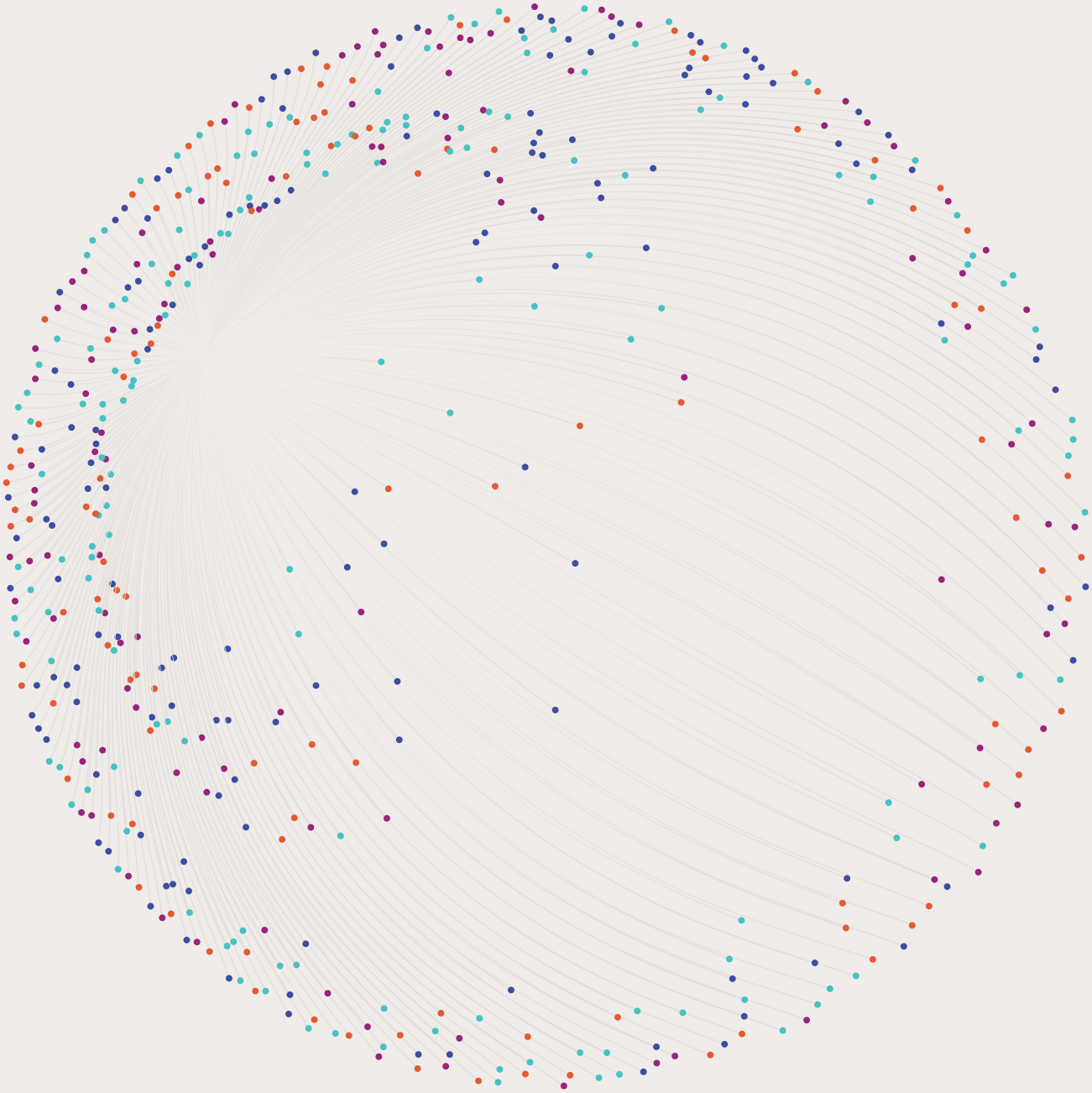
Annual Report
2020

Garvan Institute
of Medical Research

2020: Global collaboration inspired by adversity

The year of 2020 was one of the most challenging of our generation. We saw unrivaled perseverance and rapid adaptation from our dedicated scientists and support staff. Together, we made invaluable contributions to the fight against a global health crisis, and made significant strides in our existing research portfolios.



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 medical researchers with clinicians and the best technology. 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.

Organisation structure

As at 31 December 2020

Garvan Institute of Medical Research

Board of Directors

Chair: Dr John Schubert AO

Executive

Executive Director: Prof Chris Goodnow FAA FRS
Deputy Director: Prof Peter Croucher
Chief Scientific Officer: Prof Marie Dziadek
Chief Operating Officer: Nat McGregor (from March)

Research themes

Cancer

Head:
Prof David Thomas
Acting: Prof Paul Timpson
Faculty:
Prof Chris Ormandy
A/Prof Alex Swarbrick
Prof Elgene Lim
A/Prof Marina Pajic
A/Prof Joseph Powell
A/Prof Christine Chaffer
A/Prof David Croucher

The Kinghorn Cancer Centre

Director: Prof David Thomas

Genomics and Epigenetics

Head:
Prof Susan Clark FAA FAHMS
Faculty:
Prof Vanessa Hayes
Prof Sean O'Donoghue
Prof Daniel MacArthur
A/Prof Timothy Mercer
A/Prof Ozren Bogdanovic
Dr Robert Weatheritt
Emeritus Fellow:
Prof John Shine FRS AC FAA

Healthy Ageing

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

Immunity and Inflammation

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

Kinghorn Centre for Clinical Genomics

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

Garvan Research Foundation

Board of Directors

Chair: Dr Russell Scrimshaw

Executive

Director: Mara-Jean Tilley
Deputy Director: Brad Timms

Garvan-Weizmann Centre for Cellular Genomics

Head: A/Prof Joseph Powell

Development & Support

People and Culture:
Cleo Rowley

Australian BioResources:
Dr Jenny Kingham

Business Development & Innovation:
David Barda

Finance & Accounting:
Samantha Malone

Internal Audit & Business Improvement:
Carolyn Loughnan

Information Technology:
Esteve Mayolas

Legal Office:
Nancy Campisi

Building Services:
Lynn Croft

Engineering Services:
Ryan Kolster

Facilities:
Amanda Brindley

Scientific Support Services:
Dr Rebecca Brown

WHS and Compliance:
Dr Kharen Doyle

Chief Scientific Officer:
Prof Marie Dziadek

Grants Administration:
Sonja Bates and
Mariëtte Le Roux

Human Research Governance:
Therese Yim

Animal Ethics:
Dr Rayson Tan

Animal Welfare:
Dr Vivian Song

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 2020

Across the globe, 2020 was a watershed year for medical research. This has indeed been the case for the Garvan Institute of Medical Research.

Dr John Schubert AO
Chairman

Professor Chris Goodnow FAA FRS
Executive Director

Early in the year, the world collectively faced one of the greatest challenges of our time. The COVID-19 pandemic initiated an unprecedented global research effort. At Garvan, our researchers responded immediately, utilising their excellence in antibody research, immunology, cellular genomics and whole genome sequencing against COVID-19.

The efforts of Garvan researchers in driving or collaborating on projects locally and globally to develop new ways to treat and prevent infection, and to learn more about virus strains, and inform global treatment strategies, is a source of immense pride.

As you'll read on page 25, researchers from Garvan and the Kirby Institute at UNSW Sydney established and validated the most rapid coronavirus genome sequencing strategy in Australia to date. This rapid sequencing allows the earlier linking of cases which is critical to successful contract tracing. The team continues to assist NSW Health in COVID-19 contact tracing well into 2021 in this regard and has assisted other Australian health teams to implement the method.

Yet despite the pandemic, the devastating human impact of other diseases has not lessened. We have maintained our critical research programs in cancer, immune diseases, osteoporosis, brain diseases, endocrine diseases and human genome biology, among others with many important breakthroughs during the year.

The ultimate goal of each initiative at Garvan is to lead to benefits for patients in Australia and worldwide. In 2020, Garvan researchers published 392 research articles to advance our collective understanding of human biology and disease. We worked within the boundaries of COVID-19 to run clinical trials, ensuring patients could access the treatments they needed. Many of these were covered in the media.

This year, Garvan welcomed Nat McGregor to the role of Chief Operating Officer and saw Professors Katherine Samaras and Paul Timpson take acting roles as Theme Leaders of Healthy ageing and Cancer research, respectively. Professors Peter Croucher and David Thomas retain their leadership at Garvan as Deputy Director of the Institute and Director of The Kinghorn Cancer Centre, and we thank them sincerely for their contributions as Theme Leaders.

Professor Marie Dziadek, Garvan's Chief Scientific Officer, finished her role in December after nine years of service. We are grateful for Professor Dziadek's immense expertise and passion for science throughout this time.

Our Board of Directors, who volunteer their time and knowledge to support Garvan, provided crucial guidance in our navigation of COVID-19. We also acknowledge and thank the generous individuals, groups and organisations that form the Garvan family. Without your philanthropic support of Garvan, we would not be able to achieve our vision: to make the discoveries that improve quality and longevity of a healthy life and to prevent avoidable suffering.

Garvan Research Foundation

Report 2020

2020 will go down as one of the most challenging years in our history, and yet it has never been a greater honour to work at the coalface of medical research.

Dr Russell Scrimshaw
Chairman

Mara-Jean Tilley
Director

The enduring commitment of the Garvan family in tough times has inspired our talented researchers, and galvanised them in their pursuit of improving human health. Collectively, in 2020, our Garvan supporters raised and donated more than $48m to support our pioneering research. This truly surpassed our expectations of what was possible during these uncertain times. We are humbled by your philanthropic investment, thank you!

The Foundation team, small but mighty, has faced every challenge with determination and resilience. We are passionate about creating awareness for the power of medical research and facilitating the critical support required to ensure our scientists can continue to pioneer discoveries to improve human health. Accordingly, it's been an unexpected joy to observe the medical research vernacular dominate the media and the every-day conversations of the community at large.

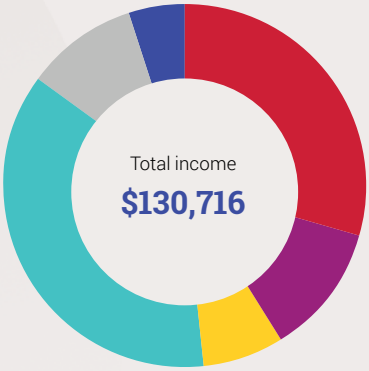
We sincerely thank our Board of Directors for their expert guidance and extensive contributions throughout 2020. Your leadership, advocacy and generosity is valued by everyone at Garvan. We warmly welcomed Sue Cato AM, Rajeev Gupta and Greg Paramor AO to the Board in 2020, and thank retiring Director, Dr Jeanne-Claude Strong for her significant contributions to Garvan over many years.

Once again, our deepest gratitude goes to everyone who supports Garvan's research. Every donation, no matter how big or small, catalyses and accelerates Garvan's science. Our wonderful *Partners for the Future* who include a gift in their Will to Garvan, our individual donors and corporate partners, our *Partners for Discovery* who make a donation to Garvan monthly and every generous individual who supports our research in memory or celebration of a loved one. You are investing in the future of health. We thank you for joining us on this exciting journey.

The year at a glance

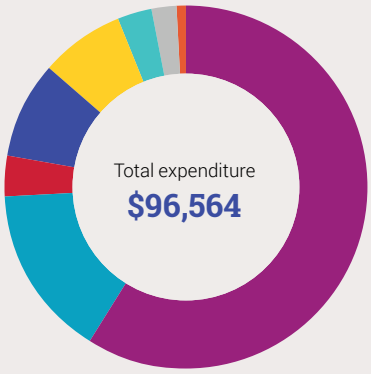
As at 31 December 2020
All figures are A$'000

Garvan income



- Peer-reviewed and other research grants **$38,506**
- NHMRC fellowships, scholarships and other grants **$15,519**
- NSW government grants **$9,261**
- Donations received **$48,107**
- Revenue from contracts with customers **$12,801**
- Other Income **$6,522**

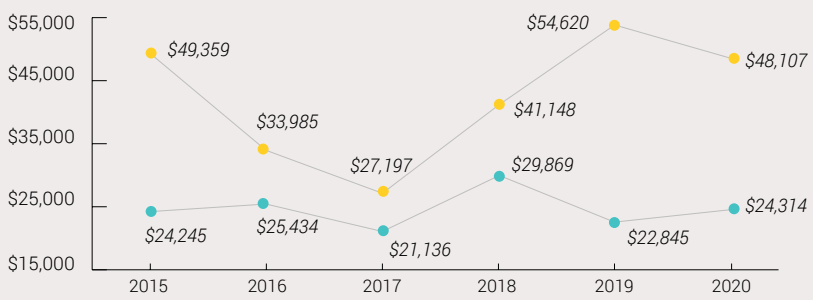
Total expenditure



- Employee benefits expense **$57,070**
- Other research expenses **$14,759**
- Sequencing consumable expense **$3,309**
- Building and scientific expenses **$8,545**
- Depreciation and amortisation expense **$7,063**
- Administration expense **$2,946**
- Fundraising expenses **$2,308**
- Finance costs **$564**

Philanthropic income

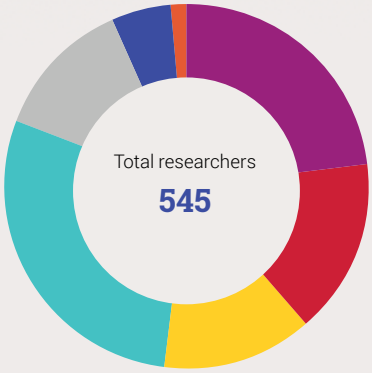
- Philanthropic income with bequests
- Philanthropic income without bequests



Garvan at a glance

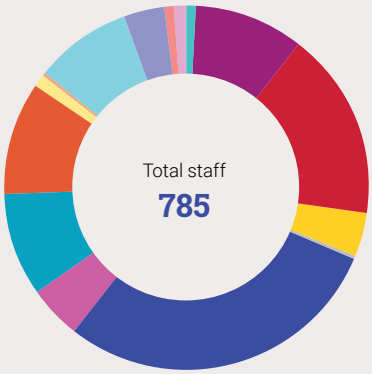
Garvan researchers

As at 31 December 2020



- Healthy Ageing **126**
- Immunity & Inflammation **85**
- Genomics & Epigenetics **73**
- Cancer **158**
- Kinghorn Centre for Clinical Genomics **68**
- Garvan-Weizmann Centre for Cellular Genomics **28**
- Centre for Population Genomics **7**

Total staff



- Honours and Masters students **8**
- PhD students **75**
- Visiting scientists **132**
- Visiting students **31**
- Visiting professionals **2**
- Scientists **228**
- Foundation staff **37**
- Scientific services (facility and technology) team **73**
- Operations team **77**
- Executive leadership team **10**
- Emeritus, Fellow and staff **2**
- Kinghorn Centre for Clinical Genomics **68**
- Garvan-Weizmann Centre for Cellular Genomics **28**
- Centre for Population Genomics **7**
- Scientific Affairs **7**

785
Total staff

460
Female

1
Non-binary

324
Male

39
Average age in years

Public community engagement and education

3,305
attended 13 virtual public seminars

113
attended 6 small group tours

40
attended 1 external presentation

100
attended 7 public tours

123
attended 3 genomics showcases

558
attended 7 other virtual events

Garvan
collaborations

Local research with global reach

Excellence in research is only possible when scientists work together at the cutting-edge, combining their unique expertise and capability.

In 2020, Garvan was proud to continue its world-leading collaborations to advance our discoveries. This graphic demonstrates the reach of Garvan's research collaborations, with each number referring to joint publications with international institutions.

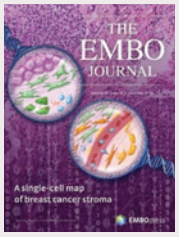
Key

- Europe **130**
- North America **126**
- United Kingdom **81**
- Asia **71**
- Israel **16**
- Middle East **14**
- South America **14**
- New Zealand **12**
- Africa **8**

Publications

Peer-reviewed scientific journals serve as a key mechanism for scientists to share their research and expertise. This shared knowledge allows scientists to advance their understanding and develop better ways to predict, diagnose and treat disease.

Cover Issues

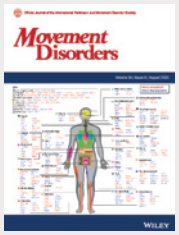


The EMBO Journal
Stromal cell diversity associated with immune evasion in human triple-negative breast cancer

Nature Reviews Cancer
The dormant cancer cell life cycle

Journal of Molecular Biology
Evolution of DNA methylome diversity in eukaryotes

Immunological Reviews
The geography of memory B cell reactivation in vaccine-induced immunity and in autoimmune disease relapses



Movement Disorders
Common variants coregulate expression of GBA and modifier genes to delay Parkinson's disease onset

392
total publications in 2020, including journal articles, reports, reviews, letters, books and book chapters

305
original research papers

110
publications in journals with an impact factor greater than 8

Papers in key journals

2 Nature Reviews Cancer
5 Nature
2 Science
1 Nature Reviews Disease Primers
2 Cell
1 Nature Biotechnology
3 Nature Medicine
1 Journal of Clinical Oncology
2 Nature Genetics
1 Cancer Cell

See page 65 for a full list of Garvan's 2020 publications.

Behind the science
Cecilia Chambers

Cancer

We combine excellence in cancer research with cutting-edge genomics, imaging technologies and clinical trials to address almost every cancer type – from the rarest to the more common.

From the Heads

Professor David Thomas
Director of The Kinghorn Cancer Centre (Theme Head until August 2020)

Professor Paul Timpson
(Theme Head from August 2020)

Despite new treatments and early detection improving the outlook for many, cancer remains a leading cause of death in Australia. At Garvan, we combine excellence in cancer research with cutting-edge genomics, imaging technologies and clinical trials to address almost every cancer type – from the rarest to the more common.

Cancer is fundamentally a genetic disease, and our remarkable advances in research enable the analysis of the DNA of a patient's tumours to personalise their treatment. We are also increasingly understanding the critical role the cancer environment plays in tumour growth and progression. Together, our discoveries are setting new in-roads for cancer therapy, many of which we have already translated to clinical trials.

In 2020, we made breakthrough discoveries in resistance to cancer treatment and reported findings that will contribute to better diagnostics and therapy for those affected by pancreatic, breast and lung cancer.

The Kinghorn Cancer Centre brings together the scientific expertise of Garvan with the medical expertise of St Vincent's Hospital to improve outcomes for cancer patients. Working side by side, researchers and clinicians have created an environment where clinical challenges can drive laboratory research, and research findings can be directly applied to clinical care.

Our vision is to innovate new ways to detect and treat cancer, to ultimately improve clinical outcomes for all patients. We are collaborating at the local and international level, working at the frontline to target tumours from every angle.

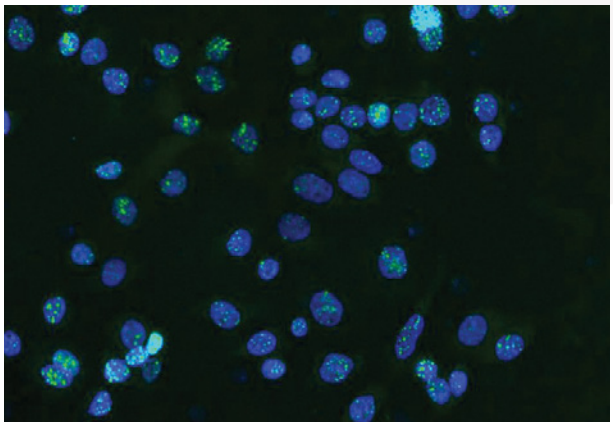
Research highlight

Revealed: how cancer develops resistance to treatment

Garvan researchers have uncovered a fundamental survival strategy that cancer cells use to develop drug resistance – one of the leading causes of cancer-related deaths that affects hundreds of thousands of patients every year. Published in the prestigious scientific journal *Science*, researchers led by Professor David Thomas revealed how cancer cells undergo a process called 'stress-induced mutagenesis' when exposed to targeted therapies, a common treatment for many forms of cancer.

In a broad range of cancers, including melanoma, pancreatic cancer, sarcomas and breast cancer, the team discovered that cancer cells shuffled their genome when exposed to targeted therapy, generating a high number of errors that lead to drug resistance. Bacteria use a similar process to develop antibiotic resistance. Combining conventional targeted cancer therapy with drugs that target DNA repair mechanisms, the researchers say, may lead to more effective therapeutic strategies. In an experimental model, the researchers combined a cancer treatment with a drug that selectively targets cells with impaired DNA repair. They were able to reduce cancer growth by almost 60%, compared to the cancer drug alone. The researchers are now designing clinical trials for the potential approach, in the hope of improving clinical outcomes for those affected by cancer drug resistance.

Image credit: Dr Arcadi Cipponi



Research highlight
Garvan contributes to global cancer genome 'map'

The Australian Pancreatic Cancer Genome Initiative (APGI) is a world-leading initiative, founded and administered by the Garvan Institute, that includes genome data and a 'biobank' of thousands of pancreatic tumour samples that have been donated by patients. Recently, the APGI contributed genomes to the Pan-Cancer Project, a global effort to create the most comprehensive database of cancer genomes in the world. To date, the database consists of over 2,600 cancer genomes of 38 different tumour types, from 37 countries. This new resource will allow researchers from Garvan and across the globe to better access cancer genome data, which they will use to study pancreatic and other cancers. Over recent years, researchers have discovered more and more relationships between different cancer types. Contributing the APGI's genomic data to the Pan-Cancer Project will help the global research community to uncover the differences and similarities between different cancers, and will ultimately advance discoveries that enable better diagnostics and treatments.

Research highlight
Breast cancer 'ecosystem' reveals possible new targets for treatment

Garvan researchers have used cellular genomics to uncover four new subtypes of cells within triple negative breast cancers, some of which produce molecules that suppress immune cells and may help cancer evade the body's immune system. By analysing gene activity in 24,271 individual cells extracted from the biopsy samples of five triple negative breast cancer patients, the researchers revealed four new subtypes of stromal cells, which form connective tissues in the body.

Previous studies in triple negative breast cancers had generally considered there to be only one type of stromal cell. The researchers revealed surprising interactions between the signalling molecules produced by these stromal cell subtypes and immune cells. "Our findings suggest that there is significant crosstalk between the immune system and stromal cells, which were generally thought to have only a structural role in cancers," says Associate Professor Swarbrick. "This is significant because immunotherapy – which is designed to activate the patient's immune system against a tumour – has limited response in many patients with triple negative breast cancer."

Research highlight
Researchers uncover the genomics of health

Most diseases have a genetic component. To better understand these diseases, researchers led by the Garvan Institute are analysing genetic information to determine what keeps us healthy. In a world first, the team has compiled a genome reference database of thousands of healthy older Australians, which has the potential to predict disease-linked gene variants more accurately than has been previously possible. The researchers recently released the first 2,570 genomes of the Medical Genome Reference Bank (MGRB). The genomes come from older Australians (64 to 95 years old) that were free from cancer, cardiovascular disease or neurodegenerative disease until the age of at least 70.

"This first release of data from the Medical Genome Reference Bank gives researchers a much more statistically powerful framework to identify new disease-causing gene variants," says Professor Thomas. "For instance, when we analysed genomes of prostate cancer patients, we found that using the MGRB as a 'control' gave us a 25% higher predictive power of disease-linked gene variants than another genome database that is commonly used by researchers to find such variants."

The researchers also detected genetic changes associated with ageing, including shorter telomeres (the 'caps' at the end of chromosomes) and the less mitochondrial DNA. These indicators may serve as a better way to gauge people's biological age and health than using chronological age, Professor Thomas says.

Research highlight
Precision approach for lung adenocarcinoma

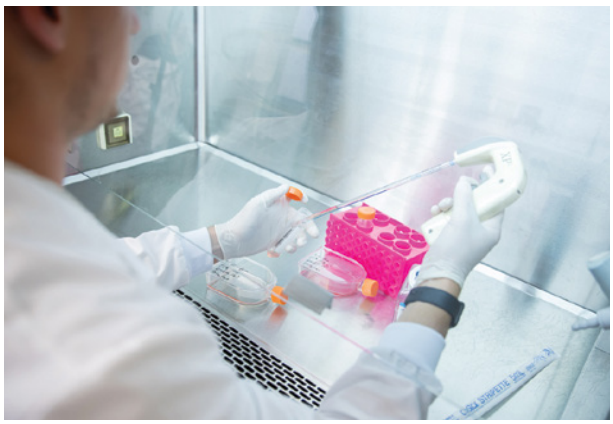
In a proof-of-principal laboratory study, Garvan researchers uncovered a new precision approach for treating lung adenocarcinoma – the most common type of lung cancer, which is the leading cause of cancer-related deaths worldwide. Led by Dr David Croucher, researchers discovered that blocking the enzyme P70S6K in some lung adenocarcinoma cells could improve the efficacy of platinum-based chemotherapy, which has been used in the clinic for over four decades but is effective in less than a third of patients. In the lab, the Garvan-led researchers investigated how different lung adenocarcinoma cells responded to cisplatin treatment, and discovered that P70S6K was found in higher levels than in cells which were effectively targeted by the drug. In experimental models, the researchers found when they inhibited P70S6K with a drug, or genetically reduced the enzyme's levels, they could sensitise resistant lung adenocarcinoma cells to cisplatin. While more research is needed, the researchers are hopeful the findings will inform the design of future precision therapy for lung adenocarcinoma, and light the way to better clinical outcomes.

Research highlight
Study guides next generation of advanced ER+ breast cancer therapy

In a proof-of-principle study, Garvan researchers have revealed a potential therapeutic approach for targeting oestrogen receptor positive (ER+) breast cancers resistant to current therapies. By combining current gold-standard treatments with a drug that restores the activity of p53, a cancer suppressor protein, the researchers found they could sensitise breast cancer cells to therapy and slow cancer growth in laboratory models of ER+ breast cancer. The findings are a promising step towards better treatments for breast cancer, which affects almost 20,000 individuals each year in Australia alone. The researchers are now developing clinical trials at St Vincent's Hospital to test the new approach in patients with advanced breast cancer.

News highlight
Childhood cancer program powered by genomics and philanthropy

Children with high-risk cancers have received effective treatments leading to complete or partial regression of their cancer thanks to a pioneering research program that tailors therapy based on the complete DNA sequence of a patient's individual tumour. A report of 247 participants of the Zero Childhood Cancer Program published in *Nature Medicine,* has revealed that over 70% of participants could be recommended a personalised treatment option based on a full scan of the genetic makeup of their unique cancer. Of those children who received a targeted therapy based on this DNA information, one third went into partial or complete remission. Adding DNA scans of the children's tumours to the other cancer analyses performed in the Zero Childhood Cancer Program was made possible through the Lions Kids Cancer Genome Project.



Celebrating giving
R T Hall Trust

The Estate of the late R T Hall has been generously supporting the Garvan Institute for over two decades, starting in 1994, and has provided catalytic support to Garvan's cancer research for the past decade. Since 2018, the Trustees have supported two crucial staff members who underpin research undertaken by two major cancer initiatives – the Cancer Gene Discovery and Validation Program and the Breast Cancer Research Program.

R T Hall Trust's multiyear support of the Molecular Pathology Facility Manager as part of the Cancer Gene Discovery and Validation Program enables the facility to support key cancer programs at Garvan such as the Molecular Screening and Therapeutics (MoST) Study and labs such as the Cancer Invasion and Metastasis Group, which researches pancreatic cancer.

The enduring philanthropic investment by the Trust into Garvan's Breast Cancer Research Program has likewise contributed to discoveries that could one day improve patient treatment, such as the aforementioned proof-of-principle study that revealed a potential therapeutic approach for targeting oestrogen receptor positive (ER+) breast cancers resistant to current therapies.

We are immeasurably grateful for the long-term support of the R T Hall Trust. Their continued support of Garvan's cancer research program has enabled cutting-edge, breakthrough research.

"We continue to support Garvan because we place great importance on its global and collaborative approach to research. We have been impressed over the years by the world-leading research being undertaken, and particularly with the results being achieved in the two cancer programs we support," says a R T Hall Trustee.

Behind the science
Nikita Bajaj

Healthy Ageing

As advances in health care enable us to live longer than ever, the ability to not live just long, but healthy lives is increasingly critical.

From the Heads

Professor Peter Croucher
Deputy Director, Garvan Institute (Theme Head until August 2020)

Professor Katherine Samaras
(Theme Head from August 2020)

We know that healthy ageing relies on a complex mix of genetic, environmental and social factors, and that age-related conditions come in many forms. They may affect our nerves and brain, leading to Parkinson's disease, dementia, hearing loss and eye diseases, or affect cells that control metabolism leading to diabetes. They also include skeletal disease such as osteoporosis, which is estimated to affect 900,000 Australians.

At Garvan, 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 to create a future where people can live longer, healthier lives. Our researchers are at the forefront of ageing research, using some of the most advanced techniques to investigate degenerative diseases.

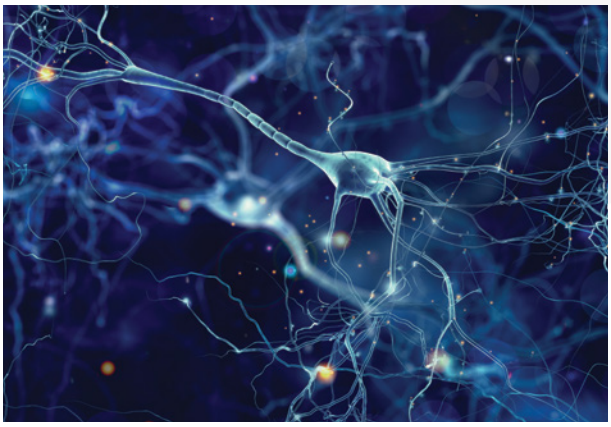
In 2020, we published landmark discoveries and continued our world-leading research, employing genomics, cellular genomics, advanced imaging technologies, and patient epidemiology. One landmark discovery linked a common diabetes medication to slowed cognitive decline, a demonstration of the transformative power of research that intersects disciplines. Other findings have yielded crucial insights in bone health and cancer metastasis, which will help lead to better ways to prevent and treat disease.

Patients are at the centre of Garvan's research. We work closely with clinical collaborators, and 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.

Research highlight

Treatment linked to slowed cognitive decline

Metformin is the first-line treatment for most cases of type 2 diabetes and one of the most commonly prescribed medications worldwide, with millions of individuals using it to optimise their blood glucose levels. A new research study, conducted over six years as part of the Sydney Memory and Ageing Study in 1,037 Australians (aged 70 to 90 years old at baseline), has revealed an additional effect: individuals with type 2 diabetes who used metformin experienced slower cognitive decline with lower dementia rates than those who did not use the medication. The study, led by researchers at the Garvan Institute of Medical Research and the Centre for Healthy Brain Ageing (CHeBA), UNSW Sydney, provides new hope for a means of reducing the risk of dementia, which is currently estimated to affect nearly 47 million people worldwide. "This study has provided promising initial evidence that metformin may protect against cognitive decline," says study author Professor Katherine Samaras, Leader of the Healthy Ageing Research Theme at the Garvan Institute and endocrinologist at St Vincent's Hospital Sydney. "To establish a definitive effect, we are now planning a large, randomised controlled trial of metformin in individuals at risk of dementia and assess their cognitive function over three years. This may translate to us being able to repurpose this cheap medication with a robust safety profile to assist in preventing against cognitive decline in older people."



Clinical trial highlight

Recruitment open for the Australian Parkinson's Mission

Over 100,000 Australians are living with Parkinson's today, with 38 people being diagnosed every day. There is currently no way to detect and diagnose the disease early, with current treatment only helping to control the symptoms that have presented in a patient.

The Australian Parkinson's Mission, an innovative 5-year Garvan-led research program, combines clinical trials and biomarker technologies with breakthrough genomics for people living with Parkinson's.

The first clinical trial will test 3 repurposed drugs (drugs that have been approved for other conditions) that have demonstrated neuroprotective effects in preclinical experiments. In 2020, recruitment of patients began in accordance with eligibility criteria, across eight sites in Australia (in NSW, VIC, SA, WA and QLD).

By using drugs that have already passed rigorous safety and toxicology trials, the APM aims to cut the time for a potential treatment to move from the laboratory to clinical trials and Parkinson's patients.

Clinical trial site details and more information about the program can be found on the Australian Parkinson's Mission website, theapm.org.au.

Thank you to our generous donors and the Federal Government for supporting the Australian Parkinson's Mission to slow, stop and reverse Parkinson's disease.

Research highlight

Critical mechanism of prostate cancer dormancy revealed

Bone metastases are arguably some of the most feared consequences of cancer, both for how they affect quality of life and pain, but also what they indicate about cancer prognosis. Bone metastases occur in up to 90% of men who develop prostate cancer that is resistant to treatment, which invariably leads to death within 12 to 24 months.

A collaborative study that included Garvan researchers has revealed a key immune pathway linked to prostate cancer cell metastasis to bone. In experimental models, the researchers found that the suppression of type I interferons, a class of immune molecules previously linked to breast cancer metastasis, was closely linked to dormant prostate cancer cells outgrowth in bone and acceleration of disease. The research also revealed a potential therapeutic approach for targeting the pathway which may help improve future therapies of prostate cancer.

The research is a key output of the Prostate Cancer Metastasis (ProMis) research program, which aims to identify the critical mechanisms responsible for prostate cancer cell dormancy, growth and metastasis to bone, determine whether existing drugs can be used more effectively, and pave the way for new treatments that will impact directly on patients.

Research highlight
Muscle strength and performance predicts fracture risk

A Garvan-led research team analysed the link between muscle strength and performance and fracture, using data collected through the ongoing Dubbo Osteoporosis Epidemiology Study, the world's largest and longest-running study of the disease.

The findings showed a significant link between the rate of decline in physical performance and fracture risk in women and men, and that this link was independent of age, bone mineral density and other common risk factors.

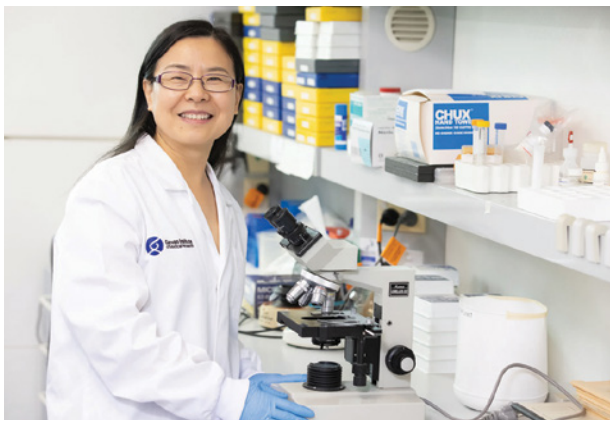
The study suggests that repeated measurements of muscle strength and performance may help identify older people at high risk of sustaining fractures, which impact quality of life and can reduce life expectancy.

Much of our osteoporosis research is being made possible through the generous and enabling support of Mrs Janice Gibson and the Ernest Heine Family Foundation

Celebrating giving
Mr and Mrs John and Elizabeth Hocking

Mr and Mrs John and Elizabeth Hocking first began supporting Garvan in 2005 after receiving information about the Institute as part of an appeal. Since then, the Hockings have been generously supporting Garvan's research into cancer, diabetes and obesity for many years.

Both John and Elizabeth understand how important long-term funding of medical research is. They both have an interest in obesity, while John has diabetes and is a prostate cancer survivor. As retired scientists themselves, they are particularly interested in keeping abreast of the research landscape and new discoveries, and attend scientific talks and seminars around Sydney. During lockdown in Sydney, they especially enjoyed Garvan's series of 'Bite Size Science' webinars which kept them entertained and informed.



We are incredibly grateful for the ongoing support of Mr and Mrs Hocking. It is the support of the Garvan family that enables our scientists to ask the important questions and undertake novel research that changes lives.

Celebrating giving
Ms Lysia O'Keefe

For the past six years, Visionary donor Ms Lysia O'Keefe has been a dedicated supporter of type 2 diabetes research at Garvan led by Dr Dorit Samocha-Bonet. Lysia has long been passionate about understanding the global epidemic of obesity and type 2 diabetes, and supporting research that can lead to better treatments and preventative measures of this disease.

Through Lysia's generosity, Dr Samocha-Bonet has established the randomised controlled trial Personalised Medicine in Prediabetes – Towards Preventing Diabetes In Individuals at Risk (PREDICT) Study, which aims to test the efficacy of metformin administered with a personalised diet on glycaemia (blood sugar control) in adults with prediabetes or early-stage type 2 diabetes.

Dr Samocha-Bonet says, "Lysia's philanthropic support has not only been instrumental in making this novel study a reality but it has meant so much more. She truly cares about the research, often providing positive and insightful support. We always look forward to her visits. We are incredibly appreciative for her remarkable commitment to our research as we strive for sustainable means to prevent the devastating circumstances of obesity."

Genomics and Epigenetics

The science of our DNA has come a long way since its early days. The power and scope of genomics was shown to the world in 2020 like never before.

From the Head

Professor Susan Clark FAA FAHMS

The science of our DNA has come a long way since its early days. The Human Genome Project took a global team 13 years to complete. Now, DNA sequencing is used increasingly as an invaluable healthcare tool.

The power and scope of genomics was shown to the world in 2020 like never before. However, there is still much more ground to cover before we can claim to completely understand how the six billion-letter code of our DNA gives rise to the vast array of different cell types, tissues and organs we need to function. Aiding this advancement is the field of epigenetics – the study of the chemical modifications of DNA that determine how our same DNA sequence can be read differently in different cellular contexts. At Garvan, we are world leaders in this field.

Our team at Garvan are investigating how epigenetic 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 novel sequencing approaches to decipher the different chemical modifications on the DNA and 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 2020, we discovered a new DNA modification signature in zebrafish, we revealed how DNA is uniquely folded in 3D shape in different cellular contexts, and how changes to this 3D arrangement are linked to treatment resistance in ER+ breast cancer.

Despite the increased public profile of genomic research throughout 2020, there have been unprecedented challenges to overcome. It was inspiring to see the innovation, creativity and determination that enabled our team to continue their groundbreaking work.

Research highlight

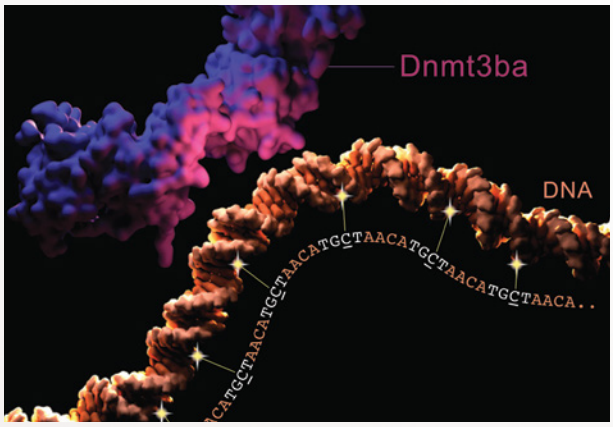
New DNA modification 'signature' discovered in zebrafish

Research led by A/Prof Ozren Bogdanovic uncovered a new form of DNA modification in the genome of a zebrafish where unusually high levels of DNA repeats of the 'TGCT' sequence undergo methylation, which may change the shape or activity of the surrounding DNA.

To investigate non-CG methylation further, the researchers conducted a comprehensive profiling of the zebrafish genome. The team discovered that methylation occurred where the sequence 'TGCT' appeared multiple times, close together. Methylation levels at TGCT repeats were higher than any non-CG methylation previously observed in the majority of adult vertebrate tissues. The researchers further revealed that the enzyme Dnmt3ba was responsible for methylating the TGCT repeats.

"While it's unclear if a similar modification occurs in animals more broadly, our discovery in zebrafish is significant, because it means we can start to selectively manipulate this atypical form of methylation in a model organism. It means we can change the levels of Dnmt3ba to see what happens when we remove just one form of methylation, but not another," says Associate Professor Bogdanovic. The study could lead to the development of new experimental models for studying how DNA modifications impact human development and disease.

Image credit: Dr Kate Patterson



Research highlight

Hormone resistance in breast cancer linked to DNA 'rewiring'

Epigenetic changes occur in the DNA of breast cancer cells that have developed a resistance to hormone therapy, an effective treatment for ER+ breast cancer, which accounts for 70% of all diagnoses. Reversing these changes, researchers say, has significant potential to help reduce breast cancer relapse.

A team led by Professor Susan Clark showed that the 3D structure of DNA is 'rewired' in hormone resistant ER+ breast cancers, altering which genes are activated and which genes are silenced in the cells. Using chromosome conformation capture, a cutting-edge technique that provides a snapshot of how DNA is arranged and interacts in three dimensions in the cell, the researchers compared different ER+ breast cancer cells that were either sensitive or resistant to hormone treatment.

They found significant changes between breast cancer cells that were still sensitive to hormone treatment and those that had developed resistance in the 3D interactions of DNA regions that control gene activation, including at genes that control oestrogen receptor levels in cells. Further, they found that this 3D 'rewiring' occurred at DNA regions that were methylated, which is an epigenetic change that the team has already linked to hormone resistance.

The researchers say that the altered DNA methylation at critical regulatory regions may explain how the 3D structure of DNA is rewired as a cancer cell develops hormone resistance, allowing the cancer to better evade treatment.

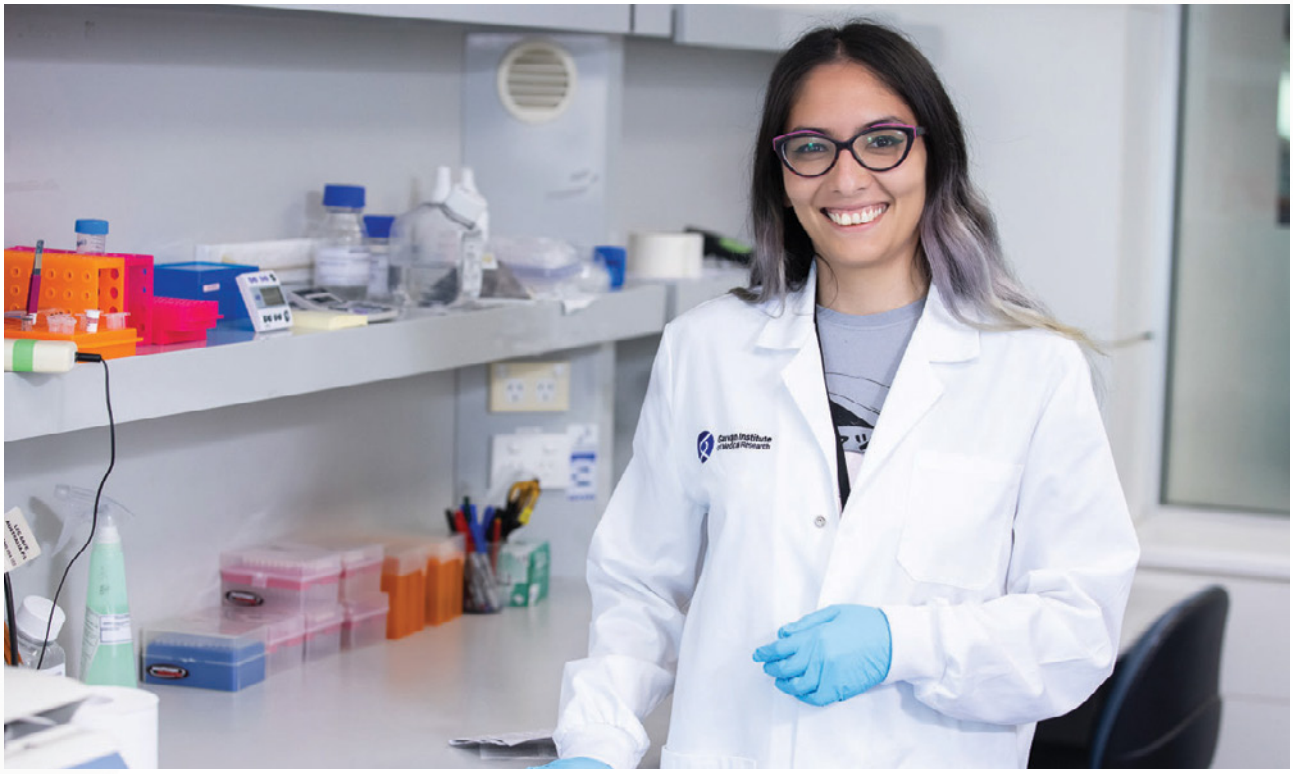
Research highlight

Study shines light on how DNA keeps its 3D shape

A team led by Professor Susan Clark has uncovered a fundamental process of how DNA's arrangement in the cell affects gene activation, to drive cell function. The researchers revealed that the protein CTCF binds to critical sections of DNA, creating loops that control how DNA interacts with itself in three dimensions. The team's findings demonstrate how DNA's shape can vastly change which genes are active.

Using a technique called chromosome conformation capture, which provides a picture of which sections of DNA are interacting with each other in three-dimensional space, the team studied what would happen if CTCF was removed from prostate cancer cells. When the researchers reduced the total amount of CTCF present in cells they were surprised to find large regions of the genome had either merged or segregated, creating new 3D interactions and new gene expression profiles in the cells. However, they found that CTCF continued to bind at some specific sites.

"This was a remarkable discovery, as it reveals how central CTCF is to the normal DNA 3D architecture in healthy cells," says Professor Clark.



Behind the science
Antoine Guerin

Immunity and Inflammation

2020 saw us publish landmark discoveries that advanced our knowledge of the immune system, some of which have directly benefited patients.

From the Head
Professor Stuart Tangye

For immunologists, for us all, 2020 was a year like no other. Words that had predominantly been used by scientists and doctors, such as 'T cells', 'cytokine storm' and 'antibody response', became part of everyday vernacular as the coronavirus pandemic swept the globe and dominated headlines.

At Garvan, we were in a unique position to activate a number of research projects that leveraged our expertise and capabilities in immunology for the global research effort to tackle COVID-19.

We initiated research on an antiviral therapy, which could potentially be administered as a preventative to at-risk individuals, and began investigating the genetic basis for severe COVID-19. This research may not only give us crucial insights for this pandemic, but may lead to findings that will help us tackle future threats head-on.

Meanwhile, 2020 saw us publish landmark discoveries that advanced our knowledge of the immune system, some of which have directly benefited patients.

We used breakthrough cellular genomics technology to pinpoint the cells at the root of autoimmune diseases, which affect one in eight Australians. We made discoveries in patient DNA that enabled us change treatments for those affected by some of the rarest conditions. Further, we made fundamental discoveries that provide new insight on how our body mounts an effective immune response.

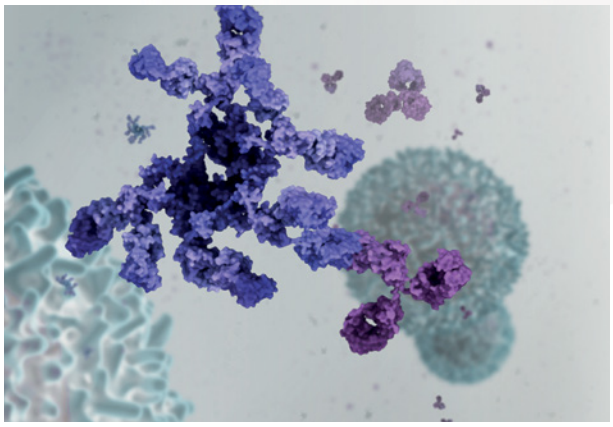
By nature, the immune system intersects with almost every other process in our body. Garvan's world-leading immunologists reflect this as they collaborate to facilitate new discoveries in cancer, bone disease and diabetes, underpinned by cutting-edge genomics. We look forward to seeing our findings support better clinical outcomes for years to come.

Research highlight
Research pinpoints rogue cells at root of autoimmune disease

In a world first, a team led by researchers at the Garvan Institute pinpointed individual cells that cause autoimmune diseases in patients. They also uncovered how these cells 'go rogue' by evading checkpoints that normally stop immune cells from targeting the body's own tissues. A paper published in the journal *Cell* outlines how the researchers used cellular genomics to develop a method to 'zoom in' on these disease-causing immune cells in blood samples of patients with cryoglobulinaemic vasculitis – a severe inflammation of the blood vessels.

By first separating individual cells, and then separating their genetic material, the researchers isolated immune cells that produced 'rheumatoid factors' – antibody proteins that target healthy tissues in the body. Once isolated, the researchers then analysed the DNA and messenger RNA of each of these 'rogue' cells, scanning more than a million positions in the genome to identify DNA variants that may be at the root of disease. These findings could have significant implications for the diagnosis and treatment of autoimmune disease.

Image credit: Dr Ofir Shein-Lumbroso



Research highlight

Researchers target immune system to treat rare cancer

Michael had severe childhood asthma and a long-standing history of cognitive dysfunction, gastrointestinal symptoms, joint pain and chronic fatigue, which began in his mid-teens and progressively worsened over four decades. In his 40s, he developed classic Kaposi's sarcoma, a rare cancer of the lymphatic cells. His cancer was initially treated successfully with chemotherapy, but had relapsed and was not responding to treatment. In 2015, Michael was referred by his immunologist to the Clinical Immunogenomics Research Consortium Australasia (CIRCA) program. Genomic analysis revealed a variant in Michael's CTLA4 gene was the probable cause of his condition. CTLA4 is an immune checkpoint protein that 'puts the brakes' on the immune system. In Michael's case, the CLTA4 brake wasn't working, leading to over-activation and exhaustion of his immune system. This genetic diagnosis enabled Garvan's Professor Tri Phan to use an existing medication to effectively treat Michael's cancer and immune symptoms, and provide relief after a lifetime of unexplained clinical features.

"We administered a drug called everolimus, an immunosuppressant that also boosts immune cells called regulatory T cells. These cells suppress unrestrained activation of conventional T cells and restore the normal function of immune cells. For Michael, we think they restored a normal immune response and recalibrated his anti-cancer immunity," says Professor Phan.

Research highlight

Clinical guidance for two rare immune conditions revealed

An international study co-led by Professor Stuart Tangye at the Garvan Institute has provided new guidance for the clinical treatment of two rare inherited immune disorders. Researchers combined global data on the two conditions, caused by mutations in the CD27 or CD70 genes, and diagnosed mostly in children. Their study revealed that people with CD27 and CD70 deficiencies were predisposed to lymphoma, a cancer originating from immune cells, but also that the cancer was successfully treated in 95% of patients when they underwent a bone marrow transplant shortly after diagnosis.

The findings suggest that for children with severe Epstein-Barr virus-associated disease or lymphoma, genetic investigation of CD27 and CD70 could be beneficial. The researchers say a diagnosis could optimise clinical management and, crucially, support the timely decision of a bone marrow transplant.

Research highlight

Revealed: how the immune system stays alert to related pathogens

Researchers at the Garvan Institute have uncovered how the immune system ensures it can target foreign antigens that have changed from their original version – a common strategy pathogens such as viruses use to evade immune detection. In experimental models, a team led by Professor Rob Brink revealed that the molecule BAFF generates a subset of 'early responder' immune cells that, instead of

specialising to produce more effective antibodies, remained dormant and able to recognise close relatives of the pathogen.

"Our findings reveal an immune strategy that underpins a faster, more effective immune response," says Professor Brink. "These non-specialised 'early responder' B cells are a crucial component of the immune system and able to target pathogens that undergo mutations, such as the seasonal strains of the influenza virus. But how they're generated and preserved in the body has been a mystery, until now."

Research highlight

Flexible targets help immune system make finely-tuned antibodies

Garvan researchers have discovered a key strategy used by the immune system to generate effective antibodies. The team, co-led by Garvan's Executive Director Professor Chris Goodnow, found the immune system mutates its B cells to generate more finely-tuned antibodies when the targets for those antibodies, referred to as 'antigens', were structurally flexible, rather than rigid. By taking this approach, the immune system creates antibodies that are finely-tuned to foreign molecules.

"Our findings address a central issue for developing vaccines – how the immune system generates antibodies that recognise 'foreign' from 'self'," says co-senior author Professor Daniel Christ, Head of Antibody Therapeutics and Director of the Centre for Targeted Therapy at Garvan. "Taking a comprehensive analytical approach, we found that a flexible target allows the immune system to create antibodies more finely-tuned to foreign molecules, which we hope will play a role in informing the design of future vaccines."

Research highlight

COVID-19 outcomes in patients with rare inborn immune disorders

The consequences of infection with the SARS-CoV-2 coronavirus are vastly different across individuals. Some infected people are more at risk of developing severe disease than others, including older individuals and those with underlying health conditions. However, little is known about those with pre-existing rare inherited immune disorders. A research study of 94 individuals with rare inherited immune disorders, otherwise known as primary immunodeficiencies (PID), who were infected with SARS-CoV-2 had similar disease outcomes to the general population. However, admission rates to intensive care tended to be higher in PID patients and the average age of affected patients was lower than in the general population. The global study, led by the Garvan Institute and Katholic University Leuven (Belgium), provides information for individuals affected by PIDs, their families and clinicians. The findings also contribute to an understanding of the components of the immune system that underpin an effective coronavirus immune response.

News highlight

Innovative research centre to image 'dark space' of cancer

A $3M grant from the Australian Cancer Research Foundation (ACRF) will establish a custom-built microscopy centre at the Garvan Institute to image the 'dark space' of cancer-immune interactions, which will enable new advances in cancer research. The ACRF Centre for Intravital Imaging of Niches for Cancer Immune Therapy (ACRF INCITe Centre) will house two Australian-designed microscopes that will allow researchers to see inside tumours at unprecedented temporal resolutions. This will enable researchers to see immune cells and molecules at the cancer site move and interact in real time – below the surface of tumours and deep inside tissues.

The ACRF INCITe Centre will address a major challenge in the treatment of cancer: why some patients respond to immunotherapies, designed to arm the immune system against cancer, while others do not. Collaborators from 23 research labs from across Australia will access the technology via a virtual network to investigate fundamental cancer biology, the role of cells, molecules and genes that regulate cancer-immune interactions, and new therapeutic approaches to enhance immunity against cancer.

Celebrating giving

John and Megan Wade

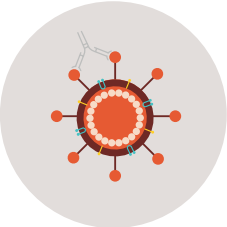
Believing that medical research is vital to improving quality of life, Life Governors John and Megan Wade have been passionate supporters of Garvan's research for over two decades.

They were inspired to support immunology research as they felt it was an area that was often underserved by philanthropists but yet so important for improving the health needs of the community. As long-term supporters of Professor Robert Brink's B cell biology research, they have seen first-hand the positive impact of their support and witnessed the dedication of Professor Brink's lab. Recently, this novel research has led to the significant finding of how the immune system stays alert to related pathogens such as viruses.

In addition, the Wades have also expanded their generous support to include the Garvan-led collaborative HOPE research program which aims to find the underlying cause of autoimmune disease.

We are incredibly grateful for John and Megan's remarkable commitment to our medical research which has enabled Garvan scientists to affect real, impactful change in the community.

COVID-19



Our COVID-19 research is focused on understanding the SARS-CoV-2 virus at a biological and genomic level, and, critically, improving outcomes for patients.

Medical research is the only solution to COVID-19, which has to date affected hundreds of millions of people worldwide, and claimed millions of lives. Researchers at the Garvan Institute of Medical Research responded immediately to the pandemic, joining a global effort to find solutions to the central issue in the COVID-19 crisis as quickly as possible. Primarily, reducing the number of people infected with the coronavirus, curing people who do get infected, and reducing deaths. Garvan's excellence in antibody research, immunology, cellular genomics and whole genome sequencing perfectly positions us to contribute to the global research effort to fight COVID-19. Yet, at the same time, our scientists are maintaining their ongoing research endeavours in cancer, diabetes and metabolism, diseases of the immune system, diseases of bone and neurodegeneration, as well as genomics and epigenetics.

Research news
Tracing coronavirus evolution

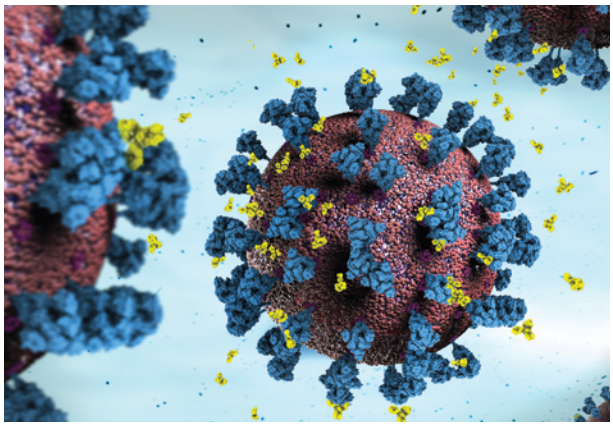
Garvan researchers, led by Dr Ira Deveson, are analysing the genetic material of virus samples isolated from COVID-19 patients at hospitals in NSW to detect genetic variations that provide critical data to inform Australia's COVID-19 response in real-time. The team's work has potential to shed light on how the coronavirus evolves, identify virus sub-strains that may be more or less infectious and crucially, guide better treatments. To date, the team has analysed hundreds of SARS-CoV-2 genome samples and is contributing to a collaborative research study charting the transmission of the coronavirus in NSW throughout the pandemic. The team has also pioneered the use of Nanopore sequencing technologies to analyse SARS-CoV-2 genome samples. Nanopore technologies are smaller and cheaper than other technologies but are just as effective at analysing the virus, meaning they can be deployed to field testing sites around the world to help inform local efforts to contain the virus. The researchers developed a mobile app in partnership with the University of Peradeniya in Sri Lanka that can sequence the data from Nanopore devices in under half an hour, further enhancing the portability and accessibility of tools to understand and combat COVID-19.

Turn to page 30 to read more about this research.

Research news
Engineering antibodies for COVID-19 protection and therapy

A research team led by Professor Daniel Christ is developing genetically engineered antibodies designed to target surface proteins of SARS-CoV-2, the novel coronavirus that causes COVID-19, which the virus uses to infect human cells. These highly specific antibodies are standardised and can be produced in unlimited quantities in the laboratory, bypassing the genetic variability of antibodies produced by people's own immune responses.They could provide immediate immunity, both for the treatment of COVID-19 and prevention for at-risk, individuals, including the elderly, chronically ill patients, and health workers on the frontline. The researchers have rapidly developed a research pipeline to test more than 100 million different antibody variants for SARS-CoV-2. Antibodies are now undergoing neutralisation testing at UNSW Sydney's Kirby Institute, on live virus samples isolated from Sydney COVID-19 patients. Early results are promising, with the engineered antibodies able to effectively stop virus replication in the laboratory. The researchers are now optimising and narrowing down the pipeline to identify the final and most powerful antibody candidate, which will progress to clinical trials.

Image credit: Dr Kate Patterson



Research news
Investigating genes linked to severe COVID-19

A Garvan research team led by Professor Stuart Tangye is working to identify genetic variants that could predispose healthy individuals to developing severe COVID-19 rather than a mild form or being asymptomatic. The researchers are analysing the DNA of individuals in Australia who were diagnosed with SARS-CoV-2 infection and developed severe symptoms, despite not having any pre-existing health conditions. Through this, the researchers hope to uncover genes and immune pathways critical for protection against COVID-19. Separately, Professor Tangye led an international team that assessed the severity of COVID-19 in individuals with rare inherited immune disorders. Despite the assumption that people with primary immune deficiencies would be at risk of severe COVID-19 disease, the study found that pre-existing conditions were generally not found to be a significant risk factor as the rate of fatality from COVID-19 was no higher in this group than the general population. Some immune defects even appeared to be protective against the dramatic immune pathology that is frequently seen in severe disease.

Another Garvan team, led by Associate Professor Joseph Powell, is leading a global effort to uncover how the genetics of different immune cells determines susceptibility, severity and outcomes of COVID-19. The researchers are using sophisticated statistical methods at the Garvan-Weizmann Centre for Cellular Genomics to analyse the genetic variation associated with severe COVID-19 symptoms, through data made available by the COVID-19 Host Genetics Initiative. Associate Professor Powell is also using cellular genomics and machine learning techniques to investigate the differences in the immune response between patients with mild and severe symptoms. His team aims to develop a test that provides a 'snapshot' of the immune cells in a patient's blood that could predict how severe their respiratory symptoms will be over time.

Read more about Professor Tangye's COVID-19 research on page 22.

Celebrating giving
In memory of Dr Wing Kan Fok

As a way to honour her late father, Dr Wing Kan Fok, a Garvan Governor has generously funded the purchase of an AKTA Purifier, to support Professor Daniel Christ's Antibody Therapeutics COVID-19 research at Garvan. Dr Wing Kan Fok was a prestigious GP in Hong Kong in the 1950s and '60s, renowned for his diligence and professionalism. He cared deeply for his family and for his patients, passing away in a chauffeur-driven car while on his way to see his patients in hospital.

Professor Christ, together with Executive Director Professor Chris Goodnow and the UNSW Kirby Institute's Director Professor Tony Kelleher, are developing antibodies designed to target surface proteins of SARS-CoV-2, the novel coronavirus that causes COVID-19, which the virus needs to infect human cells. The potential antiviral therapy could be particularly suited to at-risk individuals, including the elderly and chronically ill patients or those who are unable to receive a vaccination. The AKTA Purifier, an automated protein purification instrument, enables the research team to accelerate the production and purification pipeline and in turn, the screening capability of COVID-19 neutralising antibodies.

"With how rapidly the COVID-19 virus spreads and its ability to mutate, equipment like the AKTA Purifier is essential to stay ahead of this disease by enabling us to quicken the research process. We are immensely grateful to our generous donor who made this possible," says Professor Christ.

"I wanted to use COVID-19 as an opportunity to do some social good, in memory of my late father. Incidentally, I listened to a story on SBS News about Garvan's research into cancer and osteoporosis, which my family members suffer from. When I heard about Professor Christ's work with COVID-19, I was delighted to be able to help," says Dr Fok's daughter.

To find out more about Garvan and our work on COVID-19 please visit garvan.org.au/covid19-research

Garvan-Weizmann Centre for Cellular Genomics

The Garvan-Weizmann Centre for Cellular Genomics is one of the most sophisticated, high-throughput cellular genomics facilities in the world.

From the Head

Associate Professor Joseph Powell

The cell is the fundamental unit of life. It is also the basis by which we need to understand the complex human biology that underpins disease, allowing the development of better treatments, diagnostics and preventative measures.

The Garvan-Weizmann Centre for Cellular Genomics is one of the most sophisticated, high-throughput cellular genomics facilities in the world, internationally recognised and uniquely positioned to accelerate research from the lab to the bedside.

In 2020, we continued to build our programs and recruit world-leading research talent in machine learning and molecular genetics. We grew our team of scientists to 32, established five major research streams and sequenced close to 20 million cells for more than 200 projects, many of which would have been inconceivable only years ago. These are investigating a broad range of conditions, including cancer, autoimmune disease, diseases of the kidney, eye and lung, as well as cardiovascular disease.

Through our collaborations with clinicians in Australia and overseas, we analyse patient samples using our latest platforms in cell isolation, analysis, high-performance computing and bioinformatics. This work is carried out in partnership with the UNSW Cellular Genomics Futures Institute and the Innovation Centre at the Victor Chang Cardiac Research Institute.

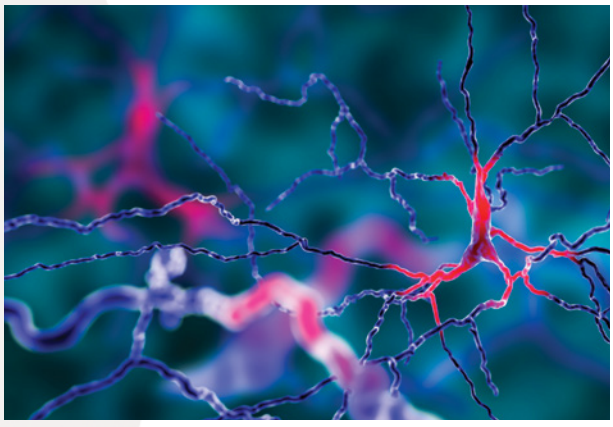
Our cellular genomics research is aimed at revealing how individual DNA profiles influence disease risk. We are now in the exciting position to translate this knowledge into new diagnostic tests, precision treatments, and launch initiatives to start identifying new therapeutic targets.

Research highlight

Parkinson's trigger in focus for new international research project

Leading researchers from the USA and Garvan will use cutting-edge technology to reveal the complex interplay of genes, molecules, cells and age-related factors that trigger Parkinson's disease, through a significant grant from the Aligning Science Across Parkinson's initiative. Parkinson's is a debilitating neurodegenerative condition that is estimated to affect more than 10 million worldwide, but for which there is no known cause.

In brain cells developed from normal and patient-derived induced pluripotent stem cells (iPS cells), the researchers will investigate how genomics and the 'second hit' risk factors – the interplay of different molecules, brain cells and ageing – shape individual disease risk. The researchers hope this new understanding will enable early diagnosis and prediction of therapeutic targets that could halt or reverse the disease, and identify subgroups of Parkinson's that may help improve the diagnosis and treatments of individual patients. At the Garvan Institute, the project will be led by Associate Professor Joseph Powell and will align with the iPS arm of the Australian Parkinson's Mission (APM), an Australian-led international research and clinical trials program that aims to slow, stop and cure Parkinson's disease. APM has been enabled by Federal funding from the Medical Research Futures Fund in 2019.



Research news
Spinak Fellow to research Crohn's disease and ulcerative colitis

In 2020, Garvan recruited Dr Kylie James as the new Spinak Fellow to spearhead the Crohn's disease and ulcerative colitis disease module at the Garvan-Weizmann Centre for Cellular Genomics.

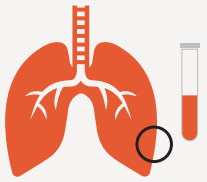
Dr James specialises in single-cell transcriptomics to investigate immune cells. In her previous position at the Wellcome Sanger Institute (UK), Dr James applied cellular genomics technology to study the immune environment of the human gut and how it changes in relation to neighbouring bacteria. Her work contributes to the Human Cell Atlas, an international collaboration that aims to create the first comprehensive map of all cells in the human body.

As the Spinak Fellow at Garvan, Dr James is investigating how the immune system contributes to inflammatory bowel disease, which includes Crohn's disease and ulcerative colitis and is estimated to affect more than 80,000 Australians. Dr James has joined the established collaborations part of the HOPE and OneK1K research programs.

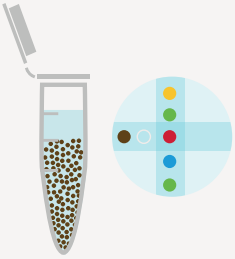
The Spinak Fellowship has been made possible by the generous philanthropic support of Ms Jillian Segal AO and Mr John Roth.

Research explainer
How cellular genomics works

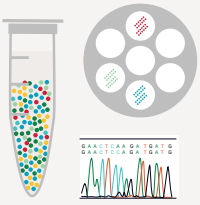
Cellular genomics is a revolutionary technology that's transforming biological and medical research. Where whole genome sequencing is the study of all our DNA averaged over millions of cells, cellular genomics is the study of the genetic makeup of a single cell – from the cell's entire DNA code (its genome), to the secondary code that organises the genome (its epigenome), and the total genetic output of the cell (its transcriptome). Cutting-edge cellular genomics technologies make it possible to unlock unprecedented insights into how cells work individually, and how they function together, in ways that were impossible only a few years ago.



1. Separation:
Biological samples, for example a cancer tumour, have millions of individual cells. Single cell sequencing lets us focus on the specific details that may occur in each cell, in a tumour.

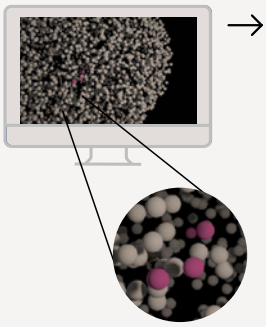


2. Library generation:
A microfluidic system attaches each cell to a tiny bead and creates a 'library' of transcriptomes (the total genetic activity of each cell). Up to 150,000 cells can be analysed at once.



3. Sequencing:
The transcriptome library of each cell is then sequenced, or read, as long strings of genetic letters. This creates a vast amount of data.

4. Bioinformatics:
We use high-performance computer tools to find patterns or variations in the data. This can reveal why some cells behave differently: even a single dysfunctional cell can lead to disease.



5. Expert analysis:
Our researchers further analyse the data for mechanisms that can lead to disease. From here, we can develop screening methods, identify personalised treatment options and develop therapies that target disease-causing cells.

Behind the science
Dr Ira Deveson

Kinghorn Centre for Clinical Genomics

Genome sequencing is being utilised more and more as a way to diagnose disease, calculate genetic risk and even prevent medical conditions.

From the Heads
Mary-Anne Young

Associate Professor
Sarah Kummerfeld

To support the translation of genomics into health care, Garvan's Kinghorn Centre for Clinical Genomics (KCCG) is helping lay the groundwork to accelerate genomic discoveries and effectively translate genomic information to health care.

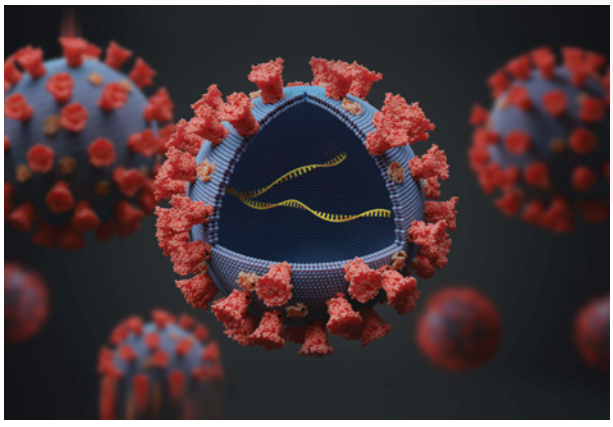
A primary example of this in 2020 was our collaboration with NSW Health and the Kirby Institute at UNSW Sydney to apply our genomic expertise to the fight against COVID-19. This work in viral genomics was complemented by KCCG's new tools and processes for DNA analysis to diagnose mitochondrial, cardiac and neurological disease and our evolving bioinformatics education program, that upskilled more than 80 researchers across Garvan in 2020. This year we also launched the MyResearchResults program, establishing a program and platform to return actionable genetic risk results to research participants.

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, and the Australian Parkinson's Mission.

We are grateful to The Kinghorn Foundation for their ongoing catalytic philanthropic investment in the Centre and look forward to taking our research, translation and productive collaborations to new heights in 2021.

Research highlight
Sydney researchers develop rapid genomics strategy to trace coronavirus

Thanks to cutting-edge Nanopore genome sequencing technology, researchers at the Garvan Institute of Medical Research and the Kirby Institute at UNSW Sydney have developed the most rapid coronavirus genome sequencing strategy in Australia to date, sequencing the genome of the SARS-CoV-2 virus in as little as four hours. The technological advance has the potential to provide critical, timely clues on how cases of SARS-CoV-2 infection are linked. The researchers published an analytical validation and best practice guidelines for Nanopore sequencing of SARS-CoV-2 in *Nature Communications*, which they hope will enable a greater uptake of the fast sequencing technology for health initiatives in Australia and overseas. The researchers' analysis revealed the Nanopore sequencing method to be highly accurate (variants were detected with >99% sensitivity and >99% precision in 157 SARS-CoV-2-positive patient specimens) and provides best practice guidelines, which the researchers hope will promote the uptake of the technology by other teams globally.



Research highlight
Genomics data to enable critical brain and mitochondrial research

A new genomics platform, called Variant Atlas, developed by a team of Garvan researchers, will provide new insights into some of the most devastating inherited conditions through anonymised genomic and clinical summary data made available by Australian Genomics. Variant Atlas connects the genomic and clinical data of research participants from four Australian rare disease clinical studies, including studies of mitochondrial disorders and brain malformations. It's hoped this platform will drive new insights and help identify better treatments for a range of conditions. "Genomic data can be challenging to work with, yet accessibility of data is so critically important to resolving undiagnosed cases, fostering research collaborations and for making those all-important breakthroughs," says Dr Warren Kaplan, Chief of Informatics at the Kinghorn Centre for Clinical Genomics at Garvan. His team manages the processing and integration of genomic and clinical data into the platform.

Research highlight
App analyses coronavirus genome on a smartphone

A new mobile app has made it possible to analyse the genome of the SARS-CoV-2 virus on a smartphone in less than half an hour. Cutting-edge nanopore sequencing technology has enabled scientists to sequence the genetic material in a biological sample outside a laboratory. However analysing the raw data has still required access to high-end computing power to piece the many strings of genetic letters from the raw data into a single sequence and pinpoint the instances of genetic variation that shed light on how a virus evolves. The researchers tested Genopo on the raw sequencing data of virus samples isolated from nine Sydney patients infected with SARS-CoV-2, which involved extracting and amplifying the virus RNA from a swab sample, sequencing the amplified DNA with a Nanopore MinION sequencer and analysing the data on a smartphone. The researchers also showed that Genopo can be used to profile DNA methylation – a modification which changes gene activity – in a sample of the human genome.

Research highlight
Study explores benefits of genomics in community genetic screening

The OneScreen Community Genomics Study launched in 2020 as a partnership with the Wolper Jewish Hospital. The study runs alongside the Sydney Jewish Community Genetics Program, which offers screening for nine different genetic conditions to senior high school students and couples prior to starting their families. The OneScreen Study builds on the success of the current community genetic screening program to investigate whether DNA analysis of more genetic conditions would benefit individuals and their families. The study is addressing technical challenges in generating, interpreting, storing and accessing genetic information. It also aims to address some of the challenges in providing information about genetic and genomic screening at scale, by providing information in schools and online and exploring community attitudes to the use of genomic information in health care.

Celebrating giving
Petersen Family Foundation

Visionary donors the Petersen Family Foundation have been generously supporting the Garvan Institute since 1997, when Arvid Petersen made a philanthropic pledge to the then cancer centre. In the years since, the Petersen family, through their Foundation have been long-standing supporters of Garvan's Molecular Screening and Therapeutics (MoST) Study.

The MoST Study provides a novel approach to treating patients with rare and uncommon cancers. The study compares the genome of each patient to that of their tumour to discern the underlying cause of their cancer and target treatment accordingly. The MoST Study is only one of the many Garvan programs that utilise the cutting-edge facilities, technology and world-class expertise of the Kinghorn Centre for Clinical Genomics to push the boundaries of scientific discovery.

We are incredibly grateful for the long-term support of the Petersen Family Foundation and their continued engagement with the Institute through seminars and events. Their ongoing generosity has enabled Garvan researchers to help patients who have exhausted all other options and who have, on average, doubled their life expectancy.

"Our family has had its own personal journey with cancer and this drives our motivation to find a cure. The Kinghorn Cancer Centre is one of the best in the world; driven by its passionate team of researchers and scientists, cutting edge technology and its commitment to patient-led care. We see this every time we walk in the door, and this is why we are so committed to this partnership." – The Petersen Family Foundation.

PhD completions 2020

Congratulations to all Garvan students awarded PhDs in 2020.

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.

Jordan Hastings
Supervised by David Croucher
"Applications of signal transduction network analysis in precision medicine"

Yolanda Colino Sanguino
Supervised by Fatima Valdes Mora & Susan Clark
"Dissecting the role of histone variant H2A.Z acetylation in transcription regulation"

Ashleigh Parkin
Supervised by Marina Pajic & Paul Timpson
"Targeting the SRC/JAK/STAT3 signalling pathway: a novel and promising therapeutic strategy for pancreatic cancer"

Julia Bier Nogueira
Supervised by Elissa Deenick & Stuart Tangye
"Elucidating the impact of PIK3cd GOF mutations on T cell development and function"

Kendelle Murphy
Supervised by Paul Timpson, Marina Pajic & David Herrmann
"Fine-tuned stromal versus epithelial FAK manipulation to improve systemic response to gemcitabine and abraxane in pancreatic cancer"

Mayan Amiezer
Supervised by Tri Phan & Robert Brink
"Regulation of mucosal immune responses by the IgA cytoplasmic tail"

Subotheni Thavaneswaran
Supervised by David Thomas & Mandy Ballinger
"The clinical translation of genomic output in oncology"

Sumedh Kamble
Supervised by Mike Rogers & Aaron Schindeler
"Bisphosphonates for bone targeting and cancer therapy"

Masters of Science

Madhura Bakshi
Supervised by Marcel Dinger & Georgina Hollway
"Application of whole genome sequencing for diagnosis of Intellectual disability in a multiethnic cohort- initial findings and reanalysis"

Garvan Institute of Medical Research

Board of Directors

The Board of Directors for the Garvan Institute of Medical Research donate their time and expertise. They are responsible for policy development and effective management of the Institute's affairs.

John Schubert AO Chair
Nominated by the Trustees of St Vincent's Hospital

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

Annabelle Bennett AC SC
Nominated by the Trustees of St Vincent's Hospital

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, Chair of the Australian Nuclear Science and Technology Organisation (ANSTO) and Chair of Gardior Pty Ltd, the trustee of The Infrastructure Fund (TIF). Dr Bennett has extensive knowledge and experience in intellectual property arising from her position as a Judge, as a senior counsel specialising in Intellectual Property and as President of the Copyright Tribunal.

Annette Cunliffe RSC
Nominated by the Sisters of Charity

Sister Annette was the Sisters of Charity Congregational Leader. She has been President of the Conference of Leaders of Religious Institutes (NSW), 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.

Chris Goodnow FAA FRS
Exective Director

Professor Goodnow is an internationally renowned immunologist. He is the Executive Director of Garvan, the Bill & Patricia Ritchie Foundation Chair, and head of the Immunogenomics Laboratory. Chris has had an extensive international research career. He has been a faculty member at Stanford University and the Australian National University, and has been closely involved in several biotechnology start-up companies. He is best known for discovering immune tolerance checkpoints by 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.

Stephen Johns
Nominated by the Garvan Research Foundation

Mr Johns is the Chairman and a non-executive director of the publicly listed Goodman Group. He is a former Chairman and non-executive director of Brambles Limited, Leighton Holdings Limited and Spark Infrastructure Group; and a former finance director and, following his retirement as an executive, a non-executive director of Westfield Group. He has a Bachelor of Economics degree from the University of Sydney and is a Fellow of both the Institute of Chartered Accountants in Australia and the Institute of Company Directors.

Thomas John (Jack) Martin AO FAA FRS
(to 30 September 2020)
Nominated by the Federal Minister for Health

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.

Paul Kelly
Nominated by the Trustees of St Vincent's Hospital

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.

Helen Nugent AO
Nominated by the NSW Minister for Health

Dr Nugent is the Chairman of the National Disability Insurance Agency and Ausgrid, a non-executive director of Insurance Australia Group Limited and TPG Telecom. 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 and was recently awarded the Order of Merit by the Australian Olympic Committee.

Patricia O'Rourke
Nominated by the Sisters of Charity

Adjunct 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 and Epiminder. She is a graduate of the Australian Institute of Company Directors and a member of the Harvard Business Club of Australia.

Vlado Perkovic
Nominated by UNSW Sydney

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
Nominated by the Sisters of Charity

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.

Russell Scrimshaw
Nominated by the Federal Minister for Health

Dr Scrimshaw is the Garvan Research Foundation Board Chair. He is currently Non-Executive Chairman of Tech Project Group P/L, Deputy Chairman of Ignition Advice 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.

Jillian Segal AO
Nominated by UNSW Sydney

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 of Rabobank Australia Limited. She is a member of the International Board of the Weizmann Institute of Science and of the Council for the Order of Australia. She has been a senior regulator, lawyer and a director of other listed and government organisations.

Ronald Trent
Nominated by the NSW Minister for Health

Professor Trent is Head of the Department of Medical Genomics at the Royal Prince Alfred Hospital and a Professor at the University of Sydney. He is Director for the Institute of Precision Medicine & Bioinformatics at the Sydney Local Health District. He is President of the School Council for the Sydney Boys High School. He is a Fellow of the Royal Australasian College of Physicians, the Royal College of Pathologists of Australasia, Faculty of Science (RCPA) and of the Australian Academy of Technology and Engineering.

Garvan Research Foundation

Board of Directors

The Garvan Research Foundation Board was established in 1981. They oversee the effective marketing and fundraising activities of the Garvan Research Foundation, ensuring Garvan's innovative research is supported.

Russell Scrimshaw Chair

Dr Scrimshaw is the Garvan Research Foundation Board Chair. He is currently Non-Executive Chairman of Tech Project Group P/L, Deputy Chairman of Ignition Advice 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.

Chris Goodnow FAA FRS Executive Director

Professor Goodnow is an internationally renowned immunologist. He is the Executive Director of Garvan, the Bill & Patricia Ritchie Foundation Chair, and head of the Immunogenomics Laboratory. Chris has had an extensive international research career. He has been a faculty member at Stanford University and the Australian National University, and has been closely involved in several biotechnology start-up companies. He is best known for discovering immune tolerance checkpoints by 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.

Nick Abrahams

Mr Abrahams is the Global Head of Technology and Innovation at Norton Rose Fulbright and has deep commercial expertise and global networks in the technology space. He is a co-founder of leading online legal site, LawPath. He was a non-executive director on ASX300 software company, Integrated Research for six years. He is a director of the Sydney Film Festival and is on the board of the Vodafone Foundation, and past President of the Australian Communications and Media Law Association. He is the author of two books: Digital Disruption in Australia and Big Data, Big Responsibilities: A Guide to Privacy & Data Security for Australian Business.

Jane Allen

Ms Allen is a founding Partner of Maritana Partners, a specialist Governance Advisory business. Previously she was a Managing Partner at Egon Zehnder in Australia, 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 is also a Director of the American Australian Association Limited, which promotes cooperation and understanding between the United States and Australia, as well as a Director of the United States Studies Centre.

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 was Managing Director of Freehill, Hollingdale & Page from 1991-1994. After 15 years overseas with IBM, where he was IBM's Vice President, Global Strategy for Growth Markets, he retired in July 2012. Mr Cannon-Brookes, a UK citizen, took Australian citizenship in 1994. He graduated with Honors in Law from Cambridge University. He was for 8 years a Global Board Member of Advance.org, and is a Fellow of the Australian Institute of Company Directors.

Sue Cato (from July)

Ms Cato is recognised as one of Australia's leading corporate communication and issues management experts, having managed some of the largest issues confronting corporate Australia and beyond. Ms Cato established Cato Counsel in 2003 as a corporate communications company providing high-level strategic transaction support and public and corporate affairs advice. Cato Counsel has since evolved into Cato & Clive. Ms Cato is on the board of the National Gallery Australia Foundation, is an advisory board member of Sydney Contemporary and is an Ambassador of Women for Election Australia. She is also a member of Chief Executive Women and is on the board of the creative think tank, A New Approach.

Wallis Graham

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. Wallis has a BA in Economics Modified with Mathematics from Dartmouth College in the United States.

Rajeev Gupta (from December)

Mr Gupta is a Partner of the cross-over technology focused investment fund, Alium Capital. Mr Gupta began his career at Goldman Sachs where he worked in the investment group in Hong Kong, Singapore & New York with a focus on listed & unlisted technology companies. He then utilised his technology investment experience as a portfolio manager at both Tribeca & Merricks Capital where he ran global technology funds. He then built his own 25-person technology start up called Geckolife, before establishing Alium Capital. Mr Gupta holds a Bachelor and Honours degree in Finance, Econometrics & Law from the University of Sydney. He is also a CFA & CMFAS charter holder, as well as being a AICD Member.

Hamish McLennan

Mr McLennan is a media and marketing industry executive. He is the Chairman of Rugby Australia, REA Group, and of HT&E, and Vice Chairman of Magellan Financial group and a Non Executive Director of Scientific Games and Claim Central P/L. He was Executive Chairman and CEO of Ten Network Holdings until July 2015 and prior to that he was Executive Vice President, Office of the Chairman, at News Corp (formerly News Corporation). Mr McLennan has also held the role of global Chairman of Young & Rubicam, part of WPP, the world's largest communications services group. He has previously served on the Board of Directors for the United Negro College Fund (UNCF) and the US Ad Council.

Cav Professor Simon Mordant AO

Professor Mordant is Executive Co-Chairman of Luminis Partners. He is also Co-Vice Chair of MOMA PS1 in New York and Chair's the NSW Government Visual Arts Board and is chair of Lend Lease Barangaroo Public Art Committee. He is a Trustee of the American Academy in Rome and a member of the Executive Committee of Tate International Council and of the International Council of the Museum of Modern Art in New York. An Enterprise Professor at the Centre of Visual Art (CoVA) at the University of Melbourne, and an Adjunct Professor at Universita Cattolica in Milan and Rome, he is also on the boards of the Centre for Independent Studies and the Ethics Centre. He has been awarded a Knighthood in the Order of the Star of Italy, and is Inaugural International Ambassador for Gallerie dell'Accademia Museum in Venice.

Greg Paramor AO (from August)

Mr Paramor is the Chairman of the Leftfield Group and a non-executive director of the Charter Hall Group. He is the former Managing Director of Folkestone Limited. He was the co-founder of Growth Equities Mutual, Paladin Australia and the James Fielding Group and CEO of Mirvac. He is a past president of the Property Council of Australia and of the Investment Funds Association. He has been involved with a number of not-for-profit groups including the current chair of BackTrack Youth Works, and is a director of The Nature Conservancy – Australian Trustee. He is a board member of the Sydney Swans and Sydney Swans Foundation.

Geoff Raby AO

Dr Raby is Chairman and Founder of Geoff Raby and Associates, a Beijing-based corporate advisory firm providing strategic advice and analysis on China. He is an Independent Non-executive Director of Yancoal and OcenaGold and was also on the Board of Fortescue Metals Group. 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 founded and led DFAT's East Asia Analytical Unit. He also Chairs a number of not-for-profit organisations in Australia.

Garvan Research Foundation
Board of Directors continued

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, Chairman and MD of Esso Australia Ltd, and non-executive director of Hanson Plc.

Jeanne-Claude Strong (to December)

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.

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 Australian Federal Government-owned Export Finance and Insurance Corporation (EFiC). He is a former Non-Executive Director of Fairfax Media, the Sydney Theatre Company, PrimeAg Australia, a Trustee of NSW Art Gallery, and subsequently a Trustee of the Queensland Art Gallery, and a member of the Board of the Great Barrier Reef Foundation. He is a recipient of the Australian Federal Government's Centenary Medal and in 2008 was appointed a Member of the Order of Australia (AM) for his services to business and commerce.

Garvan
highlight

Mairi Payten

When Mairi Payten retired, she was bittersweet about the friends she was leaving behind and what to do with her newfound time. In her words, "not only do you go to work each day but over time, those you work with do become your family – you share so much of your life with each other." In 2014, Mairi became just that – part of the Garvan family when she began to volunteer within the Garvan Research Foundation.

Mairi spent the majority of her life within and surrounded by the health sector, working as the Office Manager at the Haematology and Bone Marrow Transplant Department at St Vincent's Hospital for 24 years. Her husband, Dr Bob Payten, is an Ear, Nose, and Throat Surgeon, and continues to work, despite being 81 years of age.

After her retirement, Mairi attended a dinner with her husband at The University of Sydney to celebrate the 50-year anniversary of the 1964 medical graduates. It was there that she caught up with Professor Donald Chisholm – a scientist in the Clinical Diabetes, Appetite and Metabolism Lab at Garvan, who suggested that she volunteer at the Institute.

Mairi has been volunteering with Garvan for seven years now, and has been enjoying every day she comes into the Institute. "I'm so impressed with the effort the Foundation put in during the Thank You event for the volunteers at the end of the year, and I enjoy hearing from the scientists and what they're doing with their research," says Mairi.

Mairi's contribution to the Foundation is incredibly appreciated. She assists the team across a range of work, from lending a helping hand with day-to-day office tasks to helping with special projects providing feedback on our publications for the Genomic Cancer Medicine Program. During her spare time, she loves to cross-stitch and has created a special piece to hang in the Supporter Services office where the whole team can see it.

It's truly thanks to incredible individuals like Mairi and our other wonderful volunteers, that our Supporter Services team runs as smoothly and productively as it does. Thank you, Mairi!

Mairi Payten

"Not only do you go to work each day but over time, those you work with do become your family – you share so much of your life with each other."

Peer-reviewed grants and fellowships

Many of Garvan's ground-breaking discoveries are supported by competitive, peer-reviewed funding, which underpins our researchers' salaries and research activity.

From the Deputy Director
Professor Peter Croucher

Competitive fellowships and grants from the National Health and Medical Research Council (NHMRC) and other funding bodies are selected in a highly competitive process, where panels of experts assess applications and rank them on scientific merit, innovation and the track record of investigators.

When successful, grant proposals demonstrate how highly we are regarded by our peers in the medical research sector; however, the competition for available grants remains high and limited budgets only allow a small proportion of applications to be funded in each round.

Community support, fundraising and the contributions of Garvan's donors cannot be emphasised enough as critical to making the excellent work of our researchers possible. 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-led grants continued

Peer-reviewed funding

Funding Body	Type of Grant	Principal Investigator	Co-Investigators	Project Title	Amount Funded	Years of Funding
Australia and New Zealand Sarcoma Association	Johanna Sewell Sarcoma Research Grant	Jim Blackburn	Erin Heyer Mandy Ballinger	Improving fusion gene detection and immune response assessment in sarcoma patients	$50,000	1
Australian Government Community Grants	Public Health and Chronic Disease Program: Osteoporosis Consumer Awareness Grant	Jacqueline Center	Christopher White (Maridulu Budyari Gumal SPHERE-Musculoskeletal Clinical Academic Group) Rebekah Moles (University of Sydney) Osteoporosis Australia	Bone up	$500,000	3
Medical Research Future Fund	Coronavirus Research Response – 2020 Antiviral Development for COVID-19	Daniel Christ	William Rawlinson (South Eastern Area Local Health Service) Christopher Goodnow Sean Emery (UNSW)	Monoclonal antibody therapy of COVID-19	$594,420	1
National Breast Cancer Foundation	Investigator Initiated Research Scheme: Precision medicine in prevention and treatment	Paul Timpson	Liz Caldon	Precision medicine approach to overcome ribociclib resistance using live intravital single cell tumour imaging: customising patient response in stratified tissue settings using biosensor technology	$374,848	3
National Health and Medical Research Council	Ideas grant	Vanessa Hayes	Riana Bornman (University of Pretoria, South Africa)	Mutational signatures of DDT: the role of a controversial persistent endocrine disrupting pollutant on prostate cancer aetiology	$991,000	3
	Ideas grant	Herbert Herzog		Feeding behaviour and obesity development: identification of novel intervention points	$923,668	4
	Ideas grant	Cecile King	Marcel Dinger (UNSW)	The role of LINE encoded natural antisense transcripts in immune regulation	$934,853	3
	Ideas grant	Nicola Lee	Yue Qi	Central leptin control of energy partitioning	$684,993	3
	Ideas grant	Tri Phan	Akira Nguyen	Bring out your dead: how does defective apoptotic cell clearance by tingible body macrophages lead to the activation of self-reactive B cells in SLE?	$721,597	3
	Ideas grant	Thomas Cox		The collagen-rich matrix as a driver of breast cancer progression and resistance to therapy	$702,230	3

Garvan-led grants continued

Peer-reviewed funding

Funding Body	Type of Grant	Principal Investigator	Co-Investigators	Project Title	Amount Funded	Years of Funding
National Health and Medical Research Council	Ideas grant	Marina Pajic	Ruta Gupta (Royal Prince Alfred Hospital) Jonathan Clark (Chris O'Brien Lifehouse) Michael Boyer (Chris O'Brien Lifehouse) Jean Yang (University of Sydney) Jane Dahlstrom (Australian National University)	From functional genomics to precision medicine: identifying the cause and finding optimal therapy for oral squamous cell carcinoma	$855,992	3
	Development grant	Daniel Christ	Herbert Herzog Paul Timpson	Development of a therapeutic monoclonal antibody	$656,985	3
St Vincent's Clinic Foundation	Sr Mary Bernice, Packer Family Foundation Research Grant	Jerry Greenfield		Elucidating the immune and metabolic phenotype of autoantibody negative diabetes in adults	$120,000	1
	Annual Research Grant	David Herrmann	Kenny Ip Paul Timpson Amy Pawira Lorraine Chantrill	Pinpointing and targeting novel drivers of pancreatic cancer progression, invasion and metastasis	$40,000	1
	AMR Translational Research Grant	Alisa Kane	Winnie Tong Andrew Carr Anthony Kelleher John Moore	The clinical and immunological benefits of curative allogeneic haematopoietic stem cell transplantation (HSCT) and precision therapeutics in adults with primary immunodeficiency	$50,000	1
Sydney Catalyst	Pilot and Seed Funding grant	Brooke Pereira	Tatyana Chtanova John Whitelock (UNSW)	Dual targeting of stromal and immunological aberrations in pancreatic cancer by combining perlecan inhibition with immunotherapy	$50,000	1
The Cure Parkinson's Trust (UK)	Research Project	Antony Cooper	Justin O'Sullivan (University of Auckland)	RG200851: Identification and stratification of Parkinson's patients lacking GBA mutations best suited to benefit from GBA therapeutics	£68,000	1
University of New South Wales	Cellular Genomics Futures Institute Seed grant	Tatyana Chtanova	Fabio Zanini (UNSW) Nigel Lovell (UNSW)	Defining the molecular basis of effective antigen cross-presentation via integrated single cell imaging and sequencing [SF014]	$65,000	2
	Cellular Genomics Futures Institute Seed grant	Timothy Mercer		Synthetic reference controls for single-cell sequencing	$34,115	1

Funding Body	Type of Grant	Principal Investigator	Co-Investigators	Project Title	Amount Funded	Years of Funding
University of New South Wales	Cellular Genomics Futures Institute Seed grant	Peter Croucher	John Murray (UNSW) Maurice Pagnucco (UNSW) Tri Phan Georgia McCaughan (St Vincent's Hospital) Ashish Goyal (Fred Hutchinson Cancer Research Center, USA) John Moore (St Vincent's Hospital)	Predicting Time to Environment-Dependent Emergence of Myeloma in Patients (PreEEMPT)	$443,817	3
	Cellular Genomics Futures Institute Seed grant	Joanna Achinger-Kawecka	Susan Clark Anthony Schmitt (Arima Genomics) Hamid Alinejad-Rokny (UNSW)	Single cell Hi-C technology development	$99,805	1
	COVID-19 Rapid Response Research Initiative	Stuart Tangye	Chris Goodnow Joseph Powell Elissa Deenick Daniel MacArthur Tri Phan Sarah Kummerfeld Alex Swarbrick Gail Matthews (St Vincent's Hospital)	Why do only some patients develop severe COVID-19 following infection with SARS-CoV-2?	$500,000	2
	Maridulu Budyari Gumal (SPHERE) Triple I Laboratory grant	Manu Singh	Golo Ahlenstiel (Westmead Institute for Medical Research)	An integrated approach to dissect the immunopathogenesis in coeliac disease by identifying lymphocytes going rogue	$75,000	1

Collaborative grants

Peer-reviewed funding

Funding Body	Type of Grant	Admin Institution	Garvan Investigator/s	Co-Investigators	Project Title
Australian Research Council	Discovery Project	University of New South Wales	Cecile King	Marcel Dinger (UNSW)	Gene regulation by retroelement encoded natural antisense transcripts
Cancer Institute NSW (CINSW)	Translational Research Program Grant	University of New South Wales	Paul Timpson David Thomas Marina Pajic	David Goldstein (UNSW) Phoebe Phillips (UNSW) Katrin Sjoquist (University of Sydney) Lorraine Chantrill (Wollongong Hospital) Anthony Gill (Royal North Shore Hospital)	Molecular Screening and Therapeutics (MoST)-P: precision oncology in pancreatic cancer
Medical Research Future Fund	Genomics Health Futures Mission Project Grant	University of Queensland	Elgene Lim Sandra O'Toole	Amy McCart Reed (University of Queensland) Peter Simpson (University of Queensland) Chris Pyke (University of Queensland) Po Inglis (Queensland Health) Euan Walpole (Queensland Health) Gorane Santamaria (Queensland Health) Kenneth O'Byrne (Queensland Health) Rahul Ladwa (Queensland Health) Stephen Fox (PeterMac) Sherene Loi (PeterMac) Geoff Lindeman (WEHI) Erik Thompson (QUT) Cameron Snell (Mater Hospital) Natasha Woodward (Mater Hospital) Stephen Rose (CSIRO) Christobel Saunders (University of Western Australia) Benhur Amanuel (University of Western Australia) Louisa Gordon (QIMR Berghofer) Nic Waddell (QIMR Berghofer) Snell (Mater Hospital)	Whole genome sequencing of high risk breast cancers
Michael J Fox Foundation for Parkinson's Research (USA) and Shake It Up Australia Foundation	Use of PD biosamples	University of New South Wales	Antony Cooper	Yann Gambin (UNSW) Emma Sierecki (UNSW)	Single molecule detection of oligomeric synuclein in body fluids
National Breast Cancer Foundation	Investigator Initiated Research Scheme	University of Melbourne	Mary-Anne Young	Paul James (University of Melbourne) Georgia Chenevix-Trench (QIMR) Melissa Southey (Monash Mealth)	Using Polygenic Risk Modification to improve breast cancer prevention: The PRIMO Trial

Collaborative grants continued

Peer-reviewed funding

Funding Body	Type of Grant	Admin Institution	Garvan Investigator/s	Co-Investigators	Project Title
National Health and Medical Research Council	Ideas grants	University of Adelaide	Elgene Lim	Wayne Tilley (University of Adelaide) Richard Iggo (University of Adelaide) Jason Carroll (Cambridge Institute for Medical Research, UK)	A combinatorial drug strategy to target lethal forms of breast cancer
National Institutes of Health NIH (USA)	Research Project Grant	University of Arkansas for Medical Sciences, USA	Michelle McDonald	Jesus Delgado-Calle (University of Arkansas for Medical Sciences, USA)	Bone-targeted therapies to improve bone health and prevent relapse in multiple myeloma
The Chan Zuckerberg Initiative (USA)	Seed Networks for the Human Cell Atlas (application portal opens 18 September)	Northwestern University, USA	Joseph Powell	Alexander Misharin (Northwestern University, USA)	Human Lung Cell Atlas 1.0

Equipment grants 2020

Peer-reviewed funding

Funding Body	Type of Grant	Project Title	Principal Investigator	Co-Investigators	Amount Funded
Australian Cancer Research Foundation	Annual grant	The ACRF Centre for Intravital Imaging of Niches for Cancer Immune Therapy (ACRF INCITe Centre)	Tri Phan	Paul Timpson Marina Pajic David Thomas Peter Croucher Mark Smyth (QIMR Berghofer) Woei Ming Lee (ANU) Dayong Jin (UTS)	$3,300,000

Fellowships and scholarships 2020

Peer-reviewed funding

Funding Body	Type of Award	Awardee	Project Title	Amount Funded	Years of Funding
Australian & New Zealand Urogenital and Prostate (ANZUP) Cancer Trials Group Ltd	Noel Castan Fellowship (Bioinformatics)	Hui-Ming Lin	Noel Castan Fellowship - Lin	$100,000	2
Cancer Institute NSW	Early Career Fellowship	Ksenia Skvortsova	Rescuing tumour-suppressor gene activity to cure follicular lymphoma	$488,660	3
	Career Development Fellowship	Liz Caldon	A new target to improve cancer survival: endocrine tolerant cells in late recurring breast cancer	$150,000	3
	Career Development Fellowship	Robert Weatheritt	P-bodies: a novel mechanism driving triple negative breast cancer?	$498,995	3
Funadacion Ramon Areces	Postdoctoral Fellowship	Laura Rangel	SULF1: a new therapeutic target to fight against breast cancer	€ 28,800	1
Lung Foundation Australia	Deep Manchanda-Lung Foundation Australia Lung Cancer Fellowship	Venessa Chin	Utilising single cell sequencing to change the management of lung cancer	$160,000	2
National Health and Medical Research Council	Investigator grant (EL1)	Kylie James	Defining the role of B lymphocytes in breast cancer at single-cell resolution	$645,205	5
	Investigator grant (L2)	Lisa Horvath	Integration of novel biological targets/biomarkers in the treatment of lethal prostate cancer	$1,930,260	5
	Investigator grant (L3)	Tuan Nguyen	Prediction of fracture by clinico-genetic profiling	$2,339,215	5
	Investigator grant (L3)	David Thomas	Genomic Cancer Medicine	$1,814,215	5
	Postgraduate Scholarship (Medical)	Karrnan Pathmanandavel	Identifying the molecular basis of memory B cell function and human immunoglobulin E memory via hyper immunoglobulin E syndromes	$96,009	2
Snow Medical Research Foundation	Snow Fellowship	Owen Siggs	Mutation and acquired errors of immunity	$7,279,346	8

Join the Garvan family

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

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

Donate regularly:
By becoming a *Partner for Discovery,* your monthly donation will give our researchers the momentum needed to make amazing discoveries.

Donate in memory:
Giving in memory of a loved one can be a powerful and lasting way to celebrate their life — while contributing to medical research.

Donate in celebration:
In celebration donations are a great way to commemorate a special occasion in your life.

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.

Corporate partnerships:
Joining the Garvan community as a corporate partner is a sound business decision and one that could make a significant difference to the long-term health of our community.

Donate now

1300 73 66 77

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Financial highlights

Statement of financial position as at 31st December 2020

Profit and loss statement

Revenue	2020 A$'000	2019 A$'000
Fundraising and grant income		
NHMRC fellowships, scholarships and other grants	15,519	14,303
Peer-reviewed research grants	12,560	12,480
NSW government grants	9,261	6,201
Other grants	25,946	20,493
Donations received	48,107	54,620
UNSW contribution	6,961	3,910
	118,354	112,007
Other income		
Revenue from contracts with customers	12,801	14,579
Investment (loss) / income	(468)	6,154
Share of losses of associates accounted for using the equity method	43	(11)
Net (loss)/gain on foreign exchange	(14)	(191)
	12,362	20,531
Total revenue	**130,716**	**132,538**

Expenditure on research activities	2020 A$'000	2019 A$'000
Sequencing consumable expenses	3,309	4,603
Employee benefits expenses	57,070	54,266
Other research expenses	14,759	15,901
Depreciation and amortisation expenses	7,063	7,869
Administration expenses	2,946	6,744
Fundraising expenses	2,308	2,600
Building and scientific expenses	8,545	10,463
Finance costs	564	809
Total expenses	**96,564**	**103,255**
Total comprehensive income/ (loss) for the year	**34,152**	**29,283**

Balance sheet

Assets	2020 A$'000	2019 A$'000
Current assets		
Cash and cash equivalents	47,968	23,764
Trade receivables	11,251	7,337
Financial assets at fair value through profit and loss	15,788	37,000
Financial assets at amortised cost	0	8,700
Sequencing consumables	1,019	1,043
Term deposits	84,678	44,530
Other current assets	633	1,045
Biological assets	382	521
Total current assets	161,719	123,940
Non-current assets		
Property, plant and equipment	69,241	73,104
Investments accounted for using the equity method	93	50
Right-of-use assets	10,959	11,796
Intangibles and others	195	225
Total non-current assets	80,488	85,175
Total assets	242,207	209,115

Liabilities	2020 A$'000	2019 A$'000
Current liabilities		
Lease liabilities	900	881
Trade and other payables	7,015	9,917
Employee benefit obligations	6,853	6,273
Deferred revenue	6,252	4,433
Total current liabilities	21,020	21,504
Non-current liabilities		
Lease liabilities	6,440	7,107
Employee benefit obligations	1,167	1,076
Total non-current liabilities	7,607	8,183
Total liabilities	28,627	29,687
Net assets	**213,580**	**179,428**
Equity		
Reserves	140,600	121,525
Retained surplus	72,980	57,903
Total equity	**213,580**	**179,428**

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.

Garvan highlight

Josie La Spina

A family legacy that continues to inspire

Josie La Spina understands first-hand how disease can impact a family. Now, as a Garvan *Partner for the Future,* she is leaving a legacy for future generations.

It was while working for MLC many years ago that Josie La Spina first heard about the Garvan Institute from a colleague. "I worked with a gentleman who was in his 90s and he still looked after the finances and Wills for the last surviving Garvan sisters," says Josie. "He knew them quite well and he told me many stories including how the Garvan Institute was established in 1963 and named in honour of James Patrick Garvan, and about all the wonderful philanthropic work the Garvan family did for the Australian community." It was these stories that first inspired Josie to support the Garvan Institute.

When the time came for Josie to review her Will, she recognised the importance of long-term investment in cutting-edge medical research. She decided to go one step further and become a Garvan *Partner for the Future* (those who have left a lasting legacy to medical research by including a bequest in their Will). Josie's farsighted generosity and dedication to Garvan is motivated by causes that are close to her heart, she understands first-hand how families can be devastated by disease.

"My dad passed away from complications of type 1 diabetes and my mum had dementia," she says. "One of my two sisters had bowel cancer – she's all clear now thankfully. My other sister lives with me and I am her full-time carer, she has brain damage, epilepsy and mild type 2 diabetes."

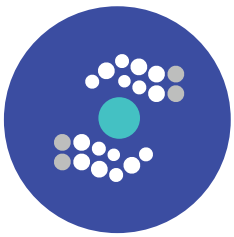
Josie continues, "I decided to leave a gift to the Garvan Institute in my Will because I want to help make a difference for people affected by disease, and for their families as well."

The Garvan Institute of Medical Research was established in 1963 as a small research department of St Vincent's through funds from the Sisters of Charity's Centenary Appeal. One of the primary donors to the appeal was Mrs Helen Mills, who contributed 100,000 pounds. She requested the Institute be named after her late father, James Patrick Garvan – a distinguished NSW parliamentarian and business leader.

Josie La Spina

"When thinking about my future legacy contributing to new discoveries for treating disease, I feel really hopeful."

Partners for the Future



Our generous supporters come from all walks of life and give in various ways. We extend our gratitude to all of these wonderful supporters who have chosen to include a future bequest to Garvan in their Will.

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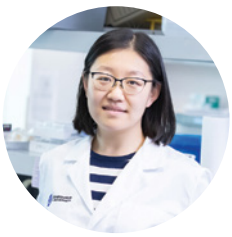
Partners for the Future continued



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Estates received in 2020

In 2020, Garvan was privileged to receive bequests from the estates of these farsighted, generous people in our community.

We extend our heartfelt thanks to these supporters and condolences to their loved ones and friends. Their legacies will transform the health and lives of future generations.

In loving memory of :

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Timothy Suttor
Joan Thomas
Sheila Woodcock

In memory

In 2020, we mourned the passing of several members of our Garvan family. Here we remember two very special supporters for their distinctive lives and contributions to the global community.

Emery Angles

The Garvan Institute recently lost a loyal supporter and friend with the passing of Mr Emery Angles.

Mr Angles was born in 1924 in Ujpest, Hungary before migrating to Sydney where he met his wife, Anne, who he was married to for 65 years. Having survived the Holocaust, Mr Angles was heavily invested in philanthropy and providing a better future for his community.

Having a strong desire to improve the lives of others, Mr Angles was one of the first supporters of the Garvan-Weizmann Partnership. He contributed to the partnership since its inception and continued this support over the course of his life. Being a dedicated Garvan *Partner for the Future,* he planned that his support would be maintained as an on-going legacy through the establishment of the charitable Angles Family Foundation as part of his Will. His son, Mark had the opportunity to visit the Weizmann Institute of Science in Israel to experience first-hand the impact of his father's support and philanthropic work across the many joint projects undertaken as part of the Garvan-Weizmann Partnership.

"The connection between Australia and Israel was very important to my father. While I think he would have loved to have settled in Israel, he ended up coming to Australia and found a great sense of satisfaction in being able to contribute to the advancement of both countries. Helping the community through medical research was one of his passions. It was a privilege to be able to see the fruits of his support of the Garvan-Weizmann Partnership while visiting the Weizmann Institute of Science," said his son Mark.

Mr Angles' passion for philanthropy and improving the lives of others was so important to him that the Angles Family Foundation generously gives to a number of organisations, in addition to its support of Garvan. Mr Angles was an incredible man with a huge heart and visionary foresight. His contributions will leave a lasting legacy to the Institute and to the future of health care, for which we are immensely grateful.

Alison Burrell

In 2020, Garvan received a remarkably generous bequest from the late Alison Margaret Burrell.

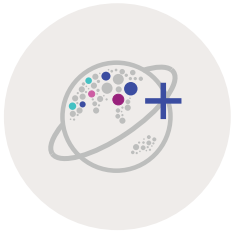
Alison was an accomplished economist, teacher, editor and composer. Born in Sydney in July 1943, she grew up with a passion for music which led her to travel to Paris as a young woman with the intention of studying music composition. However, on her arrival the Paris revolt of May 1968 led her to change her interests and career ambitions. She moved to the UK where she studied Mathematical Economics and Econometrics at the London School of Economics. Over the course of her career she was admired and continually sought out as an authoritative and influential international scientist for her analytical abilities, and gifts as a teacher and editor throughout Europe.

In 2016, after a long and successful international career in the field of economics, Alison returned to Sydney to pursue her original passion of composing music. Just two weeks before peacefully passing away at home in 2018 at the age of 75, she was able to listen to her music compositions being recorded along with her family. Alison was an incredible individual; one of passion, intelligence and foresight. She will be truly missed by her beloved family, friends and peers around the world.

Gifts in Wills, such as the farsighted gift Alison left to Garvan, are incredibly important. Bequests enable us to allocate funding where it is most needed, and enables our researchers to pursue novel, daring projects that have not yet received government funding. We are incredibly inspired and grateful to Alison for her farsighted bequest to Garvan's research. Her generous gift will benefit the Institute, its people and research programs, leaving an invaluable legacy which will help to transform the lives and health of people around the world.

Behind the science
Allegra Angeloni and Qian Du

2020 Garvan community



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 2020.

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Garvan is proud of our long-standing and successful relationships with our corporate partners. Although they represent a diverse range of industries, our partners are united in their commitment to innovative medical research, and creating a healthier future for everyone.

Chris Paspaley

Making a meaningful difference

Philanthropy is an important focus for the Paspaley business, and through its five-year partnership with the Garvan Institute, in September 2020, Paspaley reached an incredibly generous milestone of $1 million in donations.

Paspaley contribute a percentage of sales from the exclusive Kimberley Bracelet, in support of Garvan's Molecular Screening and Therapeutics (MoST) clinical trials, which focuses on accelerating Garvan's pioneering research into rare and less common cancers.

In Australia, more than 52,000 people are diagnosed each year with a rare or less common cancer. Of these, 25,000 will not survive as there are few treatment options available for these cancers. Collectively, rare and less common cancers account for over 50% of all cancer deaths every year, but comparatively receive a small fraction (13.5%) of research funding. The MoST clinical trials program opens the door to cutting-edge clinical trials for those who have exhausted all other options, and who have limited or no access to other clinical trials due to the rarity of their cancer.

Today, 3,262 patients have been enrolled into MoST, 79% of whom have a rare or less common cancer. The program compares the genome of each patient – their entire DNA – with the genome of their tumour, to discern the underlying cause of their cancer. This enables the patient's oncologist to personalise treatment based on the tumour DNA profile, rather than where the cancer arises in the body. Individuals without a targetable driver of their cancer are offered the latest in cutting-edge immunotherapies, with many showing a remarkable response to this treatment.

Paspaley's long-term support for the MoST program has been a fundamental element in the success of the program, and has enabled an additional 175 patients to be enrolled and undergo molecular screening as part of the clinical trial. Half of all patients who have received a matched therapy on the program have doubled their life expectancy.

"Giving back is important to us, so the Paspaley family and business is immensely proud to contribute to Garvan's vital cancer research," says Chris Paspaley, Director of Retail at Paspaley. "We feel privileged to know that our support can have a positive impact and help to achieve better health outcomes for cancer patients, their families and loved ones. After five years of working with Garvan, we were thrilled to achieve the milestone of $1 million in donations and look forward to reaching more milestones together in future."

"Paspaley's generosity has enabled more patients with a rare or less common cancer who have exhausted all their options to access novel, cutting-edge treatment. Their funding has contributed significantly to the impact of MoST, which has now expanded nation-wide through the Genomic Cancer Medicine Program, bringing this critical clinical trial program to people across the country," says Professor David Thomas, Head of the Genomic Cancer Medicine lab at Garvan.

For those who have been touched by Paspaley's generosity, the impact of giving hope to these patients, their families and loved ones is immeasurable. These remarkable outcomes could not have been achieved without the dedication from the Paspaley family and business, and their vision of a healthier future for all Australians. Garvan is immensely grateful for their ongoing support.

PASPALEY

Innovation goes global

Almost seven years ago, the Vodafone Foundation and Garvan formed a partnership around the shared vision of improving health for Australians through the power of technology. What began with the launch of the DreamLab app with one project in Australia has expanded to a global, multi award-winning platform.

DreamLab utilises the processing power of idle smartphones while a user sleeps to crunch data for research projects. To date, the DreamLab app has been downloaded by over one million smartphone users in 17 countries to help speed up scientific research, and has become a truly global 'citizen science' movement.

The Vodafone Foundation's support has since expanded to include the Australian Genomic Cancer Medicine Program, and the Molecular Screening and Therapeutics (MoST) program. Through these innovative programs, half of all patients who received a matched therapy to their cancer have almost doubled their life expectancy from 37 weeks to over 72.

"Garvan is at the forefront of innovative ideas and new technology that has made a palpable difference in the lives of many Australians. The Vodafone Foundation is so proud to have partnered with Garvan for the last seven years and look forward to new innovations in the health space with Garvan at the helm." – Rebecca Murray, General Manager, Enterprise & Government Integration.

Vodafone Australia Foundation

Driven to make a difference

The Sutton family, both personally and through their business, Suttons Motors, have been generously supporting Garvan's research for over 29 years. A lifetime of philanthropic investment in medical research began with the late Sir Frederick Sutton, and continues today with Laurie and Di Sutton – Life Governors of Garvan and Visionary Donors of the Garvan-Weizmann Centre for Cellular Genomics.

Since July 2019, Suttons have been generously supporting Professor Paul Timpson's pioneering pancreatic cancer research, a cause close to the Sutton family's heart. Professor Timpson is using advanced imaging to locate the molecular drivers of pancreatic cancer progression, and the factors within the tumour causing resistance to therapy. The five-year survival rate of people diagnosed with pancreatic cancer has only marginally improved over the last 40 years to about 9%. This is due to the complex molecular variations of pancreatic cancer and the late diagnosis of the disease, when it is often already locally advanced or metastatic. Professor Timpson's work to pinpoint critical events that drive tumour invasion and metastasis, and the barriers that impair efficient drug targeting, is critical to improved patient survival.

"We are honoured to support Professor Paul Timpson's research - as a family, this disease has affected us personally and we are privileged to contribute to novel research. As a company, Suttons is incredibly proud of our long-standing relationship with Garvan." – Lauren Sutton, Charity Partnerships Manager.

Suttons

Building healthy families

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

Since 2016, Accor's funding has enabled an additional 112 patients to be enrolled into the MoST program, and has also allowed Garvan researchers to undertake a suite of correlative studies with these patient samples. These results are helping us to better understand how the immune system works to fight cancer, with the potential to develop new treatment options for the thousands of Australians diagnosed with rare or less common cancers who have exhausted all other treatment options.

"Accor fundamentally believes that the translational research Garvan undertakes has real, meaningful impact on the lives of Australians and their families. Garvan is key to helping in our quest to help build healthy families across the country, particularly in a less prominent area of research." – Marc Bennie, General Manager, Indigenous Programs & Community Investment.

ACCOR COMMUNITY FUND AUSTRALIA *Building healthy families*

2020 Publications

Through scientific publications, Garvan's researchers publish discoveries across a wide range of diseases. These discoveries advance outcomes across the scientific field has research findings are made available to the wider community.

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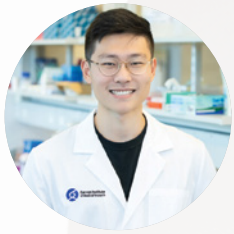

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