherapy	\$46,875	1
Sylvia and Charles Viertel Foundation	Clinical Investigator Award	Amali Mallawaarachchi		Investigating novel disease mechanisms in Autosomal Dominant Polycystic Kidney Disease	\$85,000	1
UNSW Sydney	3Rs Grant Scheme	David Gallego-Ortega		ALTEN: a biomimetic <i>in situ</i> platform as an alternative to animal testing for personalised medicine	\$65,000	1

Collaborative grants led by other institutions

Peer-reviewed funding

Funding Body	Type of Grant	Admin Institution	Garvan Investigator	Co-Investigators	Project Title
Australian Research Council	Discovery Project	Queensland University of Technology	Susan Clark	Lyn Griffiths (Queensland University of Technology) Rodney Lea (Queensland University of Technology) Heidi Sutherland (Queensland University of Technology) John Blangero (University of Texas, USA)	Characterising inheritance patterns of whole genome DNA methylation
	Discovery Project	UNSW Sydney	Robert Weatheritt	Irina Voineagu (UNSW Sydney)	Investigating the biogenesis and function of circular RNAs in the brain
Juvenile Diabetes Research Foundation	Beta Cell Replacement Innovative Awards 2019	UNSW Sydney	Shane Grey	Ewa Goldys (UNSW Sydney)	Noninvasive assessment of islet cells
Macular Disease Foundation Australia	Collaborative Research Grant	University of Melbourne	Joseph Powell	Alice Pebay (University of Melbourne) Robyn Guymer (Centre for Eye Research) Alex Hewitt (Centre for Eye Research)	Modelling geographic atrophy using human induced pluripotent stem cells
National Breast Cancer Foundation	Investigator Initiated Research Scheme	University of Adelaide	Elgene Lim	Theresa Hickey (University of Adelaide) Wayne Tilley (University of Adelaide) Shudong Wang (University of South Australia) Luke Selth (Flinders University)	Targeting CDK9 in triple negative and endocrine-resistant breast cancers
The Australian Government and the Movember Foundation collaboration	Prostate Cancer Research Alliance	University of Melbourne	Vanessa Hayes	Niall Corcoran (University of Melbourne) Margaret Centenera (South Australian Health and Medical Research Institute) Ian Collins (South West Warrnambool Hospital) Anthony Papenfuss (Walter and Eliza Hall Institute) Belinda Parker (Peter MacCallum Institute) Ben Tran (Walter and Eliza Hall Institute) Paul Boutros (UCLA, USA) Robert Bristow (University of Manchester, UK) Rosalind Eeles (Institute of Cancer Research, UK) Christopher Sweeney (Dana-Farber Cancer Institute, USA)	PRECEPT - PRostatE CancEr Prognosis and Treatment



Fellowships and scholarships 2019

Peer-reviewed funding

Funding Body	Type of Award	Awardee	Project Title	Amount Funded	Years of Funding
Cancer Institute NSW	Early Career Fellowship (Clinical)	Anthony Glover	The Endocrine Cancer Research Program	\$540,000	3
Medical Research Future Fund	Investigator grant (EL2)	Ira Deveson	Developing synthetic DNA reference standards (sequins) to ensure accuracy in emerging genomic techniques	\$1,443,588	5
National Health and Medical Research Council	Investigator grant (EL1)	Deborah Burnett	Investigation of strategies utilised by B cells to neutralise pathogens mimicking self antigens	\$639,750	5
	Investigator grant (EL1)	Qian Du	Impact of epigenetic change on cancer genome instability	\$639,750	5
	Investigator grant (L1)	Joseph Powell	The genetic control of complex diseases at a cellular level	\$3,103,030	5
	Investigator grant (L3)	Stuart Tangye	Molecular regulation of human immunity in health and diseases	\$2,701,595	5
	Postgraduate Scholarship (Medical)	Jennifer Snaith	Characterising Liver and Muscle Insulin Resistance in Type 1 Diabetes: Towards Targeted Treatment with Metformin	\$94,406	2
Royal Australasian College of Physicians	Research Entry Scholarship	Karman Pathmanandavel	Revealing the molecular mechanisms of human B cell memory in health and disease with single-cell RNA-sequencing	\$21,000	1
Sydney Catalyst and the Lung Foundation Australia	Co-funded PhD Scholarship in Lung Cancer	Jennifer Lim	Biomarkers for precision treatment in metastatic lung cancer	\$120,000	3

Equipment grants 2019

Peer-reviewed funding

Funding Body	Type of Grant	Project Title	Principal Investigator	Co-Investigators	Amount Funded
Australian Research Data Commons	Discovery Activities: Storage and Compute Infrastructure	Costs of running Production Genomics Workflows on premise as well as on Commercial Clouds	Warren Kaplan		\$36,000
	Discovery Activities: Storage and Compute Infrastructure	Garvan's love-hate relationship with commercial clouds	Warren Kaplan		\$36,000
UNSW Sydney	Research Infrastructure Scheme	Establishing the UNSW Mitochondrial Profiling Centre	Andrew Philp	Nigel Turner (UNSW Sydney) Carsten Schmitz-Peiffer Yanchuan Shi Dorit Samocha-Bonet Paul Timpson Thomas Cox Christine Chaffer Liz Caldon Michelle McDonald Michael Rogers	\$192,780

Join the Garvan family

Our research relies on the generous support of our community, which enables our researchers to push the boundaries of medical research – and find better diagnostics and personalised treatments for some of the most devastating diseases.

Donations are a catalyst for the research that unlocks the secrets of the biology of disease. Every donation makes an impact and can be done through various ways.

Donate once: A donation, no matter how big or small, can help our scientist continue to do their crucial work. You can easily donate online or by phone.

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Make a major gift: Major gifts can be made in a variety of ways according to your personal situation and preferences. You can choose to give personally, via a Private Ancillary Fund, through a trust or foundation, or through your Will.

Leave a gift in your Will: Become a Garvan *Partner for the Future* by including a gift in your Will and leave a lasting legacy of longer, healthier lives for future generations.

Donate through your pay: Workplace giving is a simple and tax-effective way for employees to make regular donations to Garvan's medical research directly from their pay.

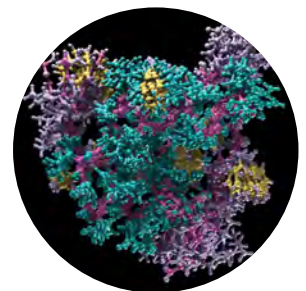
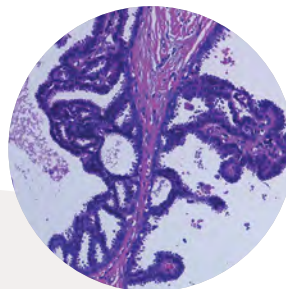
Fundraise for Garvan: Fundraising can be a fun and rewarding team-building exercise at your school or work, or even a fitness goal. It doesn't take much to be a hero and help raise funds for medical research.

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Financial highlights

Statement of financial position as at 31st December 2019

Profit and loss statement

Revenue	2019	2018	Expenditure on research activities	2019	2018
	A\$'000	A\$'000		A\$'000	A\$'000
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Fundraising and grant income			Sequencing consumable expense	4,603	5,466
NHMRC fellowships, scholarships and other grants	14,303	19,526	Employee benefits expense	54,266	57,386
Peer-reviewed research grants	12,480	12,200	Other research expenses	15,901	10,278
NSW government grants	6,201	7,169	Depreciation and amortisation expense	7,869	11,302
Other grants	20,493	5,992	Administration expense	6,744	10,344
Commercial partnership grants	0	246	Fundraising expenses	2,600	3,244
Donations received	54,620	41,148	Building and scientific expenses	10,463	8,862
UNSW contribution	3,910	3,977	Finance costs	809	715
Software licencing revenue	0	816	Total expenses	103,255	107,597
	112,007	91,074	Total comprehensive income/ (loss) for the year	29,283	(332)
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Other income					
Revenue from contracts with customers	14,579	15,878			
Investment/interest income	6,154	435			
Share of losses of associates accounted for using the equity method	(11)	(211)			
Net (loss)/gain on foreign exchange	(191)	89			
	20,531	16,191			
Total revenue	132,538	107,265			
<hr/>			<hr/>		

Balance sheet

Assets	2019	2018	Liabilities	2019	2018
	A\$'000	A\$'000		A\$'000	A\$'000
Current assets			Current liabilities		
Cash and cash equivalents	23,764	47,055	Lease liabilities	881	0
Trade receivables	6,027	5,312	Trade and other payables	9,917	8,567
Financial assets at fair value through profit and loss	37,000	33,018	Borrowings	0	159
Financial assets at amortised cost	10,010	9,236	Employee benefit obligations	6,273	5,684
Sequencing Consumables	1,043	1,196	Deferred Revenue	4,433	1,733
Term Deposits	44,530	0	Total current liabilities	21,504	16,143
Other current assets	1,045	1,536	Non-current liabilities		
Biological assets	521	531	Lease liabilities	7,107	0
Total current assets	123,940	97,884	Employee benefit obligations	1,076	1,098
Non-current assets			Borrowings	0	12,266
Property, plant and equipment	73,104	82,513	Trade and Other Payables	0	906
Investments accounted for using the equity method	50	61	Total non-current liabilities	8,183	14,270
Right-of-use assets	11,796	0	Total liabilities	29,687	30,413
Intangibles & others	225	100	Net assets	179,428	150,145
Total non-current assets	85,175	82,674	Equity		
Total assets	209,115	180,558	Reserves	121,525	106,409
			Retained surplus	57,903	43,736
			Total funds	179,428	150,145

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.



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