Walter+Eliza Hall
Institute of Medical Research

DISCOVERIES FOR HUMANITY

EXTENDED ANNUAL REPORT 2018

Contents

The Walter and Eliza Hall Institute of Medical Research

Parkville campus
1G Royal Parade
Parkville Victoria 3052 Australia
Telephone: +61 3 9345 2555

Bundoora campus
4 Research Avenue
La Trobe R&D Park
Bundoora Victoria 3086 Australia
Telephone: +61 3 9345 2200

www.wehi.edu.au

WEHIresearch
@WEHI_research
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Walter and Eliza Hall Institute

ABN 12 004 251 423

Produced by the Walter and Eliza Hall Institute's Communications and Marketing department

We acknowledge the traditional owners and custodians of the land on which our campuses are located, the Wurundjeri people of the Kulin nation, and pay our respects to their elders past and present.

About the Institute

The Walter and Eliza Hall Institute is one of Australia's leading biomedical research organisations, with a strong national and international reputation for performing highly influential basic and translational research.

The Institute was founded in 1915 with financial support from a trust established by Eliza Hall, following the death of her husband Walter. The vision was for an institute that 'will be the birthplace of discoveries rendering signal service to mankind in the prevention and removal of disease and the mitigation of suffering'.

Today, with more than 1,100 staff and students, the Institute is addressing some of the major health challenges of our time, with a focus on cancer, infection, inflammation, immune disorders, development and ageing.

We are at the forefront of research innovation, with a strong commitment to excellence and investment in research computing, advanced technologies and developing new medicines and diagnostics. Our researchers are strongly supported by Professional Services teams.

This Institute is committed to delivering long-term improvements in treating and diagnosing diseases, with many national and international clinical trials underway based on research undertaken at the Institute.

Our main laboratories are located in the world-renowned Parkville precinct, a vibrant and collaborative life science research, education and healthcare hub.

The Institute offers postgraduate training as the Department of Medical Biology of the University of Melbourne, and is affiliated with the University of Melbourne and The Royal Melbourne Hospital.

Our mission

Mastery of disease through discovery

Our vision

To be an innovative medical research institute that enriches society through discovery and education and improves health outcomes through translation

Our values

- Pursuit of excellence
- Integrity and mutual respect
- Collaboration and teamwork
- Creativity
- Accountability
- Contribution to society

President's report

The past year, 2018, has again been a year of many achievements for the Institute. These included a robust examination of its current state to inform our future direction, as well as taking many opportunities to reflect on and celebrate our values.

The Professor Lynn Corcoran Early Learning Centre on the Institute's forecourt (page 8) has altered every person's journey into our Parkville campus, whether it be for work, study or as a visitor. I am thrilled that we were able to deliver this landmark facility to assist many parents at the Institute, with the support, once again, of our generous donors, precinct partners and the Victorian Government. It is fitting that the centre's name acknowledges Professor Lynn Corcoran's tireless advocacy for gender equity.

The Institute remains in a strong financial position, and we are extremely grateful for more than $20 million in philanthropic income for the year. This valuable funding has supported areas of greatest need at the Institute, including early career researchers and traditionally hard to fund aspects of research, as well as research into significant diseases that impact our community. Thank you to all our supporters for your ongoing generosity.

A major project in 2018 was the development of the Institute's new five-year strategic plan. Since our last strategic plan was developed in 2014, the Institute and the Australian medical research sector have experienced significant change. This includes advances in research technology, which is fundamentally changing how we do research. Our funding environment has also altered with the Australian Government's Medical Research Future Fund now in operation, significantly enhancing available support, while at the same time encouraging substantial collaboration across the sector. The Institute's long-term financial stability was also bolstered by the partial sale of our royalty rights in the anti-cancer drug venetoclax in 2017, and this has provided new scope and capacities for how we plan for the future.

An extensive consultation process underpinned our new *2019-2023 Strategic Plan*. The review was built around an outstanding Scientific Strategy Advisory Group who both endorsed the Institute's performance as one of the world's leading medical research institutes, and offered creative suggestions to further build on its achievements. The process also involved the Institute's staff and students, Board and numerous external stakeholders. This has given us a holistic view of the medical research landscape and our position in it, and how we can achieve our goals effectively and sustainably. Thank you to all those who gave their time and expertise, helping us to create a plan that will guide the Institute over the coming five years and beyond.

In 2018 the Institute's Board welcomed two new members. These are Mr Peter Collins, bringing expertise in leadership and ethics, and Professor Sir John Savill, a renowned medical research leader who was a member of our Scientific Strategy Advisory Group.

Mr Christopher Thomas AM
President, Walter and Eliza Hall Institute of Medical Research

Director's report

I have often introduced our annual reports by saying the previous year was exceptionally successful. After 10 years, you might rightly be sceptical; however, I honestly believe 2018 was remarkable.

This annual report shows how our decade-long commitment to recruiting a new generation of passionate, driven and diverse scientific leaders has paid dividends, measured in advances in our understanding of medical biology, and improvements in disease prevention, diagnosis and treatment. Many of the breakthroughs highlighted in this report were made by young researchers who were recruited to lead a laboratory for the first time. I hope you will also appreciate that our success has been driven by a deep commitment to collaboration.

Among the highlights of 2018 were landmark discoveries about the molecules driving lung cancer (page 20); revelations of new subsets of immune cells (page 23); studies that improve the management of coeliac disease (page 26); discoveries providing new insights into cell biology, enabled by our Centre for Dynamic Imaging (page 30); and progress towards potential drugs and vaccines to combat malaria (page 32).

Three new scientists joined our faculty in 2018, extending our research capabilities: Dr Brad Sleebs, a medicinal chemist (page 33); Dr Anna Coussens, specialising in infectious diseases (page 35); and Professor David Komander, who leads a new Ubiquitin Signalling division unravelling the role of protein modifications in disease (page 38).

The Australian Government is our largest funder, and our researchers receive vital support from both the National Health and Medical Research Council (NHMRC) and the Medical Research Future Fund (MRFF). Significant changes to NHMRC funding schemes are being implemented in 2019. In the long run, I believe these changes will be enormously positive and result in more equitable and efficient allocation of funding, but in the short to medium term they will create unease. Philanthropic support provides a much-needed safety net to our researchers, quelling their anxiety and allowing them to be at their creative best.

In 2018 we made an important decision, as part of our work developing the Institute's *2019-2023 Strategic Plan*, to broaden the focus of our research. We will continue to build on our strengths in cancer, infection and immunology research, while also extending our impact into development and ageing – areas of increasing importance to our community in the decades to come. You can read more about our new research themes on page 4. We also extended our capacity in computational biology and in developing new medicines. With the support of the Australian Government complementing our own investment and generous philanthropic donations, we have created a new National Drug Discovery Centre to enable Australian researchers to progress towards discovering new medicines.

As part of our strategic planning work, the Institute's leadership has been restructured, creating a new 'Strategic Cabinet' that includes me as Institute director, our three deputy directors, the leaders of our five research themes, and the acting head of scientific education. It will lead important work in the long-term development and implementation of research and funding strategies.

Professor Doug Hilton AO
Director, Walter and Eliza Hall Institute of Medical Research

Launching a new era of research

The Institute's primary focus has been on cancer, infectious disease, and immune and inflammatory diseases since the 1960s. This research has advanced our understanding of disease and led to improved health outcomes. However, there are still many areas of need, and much research to do.

There are many opportunities ahead of us to take advantage of rapidly advancing technologies, which can help solve previously intractable research problems and respond to major health challenges as well as emerging threats. As part of the development of the Institute's *2019-2023 Strategic Plan*, we considered how we could best focus our research to meet the challenges of the 21st century, extend our existing strengths and amplify our impact.

We constituted an eminent panel of international and national experts, chaired by Professor Gerald Rubin (Vice President, Howard Hughes Medical Institute; Executive Director, Janelia Research Campus). The panel was tasked with reviewing our long-term aspirations and identifying opportunities to better translate our research into practical outcomes.

In response to this scientific review, the Institute is broadening our research and expanding our capacity in new and innovative research techniques and technologies. From 2019, the Institute's scientific structure will reflect our research priorities through five research themes:

- Cancer Research and Treatments;
- Infection, Inflammation and Immunity;
- Healthy Development and Ageing;
- Computational Biology; and
- New Medicines and Advanced Technologies.

The Institute will establish an innovative research program in development and ageing, with a focus on intensifying our collaborative efforts both internally and externally to generate impact in this area. The Healthy Development and Ageing theme will build on the Institute's current expertise in understanding the molecular basis of development, health and disease, and our track record of research translation.

Multi-disciplinary collaboration is a strength of the Institute and our new scientific structure recognises this with an emphasis on technology and data-driven research. Our *2019-2023 Strategic Plan* reinforces our strengths in bioinformatics and computational biology, and extends our capabilities in structural biology, medicinal chemistry, drug discovery and clinical translation. Expertise in these areas will ensure we are ideally placed to undertake ambitious and impactful research, and translate this research into clinical outcomes.

Our transition to these new themes will be overseen by a new leadership group, the Strategic Cabinet. The Strategic Cabinet includes leaders from across the Institute and was established in late 2018. This will allow us to be more strategic, to better concentrate our resources, to facilitate collaboration across our research themes, and to engage more fruitfully with external groups to tackle major research problems.

We are entering an exciting time for the Institute and the medical research sector, and we look forward to sharing our outcomes with our supporters and collaborators.

Below: The Institute's Strategic Cabinet will lead the long-term development and implementation of research and funding strategies.

The Strategic Cabinet includes, from left: Professor Andrew Roberts, Cancer Research and Treatments theme co-leader; Professor Tony Papenfuss, Computational Biology theme leader; Ms Samantha Ludolf, Deputy Director, Strategy and Operations; Professor Doug Hilton, Director; Professor Warren Alexander, Cancer Research and Treatments theme co-leader; Professor John Silke, Infection, Inflammation and Immunity theme leader; Associate Professor Marnie Blewitt, Head, Scientific Education (acting); Professor Melanie Bahlo, Healthy Development and Ageing theme leader; and Associate Professor Guillaume Lessene, New Medicines and Advanced Technologies theme leader. Absent: Professor David Vaux, Deputy Director, Science Integrity and Ethics; and Professor Alan Cowman, Deputy Director, Science Strategy.

Health impacts

Our researchers aim to bring real benefits to people on a global scale, by making fundamental scientific discoveries and translating these to better treatments for a range of significant diseases. Clinical trials based on discoveries made at the Institute include trials of vaccines for coeliac disease, diabetes and malaria; trials of new anti-inflammatory agents; and trials of a new class of anti-cancer drugs, called BH3-mimetics, for treating people with leukaemia and other cancers.

The Institute's research is focussed on the disease areas of **cancer**, **immune disorders**, **infectious diseases** and **healthy development and ageing**. In this figure, the relative amount of research into individual diseases in these areas is represented by text size.

Expanding our drug discovery capabilities

We are committed to translating fundamental research discoveries made at the Institute through to improvements in healthcare. Contributing to the development of new medicines is an important part of this endeavour.

For more than a decade, the Institute has strategically invested in technologies including structural biology, medicinal chemistry and high-throughput screening, areas that are critical for discovering drugs that target the key proteins involved in diseases.

In 2018 the Institute laid the foundations for a new National Drug Discovery Centre. This was supported by the Victorian Government; philanthropists Mr Mike Fitzpatrick AO and Ms Helen Sykes; and $32.1 million from the sale of royalty rights for venetoclax, an anti-cancer treatment based on a landmark research discovery made at the Institute in the 1980s. A $25 million contribution from the Australian Government in early 2019 means that we will be able to make the centre accessible to researchers across Australia in 2019.

Crucial technologies

The centre's world-class facilities and state-of-the-art robotic equipment will enable researchers to undertake ultra-high-throughput screening – a critical step in the translation of biomedical research discoveries.

High-throughput screening methods are extensively used in the pharmaceutical industry. They advance drug discovery by allowing hundreds of thousands of drug-like compounds to be efficiently screened in a time- and cost-effective way.

Led by a team of highly-skilled Institute scientists, the centre's facilities will support researchers across Australia to screen and discover chemical compounds needed to progress their research.

Institute director Professor Doug Hilton said that for many years the translation of Australian research into new medicines had been hampered by a lack of capacity in drug development.

"Many promising discoveries were either never pursued, or researchers were forced overseas to develop their research into new therapies," he said.

"Our National Drug Discovery Centre will help to bridge this gap in the drug discovery pipeline."

A proven track record

Professor Hilton said the Institute had a proven track record for translating its research into health outcomes for patients.

"Venetoclax is a leading example of how patients can benefit from the translation of basic research discoveries made in Australia," he said.

"While that medicine took 30 years to reach patients, we hope that our commitment to building a centre that enhances Australia's capacity for translating basic biomedical research will serve to accelerate the process of drug discovery and bring future medicines to patients faster."

Below: High-throughput screening will be a vital part of our new National Drug Discovery Centre. Dr Helene Jousset leads the Institute's screening laboratory.

Translating discoveries into better health

Our work to improve health is underpinned by a strong foundation in multidisciplinary fundamental biology, and enabled by groundbreaking technologies, clinical translation expertise and collaboration with industry and clinical partners. More than 300 research projects feed into our discovery and development pipeline, progressing towards clinical impact.

DISCOVERY → DEVELOPMENT → CLINICAL TRANSLATION

LEUKAEMIA

- Identified how leukaemia cells survive
- Collaborated with AbbVie and Genentech, a member of the Roche Group
- Development of anti-cancer drug venetoclax
- Clinical trials of venetoclax in leukaemia
- Venetoclax approved for clinical use

BREAST CANCER

- Investigated breast cancer biology
- Explored how breast cancer cells survive
- Breast cancers are susceptible to venetoclax
- Clinical trials of venetoclax in breast cancer

COELIAC DISEASE

- Defined immune reaction to gluten in coeliac disease
- Developed compound to switch off response to gluten through spin-off company Nexpep
- Collaboration with ImmusanT
- Clinical trials of therapeutic vaccine to treat coeliac disease
- Development of diagnostic test for coeliac disease

MALARIA

- Identified and deciphered novel biology of malaria parasite
- Validated targets for anti-malarial agents
- Leading drug discovery in collaboration with MSD (supported by Wellcome Trust)

Our commitment to translation is supported by expertise in:

- Structural biology
- Medicinal chemistry
- High-throughput screening
- Clinical translation
- Commercialisation and intellectual property management

National Drug Discovery Centre

allows more research to be translated through to development of new medicines

Measuring our success

Saving lives

More than 30 million people have benefited from Institute research

More than 100 clinical trials are underway based on our research

Supporting future research

Capture of intellectual property ensures royalty incomes are reinvested in our research

Benefits to Australia

Improving health, boosting innovative jobs, ensuring a strong biomedical sector and lowering healthcare costs

On-site early learning centre opened

The Institute's landmark on-site facility, the Professor Lynn Corcoran Early Learning Centre, was opened in June 2018 by the Victorian Minister for Early Childhood Education the Hon. Jenny Mikakos.

The five-storey centre, built on the Institute's forecourt, provides 100 places for children aged three months to six years, including long day care and kindergarten. A first of its kind for an Australian medical research institute, the centre is run by not-for-profit early education and care services provider FROEBEL Australia.

A win for gender equity

The centre was built as part of the Institute's commitment to gender equity and overcoming gender imbalance at senior levels by addressing the barriers and challenges facing female scientists.

Institute director Professor Doug Hilton said the centre was a proud achievement for the Institute and the sector.

"Creating a working environment that enables all parents – men and women – to equally and successfully balance their carer and professional responsibilities is essential for a contemporary organisation," he said.

"I am very pleased that this was a shared project – initiated by our staff and students, advocated for by our leadership and supported by our donors, the Victorian Government and the Institute Board. The centre will help us to foster a healthy, productive and creative workplace, and ultimately lead to more discoveries that improve health outcomes in Australia and globally," Professor Hilton said.

Honouring a gender equity champion

The centre was named in honour of gender equity champion Professor Lynn Corcoran, a senior Institute scientist who has devoted much of her career to supporting and mentoring young women in medical research, and who was instrumental in the establishment of the facility.

Professor Corcoran said the centre addressed a major unmet need in the medical research community – the challenge for women in science to transition to senior roles at a time that often corresponds with the early years of raising children.

"The Institute established a range of initiatives to help women continue to advance their careers, however access to quality child-care continued to be identified as a major obstacle to career development," she said. "The centre will make a major contribution to helping achieve gender equity at the Institute and we are proud to be leading the Australian medical research sector with this initiative."

The $9.5 million centre was established with $3 million in philanthropic support from Professor Terry Speed and Mrs FE (Sally) Speed, The Dyson Bequest, Mrs Pauline Speedy, the Lorenzo and Pamela Galli Charitable Trust, and Mrs Catherine Walter AM and Mr John Walter, and a $650,000 Victorian Government Children's Facilities Capital Program grant, with the remaining funds provided by the Institute.

Above: The Institute's new on-site child-care facility, named in honour of researcher and gender equity champion Professor Lynn Corcoran (centre), was opened with guests including Professor Corcoran's daughter, Ms Jesse Corcoran (right rear).

Growing support from the community

Support from the community for the Institute's research is growing at a steady rate. In 2018 donors contributed $20.5 million to support our research, the most since the launch of our Centenary Campaign in 2015.

The generosity of our donors has funded 25 Centenary Fellowships for early career researchers and supported investments in cutting-edge technology and blue-sky research projects that often struggle to receive government funding in their early stages.

Just as importantly, our researchers are grateful for the trust the community places in them to make the very best use of public money, whether it is government grants paid by your taxes or private donations from individuals and families. Medical research is a long game with many ups and downs. Our supporters' faith in our researchers provides extra encouragement for them to find answers for some of the most significant health issues confronting humanity. Donors provide financial support and inspiration.

As always, we encourage all our supporters to visit the Institute, meet with our researchers and hear about our research breakthroughs. Last year, more than 400 supporters attended donor functions at the Institute and many of them toured our laboratories. This is testament to the fact that our donors are keenly interested in learning more about medical research and feel a connection to the Institute, regardless of the size of their gift.

In 2018 we were honoured to receive a $5.5 million bequest from our long-term friend and supporter, the late Marion Page (nee McPherson) which will fund fellowships in immune health. The fellowships are part of a generous tradition of support by Marion over more than 60 years and by her late father, pastoralist Sir Clive McPherson.

"We want to thank you for your generosity in sharing your personal stories that have given us insights into why you support us."

Making a gift to the Institute is often a deeply personal decision and is borne out of a desire to make a lasting change to health outcomes or leave a legacy for future generations. We want to thank you for your generosity in sharing your personal stories that have given us insights into why you support us.

We are truly excited about the future of medical research and invite you to continue to partner with us to make those all-important discoveries.

Below: A celebratory morning tea was held at the Institute in August to announce the generous $5.5 million bequest from the Estate of the late Marion Page (nee McPherson).

Back row (from left): Professor Doug Hilton with Mr Peter Walsh (Page Estate Trustee), Professor Kathryn McPherson (niece of the late Marion Page), Ms Trish Betheras (daughter of Dr Gytha Betheras) and Mr Ian White (Page Estate Trustee). Front row: Dr Gytha Betheras, Institute alumna and friend of the late Marion Page.

Our supporters

The supporters who make our discoveries possible.

The advances in medical science at the Walter and Eliza Hall Institute are made possible by our generous supporters. We are proud to acknowledge these gifts, grants and bequests received from 1 January to 31 December 2018. Gifts of $1000 or more are acknowledged, unless otherwise requested by our donors.

The Institute also acknowledges the support of the Australian Government and the Victorian Government, and the support of our community who pay the taxes that enable funding through these governments.

Centenary Donors

The Walter and Eliza Hall Trust
L.E.W. Carty Charitable Fund
The Alfred Felton Bequest
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The Metcalf family
Lorenzo and Pamela Galli Charitable Trust
DHB Foundation
John T Reid Charitable Trusts
Professor Gordon K Smyth
Mr Michael Fitzpatrick AO and Ms Helen Sykes
Melbourne Water
Robert Connor Dawes Foundation
Estate of Marion Page

Individual and family philanthropy

Gifts of more than $200,000
Anonymous (2)
The Stafford Fox Medical Research Foundation

Gifts up to $200,000
Anonymous (3)
Beck Family Foundation
Dr Glenn Begley and Mrs Merrin Begley
Professor Suzanne Cory AC and Professor Jerry Adams
The Isabel & John Gilbertson Charitable Trust
Mr Colin North OAM and Dr Susan Alberti AC
Mr Edward Vellacott and Mrs Morna Vellacott
Dr Keith Watson

Gifts up to $50,000
Anonymous (1)
Mrs Yvonne Butterfield
Brian M Davis Charitable Foundation
The late Mr Robert Evans and Mrs Meredith Evans
Mr Michael Harris and Ms Kelli Garrison
Mrs Jane Hemstritch
Mrs Margaret Johnson
Ms Marie McDonald
Mrs Margaret Ross AM

Gifts up to $20,000
Anonymous (3)
Mrs Meg Bentley
Mr Shane Murphy
Nossal Family Trust
RobMeree Foundation
Ms Catherine Walter AM and Mr John Walter

Gifts up to $10,000
Anonymous (9)
Stuart and Jill Bales
Associate Professor Chris Burns
Ms Sue Clifton
Dr Andrew Cuthbertson AO
Mr Graham Gilpin
Mr Geoff Gowers and Mrs Andrea Gowers
Ms Helen Kennan
Mrs Elizabeth Leahy and Mr Philip Leahy
The Barbara Luree Parker Foundation
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Ms Caroline Richardson
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Mr Chris Thomas AM and Mrs Cheryl Thomas
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Vinta Investment Management Pty Ltd
Ms Heather White
Mrs Jean Williamson

Gifts up to $5000
Anonymous (6)
6A Foundation
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Mr Angelo Bladeni
Con and Trish Boekel and Family
Mrs June Clapton
Demak Timber and Hardware
Ms Kay Ehrenberg and Mr Scott Herne
Mr Cyril Evans and Mrs Pauline Evans
The Green Family
Col Tom Hall CVO, OBE
Mr Keith Harrison
Mrs Ann Hilton-Ley
H & K Johnston Family Foundation
Mr Donald Kay and Mrs Caryl Kay
The Valda Klaric Foundation
Mr Brian Little
Dr Darren Lockie
Mr Brendan Madigan
Mrs Christine McConnell and Mr Denis McConnell
Mr James McIntyre
Ms Carolyn O'Byrne
Professor David Penington AC
Craig Perkins Cancer Research Foundation
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Mrs Sam Sharman
Mrs Penny Stott
Ms Ricci Swart
Mrs Kay Szonert
Mr Duncan Tuck
Mr Robert Vance and Mrs Claire Vance
Ms Jenny Vero and Mr Greg Vero
Mr Mark Whinfield
Mr David Williamson

Gifts up to $2000

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Dr Peter Adams and Dr Sheryl Lawson
Professor Emeritus Robin Anders and Dr Margot Anders
The Joan Elaine Barry Memorial Fund
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Mrs Bev Brownstein
Mr Leigh Bull and Mrs Sue Bull
Mr Bruce Cochrane and Mrs Helen Cochrane
Associate Professor Paul Cooper and Mrs Jacqui Cooper
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The Dina & Ron Goldschlager Family Charitable Foundation
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Ms Alison Neumaier
Mr David Nicholds
Mr Patrick O'Connor and Ms Nadia Kadlof
Mr Simon Pedler
Mr Rory Pincott
Mr Simon Preston
Mr Don Rankin and Mrs Megan Rankin
Mr Sean Rao
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Mr Dieter Rinke and Mrs Maxine Rinke
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Ms Lisa Trinh
Mr John Walker QC and Mrs Angela Walker
Mr Kenneth Watson and Mrs Ruth Watson
Ms Marjorie Wilks
William Collinson Kerr Pty Ltd
Mrs Heather Winneke

Community organisations

Berwick Opportunity Shop
Coolah Lady Golfers
Fox Classic Car Collection
Mill Park Garden Club
Rotary Club of Eltham
Rotary Club of Point Gellibrand
Tarneit Skies Resident Association Inc
Twin Towns Services Community Foundation
Yarra Yarra Golf Club

Community fundraisers

Crofts Keogh
Mrs Jan Bates
Ms Bev Bradford
Ms Tash Edwards
Ms Sandra Gatt
Master Marcus Lai

Companies and institutions

Abacus Auctions
ASN Conferences Pty Ltd
AUSiMED Limited
Blue Illusion
Donald Cant Watts Corke
GJKFacility Services
Skysea Pty Ltd
Strathmore Community Bank Branch of Bendigo Bank
Stroud Homes
Australia-China Council

Gifts in Wills

(Listed by bequest amount)

Estate of Marion Page
Estate of Phyllis Ann Grave
Estate of Desmond Edward Sheean
Estate of Valerie May Moody
Estate of Margaret Evelyn Winterbottom
Albert H Maggs Charitable Trust
Estate of Nancy Grace Somerville
Estate of Toni Gertrude Cunningham
Estate of Sylvia Hilda Martin
Estate of Sheila Mary Helpman
Estate of Loris Ellen Fixter
Estate of Raymond Christenson
Estate of Pamela J Barclay
The Jakob Frenkiel Charitable Trust
Estate of Josephine Metcalf
Estate of Maxwell Gardiner Helpman
Estate of Joan Therese Matison
Estate of Anita Minnie Sutherland
The Hazel & Pip Appel Fund
Estate of Eleanor Margrethe Albiston (The Stang Bequest)
Estate of Ethel Mary Drummond
Frederick and Winifred Grassick Memorial Fund
Irene & Ronald MacDonald Foundation
Estate of Stephen Salo Beerman
Estate of David Von Bertouch
Estate of Trevor Goldie Klein
Estate of Pauline Speedy
Estate of the Late Frederick Linton Lees Stephens (Lin)
Estate of Florence Mary Young
Rigg Memorial Trust
Estate of Gerald Addison Brook Riley
Agnes Maude Reilly Charitable Trust
Estate of Emily Vera Winder
GT & L Potter Charitable Trust
The C.H. Boden Memorial Trust
Estate of Jean Margaret Williams
John Frederick Bransden Charitable Trust
Margaret Lewis Reilly Charitable Trust
Estate of the late Doreen Merle Taylor
The Frank Broadhurst Memorial Charitable Fund
The Mackie Bequest
Thomas, Annie & Doris Burgess Charity Trust
Estate of Lorna Mary Burden

International grants
(Listed by grant amount)

Grants of more than $500,000

Leukemia & Lymphoma Society, US
The Bill & Melinda Gates Foundation, US
The Wellcome Trust, UK
The Marcus Foundation, Inc., US

Grants of up to $500,000

Ludwig Cancer Research, US
JDRF, US
Breast Cancer Research Foundation, US
Human Frontier Science Program, France
Silicon Valley Community Foundation, US
Melanoma Research Alliance Foundation, US
The Foundation for Innovative New Diagnostics, Switzerland
Worldwide Cancer Research, US
National Institute of Health, US

Grants of up to $100,000

Cancer Research Institute, US
Howard Hughes Medical Institute, US
Rubicon Fellowship, Netherlands
Lady Tata Memorial Trust, UK
National Psoriasis Foundation, US
European Molecular Biology Organization (EMBO), Germany
Coeliac UK

Australian grants

Australian Government, including:

National Health and Medical Research Council
Medical Research Future Fund
Australian Research Council
Cancer Australia

Victorian Government, including:

Department of Health and Human Services
Victorian Cancer Agency

Other Australian grants
(Listed by grant amount)

The Cancer Council Victoria
Sylvia & Charles Viertel Charitable Foundation
DHB Foundation
Cure Brain Cancer Foundation
The National Breast Cancer Foundation
The Harry Secomb Foundation
Tour de Cure
The Jack Brockhoff Foundation
FSH Global Research Foundation
Drakensberg Trust
Leukaemia Foundation
Lung Foundation Australia
The CASS Foundation Limited
The Marian & E.H. Flack Trust
Beanies 4 Brain Cancer
Coeliac Australia
Cure Cancer Australia Foundation
The Phyllis Connor Memorial Trust
Telematics Course Development Fund
Harold and Pam Holmes Charitable Trust
JDRF Australia
The Collie Foundation
Australian Centre for HIV and Hepatitis Virology Research
The Financial Markets Foundation for Children
Diabetes Australia
The Thomas William Francis & Violet Coles Trust
L.E.W. Carty Charitable Fund
Joe White Bequest
Snowdome Foundation
Isabella and Marcus Foundation
Harold & Cora Brennen Benevolent Trust
Royal Australasian College of Physicians
The Scobie and Claire Mackinnon Trust
The Margaret Walkom Bequest
Prader-Willi Research Foundation of Australia
Movember Foundation
Rae Foundation
Geok Hua Wong Charitable Trust
Australian Rotary Health
The HMA Foundation
Royal College of Pathologists Australasia
The William Angliss (Victoria) Charitable Fund
Amelia Eliza Holland Trust
The Pierce Armstrong Foundation
One Tree Foundation
Pancare Foundation
Nell & Hermon Slade Trust
The Hermon Slade Foundation
Count Charitable Foundation
Australasian Genomic Technologies Association
S.T.A.F. - Rupert Ethel & Ronald Fraser & Ruby Thomas
The J Elliston Endowment

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EXCEPTIONAL SCIENCE AND PEOPLE

Research led by Dr Olga Kondrashova (left) and Professor Clare Scott is helping to match ovarian cancer patients with the right treatment for their disease.

Blood clues offer hope for better cancer outcomes

Newly developed blood tests that detect microscopic tumours could improve outcomes for people with cancer through the early detection of cancers, as well as matching patients to the right treatments.

The sensitive tests detect fragments of tumour DNA – or 'circulating tumour DNA' (ctDNA) – in a patient's blood, revealing the presence of cancer cells before they are detectable using other methods such as medical imaging. Clinical trials are now underway to evaluate potential benefits of ctDNA tests that were developed through a collaboration between the Walter and Eliza Hall Institute and Johns Hopkins Kimmel Cancer Center, US.

Early diagnosis for better outcomes

CancerSEEK is a ctDNA test developed for the early detection of eight common cancers, well before symptoms are present.

The test diagnoses tumours before they have spread, when the chance of cure is high, said Professor Peter Gibbs, who worked on the project with fellow Institute clinician-scientists Associate Professor Jeanne Tie and Dr Hui-Li Wong.

"Cancer mortality rates are directly related to how advanced a cancer is at diagnosis, so early detection tests have the potential to save lives," Professor Gibbs said.

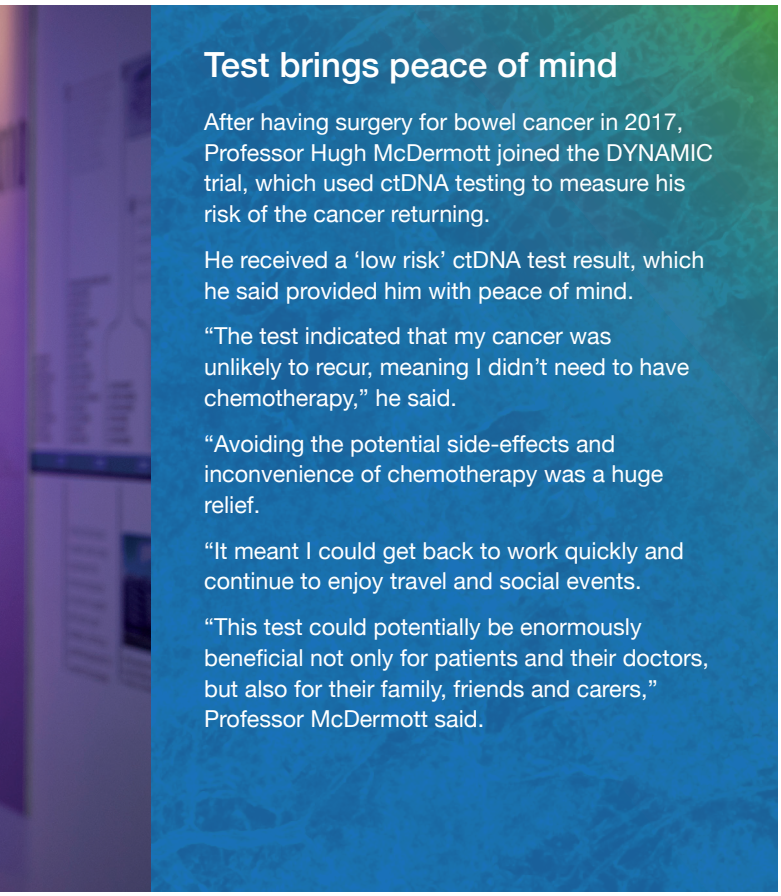
CancerSEEK was able to reliably detect early stage cancers of the ovary, liver, stomach, pancreas, oesophagus, bowel, lung and breast. There are no screening tests currently available for pancreas, ovary, liver, stomach and oesophagus cancers. Importantly, CancerSEEK had a very low 'false positive' rate – fewer than one per cent of apparently healthy people received a positive result, reducing the problem of overdiagnosis.

> *"We are hopeful that this screening test will lead to earlier diagnosis and improved survival outcomes for many tumour types."*

Associate Professor Tie said CancerSEEK had the potential to be a one-stop, widely available and safe screening test for multiple tumour types.

"We are hopeful that this screening test will lead to earlier diagnosis and improved survival outcomes for many tumour types," she said.

Above: Clinician scientists Associate Professor Sumi Ananda (left) and Associate Professor Jeanne Tie have investigated whether a simple blood test can determine which patients need chemotherapy after cancer surgery.



Test brings peace of mind

After having surgery for bowel cancer in 2017, Professor Hugh McDermott joined the DYNAMIC trial, which used ctDNA testing to measure his risk of the cancer returning.

He received a 'low risk' ctDNA test result, which he said provided him with peace of mind.

"The test indicated that my cancer was unlikely to recur, meaning I didn't need to have chemotherapy," he said.

"Avoiding the potential side-effects and inconvenience of chemotherapy was a huge relief.

"It meant I could get back to work quickly and continue to enjoy travel and social events.

"This test could potentially be enormously beneficial not only for patients and their doctors, but also for their family, friends and carers," Professor McDermott said.

ctDNA tests can detect one fragment of cancer DNA among 10,000 normal DNA fragments.

Our researchers, in collaboration with Johns Hopkins Kimmel Cancer Center, are evaluating the use of ctDNA tests to improve the detection of previously undetectable tumours.

Preventing unnecessary chemo

Clinical trials at more than 40 hospitals in Australia and New Zealand are also examining the potential of ctDNA testing to measure a patient's risk of their cancer returning after surgery, and to guide treatment decisions.

Dr Tie said many early stage cancer patients receive chemotherapy after surgery as a precaution because there is no reliable measure of a patient's risk of recurrence.

"While chemotherapy is an essential, life-saving treatment, it has many serious side-effects, so we don't want patients receiving it if they don't need it," she said.

"We would like to know which patients can safely avoid chemotherapy because their cancer is unlikely to recur.

"For patients who are at a high risk of recurrence, we want to be able to give them a more intensive dose of chemotherapy than those with a lower risk of recurrence," she said.

The DYNAMIC trials of the ctDNA test began in early stage bowel cancer patients in 2015 and have already shown the test can distinguish 'high risk' and 'low risk' patients. An ovarian cancer arm of the trial began in 2017, led by Institute clinician-researcher Associate Professor Sumi Ananda.

Associate Professor Ananda said it was suspected that many women with early stage ovarian cancer could be treated with surgery alone. "We currently treat all these patients as though their cancer may recur, with high-dose chemotherapy," she said. "I hope these trials clarify whether some ovarian cancer patients can safely avoid chemotherapy."

The trials are also being extended to other cancers including pancreatic cancer. Trial lead Dr Belinda Lee said the current methods for assessing the risk of a pancreatic cancer relapsing after surgery were imprecise.

"ctDNA testing is much more sensitive," she said. "Understanding how likely a cancer is to recur means we can make the best treatment decision for each patient."

Professor Gibbs is an oncologist at the Western Hospital; Associate Professor Tie and Associate Professor Ananda are oncologists at the Western Hospital and the Peter MacCallum Cancer Centre; Dr Lee is an oncologist at the Northern Hospital and Peter MacCallum Cancer Centre; Dr Wong is an oncologist at the Peter MacCallum Cancer Centre.

The DYNAMIC ctDNA trials were supported by the Marcus Foundation (US), the Australian National Health and Medical Research Council, the Victorian Cancer Agency and the Victorian Government. Dr Lee is supported by the Philip Hemstritch Centenary Fellowship in Pancreatic Cancer Research.

New drug puts cancers into permanent sleep

Understanding the fundamental biology of cancer is key to developing better, targeted treatments.

Institute research has underpinned the discovery of a new class of drugs that put cancer cells into a permanent sleep, halting cancer progression and delaying relapse in laboratory models.

Importantly, the drugs arrest tumour growth and spread without damaging cells' DNA – thus avoiding the harmful side-effects of conventional treatments such as chemotherapy.

The collaborative research, which was almost a decade in the making, involved more than 50 scientists in Melbourne and was led by Institute researchers Associate Professor Tim Thomas and Associate Professor Anne Voss, Professor Jonathan Baell from the Monash Institute of Pharmaceutical Sciences and Dr Brendon Monahan from Cancer Therapeutics CRC.

First-in-class drug

Associate Professor Thomas said the new class of drugs was the first to target KAT6A and KAT6B proteins, which are important drivers of cancers.

"KAT6A is the twelfth most commonly amplified gene in human cancers," he said. "We discovered that genetically depleting KAT6A quadrupled life expectancy in models of blood cancers called lymphoma.

> *"Developing KAT6 inhibitors relied on strong collaboration, bringing together expertise in cancer research, medicinal chemistry and drug discovery."*

"This discovery led us to investigate how to inhibit KAT6A and KAT6B to treat cancer."

The project was particularly significant because the scientific community had considered the KAT6 gene family 'undruggable'.

"Developing KAT6 inhibitors relied on strong collaboration, bringing together expertise in cancer research, medicinal chemistry and drug discovery," Associate Professor Thomas said.

Sparing healthy cells

The drugs prevented cancer progression in preclinical models of blood and liver cancers, while appearing not to adversely affect healthy cells.

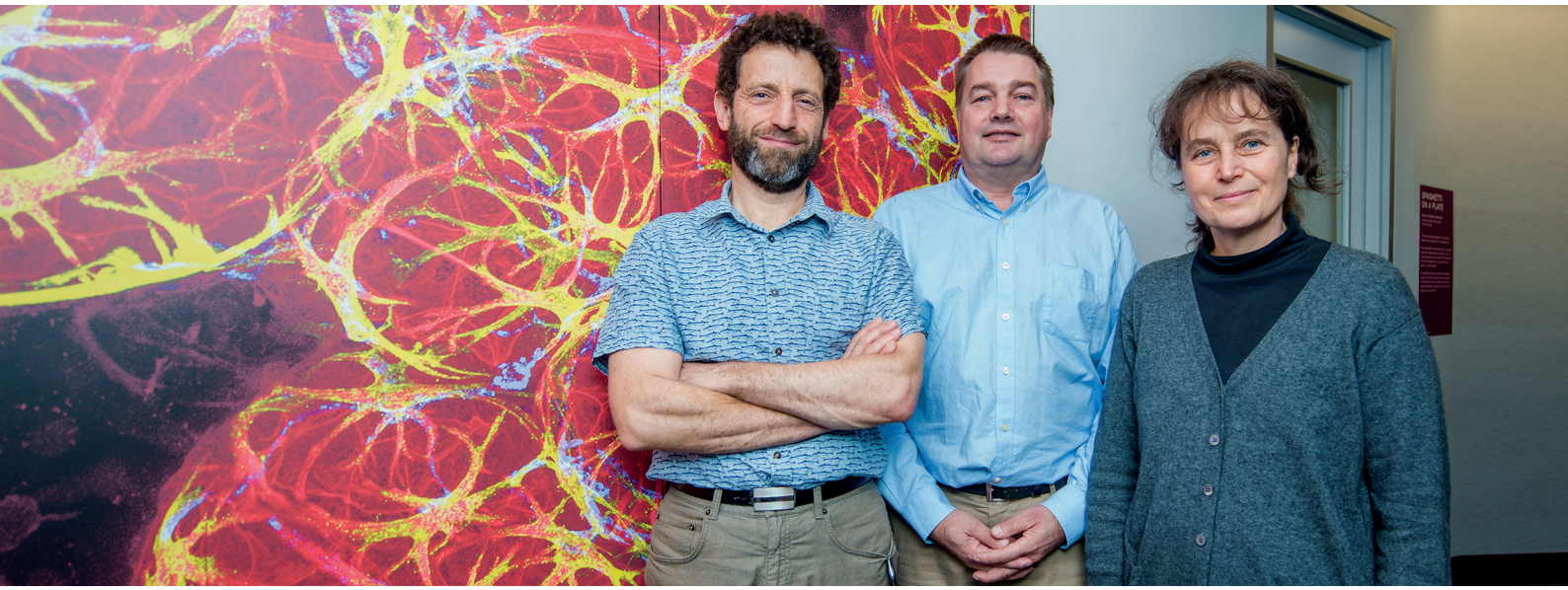
Associate Professor Voss said that unlike chemotherapy and radiotherapy the new class of drugs did not cause potentially dangerous DNA damage. "Instead the drugs work by putting cancer cells into a permanent sleep. The cells are not dead, but they can no longer divide and proliferate," she said.

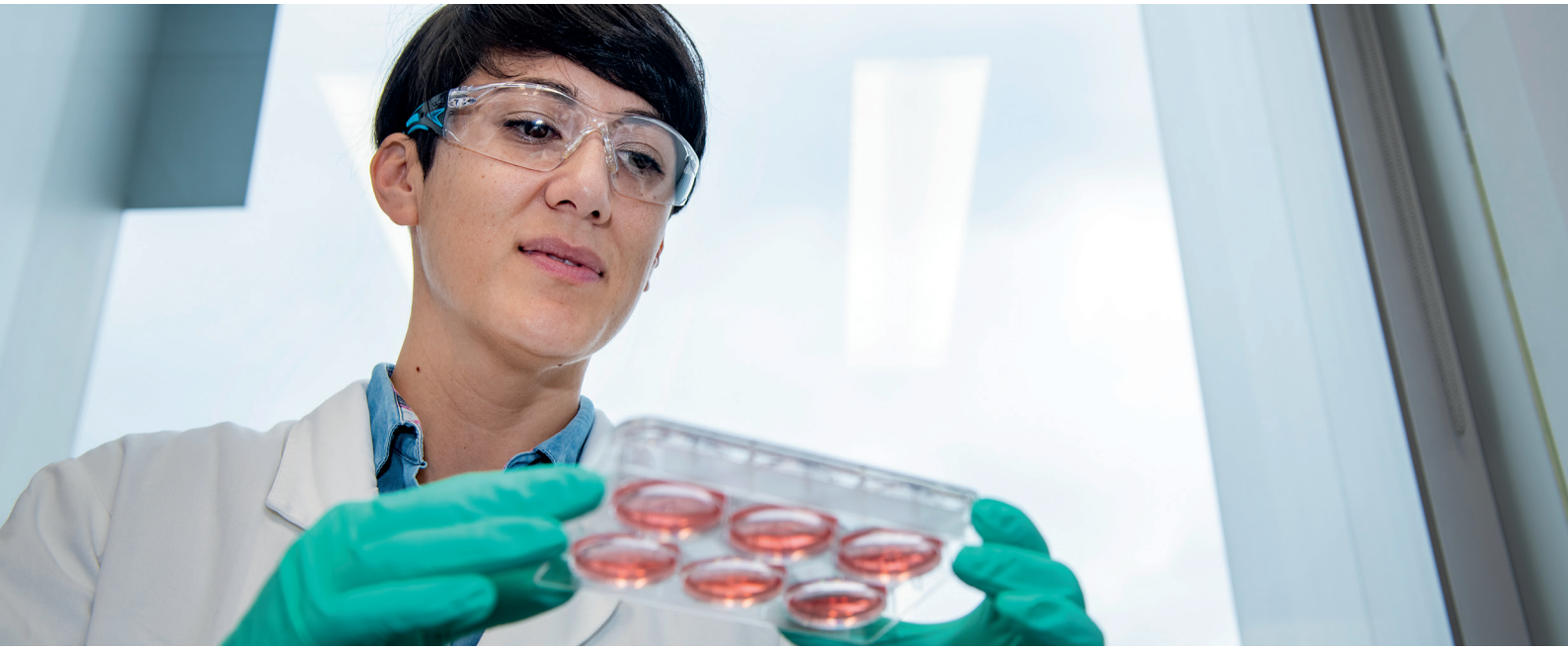
"The cancer is effectively stopped in its tracks, but healthy cells are spared the harmful DNA damage that underlies many of the side-effects of conventional cancer therapies."

More work is needed to get the drug class to the point of investigation in human cancer patients, but Associate Professor Voss said the drugs may be effective as a type of consolidation therapy that delays or prevents relapse after initial treatment.

"The possibility of giving clinicians another tool that they could use to substantially delay cancer recurrence is very encouraging and could have a big impact for patients," she said.

Below: Associate Professor Tim Thomas (left), Professor Jonathan Baell (centre) and Associate Professor Anne Voss led the development of a new class of drugs that put cancers into a permanent sleep.





PhD studies improve understanding of lymphoma

Every day our body produces hundreds of billions of new blood cells. These cells are tightly controlled, receiving signals that guide their function, migration, proliferation and death. PhD student Ms Margs Brennan has investigated molecules that control blood cell development, and how defects in these can contribute to lymphoma, a cancer of blood cells.

Better models to investigate disease

One aspect of Ms Brennan's research focussed on the protein MCL-1, which regulates the survival of blood cells. MCL-1 is also essential for the sustained growth of many lymphomas, as well as some solid tumours including breast cancer and melanoma, Ms Brennan said.

"MCL-1 is an Achilles' heel of many cancers, making it an attractive target for cancer therapies," she said.

Working with her supervisor Associate Professor Marco Herold, Dr Gemma Kelly and Professor Andreas Strasser, Ms Brennan developed a laboratory model mimicking MCL-1 expression in human cancers. This could enable more accurate testing of drugs inhibiting MCL-1 by predicting how they work in patients.

Potent inhibitors of MCL-1 have been developed by pharmaceutical company Servier. Ms Brennan tested one of these inhibitors in a model of lymphoma that she developed.

"I showed that when used alone, the MCL-1 inhibitor could cure seventy per cent of lymphoma cases in our model. Excitingly, the inhibitor also showed promise for enhancing conventional chemotherapies: a combination of a low dose of the MCL-1 inhibitor with a low dose of a common chemotherapy drug led to an almost complete cure of lymphoma in our model.

"This model has great potential for testing new therapeutic applications of MCL-1 inhibitors," Ms Brennan said.

An incredible culture

Ms Brennan said she appreciated the supportive culture and camaraderie between students at the Institute. "Doing a PhD is very rewarding, but sometimes it can be difficult. I've really appreciated the support of my peers as well as my supervisors."

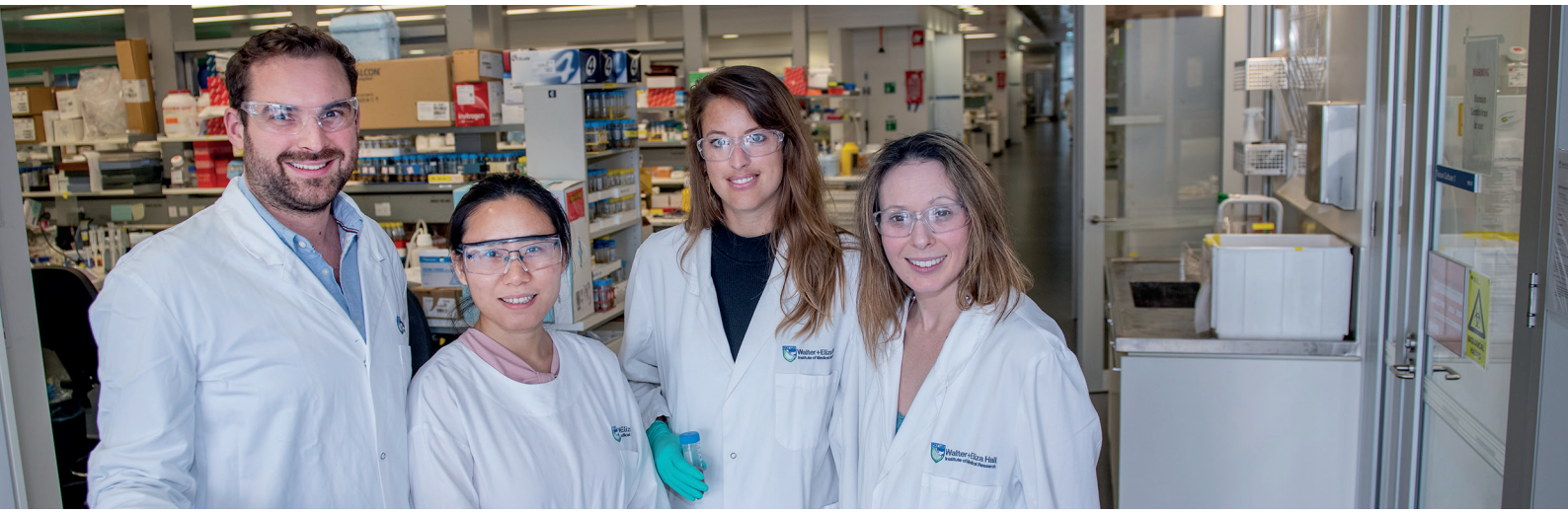
Ms Brennan also participated in the Institute's student association, WESA, serving as WESA president in 2016. "I learnt a lot, and enjoyed being able to contribute to the Institute's student culture. I was especially proud of creating a new role for LGBTQIA+ representation on the WESA committee," she said.

Other highlights of Ms Brennan's studies were authoring a paper in the journal *Blood*, and presenting her research at an international conference in Croatia.

"You can become immersed in your own research, so it is great to know your work has been appreciated by world leaders in the field," she said.

Ms Brennan's PhD studies were supported by the Leukaemia Foundation of Australia.

Above: PhD student Ms Margs Brennan has investigated how blood cell development is controlled, and why blood cancers arise.



Progressing research into new anti-cancer drug

Venetoclax is an anti-cancer drug developed on the basis of the landmark research discovery, made at the Institute in the 1980s, that the protein BCL-2 helps cancer cells survive indefinitely.

Venetoclax (marketed as VENCLEXTA® and VENCLYXTO®) was co-developed by Institute scientists in collaboration with Genentech, a member of the Roche Group, and AbbVie. International clinical trials showed venetoclax was a beneficial treatment for people with certain forms of chronic lymphocytic leukaemia (CLL), leading to its approval for clinical use.

In 2018 more than 25 clinical trials were underway in Australia testing venetoclax as a treatment for cancers, predominantly blood cancers, alone or in combination with other therapies. Our researchers are continuing to pursue new clinical applications for venetoclax in the lab and in the clinic.

Breast cancer trials

A phase I clinical trial at the Royal Melbourne Hospital, the Peter MacCallum Cancer Centre and the Olivia Newton-John Cancer Centre investigated whether venetoclax could be combined with tamoxifen, a hormone therapy, to treat breast cancer.

> *"We are excited about what this could mean for patients with incurable breast cancer."*

This was the first trial of venetoclax in solid tumours, said Professor Geoff Lindeman, an Institute clinician-scientist and a Royal Melbourne Hospital and Peter MacCallum Cancer Centre oncologist.

"The drug combination was well tolerated, and the majority of trial participants received the maximum dose with minimal side-effects," he said.

Seventy-five per cent of the 33 participants experienced an overall improvement or derived clinical benefit. "This trial has laid the groundwork for further, more thorough investigations of this drug combination," Professor Lindeman said.

The study was based on research at the Institute led by Professor Lindeman and Professor Jane Visvader, which showed that breast cancers in the laboratory responded well to the combination of venetoclax and tamoxifen.

"We are excited about what this could mean for patients with incurable breast cancer," Professor Lindeman said.

Improving leukaemia treatments

An ongoing challenge for all new therapies is that cancers are adept at finding ways to get around their effects. A gene mutation that causes resistance to venetoclax in some CLL patients was identified through a collaboration between the Institute, the Peter MacCallum Cancer Centre, the Royal Melbourne Hospital and the University of Melbourne.

Professor David Huang, who co-led the research, said the mutation was found in the leukaemia cells of seven patients who relapsed while taking venetoclax.

"The mutation was in BCL-2 – the survival protein targeted by venetoclax – explaining why the drug stopped being effective in these patients after several years," he said.

Professor Andrew Roberts, the Institute's head of Clinical Translation and a Royal Melbourne Hospital and Peter MacCallum Cancer Centre haematologist, said venetoclax remained a very effective treatment for CLL.

"Our discovery will help to further enhance the therapy for patients at risk of relapse, particularly by developing combination treatments with venetoclax that are even better for people with CLL," he said.

Above: (From left) Dr Richard Birkinshaw, Dr Jianan Gong, Dr Rachel Thijssen, and Dr Mary Ann Anderson were part of a multidisciplinary team working to improve treatments for chronic lymphocytic leukaemia.

Venetoclax researchers recognised

A team of Institute researchers received the Australian Academy of Technology and Engineering's 2018 Clunies Ross Knowledge Commercialisation Award for their role in the development of the anti-cancer medicine venetoclax, in collaboration with companies Genentech, a member of the Roche Group, and AbbVie.

The award recognised the important contributions of (from left) cancer researcher Professor David Huang, structural biologist Associate Professor Peter Czabotar, medicinal chemist Associate Professor Guillaume Lessene (holding a model of the BCL-2 protein) and clinician-scientist Professor Andrew Roberts.

Professor Roberts was also joint winner of the 2018 Victoria Prize for Science and Innovation (life sciences), with Professor John Seymour, a Peter MacCallum Cancer Centre and Royal Melbourne Hospital haematologist. This prize reflected the duo's leadership in bringing venetoclax into clinical practice through world-leading clinical trials.

Professor Roberts is head of Clinical Translation at the Institute and a haematologist at Royal Melbourne Hospital and Peter MacCallum Cancer Centre. He holds the Metcalf Chair of Leukaemia Research at the University of Melbourne and the Victorian Comprehensive Cancer Centre.

New strategies to improve lung cancer outcomes

Lung cancer causes more than 1.7 million deaths globally each year, including more than 9000 deaths in Australia – more than any other type of cancer. Our researchers are developing new approaches towards earlier detection and better treatments for people with lung cancer.

Blood clues for early detection

Unique molecular clues in the blood could be used to detect aggressive lung cancers and potentially match patients to the most effective therapies, according to research led by Dr Sarah Best and Dr Kate Sutherland.

The research, which was a collaboration with Metabolomics Australia at the Bio21 Institute, University of Melbourne, used a new laboratory model of an aggressive form of adenocarcinoma that was developed by Dr Best and Dr Sutherland. Around 40 per cent of lung cancer cases in Australia are adenocarcinoma.

> *"This is an exciting area of research that could benefit many people in our community."*

The team identified a unique 'signature' in the blood caused by altered metabolism in the adenocarcinoma, Dr Best said. "We hope this discovery could lead to a blood test for earlier detection of adenocarcinoma, when the cancer is more likely to respond to treatment," she said.

The next step of the research – which will commence in 2019 with funding from the Australian National Health and Medical Research Council – is to confirm the same signature can be found in the blood of adenocarcinoma patients.

"This is an exciting area of research that could benefit many people in our community," Dr Best said.

Dr Sutherland said the study also revealed adenocarcinomas could be susceptible to treatment with immunotherapy, which harnesses the body's own immune system to fight cancer.

"We showed for the first time that immunotherapy could cause tumour regression in this type of adenocarcinoma," Dr Sutherland said. "This is exciting because this particular type of adenocarcinoma is often resistant to chemotherapy and radiotherapy, leaving patients with few treatment options."

Above: Dr Sarah Best (left) and Dr Kate Sutherland have led research that may lead to a new blood test for the early detection of adenocarcinoma, an aggressive form of lung cancer.

Success for early career researcher

Recent PhD graduate Dr Tan Nguyen was recognised for his pioneering research, which could lead to new treatments for lung cancer.

Dr Nguyen received a 2018 Victorian Premier's Award for Health and Medical Research in recognition of his PhD research, which discovered the protein SIDT2 was important for anti-viral immunity.

Dr Nguyen said SIDT2 may be co-opted by cancers to promote their growth.

"By understanding this better, we hope to inform the development of new therapies targeting SIDT2 that could be effective against lung cancer," he said.

Dr Nguyen's explorations of the role of SIDT2 in lung cancer were supported by a Lung Foundation Australia Shine a Light on Lung Cancer Grant-in-Aid and a Cancer Council Postdoctoral Fellowship.

Triple therapy may offer hope

Lung cancers could be susceptible to a 'triple therapy' targeting proteins that allow cancer cells to survive and grow, according to research led by Dr Clare Weeden, PhD student Ms Casey Ah-Cann and Associate Professor Marie-Liesse Asselin-Labat.

The combination of three agents that blocked cells' survival and growth pathways worked so successfully in laboratory models that tumours not only stopped growing, they began to shrink away, Dr Weeden said.

"It was amazing to discover how these pathways could be inhibited to stop the spread of lung cancer," she said.

The team blocked cell growth driven by the protein FGFR, while cell survival was inhibited using two 'BH3-mimetic' agents targeted to the survival proteins BCL-XL and MCL-1.

Ms Ah-Cann said the discovery was a step towards new targeted therapies for people with lung cancer.

"We are now looking for strategies to block the same molecules safely and effectively in patients," she said. "We hope this could lead to therapies that shrink tumours, improving the quality of life of lung cancer patients, and hopefully even improving their survival," she said.

Associate Professor Asselin-Labat said these studies were based on fundamental discoveries about how cancer develops. "The more we can disrupt the molecules that cause lung cancer, the closer we will be to developing better treatments," she said.

Lung cancer research recognised

The significant achievements of our lung cancer researchers received national recognition in 2018.

Associate Professor Asselin-Labat was awarded the Australian Academy of Science's 2018 Nancy Millis Medal for Women in Science for her achievements in lung biology and cancer.

Her research has investigated how the intricate structure of the lungs develops in the embryo, and how lung cancers arise from defective cells. This research has led to the development of lung cancer models used to investigate new lung cancer treatments, Associate Professor Asselin-Labat said.

"We are also learning about defective lung development that can cause respiratory failure in newborns, particularly premature babies," she said.

Dr Best received the Research Australia Griffith University Discovery Award for her research into better diagnosis and treatments for adenocarcinoma. Dr Best and Dr Sutherland were also recipients of significant funding through the Victorian Cancer Agency and the National Health and Medical Research Council Project Grants. Dr Sutherland's research is also generously supported by the Peter and Julie Alston Centenary Fellowship.

Meanwhile, research into metastatic non-small lung cancer was boosted with the awarding of a Lung Foundation Australia/Deep Manchanda Early Career Fellowship in Lung Cancer to Dr Weeden, who also received research funding from Cure Cancer Australia and Cancer Australia, through the Cancer Australia Priority-driven Cancer Research Scheme.

More than 12,000 Australians were diagnosed with lung cancer in 2018.

Our researchers aim to improve the survival of people with lung cancer by developing better strategies for early diagnosis and treatment.

New insights into cancer: from causes to treatments

We collaborate closely with clinical partners, and encourage the involvement of clinician-scientists in our research. These strong links between laboratory and clinic provide important insights into the fundamental biology of disease, and enable the translation of our research to improve health.

Protecting against cancer

As we age, our DNA accumulates damage, increasing our risk of developing cancer. Genomic analysis of acute myeloid leukaemia (AML) samples has uncovered a key factor protecting against age-related DNA damage, providing important clues about how our body guards against cancer.

The research team, led by clinician PhD student Dr Edward Chew, Dr Ian Majewski and collaborators at Erasmus University Medical Center, Netherlands, discovered a rare genetic mutation in three patients with an unusual, early onset form of AML.

All three patients showed unusually high rates of 'methylation damage' to their DNA, Dr Chew said. "DNA methylation has a role in fine-tuning gene activity – but it also makes DNA more susceptible to damage," he said.

> *"These rare patients have helped us to gain important new insights into the link between cancer and ageing."*

Genome sequencing revealed the patients all lacked a DNA repair protein called MBD4. "Methylation damage accumulates as part of normal ageing, but without MBD4 the patients accumulated DNA damage at a higher rate than normal – as though they were ageing prematurely," Dr Chew said.

Dr Majewski said the research highlighted methylation DNA damage as an important contributor to cancer development, particularly in blood cancers. "These rare patients have helped us to gain important new insights into the link between cancer and ageing."

Dr Majewski is supported by the Alfred Felton Centenary Fellowship and a Victorian Cancer Agency Fellowship. Dr Chew is supported by a Leukaemia Foundation PhD (Clinical) Scholarship.

Improving clinical trials

An Australian-first approach to cancer trials will enhance the ability of clinicians to select the right treatments for patients.

Registry trials are conducted by using the comprehensive clinical data captured in clinical registries at many hospitals, enabling researchers to compare the impact of different treatment strategies on large numbers of patients in a real-world setting.

PhD student Mr Siavash Foroughi and Professor Peter Gibbs, a clinician-scientist at the Institute and medical oncologist at Western Health, led a study comparing registry trials with conventional randomised clinical trials.

Mr Foroughi found the potential of registry trials had recently been demonstrated in cardiovascular trials and had potential across other disease types.

"We concluded registry trials could provide a timely and cost-effective solution to answering important clinical questions for cancer patients, many of which are not being addressed by conventional trials," he said.

Professor Gibbs said registry trials that address a broad range of important questions related to routine patient management are opening at multiple sites across Australia in 2019, supported through the Victorian Comprehensive Cancer Centre alliance.

"These trials will enable us to evaluate multiple treatment strategies, giving oncologists more insight into the best approaches for improving health outcomes for individual patients," Professor Gibbs said.

Above: Dr Edward Chew (left) and Dr Ian Majewski have led genomics research revealing new clues about how our body guards against cancer.

New immune defenders defined

Our immune system is a complex network of cells working together to prevent infection and keep us healthy. However, excessive or misdirected immune cell activity can drive inflammatory conditions such as asthma and allergies.

Research led by Dr Kirsten Fairfax (left), Dr Carolyn de Graaf (centre) and Dr Jessica Bolden has revealed the identities of new subsets of granulocytes, a subset of immune cells at the frontline of our body's defences against infection.

The team defined distinct types of granulocytes and their precursors based on the presence of a cell-surface molecule called Siglec-F. The discoveries extended the team's extensive 'atlas' of blood cells, called *Haemopedia*, and highlighted key areas of interest for future studies of granulocytes and their role in diseases.

What is bioinformatics?

Bioinformatics applies mathematics, statistics and computer science to analyse complex biological data and solve medical research questions.

Our bioinformatics researchers develop innovative computational approaches to address these questions. They collaborate with researchers across the Institute, using their expertise to make sense of huge volumes of complex data.

Decoding complex data to improve health

Clues to improve cancer therapy

Scientists have used mathematics and computational biology to reveal a team of tiny molecules that make cancer cells less aggressive.

Their study, led by Dr Melissa Davis, Dr Joseph Cursons and collaborators at the University of South Australia, focussed on a 'switch' that allows cancer cells to spread through the body – a process called metastasis. Cancer cells that have made this switch are often deadlier and more difficult to treat.

Using systems biology, an approach that studies complex networks within cells, the researchers explored the cooperative behaviour of microRNAs, small molecules that are able to adjust the abundance of other molecules in a cell. They found a team of microRNAs that could work together to reverse the metastatic switch by targeting the network that controls it.

> *"This shows the value of using a whole-system-scale, network-based approach to unravel the complexities of cancer."*

Dr Cursons said the microRNAs could potentially be used to make cancer cells more susceptible to conventional therapies.

"We predict that combining the microRNAs with chemotherapy could help to clear the cancer cells," he said.

Dr Davis explained that the systems biology approach was key to the discovery. "We would not have detected the cooperation between the different microRNAs if we studied them one at a time," she said. "This shows the value of using a whole-system-scale, network-based approach to unravel the complexities of cancer."

Revealing hard-to-see gene changes

More than 30 inherited disorders are known to be caused by short repeated sequences of DNA, which have been difficult to detect simultaneously by conventional genetic testing methods that test for one disorder at a time. Huntington's disease is one of the best-known examples of a 'repeat expansion disorder'.

A new algorithm developed by our researchers will improve the number of individuals diagnosed with repeat expansion disorders by identifying these using conventional genome sequencing methods.

Most recognised repeat expansion disorders are neurological conditions. People with these disorders can have similar clinical features making diagnosis challenging. The new algorithm can test for all expansion disorders simultaneously leading to faster and better diagnoses for patients, said Professor Melanie Bahlo, who led the study with recent PhD graduate Dr Rick Tankard, Dr Mark Bennett, and Murdoch Children's Research Centre collaborators.

"Alterations in short repetitive sequences of DNA are difficult to detect using molecular testing or genome sequencing," Professor Bahlo said. "Our algorithm, called exSTRa, makes it easier and less expensive to detect repetitive DNA in genomic sequencing data."

The team hope that exSTRa could soon be used as a diagnostic tool when an inherited neurological condition is suspected, in combination with gold standard validation techniques. ExSTRa is also being used to reveal previously unrecognised genetic changes that promote diseases, and may even explain why some people age in a healthier way than others.

Above: Bioinformatics researchers Dr Joseph Cursons (left) and Dr Melissa Davis discovered how a team of tiny molecules cooperate to make cancer cells less aggressive.

Collaboration key to understanding immunity

Collaboration is one of the Institute's core values. Many of our biggest discoveries and innovations have arisen from the bringing together of expertise from diverse areas to solve important problems. In 2018 collaborations between immunologists and bioinformaticians advanced research into the functioning of immune B cells, which produce antibodies that protect us from infection.

Maintaining immune health

B cells contain roughly two metres of DNA, which holds instructions for the immune system to function and fight disease.

Keeping this DNA meticulously ordered is key to healthy immune cells, according to research led by immunologists Dr Rhys Allan and Dr Tim Johanson, in collaboration with Professor Stephen Nutt and bioinformaticians Professor Gordon Smyth and Dr Hannah Coughlan.

"Bioinformatics is shining a light on how our DNA is regulated."

The team discovered a protein called Pax5 folded, twisted and stored DNA in a fantastically ordered way in a B cell – like a jam-packed but very neat suitcase, Dr Johanson said.

"The immaculate organisation of DNA was crucial for B cells to function," he said. "B cells require access to highly specific parts of DNA to function and help keep us healthy."

A breakdown in this system could underlie diseases such as cancer, Dr Allan said. "DNA disarray can put cells at risk of dangerous changes. Many childhood leukaemias involve faulty Pax5," he said.

Dr Coughlan said recent technological advances were essential for the study. "Bioinformatics is shining a light on how our DNA is regulated, progressing our understanding of what goes wrong in diseases," she said.

Accolades for antibody study

A collaborative research project to unravel the genes controlling B cell antibody production was recognised in 2018 by the National Health and Medical Research Council (NHMRC).

The project, led by immunologist Professor Stephen Nutt and bioinformatician Associate Professor Wei Shi, received the NHMRC's Research Excellence Award as the top-ranked project proposal.

Professor Nutt said antibody production was essential for our health. "By understanding in detail how antibody producing cells are generated and function, we aim to understand diseases that stem from faulty antibody production such as primary immunodeficiencies and lupus. We also hope to gain new insights into multiple myeloma, an incurable cancer arising from antibody producing cells," he said.

The team had already identified more than 300 genes that contribute to the development and function of antibody forming cells, Associate Professor Shi said.

"NHMRC funding has allowed us to investigate how these genes function," he said. "We have developed powerful bioinformatics tools that will enable us to define the genes that impact antibody production."

Associate Professor Shi is also supported by the Institute's Centenary Fellowship supported by CSL.

Below: Research into the function of immune cells has been advanced by collaborations between specialists in immunology and bioinformatics. (From left) Professor Gordon Smyth, Professor Stephen Nutt, Dr Tim Johanson, Dr Hannah Coughlan and Dr Rhys Allan.

Improving the lives of people with coeliac disease

Coeliac disease is caused by an abnormal immune reaction to the gluten protein found in wheat, rye, barley and oats. This incurable autoimmune disease is becoming increasingly prevalent and is estimated to affect 1.4 per cent of the global population.

Our researchers are advancing the understanding of why coeliac disease develops, working to improve its diagnosis and management, and pursuing a range of novel therapies.

Vaccine progress

Institute research has underpinned a coeliac disease 'vaccine' that entered phase II clinical trials in 2018.

The global Nexvax2® (RESET CeD) trials, led by US-based biotechnology company ImmusanT Inc., aim to protect patients from the harmful effects of gluten by restoring normal immune system tolerance to this protein. The trials will assess whether a series of subcutaneous injections of Nexvax2 can effectively target and 're-train' the abnormal immune response to gluten in people with coeliac disease.

"A treatment that restores normal gluten tolerance would revolutionise coeliac disease management."

Australian trial sites include hospitals in Victoria, Western Australia, South Australia and Queensland. The trial at the Royal Melbourne Hospital is being led by Dr Jason Tye-Din, a clinician-scientist at the Institute and gastroenterologist at the hospital.

Dr Tye-Din said he was excited to see phase II trials commence because the gluten-free diet was a suboptimal treatment for coeliac disease.

"Nexvax2 may one day enable patients to safely consume gluten," he said. "A treatment that restores normal gluten tolerance would revolutionise coeliac disease management," he said.

The development of Nexvax2® was based on the discovery of the components of gluten that cause coeliac disease by Institute researchers Dr Bob Anderson, now Chief Scientific Officer for ImmusanT Inc., and Dr Tye-Din.

President of Coeliac Australia Mr Michael Bell said the organisation's members and many thousands of Australians with coeliac disease had been looking forward to the announcement of phase II trials.

"Many have been following the development of Nexvax2® for more than a decade and are hopeful the trials will bring us closer to an effective treatment for coeliac disease," Mr Bell said.

Coeliac Australia is an important supporter of the Institute's coeliac research program.

Above: Clinician-scientist Dr Jason Tye-Din leads the Institute's coeliac disease research program.

Support across generations

A Queensland family has stepped up to support coeliac disease research.

Bev Bradford heard Dr Tye-Din speak at a gluten-free expo after her granddaughter Jade was diagnosed with coeliac disease.

Bev said she immediately decided to support his research.

Bev holds annual afternoon tea fundraisers at her farm in Mackay, Queensland, spreading the word on the disease and the Institute's research. "Research brings hope to sufferers and their families," she said.

Fifteen-year-old Jade, who has visited the Institute with her mother Toni and Bev, is also active in fundraising and has delivered talks at the afternoon teas.

"Many people think coeliac disease isn't really a serious disease, is just a fad or that people are picky," Bev said. "It's not taken seriously and this can severely affect people's health."

One in 70 Australians has coeliac disease, but 80 per cent are not aware they have this disease.

Coeliac disease is a serious health condition, putting patients at risk of a range of health conditions including anaemia, osteoporosis, malnutrition, infections and certain cancers.

Scrutinising gluten-free diets

Management of coeliac disease requires a strict and lifelong gluten-free diet but this can be a challenging treatment. Unfortunately, many people with coeliac disease don't fully recover on a gluten-free diet – and our researchers have investigated why this might occur.

One possibility was that foods claiming to be gluten-free may be contaminated with gluten, Dr Tye-Din said. "We led two separate studies examining the frequency and level of gluten contamination in food served in restaurants as well as in packaged food."

The results confirmed contamination is a real issue for people with coeliac disease.

An investigation of more than 100 Melbourne restaurants and cafes, conducted with the help of Environmental Health Officers from the City of Melbourne, revealed one in 11 foods sold as 'gluten-free' contained gluten. This was more likely when there was a lack of knowledge and staff training on gluten-free food preparation.

Similarly, Dr Tye-Din's team discovered one in 40 foods labelled as 'gluten-free' did not comply with the national standard of 'no detectable gluten', after testing 256 of the most commonly purchased manufactured 'gluten-free' foods.

"Patients often report getting sick from eating out and these studies confirm that gluten contamination is happening," Dr Tye-Din said. "Our findings highlight the crucial impact of awareness and training in hospitality on the safety of gluten-free food and have supported the development of educational resources by Coeliac Australia for the food industry.

"Importantly, our work facilitates a dialogue with food businesses and regulatory authorities to effect changes that will ultimately benefit people with coeliac disease who depend on a lifelong gluten-free diet for their nutrition and good health," he said.

Dr Tye-Din has also examined the demographic, medical and psychological patient factors associated with strict adherence to a gluten-free diet. Surveys of more than 7000 people with coeliac disease in Australia and New Zealand revealed that patient dietary knowledge and psychological wellbeing were key factors shaping their ability to maintain dietary adherence and impacting their quality of life.

"It is clear that both dietitians and psychologists are underutilised. This information allows us to better help our patients who are struggling with this onerous and lifelong treatment," he said.

Turning up the heat on inflammatory diseases

Inflammation is one of our body's frontline defences against infection, but unchecked or misdirected inflammation drives many diseases. Our researchers are uncovering how inflammation is controlled and are using this information to develop new treatments for inflammatory diseases.

Inflammatory trigger pinpointed

When bacteria invade our body a protein called NOD2 detects this invasion and releases inflammatory signals to fight the infection. However, overactive NOD2 signalling has been strongly implicated in a range of inflammatory diseases including Crohn's disease and multiple sclerosis.

Research led by recent PhD graduate Dr Ché Stafford, Dr Ueli Nachbur and Professor John Silke has shed new light on how this pathway is controlled.

Dr Stafford said the team had shown that xIAP, a regulator of the pathway, was the 'master controller' that initiated inflammation via NOD2.

"These discoveries provide us with vital information that could lead to new, safe and effective treatments for inflammatory diseases."

"xIAP was the key to triggering the inflammatory response," he said. "We also showed that once the NOD2 pathway is initiated, full-strength inflammation is achieved via a second, amplifying step, which must be considered when designing therapeutic interventions for diseases related to this pathway."

Knowing the key players in the entire NOD2 pathway, from initiators to enhancers, would pave the way for new strategies to target the key components of this pathway, Dr Nachbur said.

"These discoveries provide us with vital information that could lead to new, safe and effective treatments for inflammatory diseases," he said.

Keeping inflammatory bowel disease in check

The balance of 'good' and 'bad' bacteria in our gut is an important determinant of health, impacting on our risk of a range of diseases including inflammatory bowel disease (IBD).

How our immune system promotes good gut bacteria was a focus of research led by Associate Professor Seth Masters, Dr Tracy Putoczki and Dr Alan Yu, in collaboration with the University of Melbourne's Bio21 Institute and QIMR Berghofer Medical Research Institute.

Using bowel biopsies donated by people with IBD as well as laboratory models, the team observed that higher levels of a protein called NLRP1 correlated with lower levels of good bacteria and higher levels of inflammation, said Dr Yu, who is supported by the Ormond College Thwaites Gutch Centenary Fellowship.

"NLRP1 is important for sensing infections, but we discovered excess NLRP1 can disrupt the immune system's capacity to maintain good gut bacteria," he said.

The exact triggers for the increase in NLRP1 were not known but Associate Professor Masters said faulty regulation of NLRP1 was an underlying cause of IBD.

"Our research also provides clues that may lead to new drugs that prevent unchecked inflammation," he said.

Above: Dr Alan Yu (left) and Associate Professor Seth Masters have revealed how our immune system maintains the balance of 'good' bacteria in the gut.

Potential new therapy for rheumatic fever and heart disease

Acute rheumatic fever is an inflammatory disease triggered by infection with group A streptococcus bacteria. Recurring or lengthy bouts of rheumatic fever can lead to rheumatic heart disease, causing permanent damage to the valves of the heart. Heart valve damage can have a range of consequences, including heart failure requiring patients to have cardiac surgery at a relatively young age.

Rheumatic fever and rheumatic heart disease are serious global health burdens, causing more than 300,000 deaths worldwide annually; these diseases are also significant causes of illness and death in Aboriginal and Torres Strait Islander Australians, particularly for young people living in remote communities.

Our researchers are working towards better treatments for rheumatic fever. This is one area in which we aim to contribute to closing the gap in health outcomes for Aboriginal and Torres Strait Islander Peoples.

Autoimmune triggers

Acute rheumatic fever is an autoimmune condition caused by an aberrant immune response to group A streptococcus bacteria. It provides a rare example of a definite infection preceding an autoimmune disease. However, the immunological pathways driving this sequence of events have not been defined, said study lead Professor Ian Wicks.

"Working with the Menzies School of Health Research in Darwin, we explored how group A streptococcus drives the dysregulated, autoimmune response that characterises acute rheumatic fever," he said. "We discovered that blood immune cells from people with acute rheumatic fever overproduced two inflammatory molecules, called interleukin-1B and GM-CSF, when they encountered group A streptococcus. This triggered a cascade of immune changes associated with autoimmune diseases."

New avenues for treatment

The results opened up several exciting avenues for future research into acute rheumatic fever and rheumatic heart disease.

"There are already medicines in clinical use that block interleukin-1B and GM-CSF, so these may be useful for treating acute rheumatic fever and shortening the duration of hospitalisation," Professor Wicks said.

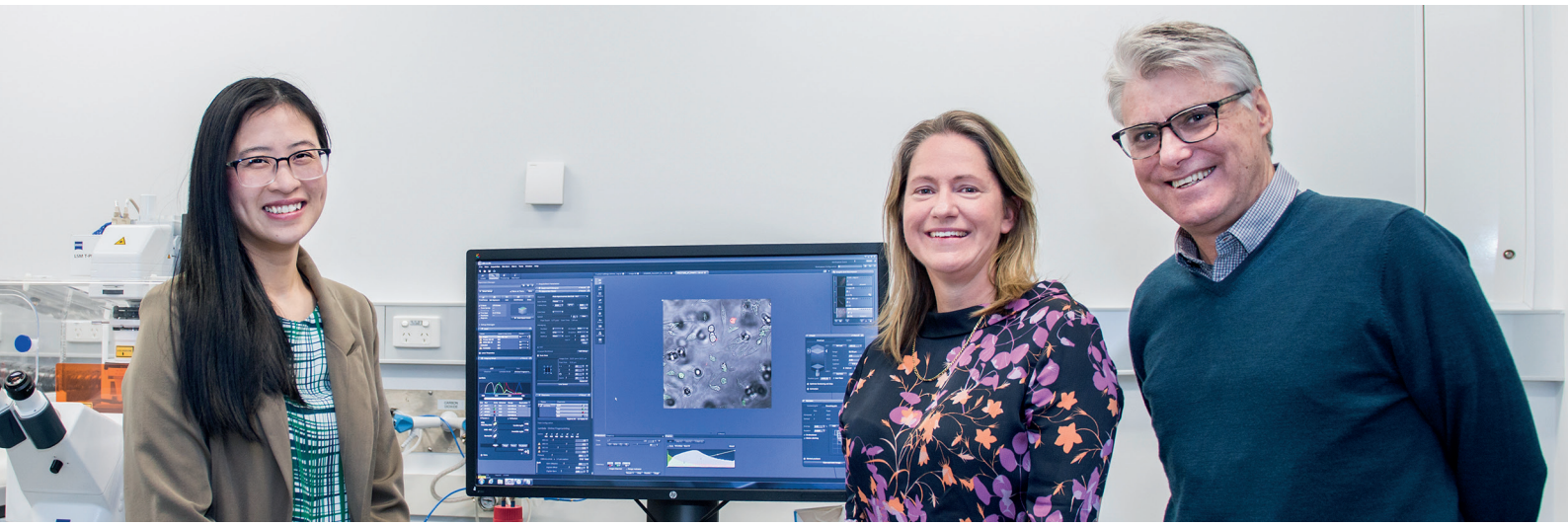
Another candidate is a drug called hydroxychloroquine that helps to 'tone down' autoimmune responses in other autoimmune diseases such as lupus, as well as being a widely used antimalarial agent.

"We demonstrated that hydroxychloroquine could reduce the autoimmune changes seen in the blood of people with acute rheumatic fever. We believe it could reduce the risk of acute rheumatic fever progressing to rheumatic heart disease and potentially save lives."

Hydroxychloroquine is relatively inexpensive and its safety profile is well established. This makes the drug an attractive addition to other secondary measures currently used to prevent rheumatic heart disease.

"We hope this research will encourage definitive clinical trials examining whether hydroxychloroquine can reduce rheumatic heart disease. It would be great to see such a trial happening in Australia," Professor Wicks said.

Below: Clinician-scientist Professor Ian Wicks' research could lead to new treatments for acute rheumatic fever.



Imaging: shedding new light on biology

Visualising biological mechanisms and behaviours is a gateway to understanding disease.

Our Centre for Dynamic Imaging helps researchers make exciting discoveries impacting major areas of human health.

The centre builds and enhances imaging equipment, enabling researchers to capture spectacular images and real-time video of single cells through to whole organs. These new views of biology are bringing us closer to developing better disease diagnostics and treatments.

DNA's great escape

Advanced imaging technology has enabled the first-ever visualisation of a key event in cell death – when DNA escapes from mitochondria.

Mitochondria normally supply cells with energy, but the leakage of DNA from damaged mitochondria can trigger autoimmune diseases such as lupus.

The research team, led by former Institute scientists Dr Kate McArthur and Professor Benjamin Kile, discovered – and filmed – the moment DNA emerged from mitochondria.

The breakthrough relied on live-cell lattice light-sheet microscopy, a new technology that images living cells at groundbreaking resolution. Dr McArthur used this microscope at the Howard Hughes Medical Institute's Janelia Research Campus (US) and the Institute where Australia's only custom-built lattice light-sheet microscope is housed. It was built by Dr Niall Geoghegan and Dr Lachlan Whitehead from the Institute's Centre for Dynamic Imaging.

Study co-author Dr Kelly Rogers, who leads the Centre for Dynamic Imaging, said lattice light-sheet microscopy was an exciting technology.

"Lattice light-sheet technology allows scientists to watch the inner workings of living cells with unprecedented detail and in 'real time'. It has been a game changer," she said.

Visualising cancer growth

Single-cell imaging techniques provided new insights into how the normal controls on cell growth are derailed in cancer cells.

Dr Kim Pham and Professor Phil Hodgkin, working in collaboration with the Centre for Dynamic Imaging, monitored the division of individual cancer cells to develop a mathematical model explaining this process.

By tagging cancer cells with a fluorescent sensor that changes colour at different stages of cell division, the team could precisely track individual cells as they divided, Dr Pham said.

> *"This study demonstrated the power of imaging to challenge earlier assumptions about cellular behaviours."*

"When we compared the division of cancer cells and healthy cells, we pinpointed striking differences between the two cell types," she said.

The research revealed that the first stage in division is minimised in cancer cells – a finding that upended a longstanding theory in the field.

The mathematical model developed by the team could have applications for better understanding the impact of chemotherapy on cancer cells, Professor Hodgkin said.

"This study demonstrated the power of imaging to challenge earlier assumptions about cellular behaviours," he said.

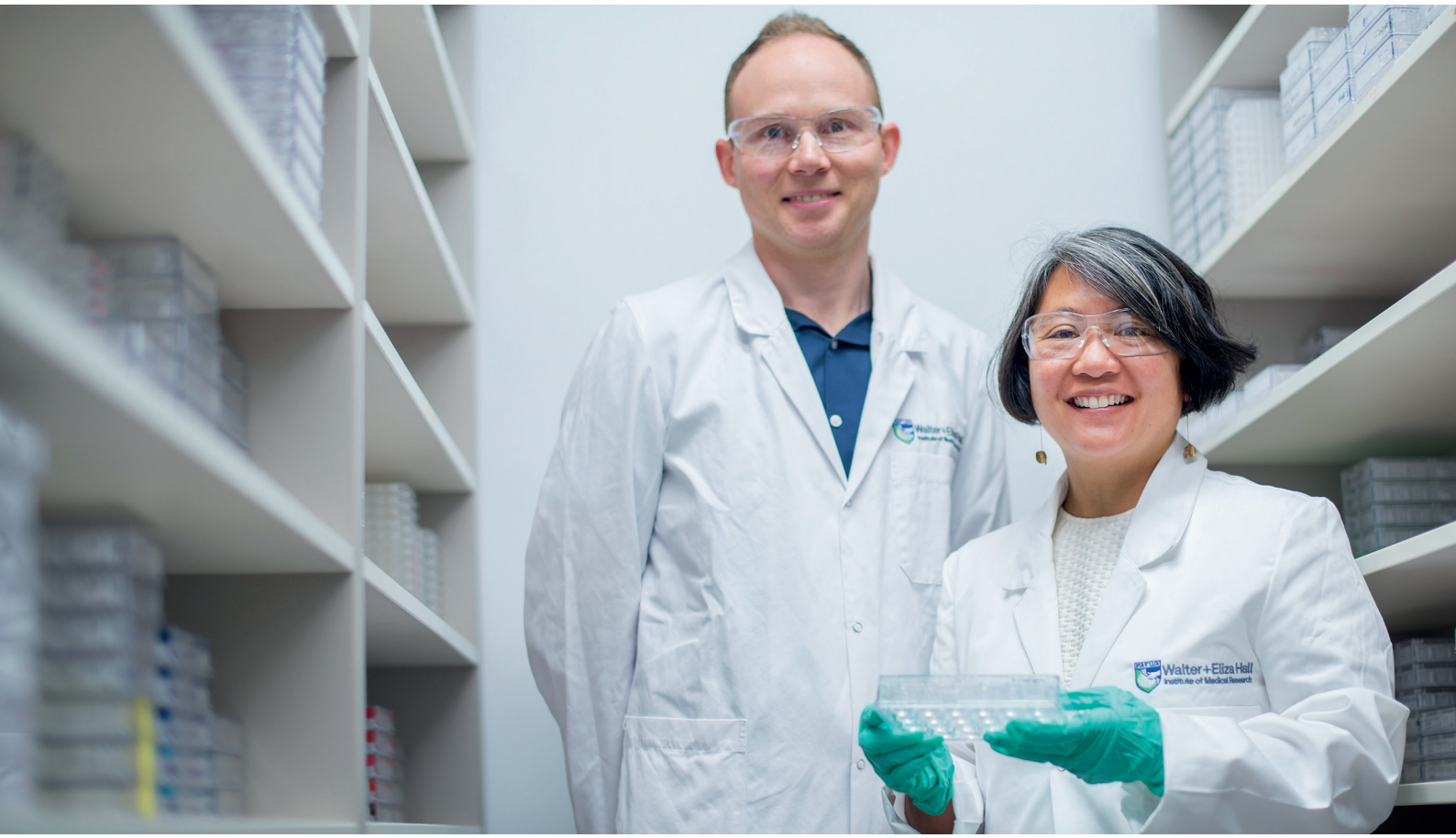
Above: A collaboration between Dr Kim Pham (left), Professor Phil Hodgkin (right) and the Centre for Dynamic Imaging, led by Dr Kelly Rogers (centre), has revealed new insights into how cancer cells divide.

Honour for Honours students

In 2018 two Honours students became joint recipients of the Institute's Colman-Speed Medal. The award recognises our top-scoring Honours students, judged on their research thesis, oral presentations and written assessments.

Ms Maggie Potts' (left) research investigated the production of platelets, tiny blood cells that regulate blood clotting. Platelets are released by bone marrow cells called megakaryocytes. Ms Potts used a technique called 'quantitative super-resolution microscopy' to visualise and understand the mechanics of platelet shedding. Her research could inform the development of better treatments for bleeding disorders.

Ms Sarah Garnish (right) investigated a human protein, MLKL, that mediates an inflammatory form of cell death, called necroptosis. Her research examined two variants of MLKL, differing in their protein sequence, that are found in around six per cent of the population. Ms Garnish discovered these variants could be associated with an inflammatory bone disease, an observation that was supported by studies of the proteins in laboratory models.



Working towards eradicating malaria

The malaria parasite infects more than 200 million people each year. This leads to a tragic human toll: more than 400,000 deaths annually, and significant economic burdens that trap communities in poverty and limit their access to healthcare.

Our researchers are committed to reducing the global burden of malaria through better prevention and treatment strategies. Our goal is to contribute to the global elimination of malaria.

First contact mapped

Effective vaccines are critical for curtailing the spread of malaria, and ultimately eliminating this disease.

Research led by Associate Professor Wai-Hong Tham and Dr Jakub Gruszczyk revealed a key step in how the malaria parasite *Plasmodium vivax* invades red blood cells – an essential stage in its lifecycle.

The discovery solved a mystery that researchers had been grappling with for decades.

P. vivax is the most common malaria parasite in countries outside of Africa, Associate Professor Tham said. "The parasite can lie dormant in the liver for months without causing any symptoms, which poses a huge challenge for treating infections and eliminating the parasite," she said.

"We discovered *P. vivax* hijacks the human transferrin receptor, a protein on the surface of the body's young red blood cells that is essential for bringing iron into the cell."

Dr Gruszczyk said once the team understood how the parasite was entering red blood cells, they were able to design antibodies to block this mode of access.

> *"Being able to stop* P. vivax *from latching onto this receptor and infiltrating the blood is a major breakthrough and important step towards malaria elimination."*

"Using the Australian Synchrotron and cryogenic electron microscopy (cryo-EM) technology, we generated a three-dimensional atomic map showing how the parasite protein latches onto the human transferrin receptor," he said.

"This helped us to design antibodies that prevented *P. vivax* from gaining entry into the human cells."

Above: Associate Professor Wai-Hong Tham and Dr Jakub Gruszczyk have revealed the structure of a key protein that helps the P. vivax *malaria parasite to invade red blood cells. This discovery may underpin the development of new antimalarial drugs or vaccines.*

Wellcome support for drug discovery

A $4.6 million grant from global charity the Wellcome Trust will accelerate the search for much-needed new medicines for malaria.

The funding grant will support a collaborative team of Institute researchers led by Associate Professor Justin Boddey, Professor Alan Cowman and Dr Brad Sleebs, and biopharmaceutical company Merck & Co., Inc., Kenilworth, NJ USA, known as MSD in Australia, to identify and investigate 'drug-like' molecules for treating malaria.

Dr Sleebs said the team had already discovered that molecules created by MSD prevented parasites growing in red blood cells. "Wellcome Trust support will allow us to modify these molecules to increase their potency and selectivity, and test them against all parasite lifecycle stages. We will also evaluate these drug candidates for safety, and consider whether drug-resistant parasites are likely to develop," he said.

Nearly half of the world's population is at risk of malaria.

New antimalarial drugs and vaccines will be essential to achieve elimination of malaria.

P. vivax parasites are incredibly diverse – which is challenging for vaccine development.

"Being able to stop *P. vivax* from latching onto this receptor and infiltrating the blood is a major breakthrough and important step towards malaria elimination," Associate Professor Tham said.

"We think this target would be ideal for an antimalarial vaccine that could be effective against a wide range of *P. vivax* parasites.

"Our detailed maps could also guide the development of antimalarial treatments that stop the spread of the parasites in the blood," she said.

Associate Professor Tham's research achievements were recognised with the Institute's highest honour, the Burnet Prize, in 2018.

Key to entering cell

A separate study also using cryo-EM revealed how the *Plasmodium falciparum* parasite enters red blood cells. *P. falciparum* is the most prevalent malaria species in Africa, and causes the deadliest form of malaria.

The research, led by Professor Alan Cowman and Dr Wilson Wong, visualised a complex of three parasite proteins, called Rh5, CyRPA and Ripr. Earlier Institute research had discovered these proteins work together to form a 'key' that unlocks red blood cells, allowing parasite entry.

The team worked with collaborators at the Howard Hughes Medical Institute's Janelia Research Campus (US) and the biotech company ExpreS^{2}ion Biotechnologies (Denmark), using the latter's unique protein production technology, ExpreS^2. These collaborations enabled the researchers to capture the first-ever image of the protein complex, Professor Cowman said.

"Making this discovery has been rewarding because it brings us an important step closer to hopefully one day achieving the ultimate goal of eradicating malaria."

"The new structure provided critical information for designing an effective vaccine against *Plasmodium falciparum* that prevents it from infecting red blood cells," he said.

"Making this discovery has been rewarding because it brings us an important step closer to hopefully one day achieving the ultimate goal of eradicating malaria."

Associate Professor Tham's and Professor Cowman's research at the Institute is supported by the Australian Research Council, Speedy Innovation Grant, Australian National Health and Medical Research Council, Howard Hughes Medical Institute, Wellcome Trust, Drakensberg Trust and the Victorian Government.

New frontiers in malaria research

Bioinformatics and computational biology are providing new insights into complex aspects of malaria biology, both through understanding the *Plasmodium* parasite's genetics as well as how it spreads within communities.

Understanding malaria control

Mathematical modelling has shed new light on the effectiveness of malaria control strategies and provided a framework for assessing future interventions.

Professor Ivo Mueller was part of an international team that assessed the incidence of *Plasmodium vivax (P. vivax)* in Papua New Guinea (PNG), and measured the impact of malaria control interventions.

The team developed a model that could predict the impact of current and future malaria control measures, Professor Mueller said.

"We assessed the impact of interventions that control mosquitoes such as insecticide-treated bed nets, as well as the role of antimalarial drugs in preventing malaria transmission," he said.

"PNG has achieved substantial reductions in the prevalence of malaria in recent years. Our models confirmed there were real risks of a resurgence, particularly in the *P. vivax* species, which can hide dormant in people's livers."

The models revealed that measures targeting mosquitoes, such as bed nets, were only one part of malaria control: ensuring people have access to antimalarial drugs was also very important.

"We have developed an invaluable tool to explore the best ways to control and ultimately eliminate malaria into the future," Professor Mueller said.

Decoding severe malaria

The severity of malaria infections can vary from a mild illness through to a life-threatening disease – and this depends, in part, on the parasite's genetics.

The differences between *Plasmodium falciparum* parasites causing severe or mild disease have been defined by our researchers and their colleagues at the Bio21 Institute, University of Melbourne, and the Eijkman Institute for Molecular Biology, Indonesia.

Professor Tony Papenfuss, who jointly led the study, said the team analysed gene expression in *P. falciparum* strains collected from malaria patients in Indonesia.

"Using a technique called RNA sequencing we identified differences between strains causing mild or severe malaria," he said. "One of the key differences was in the *var* genes, that encode a protein called PfEMP1.

"PfEMP1 is a highly variable protein, which helps parasites avoid immune detection, but in doing so it can contribute to the severity of malaria. This variability makes genomic analysis of the *var* genes extremely challenging.

"By developing and applying a new bioinformatics technique, we identified a link between certain *var* genes – and hence certain variants of PfEMP1 – and severe malaria," he said.

"This discovery could inform the development of malaria vaccines that target the most dangerous forms of PfEMP1, to prevent severe disease."

Above: Mosquitoes are essential for the transmission of malaria. Our researchers have contributed to an international study that evaluated the impact of malaria control measures targeting mosquitoes alongside the use of antimalarial drugs to stop transmission. Image by Dr Qike Wang and Dr Julie Healer.

Tackling tuberculosis

Dr Anna Coussens joined the Institute in 2018, and leads a research team based at the Institute and in South Africa. Her research focusses on understanding risk factors for people developing tuberculosis. This disease is caused by the bacterium *Mycobacterium tuberculosis*, which is spread by coughing. Co-infection with HIV and type 2 diabetes are two risk factors that increase the likelihood of developing tuberculosis.

Dr Coussens is exploring how immune cells that respond early to infection in humans are modified by these risk factors – and how this contributes to developing active disease. She is also developing a blood test to identify individuals infected and at most risk of getting sick. Understanding the intricate power struggle between the immune system and the bacteria could lead to new strategies that prevent active tuberculosis – which could save lives as well as stopping the transmission of this disease.

Combatting waterborne diseases at home and abroad

Waterborne diseases such as diarrhoea form a significant health problem worldwide, accounting for hundreds of thousands of deaths annually, the majority of them children under five. Climate change and the resulting disruptions to global rainfall patterns are set to worsen the situation.

A five-year Centenary Fellowship funded by Melbourne Water will enable our researchers to focus on developing low-cost, field-based diagnostic tools to improve the identification and control of waterborne illnesses in Australia and internationally.

A global health problem

Illnesses associated with poor water quality are a significant health problem worldwide, said Melbourne Water's Manager, Applied Research, Dr Judy Blackbeard.

"The Melbourne Water Centenary Fellowship will support researchers at the Walter and Eliza Hall Institute to find new ways to monitor disease-causing organisms in water," Dr Blackbeard said.

"Developing innovative methods of identifying and controlling these organisms has real potential to improve health outcomes, not only in Australia, but also across the world."

"Developing innovative methods of identifying and controlling these organisms has real potential to improve health outcomes, not only in Australia, but also across the world.

"We are very proud to be part of such an important project that supports the United Nations Development Goals and will have local and global health benefits," she said.

Dangerous contaminants

The fellowship, announced on World Water Day, was awarded to Dr Louise Baker, an early career researcher with extensive experience researching gastrointestinal infections, who works with Associate Professor Aaron Jex.

The fellowship will enable Dr Baker to focus specifically on water contamination by blue-green algae, gastrointestinal pathogens and mosquito larvae.

Explosions of blue-green algae choke fresh waterways of oxygen, potentially producing a variety of toxins that can cause illness or death in animals and humans. The toxins have been associated with causing respiratory issues, paralysis and numbness, damage to liver tissue and cancer. Blue-green algal blooms can also trigger other environmental issues such as mass fish deaths that lead to loss of biodiversity and pollute water.

Genetic clues pinpoint toxicity

Blue-green algae cannot always be identified by species under the microscope, and microscopy doesn't reveal which algae are toxic, Dr Baker said. "We are developing a quick screening method to determine which algae are toxic by identifying if toxin genes are present," she said.

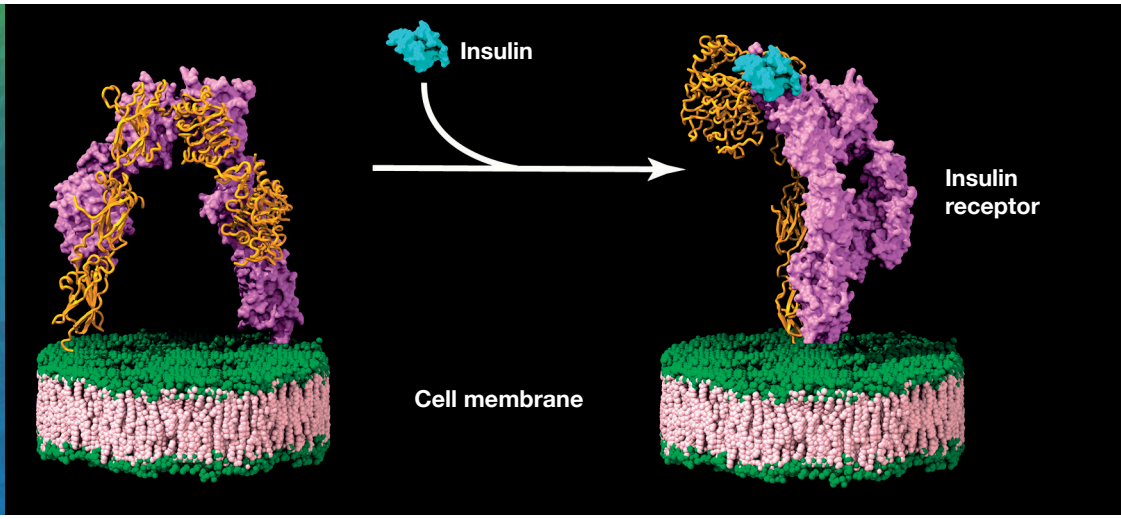
Dr Baker's goal is to develop a test with collaborators including Melbourne Water that can be used on water samples in the field rather than in laboratory.

"I hope that one day, a clean water supply is available for anyone around the world. With the support of the Melbourne Water Centenary Fellowship, I aim to develop tools that will bring this a step closer," Dr Baker said.

Below: The Melbourne Water Centenary Fellowship is enabling Dr Louise Baker to develop new approaches to detect waterborne diseases.

What is structural biology?

Structural biology reveals three-dimensional (3D) structures of proteins within our cells. These molecular 'maps' help to explain how proteins function to keep us healthy, or how they might be implicated in disease. This information is crucial for engineering new medicines that can block dysfunctional proteins from causing harm.



Structural biology: guiding future therapies

The structures of proteins are crucial to their function. Our structural biology researchers are visualising how disease-associated proteins function, and are using this information to inform new approaches to treating diseases.

Blueprint for future drugs

The visualisation of how a protein called SOCS1 'switches off' cell signalling could help in developing new medicines.

The atomic-level structure of SOCS1 binding to its partner protein JAK explains how SOCS1 dampens immune responses and blocks cancer growth said Dr Nick Liau, who jointly led the study with Dr Nadia Kershaw, Associate Professor Jeff Babon and Professor Nick Nicola.

> *"We produced an incredibly detailed view of SOCS1 binding to JAK1."*

"We produced an incredibly detailed view of SOCS1 binding to JAK1," Dr Liau said. "This explained why SOCS1 silences JAK proteins."

Dr Kershaw said both SOCS1 and JAK proteins had been implicated in driving cancers such as myeloproliferative neoplasms (MPNs) and certain childhood leukaemias, as well as inflammatory conditions.

"JAK inhibitors are already used to manage MPNs, but they do not cure the disease," Dr Kershaw said. "New medicines are needed, and a drug that switches off JAK signalling by mimicking SOCS1 might be an effective treatment."

The blueprint of the SOCS1-JAK1 complex might also underpin the development of drugs that inhibit SOCS1, Associate Professor Babon said. "These may have applications in amplifying immune responses that SOCS1 normally dampens," he said.

The Australian Synchrotron and the CSIRO Collaborative Crystallisation Centre were critical collaborators in this research.

Improving diabetes treatments

Our structural biology researchers revealed the first high-resolution 3D image of how insulin successfully binds to its receptor – a discovery that could lead to better insulin therapies for diabetes.

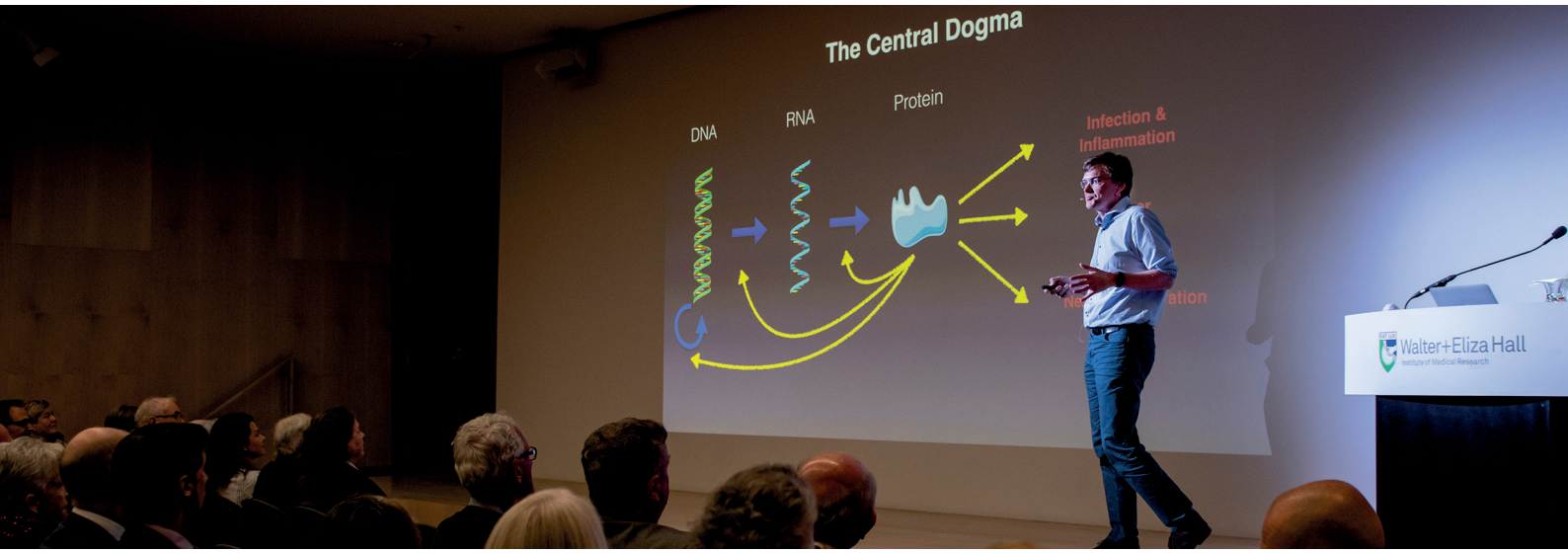
Insulin is a hormone that instructs cells such as muscle, fat and liver cells to remove sugar from the blood. These instructions are delivered via a receptor on the surface of each cell. In diabetes, damage to the pancreas can cause a shortage of insulin, leading to dangerously high blood sugar unless therapeutic insulin is administered.

Associate Professor Mike Lawrence and collaborators at EMBL, Germany, used cryogenic electron microscopy to capture hundreds of thousands of high-resolution images of insulin binding to its receptor. This created a high-resolution, 3D image of their interaction, Associate Professor Lawrence said.

"We were able to see for the first time how the insulin receptor changes shape when insulin is bound in order to successfully transmit instructions into the cell," he said.

"This will be vital information for pharmaceutical companies looking to improve insulin therapies. It means that therapeutic insulin can be designed to better mimic the body's own insulin. There has already been great interest in these results and their application from our industry collaborators."

Above: Our structural biology researchers have revealed the intricate structure of the insulin receptor (purple and yellow), and how this changes when insulin (cyan) binds to the receptor. This detailed view of how insulin signals to cells could aid the development of improved insulin therapies for diabetes.



Unlocking the secrets of Parkinson's disease

More than 80,000 Australians are living with Parkinson's disease, a neurodegenerative condition characterised by the death of specific neurons and inflammation in the brain.

We are working towards developing better diagnostics and therapies for Parkinson's disease that are underpinned by an intricate understanding of its biology.

Defective cell signalling

The causes of Parkinson's disease are not fully understood, but faults in two proteins called Parkin and PINK1 are implicated in many cases of early onset disease that arise before 50 years of age.

Parkin functions by attaching a small signalling protein, ubiquitin, to other proteins, modifying their function. Parkin is activated by PINK1, which also modifies ubiquitin itself.

A world leader in ubiquitin signalling, Professor David Komander, joined the Institute in 2018. He leads a team that uses chemical, biophysical and structural biology techniques to explore ubiquitin signalling, and how errors in this process cause diseases such as Parkinson's disease.

"Our goal is to develop new approaches to stop or delay Parkinson's disease."

Professor Komander said a deep understanding of proteins involved in diseases was critical to developing better treatments. "Our goal is to develop new approaches to stop or delay Parkinson's disease," he said. "The Institute's new National Drug Discovery Centre will be vital for this."

Understanding neuron death

Institute research has progressed knowledge about how faulty Parkin drives the excessive death of neurons in Parkinson's disease. Parkinson's disease and other neurodegenerative conditions are characterised by defects in mitochondria, the essential part of the cell that supplies energy.

The team revealed how, in healthy cells, Parkin 'buys time' for cells to repair damaged mitochondria that may otherwise kill them, said PhD student Mr Jonathan Bernardini, who led the study with Associate Professor Grant Dewson.

"In a healthy brain, Parkin helps keep cells alive and decreases the risk of harmful inflammation by repairing damage to mitochondria," he said.

"Damaged mitochondria can trigger the cell's internal death machinery, which removes unwanted cells by apoptosis, a form of programmed cell death. We discovered that Parkin blocks apoptosis by adding ubiquitin to a protein called BAK."

In damaged cells, BAK drives the destruction of mitochondria – a crucial step towards cell death and potentially also a trigger for inflammation.

Associate Professor Dewson said ubiquitin was a 'go slow' signal for BAK, allowing the cell's innate repair mechanisms to respond to damage.

"When Parkin is faulty – such as in Parkinson's disease – BAK is not restrained and excessive cell death can occur. This may contribute to the neuronal loss in Parkinson's disease."

The team hope their research could lead to new therapies that slow the progression of Parkinson's disease.

"Drugs that can stifle BAK, mimicking the effect of Parkin, may reduce harmful cell death in the brain," Associate Professor Dewson said.

Above: Professor David Komander joined the Institute in 2018. He leads a research team exploring the role of protein modifications in diseases such as Parkinson's disease.

Focus on developmental disorders

The human body develops through complex and intricate processes, many of which are poorly understood. Normal development is essential for our health, and errors in these processes can have wide-reaching and long-term consequences. Our researchers are focussed on understanding the processes underpinning normal development, and how faults in these lead to disease.

Surprising roles of cell death

Our researchers made surprise discoveries about the role programmed cell death, also known as apoptosis, plays in embryonic development and congenital birth defects.

Apoptosis is a normal process that removes sick, damaged or unwanted cells from the body. A collaborative team led by Associate Professor Anne Voss and Professor Andreas Strasser revealed that abnormal apoptosis may contribute to some common human birth defects such as spina bifida, heart vessel defects and cleft palate.

The team was also surprised to discover that many organs and tissues do not require apoptosis to develop normally, Associate Professor Voss said.

"Our collaboration … has resulted in major discoveries about embryonic development."

"It was widely thought – for very good reasons – that apoptosis was absolutely essential for the shaping of certain tissues and structures during development," she said. "But, to our surprise, in many of these tissues it was not required at all," Associate Professor Voss said.

Professor Strasser said the research was a perfect example of how collaboration accelerates research discoveries.

"Much of my team's research has been focussed on the role of proteins preventing or promoting apoptosis in cancer," he said. "Our collaboration with Associate Professor Voss' team has resulted in major discoveries about embryonic development."

Restraining genes aids healthy development

In order for all the different types of cells in the body to develop and function normally, the body needs to carefully control which genes are switched on and off.

Research led by Associate Professor Marnie Blewitt, Dr Natasha Jansz and Associate Professor James Murphy revealed a protein called SMCHD1 guided healthy development by disabling the function of specific genes when they are not needed.

Using advanced genomics, bioinformatics and imaging techniques, the team discovered SMCHD1 herds genes from vastly different parts of the chromosome into specific areas within the cell nucleus where they are efficiently silenced, Dr Jansz said. "We also uncovered a set of proteins that helps SMCHD1 to find the right genes," she said.

Understanding how SMCHD1 operates could boost efforts to develop drugs for diseases where SMCHD1 is most relevant, such as muscular dystrophy, Prader-Willi syndrome and potentially even cancer, Associate Professor Blewitt said.

"A set of genes called HOX were one of the targets of SMCHD1," she said. "These genes are critical for development and have also been implicated in cancer.

"Our next goal is to discover drugs that could help to either boost or dampen SMCHD1 activity in diseases, to bring it back to normal levels," Associate Professor Blewitt said.

Above: Dr Francine Ke (left), Dr Angus Cowan (centre) and Associate Professor Anne Voss led a study suggesting that abnormalities in cell death could be linked to common birth defects.

2018 Graduates

Students are highly valued members of our research groups, and some will go on to become the future leaders of our sector. Our students receive world-class training in medical research and broader career skills, which equips them for a range of careers in the health and medical research sector and other fields.

Congratulations to the following students who successfully completed their studies this year

Doctor of Philosophy, University of Melbourne

Dr Paul Baker
Associate Professor Seth Masters, Associate Professor Marco Herold, Professor Sammy Beoui
A CRISPR/Cas-based investigation of inflammasomes in infectious disease and autoinflammation

Dr Katrina Black
Dr Jacqui Gulbis, Professor Peter Colman
Investigating the role of the inner helix bundle crossing during KIR channel gating

Dr Michael Coffey
Associate Professor Chris Tonkin, Associate Professor Justin Boddey, Professor Alan Cowman
The function of aspartyl protease 5 in protein export by *Toxoplasma gondii*

Dr Rebecca Delconte
Associate Professor Nick Huntington, Professor Gabrielle Belz, Associate Professor Ross Dickins
Targeting regulators of natural killer cell homeostasis in cancer immunotherapy

Dr Pasquale Fedele
Professor Stephen Nutt, Dr Julie Tellier, Professor George Grigoriadis
The role of transcription factors in multiple myeloma

Dr Wenqiang He
Associate Professor Wai-Hong Tham, Professor Ivo Mueller
Characterising targets of naturally acquired immunity and correlates of clinical protection against *Plasmodium vivax*

Dr Natasha Jansz
Associate Professor Marnie Blewitt, Associate Professor James Murphy
Mechanistic insights into how the epigenetic regulator Smchd1 interacts with and alters the chromatin

Dr Callum Lawrence
Professor Mike Lawrence, Dr Jacqui Gulbis
The identification of small molecules that target the insulin or type1 insulin-like growth factor receptor ectodomain

Dr Mark Li
Associate Professor Grant Dewson, Associate Professor Andrew Webb, Professor David Vaux
The pro-apoptotic proteins BAK and BAX: activation and apoptotic pore formation

Dr Nicholas Liau
Associate Professor Jeff Babon, Professor Nick Nicola
Structural and biochemical characterisation of the regulation of Janus kinase signalling

Dr Jun Ting Low
Dr Lorraine O'Reilly, Professor Andreas Strasser, Associate Professor Tracy Putoczki
Understanding the role of pro-inflammatory cytokines in gastric cancer

Dr Michael Low
Professor David Tarlinton, Professor Stephen Nutt
The functional role of interferon regulatory factor 4 in plasma cells

Dr Dimitra Masouras
Dr Anissa Jabbour, Professor Paul Ekert
Regulation of BH3-only proteins by IKK, downstream of beta-common receptor signalling

Dr Helen McRae
Associate Professor Anne Voss, Associate Professor Tim Thomas
The role of PHF6 in haematopoiesis and tumour suppression

Dr Fiona Mogghaddas
Associate Professor Seth Masters, Professor Ian Wicks
Novel genes and mechanisms in monogenic autoimflammatory disorders

Dr Agalya Periasamy
Dr Jacqui Gulbis, Professor Peter Colman
Investigation of the mitochondrial translocase of the outer membrane (TOM) of *Drosophila melanogaster*

Dr Yi Wan Quah
Professor Ivo Mueller, Associate Professor Alyssa Barry, Associate Professor Aaron Jex
The molecular epidemiology of *Plasmodium spp.* in Solomon Islands

Dr Ranja Salvamoser
Associate Professor Marco Herold, Professor Andreas Strasser
Analysing the impact of the absences of CARD containing caspases on different forms of cell death

Dr Robyn Schenk
Associate Professor Marco Herold, Professor Andreas Strasser
Characterisation of mice deficient for the pro-survival BCL-2 family member A1/BFL-1

Dr Ché Stafford
Dr Ueli Nachbur, Professor John Silke, Associate Professor Isabelle Lucet
Investigation into the regulatory mechanisms of the NOD2 signalling pathway

Dr Michael Stutz
Professor Marc Pellegrini, Professor Gabrielle Belz, Dr James Vince
Dissecting the role of TNF signalling in *Mycobaterium tuberculosis* disease pathogenesis to identify novel therapueutic targets

Dr Rick Tankard
Professor Melanie Bahlo, Professor Terry Speed, Associate Professor Paul Lockhart
Identifying disease-causing short tandem repeats in massively parallel sequencing data, with a focus on ataxias

Dr Raphael Trenker
Associate Professor Matthew Call, Dr Melissa Call
Investigating the structure and function of transmembrane domains in MARCH e3 ligases and single-span receptors

Dr Christopher Weir
Professor Alan Cowman, Dr Anthony Hodder, Professor Paul Barlow, Dr Li Chen
Biochemical and biophysical investigations into key malaria parasite proteins

Dr Melanie Williams
Associate Professor Chris Tonkin, Professor Alan Cowman
Structural and functional analysis of host cell invasion motor in *Toxoplasma* parasites

Master of Philosophy, University of Melbourne

Ms Retno Ayu Setya (Tami) Utami
Dr Diana Hansen, Professor Alan Cowman
Association between antibody responses to blood stage parasitic antigens and protection from *Plasmodium falciparum* and *Plasmodium vivax* malaria in Timika, Indonesia

Master of Research, University of Melbourne

Mr Yijun Chen
Associate Professor Wai-Hong Tham, Dr Vanessa Bryant
Identification and characterisation of monoclonal antibodies against malaria

Mr Yuyang Cong
Dr Samir Taoudi, Professor Doug Hilton
Understanding blood fate determination using single cell technologies

Mr Zhongyu Huang
Professor Stephen Nutt, Professor Li Wu
Characterisation of roles of IRF8 in dendritic cell development and function

Mr Yuhao Jiao
Associate Professor Nick Huntington, Professor Gabrielle Belz
Investigating the role of MIC cells in graft versus host disease and graft versus leukaemia

Ms Luning Yang
Associate Professor Chris Tonkin
Characterisation of cyclic nucleotide-mediated signal transduction pathways in *Toxoplasma gondii*

Mr Chengzhong Ye
Professor Terry Speed, Professor Gordon Smyth
Improving differential expression analysis of single cell RNAseq data: method and application

Bachelor of Science (Honours) or Bachelor of Biomedicine (Honours), University of Melbourne

Ms Rebecca Abbott
Dr Misty Jenkins, Dr Ryan Cross
A novel immunotherapy to treat glioblastoma

Mr Sam Adler
Professor Doug Hilton, Dr Andrew Jarratt
Exploring the role of Setdb1 in the regulation of JAK/STAT signalling

Ms Sahanya Arsakularatne
Professor Gabrielle Belz, Associate Professor Edwin Hawkins
Investigating the role of *Gfi1* and *Gfi1b* in murine Peyer's patches

Ms Caitlin Bourke
Dr Rhea Longley, Professor Ivo Mueller
Optimising serological markers of recent exposure to *Plasmodium vivax* infection

Mr Lachlan Cain
Associate Professor Seth Masters, Dr Sophia Davidson
The role of type I interferon signalling in the chemotherapeutic action of bortezomib in multiple myeloma

Ms Jen Cheung
Dr Hoanh Tran, Professor David Vaux
Requirements for myeloid cell survival in the absence of apoptosis and growth factor

Ms Suzanne De Neefe
Dr Sant-Rayn Pasricha, Professor Alan Cowman
Erythroferrone: imaging the first erythroid-derived hormone

Mr Anthony Farchione
Dr Vanessa Bryant, Dr Susanne Heinzel
Establishing quantitative differences in human CD8+ T cell response kinetics between healthy and CVID individuals using cell tracking assays

Ms Alice Gage-Brown
Associate Professor Marco Herold, Dr Kerstin Brinkmann, Dr Gemma Kelly
Elucidating p53-independent mechanisms of the DNA damage response in thymic lymphoma cells

Ms Sarah Garnish
Dr Joanne Hildebrand, Professor John Silke
Understanding the impact of naturally occurring human MLKL polymorphisms on cell death and disease

Ms Brittany Gilchrist
Associate Professor Alyssa Barry, Professor Melanie Bahlo
Genomic signatures of malaria transmission decline and rebound using nanopore sequencing

Mr Allen Gu
Professor Doug Hilton, Dr Carolyn de Graaf, Dr Mark McKenzie, Dr Kirsten Fairfax
Designing a CRISPR knockout screen to investigate the genetic causes of neutrophil nuclear morphology

Ms Susan Huntington
Professor Alan Cowman, Dr Wilson Wong, Dr Julie Healer
Analysis of essential epitopes of *Plasmodium falciparum* PfRipr for erythrocyte invasion

Ms Ariane Lee
Dr Jason Tye-Din, Dr Melinda Hardy
Characterising regulatory T cells in coeliac disease: a study of phenotype and function

Ms Su Min Lee
Dr Melissa Call, Associate Professor Matt Call
A functional investigation of the role of the transmembrane domain in thrombopoietin receptor activation

Ms Sabrina Lewis
Dr Leigh Coultas, Dr Lachlan Whitehead
Investigating the role of cell death in neovascular eye disease

Ms Maggie Potts
Dr Samir Taudi, Associate Professor Edwin Hawkins
Investigating the mechanics of platelet formation via membrane budding

Mr Rikvin Rekhi
Associate Professor Aaron Jex, Professor Tony Burgess, Dr Louise Baker
Investigating LIM1863 cells in an attempt to generate a continuous culture system for the parasite *Cryptosporidium*

Ms Ushma Ruparel
Associate Professor Chris Tonkin, Dr Marcel Dorflinger
Identifying and characterising novel host resistance factors in *Toxoplasma gondii* infection

Ms Polly Sabljak
Associate Professor Oliver Sieber, Dr Anu Sakthiandeswaren
Elucidating cetuximab resistance in colorectal cancer

Ms Katie Saliba
Professor Marc Pellegrini, Dr Cody Allison
Causa mortis: a caspase-8-deficient endothelium

Ms Stephanie Studniberg
Dr Diana Hansen, Dr Lisa Ioannidis, Associate Professor Wei Shi
Investigating transcriptional correlates of naturally acquired immunity to malaria

Ms Kharizta Wiradiputri
Associate Professor Chris Tonkin, Dr Alex Uboldi
Functional analysis of PKAc1 during *Toxoplasma* lytic life cycle

Patents granted in 2018

Patents protect unique inventions made by Institute scientists. These facilitate Institute collaboration with commercial organisations to progress the development of new products, a key step towards clinical translation. Thus, patents ensure that the Institute is able to leverage its intellectual property for future financial benefits. Income received for commercial exploitation of Institute intellectual property is then used to invest in further research and reward the researchers who contributed to the invention (see page 50).

Alpha-helical mimetics

Inventors: J Baell, G Lessene

Belgium, France, Germany, Ireland, Sweden, Switzerland, The Netherlands, United Kingdom

Apoptosis-inducing agents for the treatment of cancer and immune and autoimmune diseases

Inventors: M Bruncko, Y Dai, H Ding, G Doherty, S Elmore, L Hasvold, L Hexamer, A Kunzer, R Mantei, W McClellan, C Park, A Petros, X Song, A Souers, G Sullivan, Z Tao, G Wang, L Wang, X Wang, M Wendt, P Czabotar, G Lessene, P Colman

China, Costa Rica, Singapore

Apoptosis-inducing agents for the treatment of cancer and immune and autoimmune diseases

Inventors: N/A

Argentina, Japan, South Korea, Ireland

Barley with low levels of hordeins

Inventors: N/A

India, Japan

Dendritic cell marker and uses thereof

Inventors: M Wright, A Proietto, K Shortman, A Lew, L Wu, I Caminschi, M Lahoud

Belgium, France, Germany, Ireland, Japan, Sweden, Switzerland, Netherlands, UK, US

Method of treating intracellular infection

M Pellegrini, G Ebert, C Begley

Australia, Singapore

Methods and compositions for treating and preventing malaria using an invasion ligand directed to a protease-resistant receptor

Inventors: A Cowman, L Chen, J Baum

Indonesia

Novel anti-cancer agents

Inventors: K Watson, T Burgess, G Lessene, F Walker, H Witchard

Canada, South Korea

Soluble mediator

Inventors: L Harrison, J Dromey, Y Zhang, E Bandala-Sanchez, M Rashidi

Belgium, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Mexico, Portugal, Republic of Croatia, Russian Federation, Spain, Sweden, Netherlands, UK, US

Soluble mediator (2)

L Harrison, Y Zhang, M Rashidi

Australia

Structure of insulin in complex with N- and C-terminal regions of the insulin receptor alpha-chain

Inventors: M Lawrence, J Menting, B Smith

France, UK

Treatment and prevention of malaria

Inventors: A Cowman, L Chen, T Triglia

Indonesia, South Korea, US

A REMARKABLE PLACE

The Institute's Art of Science exhibition at Federation Square offered members of the public the opportunity to learn about our research and meet our staff and students.

A remarkable place: laying the path to our success

Around the globe new technologies are being developed that have the capacity to enhance our research, but they come at a cost. In Australia, the way biomedical research is funded is changing. It is essential to keep abreast of these developments, while continuing to ensure the Institute supports our staff and students to reach their full potential.

Planning for the future

A major focus at the Institute in 2018 was the development of our *2019-2023 Strategic Plan*, a project that involved extensive information gathering and analysis, and widespread consultation. This incorporated input from research and professional services staff, collaborators and external experts, who provided analysis of our science (page 4), governance, education, and professional services. Our new strategic plan, launching in 2019, will guide the next phase of the Institute, ensuring we remain an organisation that undertakes world-leading basic and applied research, while also being a workplace that supports, values and encourages our people.

World-class research infrastructure

To continue to succeed on a global stage, our researchers require access to the latest research technologies. It is an ongoing challenge to plan ahead to anticipate the next important development, while ensuring that we can fund the existing technological needs of our researchers. Considerable work is done to plan which technologies the Institute should invest in independently, and which should be developed through collaborations with research partners.

"2018 saw considerable progress in our Centre for Dynamic Imaging, a flagship facility that provides our researchers with access to world-leading microscopy infrastructure."

2018 saw considerable progress in our Centre for Dynamic Imaging, a flagship facility that provides our researchers with access to world-leading microscopy infrastructure. The centre expanded its personnel, enhancing its capacity and the range of expertise available to support research. It is pleasing to see that the centre is already enabling previously unachievable research advances (page 30). The centre also launched a new website – imaging.wehi.edu.au – to raise awareness of imaging as a research field, highlight our centre's multidisciplinary capabilities, and expand collaboration with external researchers.

Work also began in 2018 on a developing a business case, in collaboration with the University of Melbourne, for establishing a new cryogenic electron microscopy (cryo-EM) facility. This technology, which brings a new level of resolution to structural biology, has already been vital for our researchers to reveal complex protein structures including those of the insulin receptor (page 37) and key malaria proteins (pages 32-33). We are excited by the potential that a local cryo-EM facility would offer to many facets of our research.

Embedding high-performance computing

Modern medical research technologies generate huge volumes of data, requiring sophisticated computational and bioinformatic techniques for its analysis and interpretation.

"The Institute has a strategy to ensure our computing systems meet current and future demands for handling and sharing complex research data."

The Institute has a strategy to ensure our computing systems meet current and future demands for handling and sharing complex research data. In 2018 we established our new Research Computing Centre to better deliver the support and infrastructure to drive our research. The centre's staff span the research and information technology areas, bringing together expertise in data management and analytics, user support, software engineering and automation, and computing infrastructure design and operations. The capacity of the Institute's high-performance computing system was also doubled to support our expanding requirements.

Supporting our people

Our people are our greatest asset, and we are committed to providing a vibrant, diverse and inclusive workplace. Considerable progress has been made in implementing our *Diversity and Inclusion Strategy*, particularly in the areas of gender equity and support for gender diversity (pages 46-47), and continuing our work in reconciliation (pages 48-49). We were honoured in late 2018 to be one of only 15 Australian organisations to be accredited with the inaugural Science in Australia Gender Equity (SAGE) Athena SWAN Bronze Award (page 47).

Our People and Culture and Scientific Education teams also led a range of initiatives to boost the health and wellbeing of our staff and students, as well as supporting professional development and inclusive leadership training. These activities are important for ensuring we remain a great place for all our staff and students to work and study.

New PhD program launched

No group at the Institute will be more impacted by changes in the global medical research landscape than our students. To better equip our PhD students for a career in the 21st century, we have enhanced our education offerings, launching a new Medical Biology PhD Program. This program provides students with world-class research training, plus the opportunity to develop the diverse skills that will benefit their future career paths.

Connecting with our community

The Institute exists to serve the community, and we are dependent on our community for support – through philanthropy, participation in clinical studies, guiding our research as consumer buddies and advocating for government support of medical research.

"We are committed to ensuring we share our research with our community: in 2018 more than 7000 members of the public participated in-person with Institute activities."

We are committed to ensuring we share our research with our community: in 2018 more than 7000 members of the public participated in-person with Institute activities. Key engagement events included our regular Discovery Tours held at the Institute, our annual *Art of Science* exhibition in Federation Square, participation in Open House Melbourne and the Victorian Seniors' Festival, and supporting school activities such as the Insights into Medical Research Day coordinated by our partners at the Gene Technology Access Centre. These events are valuable for enabling a wide range of people to learn about the breadth of medical research at the Institute, and the benefits our work brings to our community.

Managing risks

The Institute's risk assessment and hazard reporting systems have been extensively updated. This ensures we continue to provide a safe workplace for all our staff, students and visitors, as well as maintaining an organisation that responsibly anticipates, manages and mitigates a broad range of risks.

We have also worked to ensure we are compliant with the Victorian Government's compulsory standards for organisations that provide services to minors – whether they be our employees, or visitors to the Institute. This has led to the development of a Child Safe Policy underpinning a compulsory learning program and code of conduct, and systems for risk assessment and reporting.

Advocating for scientific integrity

We actively promote scientific integrity and seek to foster good scientific practice, both within the Institute and in the broader Australian research sector. The Institute is advocating for good governance structures in the sector, and an open and transparent system for reporting issues, correcting errors in the scientific literature, and rectifying research misconduct – in accordance with the Australian Code for the Responsible Conduct of Research. We have helped to drive the agenda for the establishment of a national office of research integrity to independently oversee Australian research.

Professor Alan Cowman
Deputy Director, Science Strategy

Ms Samantha Ludolf
Deputy Director, Strategy and Operations

Professor David Vaux AO
Deputy Director, Science Integrity and Ethics

The Institute's Deputy Directors, from left: Professor David Vaux, Ms Samantha Ludolf and Professor Alan Cowman.

An open and inclusive place to work

Attracting and developing exceptional people is an essential element of achieving our ambition of bringing together outstanding and diverse teams to solve complex health problems.

Developing an open and inclusive workplace is essential to this, and also forms part of our commitment to a free, fair and equitable society.

Striding with pride

The Institute's *Diversity and Inclusion Strategy*, launched in 2017, gives the Institute a strong framework to drive change. 2018 saw a key focus on activities to support and celebrate people who identify as part of the LGBTQIA+ 'rainbow' community.

The Institute was proud to participate for the first time in the Midsumma Pride March, where our staff and students – LGBTQIA+ people and allies alike – were 'striding with pride' behind an Institute banner in support of diversity.

The Institute was thrilled to see the establishment of its first employee-led LGBTQIA+ network, WE-Pride. The network is made up of LGBTQIA+ staff and students, and allies from across the Institute. It aims to support LGBTQIA+ people, celebrate diversity, educate the wider Institute community, advise the Institute on LGBTIQA+ policies and procedures, and work with the wider Parkville precinct on LGBTIQA+ issues.

Increasing visibility, celebrating achievements

A celebration was held to mark the first International Day of LGBTQIA+ People in Science, Technology, Engineering and Maths (STEM) in July. Professor Lisa Harvey-Smith, award-winning astrophysicist, LGBTQIA+ advocate and the Australian Government's Women in STEM Ambassador, addressed a special morning tea at the Institute, where we were joined by colleagues from across the Parkville Precinct.

Partnerships are a valuable component of delivering our diversity and inclusion activities. A new Melbourne-based network, QueersInScience, was established with the support of the Institute and nearby research organisations. This network aims to increase support and visibility for LGBTQIA+ people working in STEM. A 'Queers Wall' was displayed at the Institute and other Parkville organisations, celebrating the precinct's LGBTQIA+ community and their contributions to science and medical research.

Stronger through inclusion

Creating a workplace where everyone feels able to be their true and authentic self is an important goal for the Institute. To support this, the Institute launched its first policy and guidelines to support trans and gender diverse people in the workplace during Transgender Awareness Week in November. The Institute invited Sally Goldner AM from Transgender Victoria to speak at the launch on issues faced by trans and gender diverse people in the workplace, and how organisations can build inclusive environments.

Below: Our staff and students proudly marched in support of diversity behind an Institute banner for the first time in the 2018 Midsumma Pride March.

Towards gender equality

The Institute continues to make strides towards achieving gender equality in the workplace, one aspect of demonstrating our commitment to diversity and inclusion.

Award winners

The Institute's commitment to addressing gender inequality, supporting diversity and creating an inclusive workplace culture was recognised with a prestigious Athena SWAN Bronze Award from Science in Australia Gender Equity (SAGE) in December 2018.

The Institute was one of only 15 higher education and research institutions in Australia to receive the award presented by Ms Nicolle Flint MP, representing the Prime Minister, at a ceremony at Parliament House, Canberra.

The award required extensive self-assessment, data collection and analysis over a two-year period to examine our policies, practices and workplace culture relevant to gender equity and diversity. To help build a comprehensive evidence base, we undertook wide-ranging consultation through focus groups, surveys and workshops involving diverse staff and students from within the Institute and other organisations. The final stage was the development of an evidence-based action plan to address the issues identified through the analysis.

A roadmap to gender equality

The Institute's first Gender Action Plan was launched in 2018, providing a roadmap for addressing the key barriers preventing both women and men from achieving their potential and being enabled to live fulfilling work and home lives. The four-year plan seeks to strengthen our strategies around recruitment and retention of staff, career development and progression, and encourage the uptake of flexible work options for all staff. The plan also details activities to dismantle the barriers resulting from the accumulative disadvantage faced by women from minority groups, as well as a focus on role modelling and celebrating these women's achievements.

Championing change

Since 2015 our director Professor Doug Hilton has been part of Male Champions of Change (MCC), a coalition of male leaders who are committed to achieving gender equality and accelerating the advancement of more women into leadership positions.

In 2018 Professor Hilton and his counterparts maintained a strong and vocal presence in their commitment to being an agent of real and lasting change to improve gender equality. This included continuing to advocate for improving women's economic security and addressing domestic and family violence as a workplace issue, both of which have been a focus of the Institute's own gender equality work.

In 2018 Male Champions of Change released a report showing 75 per cent of MCCs are taking practical actions to address domestic and family violence in the workplace, such as additional paid leave and safety planning. Eighty three per cent of MCC organisations are conducting and actioning gender pay equity audits at least every two years.

Thinking global, acting local

The Institute is proud to be a member of the Women in Science Parkville Precinct (WiSPP) initiative, joining with four other local medical research organisations to boost the representation of women in science leadership.

Key WiSPP activities in 2018 included an event at Victorian Parliament House to celebrate the achievements of Victorian women in health and biomedical research, a career pathways showcase, and a Regional Girls Innovation Challenge.

Below: Members of the Institute's Science in Australia Gender Equity (SAGE) Self-Assessment Team with the Institute's Athena SWAN Bronze Award.

(From left) Head of People and Culture Ms Elizabeth McMahon, Associate Professor Isabelle Lucet, Deputy Director Strategy and Operations Ms Samantha Ludolf, Diversity and Inclusion Manager Ms Louise Johansson, Diversity and Inclusion Officer Ms Louise Naughton, and student representatives Ms Catia Pierotti and Mr Roberto Bonelli

Reconciliation: working towards a better future for all

The Institute takes a holistic approach to reconciliation, striving to embed our commitment across all aspects of Institute life and our place in society.

Delivery of our Innovate Reconciliation Action Plan

In 2018 we were proud to complete our two-year *Innovate Reconciliation Action Plan* (RAP), which was endorsed by Reconciliation Australia and has guided the Institute's reconciliation journey since 2016.

This journey has helped us to build our understanding of how we can best lend our voices, knowledge and resources to achieve reconciliation. The RAP has driven activities to create a culture of respect, increase awareness and understanding of Aboriginal and Torres Strait Islander history, culture and connection to the land, and build meaningful engagement with Aboriginal and Torres Strait Islander Peoples. It is these actions that will enable us to contribute to closing the gap in life expectancy and disease burden.

Celebrating Aboriginal and Torres Strait Islander women

To reflect the 2018 NAIDOC week theme 'Because of her, we can!', the Institute celebrated the contribution that Aboriginal and Torres Strait Islander women make to Australian society.

The Institute was privileged to welcome Ms Jill Gallagher AO, the Victorian Treaty Advancement Commissioner, to give a seminar to staff and students outlining how a treaty provides an opportunity to recast the relationship between Aboriginal and non-Aboriginal Victorians.

The Institute also profiled the stories of three leading Aboriginal and Torres Strait Islander women working in diverse fields to advance Indigenous health and representation: Ms Gallagher, Dr Simone Reynolds, an infectious diseases researcher, and Professor Ngiare Brown, a clinician and researcher.

Above: Ms Ky-ya Nicholson Ward (left), a member of the Djirri Djirri women's dance group, and Wurundjeri artist Ms Mandy Nicholson (centre) joined Institute director Professor Doug Hilton at our Bundoora campus for the unveiling of an Acknowledgement of Country plaque, designed by Ms Nicholson.

We embrace and acknowledge the Wurundjeri people of the Kulin Nation as the Traditional Custodians of the land on which the Bundoora Campus stands and pay our respects to Elders past, present and emerging.

Wanganyinu moondani ba ngarrgu Wurndjeri Gulinj Kulin-al Biik ngargunin twarn biik wenerop Berengarra Wilam dharri ba Boorndap Nanggit baambuth, yalingbu ba gama-dji.

We welcome in English and Woi wurrung languages

Using our voice

The Institute seeks to actively demonstrate our commitment to reconciliation and use our voice to advocate for change. Following the release of the Uluru Statement from the Heart by delegates to the First Nations National Constitutional Convention in 2017, the Institute was proud to formally support the statement through a submission to the Joint Select Committee Inquiry into Constitutional Recognition Relating to Aboriginal and Torres Strait Islander Peoples in June 2018.

In October 2018 the Uluru Statement canvas made its way to the Institute when former Uluru Working Group Co-chair Mr Thomas Mayor visited. Mr Mayor works to advocate for the aspirations within the Statement and spoke passionately to staff and students about what all Australians can do to achieve the Statement's ultimate vision: a constitutionally enshrined First Nations Voice and Makaratta Commission. Hundreds of Institute staff and students signed the canvas to lend their personal support for this vision.

National Reconciliation Week

For several years National Reconciliation Week has provided Institute staff and students with an opportunity to engage deeply with the shared histories, cultures and achievements of Indigenous people, and explore how each of us can join the national reconciliation effort. In 2018 we celebrated with a special performance from the Koomurri Dance Troupe, an Aboriginal-owned internationally renowned performance group. The performance included use of traditional song, dance, didgeridoo and dress to showcase Aboriginal culture.

Listen and learn

The Institute recognises that health and wellbeing are not isolated from wider cultural, social and economic factors. We must listen to and learn from Aboriginal and Torres Strait Islander people to understand how we can best contribute to Indigenous health research.

In June we held a roundtable meeting with Aboriginal and Torres Strait Islander health and medical research leaders to inform the development of the Institute's new *2019-2023 Strategic Plan*. The group explored how the Institute can contribute in a meaningful and impactful way to Indigenous health research, including through research and workforce capability, as well as strategic partnerships.

Creating a sense of place

We acknowledge and respect the Wurundjeri people of the Kulin Nation's continuing connection over millennia to the land on which our Institute's campuses stand. To formally recognise this, in 2018 we installed Acknowledgement of Country plaques in both Woi wurrung and English at our Bundoora and Kew campuses. This follows the acknowledgement installed at the Parkville building in 2017. The plaques were designed by Wurundjeri artist Ms Mandy Nicholson, who participated in the plaque unveiling, accompanied by women's dance group Djirri Djirri who performed as part of the ceremonies.

Rewarding scientific excellence and entrepreneurism

We are committed to translating basic research discoveries into improvements in disease prevention, diagnosis and treatment.

One important route to translation is to work with commercial organisations by licensing or co-developing intellectual property, and progressing development of new products. In return, commercial organisations reward the Institute by providing payments such as up-front fees, milestone payments and royalties on sale of products.

The translation of scientific discoveries through to commercial products requires an entrepreneurial workforce. We have revised how we recognise the many ways that our staff and students contribute to successful commercialisation.

Sharing our successes

In 2018 the Institute revised its policy for distributing commercial income to personnel who contributed to research projects that have been commercialised. The new approach recognises the many ways researchers contribute to translation of the Institute's research, such as by publishing relevant research papers, generating inventions that can be protected by patents, driving and maintaining collaborations with commercial partners, and planning and executing clinical studies. This is an extension of our previous policy of sharing commercial income primarily with those researchers named as inventors on patents that are licensed to generate commercial income.

The Institute has long had a practice of making a payment, at the Institute Board's discretion, to all eligible staff and students from across the Institute, both in the scientific and professional services areas, irrespective of whether they directly contributed to any commercialised project. The new approach maintains this broad distribution of a portion of commercial income in addition to payments made to a widened pool of contributors to individual, commercialised projects.

Rewarding diverse contributions

The journey to take a research discovery through to a commercialised product is often long and requires a team of people with diverse expertise, Institute director Professor Doug Hilton said. "We wanted to ensure the many different people who contributed to a commercialised product were recognised," he said.

> *"Our new policy is very inclusive, and provides a fair system for comparing different individuals' contributions."*

"A challenging part of the project was to define the varied contributions that lead to commercialisation and clinical translation. Our new policy is very inclusive, and provides a fair system for comparing different individuals' contributions.

"I am excited that we now have a robust system in place that reflects the reality of medical research, and can be used into the future to reward the many contributors to our commercial success," Professor Hilton said.

Reconnecting with our alumni

We value our ongoing connections with former Institute staff and students, who have followed diverse paths since leaving the Institute.

In 2018 20 alumni living in Europe gathered at a reunion in London, making new acquaintances, rekindling old friendships and sharing their memories of the Institute.

ORGANISATION AND GOVERNANCE

The Institute participated in Open House Melbourne, welcoming visitors who toured our labs, met our scientists and participated in educational activities run by the Gene Technology Access Centre.

Institute divisions and laboratory heads 31 December 2018

ACRF Chemical Biology division

Division head

Associate Professor Guillaume Lessene

Laboratory heads

Associate Professor Chris Burns, visiting scientist
Dr Ethan Goddard-Borger
Dr Isabelle Lucet (jointly with Structural Biology division)
Dr Hélène Jousset Sabroux (jointly with Systems Biology and Personalised Medicine division)
Dr Brad Sleebs (from July 2018)
Professor Keith Watson, honorary

ACRF Stem Cells and Cancer division

Division heads

Professor Geoff Lindeman
Professor Jane Visvader

Laboratory heads

Associate Professor Marie-Liesse Asselin-Labat
Professor Clare Scott
Dr Kate Sutherland

Bioinformatics division

Division heads

Professor Gordon Smyth

Laboratory heads

Dr Melissa Davis
Professor Tony Papenfuss
Associate Professor Wei Shi
Professor Terry Speed, honorary

Cancer and Haematology division

Division heads

Professor Warren Alexander
Professor Nick Nicola

Laboratory heads

Associate Professor Jeff Babon (jointly with Structural Biology division)
Professor David Huang
Dr Emma Josefsson
Dr Ian Majewski
Professor Andrew Roberts
Dr Samir Taoudi (jointly with Molecular Medicine division)
Professor Christine Wells, honorary (jointly with Molecular Medicine division)

Cell Signalling and Cell Death division

Division heads

Professor John Silke
Professor David Vaux

Laboratory heads

Associate Professor Grant Dewson
Associate Professor James Murphy

Development and Cancer division

Division head

Associate Professor Anne Voss

Laboratory heads

Dr Leigh Coultas
Associate Professor Joan Heath
Associate Professor Tim Thomas

Immunology division

Division head

Professor Phil Hodgkin

Laboratory heads

Dr Bob Anderson, honorary
Associate Professor Daniel Gray (jointly with Molecular Genetics of Cancer division)
Dr Joanna Groom (jointly with Molecular Immunology division)
Associate Professor Edwin Hawkins
Dr Misty Jenkins
Professor Andrew Lew
Emeritus Professor Jacques Miller
Dr Shalin Naik (jointly with Molecular Medicine division)
Professor Ken Shortman, honorary
Dr Jason Tye-Din

Infection and Immunity division

Divsion heads

Professor Alan Cowman
Professor Marc Pellegrini

Laboratory heads

Associate Professor Justin Boddey
Dr Anna Coussens
Dr Diana Hansen
Dr Sant-Rayn Pasricha (jointly with Population Health and Immunity division)
Associate Professor Wai-Hong Tham
Associate Professor Chris Tonkin

Inflammation division

Division head

Professor Ian Wicks

Laboratory heads

Associate Professor Seth Masters
Associate Professor Sandra Nicholson
Dr Tracy Putoczki
Dr James Vince

Molecular Genetics of Cancer division

Division head

Professor Andreas Strasser

Laboratory heads

Professor Jerry Adams, honorary
Dr Philippe Bouillet
Professor Suzanne Cory (honorary distinguished research fellow)
Associate Professor Daniel Gray (jointly with Immunology division)
Associate Professor Marco Herold
Dr Ruth Kluck

Molecular Immunology division

Division head

Professor Stephen Nutt

Laboratory heads

Dr Rhys Allan (jointly with Molecular Medicine division)
Professor Gabrielle Belz
Professor Lynn Corcoran
Dr Joanna Groom (jointly with Immunology division)
Professor Axel Kallies, honorary
Associate Professor Nicholas Huntington
Professor Li Wu, honorary

Molecular Medicine division

Division heads

Associate Professor Marnie Blewitt
Professor Doug Hilton

Laboratory heads

Dr Rhys Allan (jointly with Molecular Immunology division)
Dr Shalin Naik (jointly with Immunology division)
Associate Professor Matthew Ritchie
Dr Samir Taoudi (jointly with Cancer and Haematology division)
Professor Christine Wells, honorary (jointly with Cancer and Haematology division)

Population Health and Immunity division

Division heads

Professor Melanie Bahlo
Professor Ivo Mueller

Laboratory heads

Associate Professor Alyssa Barry
Professor Len Harrison
Associate Professor Aaron Jex
Dr Sant-Rayn Pasricha (jointly with Infection and Immunity division)
Dr Leanne Robinson

Structural Biology division

Division heads

Associate Professor Matthew Call
Associate Professor Peter Czabotar

Laboratory heads

Associate Professor Jeff Babon (jointly with Cancer and Haematology division)
Professor Antony Burgess
Dr Melissa Call
Professor Peter Colman
Dr Jacqui Gulbis
Associate Professor Mike Lawrence
Dr Isabelle Lucet (jointly with ACRF Chemical Biology division)

Systems Biology and Personalised Medicine

Division heads

Associate Professor Oliver Sieber (acting)
Dr Andrew Webb (acting)

Laboratory heads

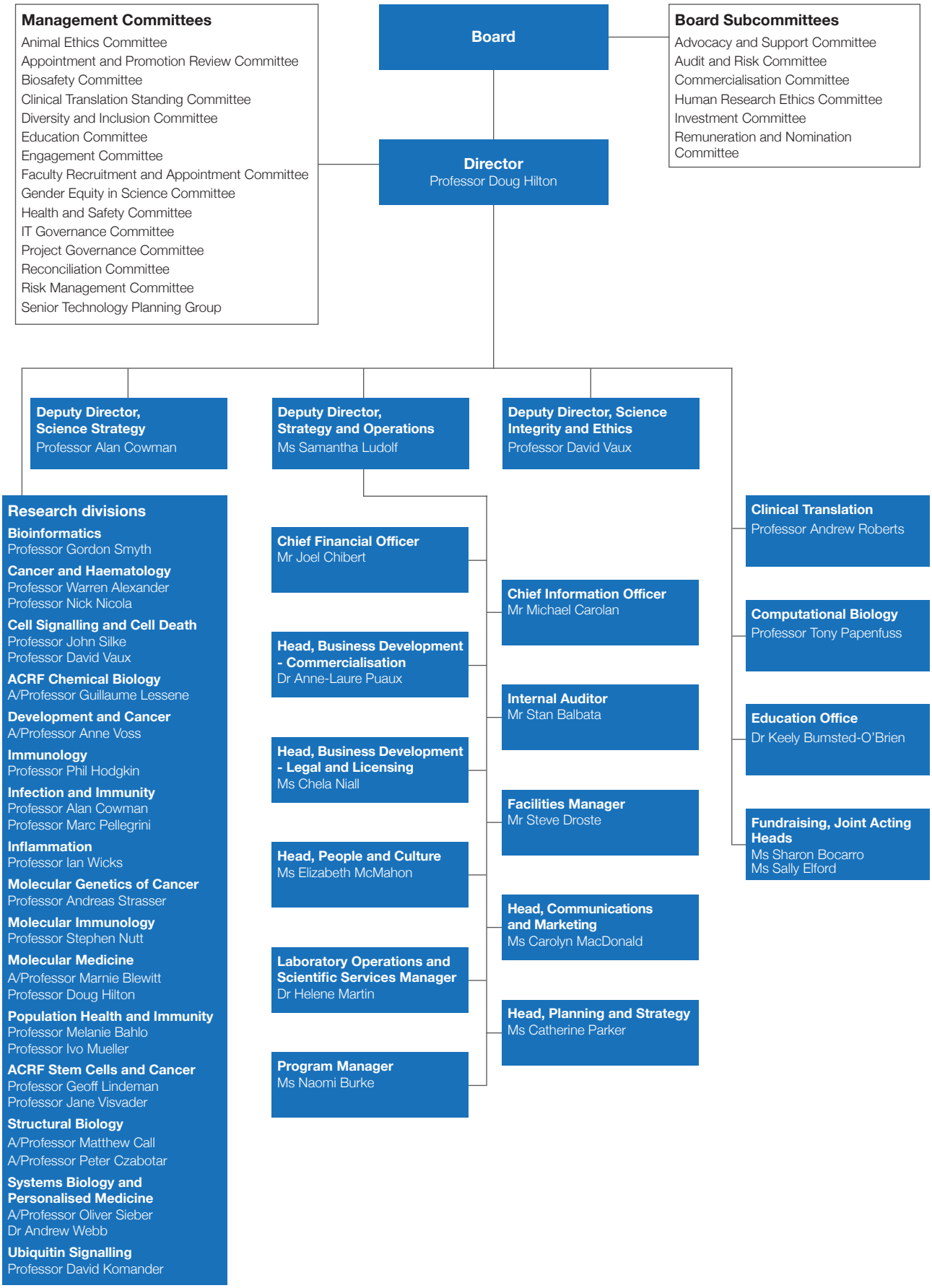
Professor Peter Gibbs
Mr Simon Monard
Dr Kelly Rogers
Dr Hélène Jousset Sabroux (jointly with ACRF Chemical Biology division)
Dr Ian Street
Dr Stephen Wilcox

Ubiquitin Signalling division

Division head

Professor David Komander (from November 2018)

Institute organisation 31 December 2018



2018 Board Subcommittees 31 December 2018

Advocacy and Support Committee

Mr John Dyson (chair)
Ms Sharon Bocarro
Mr Joel Chibert
Associate Professor Paul Cooper
Mr Michael Daddo
Ms Sally Elford
Professor Doug Hilton AO
Mr Hugh Hodges
Ms Caroline Johnston
Ms Andrea Lapidge
Ms Samantha Ludolf
Ms Carolyn MacDonald
Ms Catherine Robson
Mr Christopher Thomas AM
Ms Kelly Rodger (minutes)

Audit and Risk Committee

Mr Robert Wylie (chair)
Mr Malcolm Broomhead AO
Mr Joel Chibert
Ms Jane Hemstritch
Professor Doug Hilton AO
Ms Jayda Hindson (Deloitte)
Ms Samantha Ludolf
Mr Christopher Thomas AM
Ms Anneke Du Toit (Deloitte)
Mr Stan Balbata (minutes)

Commercialisation Committee

Dr Graham Mitchell AO (chair)
Mr Saul Cannon
Professor Peter Colman AC
Dr Leigh Farrell
Ms Lisa Hennessy (independent member)
Professor Doug Hilton AO
Ms Samantha Ludolf
Dr George Morstyn
Ms Chela Niall
Professor Nick Nicola AO
Dr Anne-Laure Puaux

Human Research Ethics Committee

Mr Peter Collins (chair)
Reverend Father Michael Elligate (deputy chair)
Dr John Bonacci
Dr Vanessa Bryant
Mr David Freeman
Dr Emma Josefsson
Dr Ian Majewski
Mrs Netta McArthur
Professor Marc Pellegrini
Ms Moira Rayner
Ms. Kimberley Walsh
Mr Kyle Heffernan (minutes)
Professor Doug Hilton AO (observer)
Dr Lina Laskos (observer)
Professor David Vaux AO (observer)

Investment Committee

Mr Robert Wylie (chair)
Mr Adam Blennerhassett (JBWere)
Mr Malcolm Broomhead AO
Mr Joel Chibert
Professor Doug Hilton AO
Ms Samantha Ludolf
Mr Stephen Merlicek
Mr Stephen Milburn-Pyle
Mr Andrew Scott
Mr Christopher Thomas AM
Ms Fiona Trafford-Walker
Ms Karen O'Duil (minutes)

Remuneration and Nomination Committee

Mr Christopher Thomas AM (chair)
Ms Marie McDonald
Mr Terry Moran AC

Walter and Eliza Hall Institute Board

The directors of the Walter and Eliza Hall Institute of Medical Research Board
31 December 2018

President
Mr Christopher W Thomas AM

BCom (Hons) MBA *Melbourne* FAICD

Appointed: February 2001
Appointed President: February 2013

Mr Thomas joined executive search firm Egon Zehnder International in 1979 and was managing partner of the Melbourne office from 1986 to 2003. He was also leader of the firm's global Board Consulting Practice Group (1998-2006) and chaired the firm's twice-yearly international partners' meetings (1997-2007).

Mr Thomas is a fellow of the Australian Institute of Company Directors, and is currently a member of the National Gallery of Victoria's Remuneration and Nomination Committee. He has served on the board of the Corps of Commissionaires (Victoria) and the Council of the Australian Film, Television and Radio School. He was Chairman of the Heide Museum of Modern Art, Chairman of the Victorian Community Foundation and President of the Melbourne Business School Alumni.

Vice President
Mrs Jane Hemstritch

BSc (Hons) *London University* FICAEW FICAA FAICD

Appointed: October 2013
Appointed Vice President: July 2016

Mrs Hemstritch was Managing Director Asia Pacific for Accenture Limited from 2004 until her retirement in February 2007. In this role, Mrs Hemstritch was a member of Accenture's global executive leadership team and oversaw the management of Accenture's business portfolio in Asia Pacific.

She holds a Bachelor of Science with Honours in biochemistry and physiology and has professional expertise in technology, communications, change management and accounting.

Mrs Hemstritch is the Deputy Chair of the Council of the National Library of Australia, and a member of the Global Council of Herbert Smith Freehills, the Council of Governing Members of The Smith Family, and Chief Executive Women. She is an independent non-executive director of Lend Lease Corporation Limited and is Chair of the Accenture Australia Foundation.

Honorary Treasurer
Mr Robert Wylie

FCA FAICD

Appointed: April 2014
Appointed Honorary Treasurer: April 2014

Mr Wylie is a fellow of the Australian Institute of Company Directors, a fellow and past president of the Institute of Chartered Accountants in Australia and a member of the Institute of Chartered Accountants in Scotland. He is a non-executive director of Maxitrans Industries Limited.

Mr Wylie joined Deloitte in 1973 in the United Kingdom, transferring to Australia in 1976. He was National Chairman of Deloitte Australia from 1993 to 2001. He was Deputy Managing Partner Asia Pacific from 2001 before joining Deloitte & Touche USA as a senior executive partner in 2002 until 2006. He was also a member of The Deloitte Global Board and Global Governance Committee as well as The Deloitte Consulting Global Board.

Mr Malcolm Broomhead AO

BE (Civil) MBA *UQ* FIE (Aus) FAusIMM FAIM MICE (UK) FAICD

Appointed: July 2014

Mr Broomhead is a professional non-executive director. His directorships include BHP Billiton Limited and Orica Limited (Chairman) and he is a council member of Opportunity International Australia.

Mr Broomhead was formerly Managing Director and CEO of Orica Limited from 2001 until September 2005. Prior to Orica, he was Managing Director and CEO of the global diversified resources company North Limited.

He has had extensive experience in the resources industry, as well as in finance, investment and construction activities. He has worked in management positions with Halcrow (UK), MIM Holdings, Peko Wallsend and Industrial Equity.

Mr Peter Collins

BA (Hons) *Melbourne* BTheology *MCD* Masters *Oxford and HEC Paris*

Appointed: May 2018

Mr Collins is the Director of the Centre for Ethical Leadership and Director of the Vincent Fairfax Fellowship. He consults on ethics and leadership with ASX100 companies, Australian and Victorian Government departments and the health and medical research sector.

Mr Collins started his consulting career at McKinsey & Company with a focus on organisational change and leadership. Prior to this he worked in the Australian Parliament, for the Minister for Foreign Affairs and later the Minister for Health.

Mr Collins has a Masters degree from the University of Oxford and HEC Paris and is undertaking a Doctor of Philosophy in ethics at the University of Oxford.

Mr John Dyson

BSc *Monash* Grad Dip Fin Inv SIA MBA *RMIT*

Appointed: May 2016

Mr Dyson has been an active participant in the venture capital industry for more than two decades. He is one of the founders of Starfish Ventures, a venture capital company established in 2001; and former chair of Swinburne Ventures Pty Ltd, the entity responsible for the commercialisation of technology for Swinburne University of Technology.

From 1997 to 2002 he was a director of the Australian Venture Capital Association Limited, including Deputy Chairman in 1998 and Chairman in 1999. He is currently a director of technology companies Aktana, Atmail, Audinate, Design Crowd, Echoview, Hearables 3D and Nitro Software.

Mr Dyson is a former Chairman of the Mount Buller and Mount Stirling Alpine Resort Management Board, which oversees the management of Victoria's largest alpine resort. He is also a co-trustee of the Dyson Bequest, a $15 million charitable foundation that supports a range of social welfare, education, medical research and environmental causes.

Professor Shitij Kapur

MBBS *AIIMS* PhD *Toronto* FRCPC FMedSci

Appointed: May 2017

Professor Shitij Kapur is the Dean, Faculty of Medicine, Dentistry and Health Sciences and assistant Vice-Chancellor (Health), University of Melbourne.

Professor Kapur is a clinician-scientist with expertise in psychiatry, neuroscience and brain imaging. Before moving to Australia, he was Executive Dean of the Institute of Psychiatry, Psychology and Neuroscience, Europe's largest and leading centre for mental health research.

He has served as a non-executive director of the South London and Maudsley NHS Trust in the UK, as Secretary of the International College of the Neuropsychopharmacology, and Treasurer of the Schizophrenia International Research Society. He currently serves as a director on the boards of Melbourne Health, St Vincent's Institute for Medical Research, Aikenhead Centre for Medical Discoveries and chairs the board of the Melbourne Academic Centre for Health.

Professor Christine Kilpatrick

MBBS MBA MD DMedSci (Hon) *Melbourne* FRACP FRACMA FAICD FAHMS

Appointed: May 2017

Professor Kilpatrick commenced as Chief Executive, Melbourne Health in May 2017. Previous appointments include Chief Executive, the Royal Children's Hospital from (2008-17), executive director medical services, Melbourne Health and executive director Royal Melbourne Hospital, Melbourne Health (2004-08). Prior to these appointments she was a neurologist, specialising in epilepsy.

Professor Kilpatrick is a member of boards including Orygen, National Centre of Excellence in Youth Mental Health, and the Victorian Comprehensive Cancer Centre. She was awarded a Centenary Medal in 2003, in 2014 was included in the Victorian Honour Roll of Women, in 2017 was a recipient of the inaugural Distinguished Fellow's Award, Royal Australasian College of Medical Administrators, and in 2018 inducted in the Top 50 Public Sector Women.

Professor James McCluskey AO

BMedSc MBBS MD *UWA* FRACP FRCPA FAA FAHMS

Appointed: April 2011

Professor McCluskey is Deputy Vice-Chancellor (Research) at the University of Melbourne and a Redmond Barry Distinguished Professor in Microbiology and Immunology.

He has published widely on the genetic control of specific immunity and his research has been recognised by a number of awards.

Professor McCluskey is a director of Australian Friends of Asha Slums, the Victorian Comprehensive Cancer Centre, UoM Commercial, Trinity College, the Chair of Nossal Institute Ltd and a foundation director of the governing board of the Atlantic Institute, Oxford. He is a consultant to the Australian Red Cross Blood Service Immunogenetics and Transplantation Services. He has previously been a board director of the Bionics Institute, the Florey Institute of Neuroscience and Mental Health, the Burnet Institute and St Vincent's Institute. Professor McCluskey led the development of the Peter Doherty Institute for Infection and Immunity, and also led the multi-institutional team that developed the Atlantic Fellows Social Equity Program supported by The Atlantic Philanthropies.

Ms Marie McDonald

BSc (Hons) LLB (Hons) *Melbourne*

Appointed: October 2016

Ms McDonald was a partner of Blake Dawson (now global law firm Ashurst) from 1990 to 2014. She specialised in corporate and commercial law and, in particular, cross-border mergers and acquisitions, and corporate governance.

She was a member of the Australian Takeovers Panel (2001-10) and Chair of the Corporations Committee of the Business Law Section of the Law Council of Australia (2012, 2013) and a Deputy Chair (2010, 2011).

Prior to becoming a lawyer, Ms McDonald completed a Bachelor of Science (Honours) degree with first class honours, majoring in chemistry. Ms McDonald is a non-executive director of CSL Limited, Nanosonics Limited and Nufarm Limited. She is also a senior adviser at Flagstaff Partners, a corporate advisory firm.

Dr Graham Mitchell AO

RDA BVSc *Sydney* FACVSc PhD *Melbourne* FTSE FAA

Appointed: July 2007

Dr Mitchell completed his PhD at the Walter and Eliza Hall Institute in the late 1960s that involved the discovery of T and B cells.

In 1973 after postdoctoral experience in the United States, United Kingdom and Switzerland, Dr Mitchell returned to the Institute and established the parasitology/malaria program. He was also a previous Director of Research in the R&D Division of CSL Limited.

Dr Mitchell was an adviser on science and innovation to the Victorian Government and other governments and is a Principal and the CEO of Foursight Associates. He is a non-executive director of Antisense Therapeutics Limited and has a detailed knowledge of the academia-industry interface, commercialisation and global health.

Professor Sir John Savill

BA *Oxford* MBChB *Sheffield* PhD *London* FRCP FRCPE FRCS Ed(Hon) FRCPCH(Hon) FASN FRSE FMedSci FRS

Appointed: June 2018

Professor Sir John Savill is a physician scientist who has been based at the University of Edinburgh since 1998. His clinical interests have been in nephrology and general internal medicine, with research focussing on clearance of dying cells as a key control point in inflammatory responses. In 2000 he established the MRC Centre for Inflammation Research in Edinburgh as inaugural director.

Between 2002 and 2017 he served as Vice-Principal and Head of the College of Medicine and Veterinary Medicine at the University of Edinburgh. This role was combined with spells as Chief Scientist in the Scottish Government Health Directorates (2008-10) and Chief Executive of the UK Medical Research Council (2010-18), having previously served as a member of MRC Council and research board chair (2002-08).

In 2017 Her Majesty The Queen appointed him to the Regius Chair of Medical Science at the University of Edinburgh, where he now directs the Wellcome Trust Edinburgh Clinical Academic Track.

His contributions to medical research, innovation and practice have been recognised by various fellowships, most notably those from the Royal Society and Academy of Medical Sciences, and he was knighted in 2008 for services to clinical science.

Mr Terry Moran AC

BA (Hons) *LaTrobe*

Appointed: November 2013

Mr Terry Moran is the former secretary of the Department of Prime Minister and Cabinet and former secretary of the Victorian Department of Premier and Cabinet.

Mr Moran's involvement in the public service has resulted in the establishment of institutions that have made important contributions to Australia's cultural and educational landscape, such as the Wheeler Centre, the Grattan Institute, Opera Victoria, the Melbourne Recital Centre, the Australian and New Zealand School of Government, and the National Institute of Public Policy.

He is the Chair of the Barangaroo Delivery Authority, the Melbourne Theatre Company and the Centre for Policy Development. He is also Chancellor of Federation University.

Ms Carolyn Viney

LLB/BA *Monash*

Appointed: December 2016

Ms Carolyn Viney has more than 20 years' experience in construction, property development and real estate investment. Ms Viney is currently the Chief Development Officer at Vicinity Centres. Over a 13-year period she held a number of senior roles at Grocon, including CEO, Deputy CEO, Head of Development and in-house counsel. Before this, she was a senior associate at law firm Minter Ellison. Ms Viney is an advisory board member to the Victorian Government's Office of Projects Victoria, an advisory board member of Women's Property Initiatives, a not-for-profit housing provider to women and children at risk of homelessness, and a director of The Big Issue and Homes for Homes, both of which are not-for-profit providers of employment and support to homeless, marginalised and disadvantaged people.

Members of the Institute to 31 December 2018

The Royal Melbourne Hospital
University of Melbourne
Dr Susan Alberti AC
Professor Emeritus Robin Anders
Professor James Angus AO
Mr Donald Argus AC
Mr Barry Axtens
Mr Paul Barnett
Ms Helen Barry
Mrs Ann Bates
Mr Robert Bates
Mr Lance Bauer
Chairman, The Walter and Eliza Hall Trust
Dr Elsmaree Baxter
Dr Glenn Begley
Professor Claude Bernard
Mr Marc Besen AC
Dr Gytha Betheras AM
Professor Rufus Black
Mr Malcolm Broomhead AO
Professor Graham Brown AM
Mrs Rosalind Brown
Mrs Beverley Brownstein
Dr Gerard Brownstein
Mr Ian Brumby
Mr John Brumby AO
Dr Margaret Brumby AM
Professor Tony Burgess AC
Professor Christopher Burrell AO
Professor Robert Burton
Mr Greg Camm
Mr Terry Campbell AO
Ms Kate Cannon
Mr Saul Cannon
Mrs Gill Carter
Mr Pat Cashin
Mr John Chatterton AM
Dr Julian Clark
Lady Susannah Clarke
Mr James Clegg
Retired 2018 Trustee,
The Walter and Eliza Hall Trust
Ms Pippa Connolly
Mrs Jacqui Cooper
Associate Professor Paul Cooper
Mr Glenn Corke
Mrs Joan Curtis
Dr Andrew Cuthbertson AO
Mr John Dahlsen
Mr Stephen Daley
Mrs June Danks
Mrs Annette Davis
Mr Leon Davis AO
Ms Liz Dawes
Dr Simon de Burgh
Professor David de Kretser AC
Professor John Denton
Mrs Liz Dexter
Mr Mick Dexter
Mr Angelo Di Grazia
Mrs Helen Diamond
Ms Melda Donnelly
Professor Ashley Dunn
Mr John Dyson
Ms Roz Edmond
Mr Garry Emery
Dr Peter Eng
Professor Sir Marc Feldmann
Mr Michael Fitzpatrick AO
Mrs Pauline Flanagan
Dr Sue Forrest
Professor Richard Fox
Mrs Nolene Fraser
Mr Paul Fraser
Mrs Pam Galli
Ms Kelli Garrison
Dr Andrew Gearing
Ms Louise Gehrig
Mr Barry Gilbert
Mrs Janet Gilbertson
Mr Peter Gilbertson
Ms Rose Gilder
Professor James Goding
Mr Charles Goode AC
Dr Gareth Goodier
Associate Professor Nicholas Gough
Retired 2018
Mrs Andrea Gowers
Mr John Grace
Mrs Maureen Grant
Mr Tony Gray
Sir Andrew Grimwade CBE
Mrs Jean Hadges
Col Tom Hall CVO, OBE
Professor Emanuela Handman
Mr Michael Harris
Mr Harry Hearn AM
Mrs Jane Hemstritch
Professor David Hill AO
Mrs Janet Hirst
Dr Margo Honeyman
Dr Thomas Hurley AO OBE
Mr Darvell Hutchinson AM
Mr Jon Isaacs
Trustee, The Walter and Eliza Hall Trust
Mr Murray Jeffs
Mr Jose Jimenez
Mrs Terese Johns
Professor Shitij Kapur
Ms Helen Kennan
Mr Rowan Kennedy
Mrs Margot Kilcullen
Mr Rob Kilcullen
Professor Christine Kilpatrick
Professor Emeritus Frank Larkins AM
Professor Richard Larkins AC
Mrs Belinda Lawson
Mr Gary Liddell
Professor Emeritus Ian Mackay AM
Dr Rowena MacKean OAM
Dr Alex Macphee
Ms Eve Mahlab AO
Mrs Robyn Male
Mr Roger Male
Mrs Lorrie Mandel
Mr Barrie Marshall
Mr John Marshall AM
Ms Josephine Marshall
Professor Emeritus Jack Martin AO
Professor Ray Martin AO
Mr Erich Mayer AM
Mrs Netta McArthur
Dr Neville McCarthy AO
Professor James McCluskey AO
Ms Marie McDonald
Professor John McKenzie AM

Mrs Kate McMahon
Mr Tim McMahon
Professor Kathryn McPherson
Professor Frederick Mendelsohn AO
Mrs Johanna Metcalf
Ms Kate Metcalf
Professor Jacques Miller AC
Professor John Mills AO
Mr Robert Minter
Trustee, The Walter and Eliza Hall Trust
Professor Christina Mitchell
Dr Graham Mitchell AO
Dr Judith Mitchell
Mr Barry Moore
Mr Terry Moran AC
Mrs Barbara Morgan
Mr Hugh Morgan AC
Dr George Morstyn
Mr Bob Munro
Mr John Murphy
Trustee, The Walter and Eliza Hall Trust
Mr Tony Murphy
Ms Linda Nicholls AO
Dr Leslie Norins
Mrs Rainey Norins
Mr Colin North OAM
Lady Lyn Nossal
Ms Maureen O'Keefe
Mr Bill O'Shea
Sir Arvi Parbo AC
Professor David Penington AC
Professor Emeritus Roger Pepperell
Ms Gayle Petty
Professor Emeritus Jim Pittard AM
Lady Primrose Potter AC
Mr John Prescott AC
Mr John Pye
Mrs Edith Qualtrough
Mrs Cathy Quilici
Mr Denis Quilici
Professor Peter Rathjen
Ms Kate Redwood AM
Mr John Reid AO
Mr Dieter Rinke
Associate Professor Ken Roberts AM
Mr Michael Robinson AO
Ms Linda Rodger
Mrs Mary Rodger
Mrs Margaret Ross AM
Mr Fergus Ryan
Professor Graeme Ryan AC
Mr Colin Sakinofsky
Professor Nick Samaras
Mrs Pam Sargood
Mr Keith Satterley
Professor Sir John Savill
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Mr Robert Smorgon AM
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Professor Terry Speed
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Ms Helen Sykes
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Mrs Cheryl Thomas
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Ms Carolyn Viney
Mr John Walker QC
Mr Stanley Wallis AC
Mr Peter Walsh
Ms Catherine Walter AM
Mr John Walter
Mr John Warburton
Mr Robert Warren
Mrs Catherine Watt
Ms Marion Webster OAM
Mr Kevin Weight
Professor Richard Wettenhall
Dr Senga Whittingham
Mr David Williamson
Mr Malcolm Williamson
Professor Robert Williamson AO
Professor Ingrid Winship
Ms Sally Wood
Mr Peter Worcester
Mr Rob Wylie

The Institute remembers those members who passed away before 31 December 2018

Mr Warwick Kent AO
Ms Mary-Ann Metcalf
Mr Robert Evans

The Walter and Eliza Hall Institute acknowledges the support of the following organisations, which contributed $10,000 or more to our research in 2018

The Walter and Eliza Hall Institute is associated with the following organisations

THE UNIVERSITY OF MELBOURNE

MELBOURNE HEALTH

agrf

Athena SWAN Member

Australian Genomics Health Alliance

BIOMEDICAL RESEARCH VICTORIA

BIOGRID AUSTRALIA

Cancer Therapeutics CRC

Cancer Trials Australia

CareerTrackers Indigenous Internship Program

CART-WHEEL

CATALYST therapeutics

GTAC GENE TECHNOLOGY ACCESS CENTRE

THE HEARING CRC

ionopticks

Male Champions of Change Victoria

MRCF

Melbourne Academic Centre for Health

Melbourne Genomics Health Alliance

ORMOND COLLEGE THE UNIVERSITY OF MELBOURNE

Type 1 Diabetes TrialNet

SupplyNation MEMBER

VICTORIAN BREAST CANCER RESEARCH CONSORTIUM INC

Victorian Cancer Biobank

VICTORIAN COMPREHENSIVE CANCER CENTRE

In-kind support was received from these organisations

CCB 中国建设银行 China Construction Bank

EgonZehnder

HARRY M. HEARN AM SOLICITOR

pwc

I'm leaving a gift in my Will to the Institute.

Will you join me?

Walter+Eliza Hall
Institute of Medical Research
DISCOVERIES FOR HUMANITY

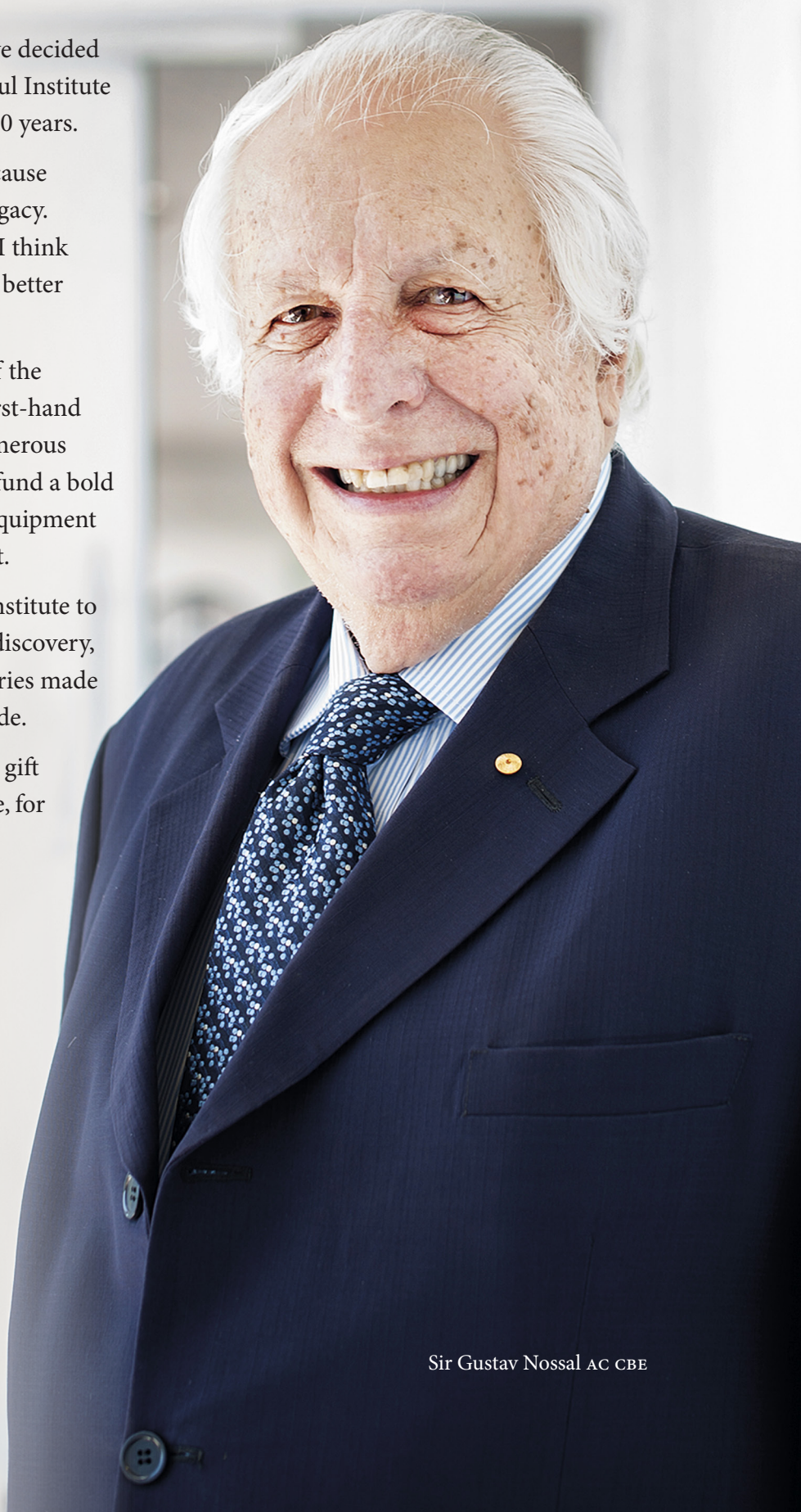
With the support of my family, I have decided to make a legacy gift to the wonderful Institute that has been my pride and joy for 60 years.

I am making my decision public because you may also be considering your legacy. In addition to taking care of family, I think that we all want to leave the world a better place for the next generation.

In the decades that I was Director of the Institute (1965-96), I experienced first-hand the impact of bequests. So often, generous gifts in Wills arrived just in time to fund a bold new idea, purchase a vital piece of equipment or support a brilliant young scientist.

It is often bequests that enable the Institute to continue to support the journey of discovery, and make sure that brilliant discoveries made at the bench do make it to the bedside.

Will you join me in making a legacy gift to the Walter and Eliza Hall Institute, for the benefit of generations to come?



Sir Gustav Nossal AC CBE

For more information
please contact
Ms Anne Rady
Future Giving Manager
on 03 9345 2929
rady.a@wehi.edu.au

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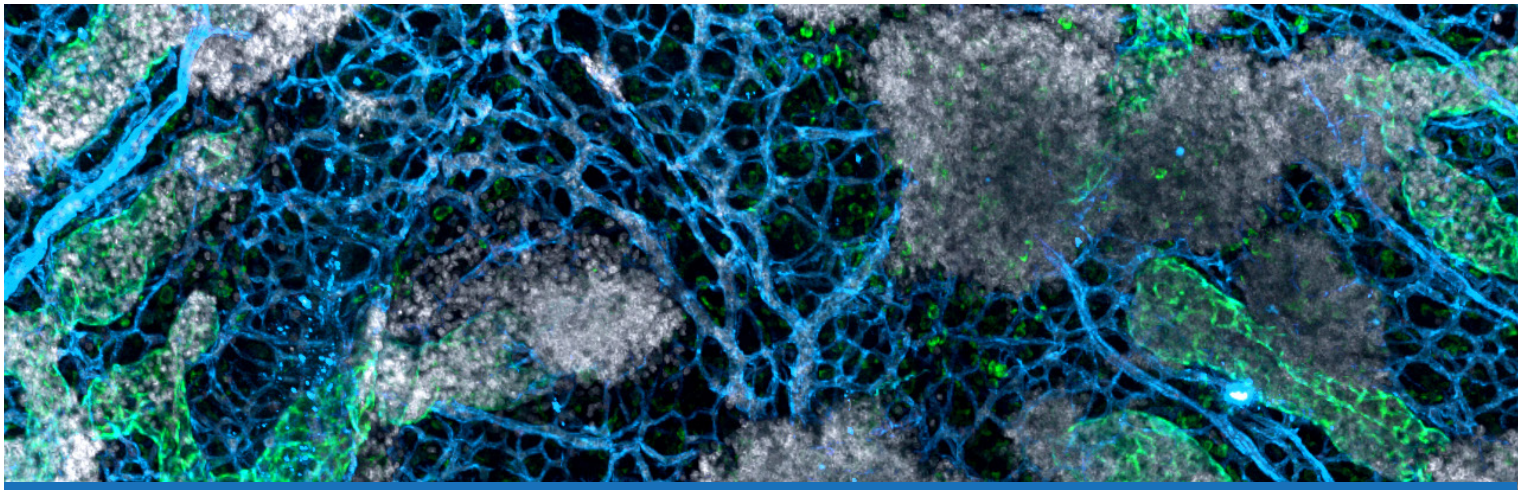
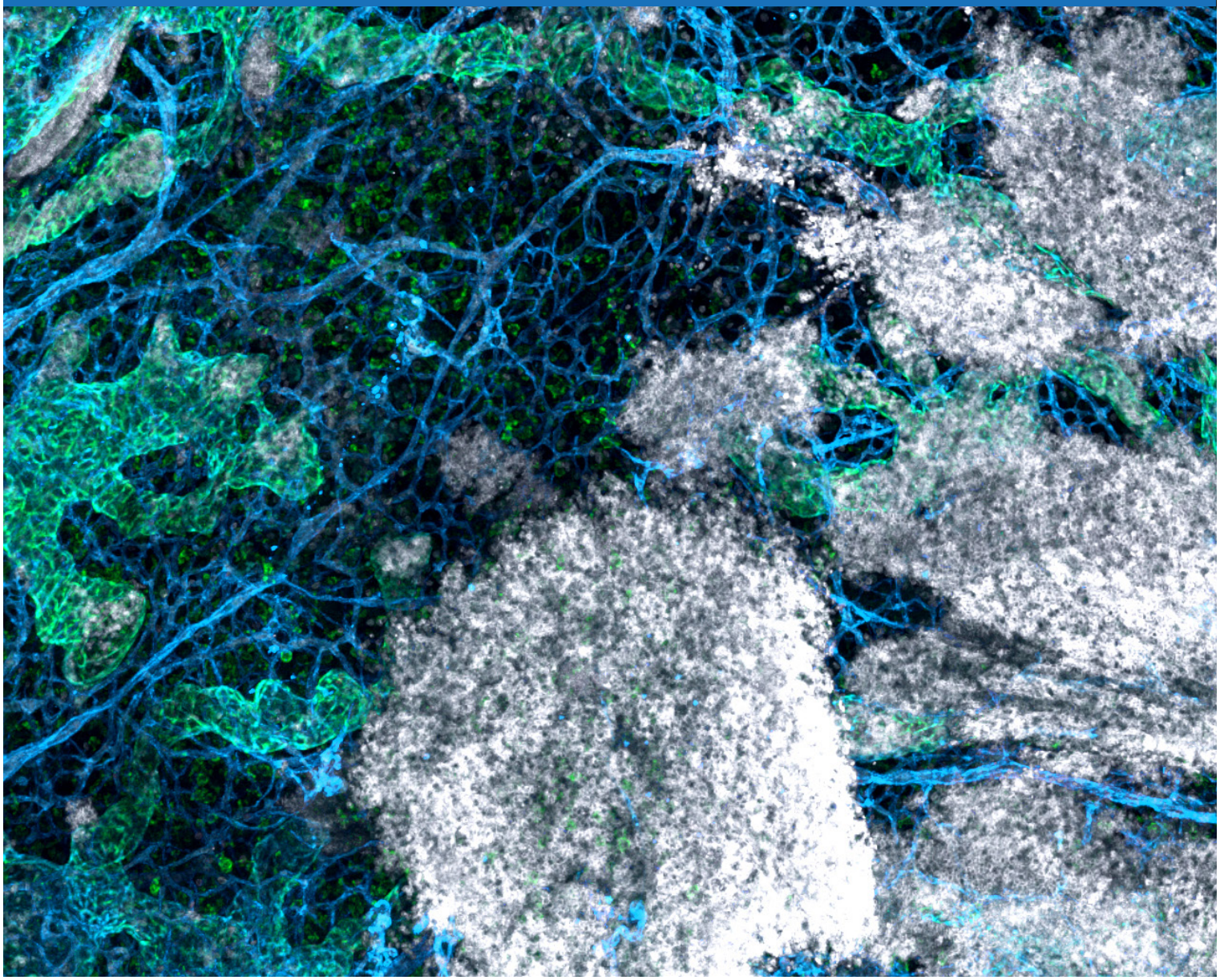


Walter+Eliza Hall
Institute of Medical Research

DISCOVERIES FOR HUMANITY

ANNUAL REPORT
2018 FINANCIAL STATEMENTS



CONTENTS

NOTE

The Walter and Eliza Hall Institute of Medical Research

Parkville campus
1G Royal Parade
Parkville Victoria 3052 Australia
Telephone: +61 3 9345 2555

Bundoora campus
4 Research Avenue
La Trobe R&D Park
Bundoora Victoria 3086 Australia
Telephone: +61 3 9345 2200

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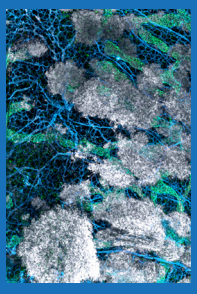

Cover image
Bird's eye view by Dr Alison Farley

Networks of blood vessels (blue) and lymphatic vessels (green) are found throughout the body. Dr Farley is studying how platelets – cells that help blood to clot – aid vessel development. Normally blood and lymphatic vessels separate during development, but without platelets, this process goes awry. As a result, blood (white) leaks from blood vessels and spills out across the tissue.

We acknowledge the traditional owners and custodians of the land on which our campuses are located, the Wurundjeri people of the Kulin nation, and pay our respects to their elders past and present.

Statement of profit or loss and other comprehensive income for the year ended 31 December 2018

Operating revenue	Note	2018 $'000	2017 $'000
Government revenue			
National Health and Medical Research Council		41,407	41,355
Cooperative Research Centres		2,333	2,238
Other Australian Government grants		1,161	1,058
Other Australian Government fellowships		156	512
Victorian Government grants		10,909	12,739
Foreign Government grants and fellowships		22	243
		55,988	**58,145**
Other grant revenue			
Industrial grants and contracts		7,182	4,044
Philanthropic grants and fellowships – Australia		15,759	7,444
Philanthropic grants and fellowships – International		6,824	6,468
		29,765	**17,956**
Other revenue			
Investment income	2	30,063	12,118
Royalty income		4,027	11,059
General income		8,260	7,560
Donations and bequests		13,568	9,327
		55,918	**40,064**
Total operating revenue before monetisation		**141,671**	**116,165**
Royalty monetisation income (venetoclax)	5	**-**	**331,082**
Total operating revenue		**141,671**	**447,247**

The financial statements are to be read in conjunction with the notes to, and forming part of the financial statements.

Operating expenditure	Note	2018 $'000	2017 $'000
Scientific laboratories			
Staff costs		62,057	59,328
Apparatus and equipment		2,409	2,980
Consumable supplies		12,393	12,485
Other expenses		4,505	3,917
		81,364	**78,710**
Support laboratories			
Staff costs		14,397	15,742
Apparatus and equipment		943	1,067
Consumable supplies		1,528	1,694
Other expenses		1,612	2,660
		18,480	**21,163**
Professional services			
Staff costs		10,549	9,480
Furniture and equipment		287	194
Building operating costs and maintenance		5,801	4,849
Other expenses		6,361	4,873
		22,998	**19,396**
Strategic initiatives			
Staff costs		3,490	658
Furniture and equipment		155	27
Other expenses		1,648	844
		5,293	**1,529**
Allowance for credit loss increase / (decrease)	8(b)	188	(47)
Unrealised foreign exchange loss / (gain)		(4,998)	-
Total operating expenditure before monetisation		**123,325**	**120,751**
Royalty monetisation (venetoclax)			
Net commercial income distributions to inventors and staff	5	4,755	41,930
Unrealised foreign exchange loss / (gain)	5	-	4,130
Adviser and legal fees	5	-	3,830
Consultants and other expenses	5	-	1,253
		4,755	**51,143**
Total operating expenditure		**128,080**	**171,894**
Surplus from operations		**13,591**	**275,353**
Other income	3	2	5,002
Depreciation and amortisation	11	(9,368)	(9,044)
Gain/(loss) on financial assets taken to profit or loss (FVTPL Instruments)		(589)	-
Bequests and grants for capital works		7,708	7,207
Net surplus for the period	16(a)	**11,344**	**278,518**
Other comprehensive income			
Items that will not be reclassified subsequently to profit or loss			
Gain/(loss) on financial assets taken to equity (FVTOCI equity Instruments)	16(h)	(28,996)	-
Items that may be reclassified subsequently to profit or loss			
Gain/(loss) on financial assets taken to equity (FVTOCI debt Instruments)	16(h)	(858)	-
Gain on available-for-sale financial assets taken to equity	16(h)	-	11,551
Cumulative gain reclassified to profit or loss on sale of available-for-sale financial assets	16(h)	-	(5,091)
Total comprehensive income for the year		**(18,510)**	**284,978**

The financial statements are to be read in conjunction with the notes to, and forming part of the financial statements.

Statement of financial position as at 31 December 2018

Assets	Note	2018 $'000	2017 $'000
Current assets			
Cash and cash equivalents	17(a)	67,743	344,746
Current tax assets	8(a)	5,278	1,387
Trade and other receivables	8(b)	13,036	6,742
Prepayments		1,042	980
Prepaid operating lease	9	32	32
Total current assets		**87,131**	**353,887**
Non-current assets			
Other financial assets	10	465,513	233,412
Property, plant and equipment	11	199,157	187,601
Prepaid operating lease	9	2,544	2,576
Total non-current assets		**667,214**	**423,589**
Total assets		**754,345**	**777,476**
Liabilities			
Current liabilities			
Trade and other payables	12	14,739	10,176
Provisions	13	28,678	23,592
Unearned grants and fellowships	14	15,221	23,343
Other liabilities	15	270	310
Total current liabilities		**58,908**	**57,421**
Non-current liabilities			
Provisions	13	35,763	41,871
Total non-current liabilities		**35,763**	**41,871**
Total liabilities		**94,671**	**99,292**
Net assets		**659,674**	**678,184**
Funds			
Permanent invested funds	16(b)	194,181	185,610
General funds	16(c)	377,710	378,204
Royalty fund	16(d)	48,054	44,410
Leadership fund	16(e)	26,557	24,562
Discovery fund	16(f)	4,961	4,545
Child care centre fund	16(g)	-	-
Investment revaluation reserve	16(h)	8,211	40,853
Total funds		**659,674**	**678,184**

The financial statements are to be read in conjunction with the notes to, and forming part of the financial statements.

Statement of cash flows for the year ended 31 December 2018

	Note	2018	2017
Cash flows from operating activities		**$'000**	**$'000**
Donations and bequests		13,377	7,945
General income		9,490	6,611
Receipts from granting bodies		72,944	79,167
GST paid to ATO		(3,398)	(3,102)
Payments to suppliers and employees		(133,343)	(119,894)
Royalty receipts		4,027	338,196
Dividends received		19,038	10,582
Interest and bill discounts received		11,902	3,955
Net cash (used in) / provided by operating activities	17(b)	**(5,963)**	**323,460**
Cash flows from investing activities			
Payment for other financial assets		(281,777)	(19,328)
Proceeds on sale of other financial assets		20,099	20,723
Grants and donations for property, plant and equipment		1,198	4,330
Payment for property, plant and equipment		(22,028)	(16,078)
Net cash used in investing activities		**(282,508)**	**(10,353)**
Cash flows from financing activities			
Donations and bequests to permanent invested funds		6,510	2,877
Net cash provided by financing activities		**6,510**	**2,877**
Net increase / (decrease) in cash held		**(281,961)**	**315,984**
Cash and cash equivalents at the beginning of the year		**344,436**	**32,592**
Effects of exchange rate changes on the balance of cash held in foreign currencies		4,998	(4,140)
Cash and cash equivalents at the end of the year	17(a)	**67,473**	**344,436**

The financial statements are to be read in conjunction with the notes to, and forming part of the financial statements.

Statement of changes in equity

	Permanent fund	General fund	Royalty fund	Leadership fund	Discovery fund	Child care centre fund	Investment revaluation reserve	Total
Balance at 1 January 2017	181,162	114,306	34,981	23,581	2,682	2,101	34,393	**393,206**
Transfers not reflected in current year surplus	-	2,971	-	-	-	(2,971)	-	**-**
Surplus / (deficit) for the year	4,448	260,927	9,429	981	1,863	870	-	**278,518**
Other comprehensive income for the year								
Gain / (loss) on available-for-sale investments	-	-	-	-	-	-	11,551	**11,551**
Cumulative gain reclassified to profit or loss on sale of available for sale financial assets	-	-	-	-	-	-	(5,091)	**(5,091)**
Total comprehensive income / (loss) for the year	**4,448**	**263,898**	**9,429**	**981**	**1,863**	**(2,101)**	**6,460**	**284,978**
Balance at 31 December 2017	**185,610**	**378,204**	**44,410**	**24,562**	**4,545**	**-**	**40,853**	**678,184**
Equity transfer on initial adoption of AASB 9	-	7,969	-	-	-	-	(7,969)	**-**
Transfers not reflected in current year surplus	-	(5,181)	-	-	-	-	5,181	**-**
Surplus / (deficit) for the year	8,571	(3,282)	3,644	1,995	416	-	-	**11,344**
Other comprehensive income for the year								
Gain / (loss) on available-for-sale investments	-	-	-	-	-	-	(29,854)	**(29,854)**
Total comprehensive income / (loss) for the year	**8,571**	**(494)**	**3,644**	**1,995**	**416**	**-**	**(32,642)**	**(18,510)**
Balance at 31 December 2018	**194,181**	**377,710**	**48,054**	**26,557**	**4,961**	**-**	**8,211**	**659,674**

The financial statements are to be read in conjunction with the notes to, and forming part of the financial statements.

Notes to the annual accounts for the year ended 31 December 2018

1. Statement of significant accounting policies

The Walter and Eliza Hall Institute of Medical Research ('the Institute') is incorporated in Victoria as a company limited by guarantee. The Institute has 228 members and the guarantee is limited to two dollars per member.

The financial report is a general purpose financial report in accordance with the Australian Charities and Not-for-profits Commission Act 2012, Australian Accounting Standards (AASs) and complies with other requirements of the law. Accounting Standards include Australian equivalents to International Financial Reporting Standards (A-IFRS). The Institute is exempt from taxation. The Institute is a not-for-profit entity.

The financial statements were authorised for issue by the directors on 11 April 2019.

The financial report has been prepared on the basis of historical cost except for the revaluation of certain non-current assets and financial instruments. Cost is based on the fair values of consideration given in exchange for assets.

The Institute is a company of the kind referred to in ASIC Corporations (Rounding in Financial/Directors' Reports) Instrument 2016/191 dated 24 March 2016, and in accordance with that Class Order amounts in the financial report are rounded to the nearest thousand dollars, unless otherwise indicated.

Accounting policies are selected and applied in a manner which ensures that the resulting financial information satisfies the concepts of relevance and reliability, thereby ensuring that the substance of the underlying transactions or other events is reported.

The following significant accounting policies have been adopted in the preparation and presentation of the financial report:

(a) Reporting Entity

The financial statements include all the activities of The Walter and Eliza Hall Institute of Medical Research.

Principal address of the Institute is:

1G Royal Parade

Parkville, Victoria, 3052

(b) Property, plant and equipment

Property, plant and equipment held for use in research, or for administrative purposes, are stated in the statement of financial position at cost, less any subsequent accumulated depreciation.

Depreciation is provided on property, plant and equipment. Depreciation is calculated on a straight-line basis so as to write off the net cost of each asset over its expected useful life.

A regular review of useful lives, depreciation rates and residual values is conducted at each year end, with the effect of any changes in estimate accounted for on a prospective basis.

The following table indicates the expected useful lives of non current assets on which the depreciation charges are based.

	31 December 2018	31 December 2017
Buildings	20 - 40 years	20 - 40 years
Plant and equipment	3 - 20 years	3 - 20 years
Furniture and fittings	5 - 20 years	5 - 20 years

Land leased at Parkville is recognised as part of property, plant and equipment at fair value. Subsequent measurement will be under the cost method, whereby the assets will not be revalued.

(c) Acquisition of assets

Assets acquired are recorded at the cost of acquisition, being the purchase consideration determined as at the date of acquisition plus costs incidental to the acquisition. Items of property, plant and equipment are recorded at cost less accumulated depreciation.

(d) Source of capital funds

The Institute is a company limited by guarantee and as such has no issued capital.

(i) Permanent Invested Funds originate from gifts and bequests, the income from which is applied as stipulated by the donor, or to general research where there is no specific stipulation. These gifts and bequests are appropriated to Capital Funds.

(ii) General Funds consist of the net accumulation of surpluses and deficits of prior years.

(iii) The Royalty Fund consists of the balance of royalties received in respect of patented inventions and not expended.

(iv) The Leadership Fund consists of donations and income earned thereon. The Leadership Fund was established in honour of Professors Gustav Nossal, Donald Metcalf, Jacques Miller and Suzanne Cory to provide named fellowships to nurture the development of outstanding young scientists with the potential to be future leaders of biomedical research.

(v) The Discovery Fund consists of donations and income earned thereon, less funds spent on research to date. The Fund was established by the Institute to support specialist research and will be applied based on the merits of submissions to the Institute Director. There are three areas of focus; early drug discovery, blue sky basic biological research and technical innovation.

(vi) The Child Care Centre Fund consists of donations received in support of the construction of a child care centre on the institute's premises in Parkville. This fund was fully utilised during the year.

(vii) The Investment Revaluation Reserve consists of gains and losses recognised through movement in the fair value of investments and other financial assets.

(e) Revenue recognition

Grants

Government and other funds received often have conditions attached for specific services to be performed. These agreements are considered reciprocal and as such, revenue is only recognised once the services have been performed, typically being the expenditure incurred in relation to the specific grant. Until such point, revenue is recorded as deferred income. For all other grants, revenue is fully recognised and not deferred.

Sale of goods and disposal of assets

Revenue from the sale of goods and disposal of assets is recognised when goods are delivered and legal title has passed.

Rendering of services

Revenue from a contract to provide services is recognised by reference to the stage of completion of the contract.

Royalties

Royalty income is recognised when received.

Contributions of assets

Revenue arising from the contribution of assets is recognised when the Institute gains control of the contribution.

Donations and bequests

Donation and bequest income is recognised on receipt of the donation or bequest. They are disclosed as part of operating revenue, except for, where stipulated by the donor or bequestor, certain amounts are treated as donations and bequests for capital works and are appropriated to Permanent Funds.

(f) Investments and other financial assets

(i) Initial measurement and derecognition

Financial assets and financial liabilities are initially measured at fair value. Transaction costs that are directly attributable to the acquisition or issue of financial assets and financial liabilities (other than financial assets and financial liabilities at fair value through profit or loss) are added to or deducted from the fair value of the financial assets or financial liabilities, as appropriate, on initial recognition. Transaction costs directly attributable to the acquisition of financial assets or financial liabilities at fair value through profit or loss are recognised immediately in profit or loss.

All regular way purchases or sales of financial assets are recognised and derecognised on a trade date basis. Regular way purchases or sales are purchases or sales of financial assets that require delivery of assets within the time frame established by regulation or convention in the marketplace. All recognised financial assets are measured subsequently in their entirety at either amortised cost or fair value, depending on the classification of the financial assets.

(ii) Classification of financial assets

Debt instruments that meet the following conditions are measured subsequently at amortised cost:

- the financial asset is held within a business model whose objective is to hold financial assets in order to collect contractual cash flows; and
- the contractual terms of the financial asset give rise on specified dates to cash flows that are solely payments of principal and interest on the principal amount outstanding.

Debt instruments that meet the following conditions are measured subsequently at fair value through other comprehensive income (FVTOCI):

- the financial asset is held within a business model whose objective is achieved by both collecting contractual cash flows and selling the financial assets; and
- the contractual terms of the financial asset give rise on specified dates to cash flows that are solely payments of principal and interest on the principal amount outstanding.

By default, all other financial assets are measured subsequently at fair value through profit or loss (FVTPL). Despite the foregoing, the Institute may make the following irrevocable election/designation at initial recognition of a financial asset:

- the Institute may irrevocably elect to present subsequent changes in fair value of an equity investment in other comprehensive income if certain criteria are met; and
- the Institute may irrevocably designate a debt investment that meets the amortised cost or FVTOCI criteria as measured at FVTPL if doing so eliminates or significantly reduces an accounting mismatch.

Financial assets at amortised cost using the effective interest method

The amortised cost of a financial asset is the amount at which the financial asset is measured at initial recognition minus the principal repayments, plus the cumulative amortisation using the effective interest method of any difference between that initial amount and the maturity amount, adjusted for any loss allowance. The gross carrying amount of a financial asset is the amortised cost of a financial asset before adjusting for any loss allowance. The Institute's cash and cash equivalents and trade receivables fall within this category.

Interest income is recognised in profit or loss and is included in the "investment income" line item (note 2).

Debt Instruments at fair value through other comprehensive income (FVTOCI)

The corporate bonds held by the Institute are classified as FVTOCI. Subsequently, changes to the carrying value due to foreign exchange, impairment and interest income are recognised in the profit and loss. All other changes in the carrying value will be recognised in other comprehensive income. Upon derecognition, the cumulative gains or losses previously recognised in other comprehensive income are reclassified to profit or loss. Corporate bonds were previously classified as 'available for sale' under AASB 139.

Equity instruments at fair value through other comprehensive income (Equity FVTOCI)

On initial recognition, the Institute may make an irrevocable election (on an instrument-by-instrument basis) to designate investments in equity instruments as at FVTOCI. Designation at FVTOCI is not permitted if the equity investment is held for trading. Investments in equity instruments at FVTOCI are initially measured at fair value plus transaction costs. Subsequently, they are measured at fair value with gains and losses arising from changes in fair value recognised in other comprehensive income and accumulated in the investments revaluation reserve. The cumulative gain or loss is not be reclassified to profit or loss on disposal of the equity investments, instead, it is transferred to retained earnings.

Dividends on these investments in equity instruments are recognised in profit and loss in accordance with AASB 9. This is included in the "investment income" line item (note 2).

This category includes equity investments which were previously classified as 'available-for-sale' under AASB 139.

Financial assets at fair value through profit or loss (FVTPL)

Financial assets that are held within a different business model other than 'hold to collect' or 'hold to collect and sell' are categorised at fair value through profit and loss. Further, irrespective of business model financial assets whose contractual cash flows are not solely payments of principal and interest are accounted for at FVTPL. The Institute's investment in hybrid instruments and managed international share fund fall within this category. These were previously classified as 'available-for-sale' under AASB 139.

(iii) Foreign exchange gains and losses

The carrying amount of financial assets that are denominated in a foreign currency is determined in that foreign currency and translated at the spot rate at the end of each reporting period.

(iv) Impairment of financial assets

The Institute recognises a loss allowance for expected credit losses (ECL) on investments in debt instruments that are measured at amortised cost or at FVTOCI, lease receivables, trade receivables and contract assets, as well as on financial guarantee contracts. The amount of expected credit losses is updated at each reporting date to reflect changes in credit risk since initial recognition of the respective financial instrument.

The Institute recognises lifetime ECL when there has been a significant increase in credit risk since initial recognition. However, if the credit risk on the financial instrument has not increased significantly since initial recognition, the Institute measures the loss allowance for that financial instrument at an amount equal to 12-month ECL.

Lifetime ECL represents the expected credit losses that will result from all possible default events over the expected life of a financial instrument. In contrast, 12-month ECL represents the portion of lifetime ECL that is expected to result from default events on a financial instrument that are possible within 12 months after the reporting date.

(v) Term Deposits are recorded at amortised cost, with revenue recognised on an accruals basis.

(vi) Dividend revenue is recognised when the dividend is received. Interest revenue is recognised and accrued on a time proportionate basis that takes into account the effective yield on the financial asset.

(vii) Interests in jointly controlled assets or operations

In respect of any interest in jointly controlled assets, the Institute does not consolidate but recognises in the financial statements:

- its share of jointly controlled assets;
- any liabilities that it had incurred;
- its share of liabilities incurred jointly by the joint venture;
- any income earned from the selling or using of its share of the output from the joint venture; and
- any expenses incurred in relation to being an investor in the joint venture.

For jointly controlled operations, the Institute recognises: the assets that it controls and the liabilities that it incurs; expenses that it incurs; and its share of income that it earns from selling outputs of the joint venture.

(g) Cash and cash equivalents

Cash comprises cash on hand and on-demand deposits. Cash equivalents are short-term, highly liquid investments that are readily convertible to known amounts of cash, which are subject to an insignificant risk of changes in value and have a maturity of three months or less at the date of acquisition.

(h) Trade and Other Receivables

Trade and other receivables are recognised initially at fair value and subsequently measured at amortised cost using the simplified approach to record the loss allowance at the amount equal to the expected lifetime credit losses. The Institute uses historical experience and forward looking information to calculate expected credit losses.

(i) Trade and Other Payables

Trade payables and other accounts payables are initially measured at fair value and then subsequently carried at amortised cost. They are recognised when the Institute becomes obliged to make future payments resulting from the purchase of goods and services.

(j) Research costs

Research costs are recognised as an expense when incurred and reported in the financial year in which they relate.

(k) Goods and Services Tax (GST)

Revenues, expenses and assets are recognised net of the amount of GST except:

(i) where the amount of GST incurred is not recoverable from the taxation authority, it is recognised as part of the cost of acquisition of an asset or as part of an item of expense; or

(ii) for receivables and payables which are recognised inclusive of GST.

The net amount of GST recoverable from, or payable to, the taxation authority is included as part of receivables or payables. Cash flows are included in the statement of cash flows on a gross basis. The GST component of cash flows arising from investing and financing activities which is recoverable from, or payable to, the taxation authority is classified within operating cash flows.

(l) Provisions

Provisions are recognised when there is a present obligation (legal or constructive) as a result of a past event, it is probable that the organisation is required to settle the obligation, and a reliable estimate can be made of the amount of the obligation. The amount recognised as a provision is the best estimate of the consideration required to settle the present obligation at the end of the reporting period, taking into account the risks and uncertainties surrounding the obligation. When a provision is measured using the cash flows estimated to settle the present obligation, its carrying amount is the present value of those cash flows (where the effect of the time value of money is material).

(m) Employee benefits

Provision is made for benefits accruing to employees in respect of annual leave and long service leave, when it is probable that settlement will be required and they are capable of being measured reliably.

Provisions made in respect to annual leave and long service leave expected to be settled within 12 months, are measured at their nominal values, using the remuneration rate expected to apply at the time of settlement.

Provisions made in respect to long service leave which are not expected to be settled within 12 months are measured at the present value of the estimated future cash outflows to be made by the Institute in respect of services provided by employees up to the reporting date.

(n) Foreign currency

All foreign currency transactions during the financial year are brought to account using the exchange rate in effect at the date of the transaction. Foreign currency monetary items at reporting date are translated at the exchange rate existing at that date and exchange differences are recognised in the net surplus or deficit in the period in which they arise.

(o) Leased assets

Operating lease payments are recognised as an expense on a straight-line basis which reflects the pattern in which economic benefits from the leased asset are consumed.

(p) Impairment of non-financial assets

All assets are assessed annually for indications of impairment. If there is an indication of impairment, the assets concerned are tested as to whether their carrying value exceeds their possible recoverable amount. Where an asset's carrying value exceeds its recoverable amount, the difference is written-off as an expense. The recoverable amount for most assets is measured at the higher of value in use and fair value less costs to sell. Depreciated replacement cost is used to determine value in use. Depreciated replacement cost is the current replacement cost of an item of plant and equipment less, where applicable, accumulated depreciation to date, calculated on the basis of such cost.

(q) Properties held for sale

Properties are classified as held for sale when they are immediately available for sale in their present condition and their sale is highly probable and expected to be completed within 12 months of the Institute's reporting date.

The properties are valued at fair value less costs to sell.

(r) Critical accounting judgements and key sources of estimation uncertainty

In the application of the Institute's accounting policies, which are described above, management may from time to time make judgements, estimates and assumptions about the carrying values of assets and liabilities that may not be readily apparent from other sources. The estimates and associated assumptions are based on historical experience and various other factors that are believed to be reasonable under the circumstances, the result of which form the basis of making the judgement. Key areas in which management has exercised judgement include the calculation of the fair value of financial assets, the carrying value of employee benefits, and the carrying value of provisions for royalties.

(s) Impact of new and revised Accounting Standards

In the current period, the Institute has adopted all of the new and revised standards and interpretations issued by the Australian Accounting Standards Board (the AASB) that are relevant to its operations and effective for the current reporting period.

AASB 9 'Financial Instruments', and the relevant amending standards

The Institute has applied AASB 9 Financial Instruments, which replaces AASB 139 Financial Instruments: Recognition and Measurement. When adopting AASB 9, the Institute has applied transitional relief and opted not to restate prior periods. Differences arising from the adoption of AASB 9 in relation to the classification and measurement are recognised in opening retained earnings as at 1 January 2018.

Classification and measurement

The date of initial application is 1 January 2018. Accordingly, the Institute has applied the requirements of AASB 9 to instruments that continue to be recognised as at 1 January 2018 and has not applied the requirements to instruments that have already been derecognised as at 1 January 2018. Comparative amounts in relation to instruments that continue to be recognised as at 1 January 2018 are displayed in note 10.

Management have reviewed and assessed the Institute's existing financial assets as at 1 January 2018 based on the facts and circumstances that existed at that date and concluded that the initial application of AASB 9 has had the following impact on the Group's financial assets as regards their classification and measurement:

- the Institute's investment in corporate bonds that were classified as available-for-sale financial assets under AASB 139 have been classified as financial assets at Fair Value Through Other Comprehensive Income (FVTOCI) because they are held within a business model whose objective is both to collect contractual cash flows and to sell the bonds, and they have contractual cash flows that are solely payments of principal and interest on principal outstanding. The change in the fair value on these redeemable notes continues to accumulate in the investment revaluation reserve until they are derecognised or reclassified;
- the Institutes' investments in equity instruments (not held for trading) that were previously classified as available-for-sale financial assets and were measured at fair value at each reporting date under AASB 139 have been designated as at FVTOCI. The change in fair value on these equity instruments continues to be accumulated in the investment revaluation reserve; the Institute does not hold any equity instruments for trading. The Institute has designated all investments in equity instruments as FVTOCI upon initial application.
- The Institute's investments in hybrid instruments and international managed funds that were classified as available-for-sale financial assets under AASB 139 have been classified as financial assets at Fair Value Through Profit and Loss (FVTPL) because the contractual cash flows are not solely payments of principal and interest. The change in fair value of these instruments are recognised through the statement of profit and loss.
- financial assets classified as cash and cash equivalents, and trade and other receivables under IAS 39 that were measured at amortised cost continue to be measured at amortised cost under AASB 9 as they are held within a business model to collect contractual cash flows and these cash flows consist solely of payments of principal and interest on the principal amount outstanding.

Impairment of financial assets

In relation to the impairment of financial assets, AASB 9 requires an expected credit loss model as opposed to an incurred credit loss model under AASB 139. The expected credit loss model requires the Institute to account for expected credit losses and changes in those expected credit losses at each reporting date to reflect changes in credit risk since initial recognition of the financial assets. In other words, it is no longer necessary for a credit event to have occurred before credit losses are recognised.

Specifically, AASB 9 requires the Institute to recognise a loss allowance for expected credit losses on:

- Debt investments measured subsequently at amortised cost or at FVTOCI;
- Lease receivables;
- Trade receivables and contract assets; and
- Financial guarantee contracts to which the impairment requirements of AASB 9 apply.

In particular, AASB 9 requires the Institute to measure the loss allowance for a financial instrument at an amount equal to the lifetime expected credit losses (ECL) if the credit risk on that financial instrument has increased significantly since initial recognition, or if the financial instrument is a purchased or originated credit-impaired financial asset. However, if the credit risk on a financial instrument has not increased significantly since initial recognition (except for a purchased or originated credit-impaired financial asset), the Institute is required to measure the loss allowance for that financial instrument at an amount equal to 12-months ECL. AASB 9 also requires a simplified approach for measuring the loss allowance at an amount equal to lifetime ECL for trade receivables, contract assets and lease receivables in certain circumstances.

Reconciliation on adoption of AASB 9

On the date of initial application, 1 January 2018, the financial instruments of the Institute were reclassified as follows:

Reconciliation of adoption of AASB 9 at 1 January 2018

	Measurement category		Carrying amount		
	Original AASB 139 category	New AASB 9 category	Closing balance as at 31 December 2017 (AASB 139)	Re-measurement on adoption of AASB 9	Opening balance as at 1 January 2018 (AASB 9)
			$'000	$'000	$'000
Assets					
Current financial assets					
Cash and cash equivalents	Amortised cost	Amortised cost	344,746	-	344,746
Trade and other receivables	Amortised cost	Amortised cost	6,742	-	6,742
Non current financial assets					
Domestic equities	Available for sale	Equity FVTOCI	157,574	-	157,574
International managed fund	Available for sale	FVTPL	12,049	-	12,049
Hybrid instruments	Available for sale	FVTPL	56,862	-	56,862
Corporate bonds	Available for sale	FVTOCI	5,146	-	5,146
* Unquoted equities	Available for sale	N/A - Equity Method	1,781	-	1,781
Total financial assets			**584,900**	**-**	**584,900**
Liabilities					
Current financial liabilities					
Trade and other payables	Amortised cost	Amortised cost	10,176		10,176
Total financial liabilities			**10,176**	**-**	**10,176**

* Unquoted equities relate to the Institute's investment in associated entities, these are beyond the scope of AASB 9.

Reconciliation of equity for the impact of AASB 9 at 1 January 2018

Impacted area	Asset revaluation reserve	General funds
Closing balance 31 December 2017 - AASB 139	40,853	378,204
Reclassify international share fund from available for sale to FVTPL**	(5,352)	5,352
Reclassify hybrid instruments from available for sale to FVTPL**	(2,617)	2,617
Reversal of cumulative gain reclassified to profit or loss on sale of available-for-sale financial assets	-	(5,078)
Transfers to general funds on sale of investment (FVTOCI)	-	5,078
Opening balance 1 January 2018 - AASB 9	**32,884**	**386,173**

** Previously, the Institute's investment in Hybrids and the International share fund were treated as FVTOCI. With the implementation of AASB 9, all movements relating to these investments will now be shown in the statement of profit and loss (FVTPL), resulting in an equity transfer on 1 January 2018 for initial implementation.

Other new and revised Standards adopted

The Insitute also adopted the following standards which had no material financial impact in the current period:

AASB 2016-5 Amendments to Australian Accounting Standards - Classification and Measurement of Share-based Payment Transactions

This standard amends AASB 2 Share-based Payment, clarifying how to account for certain types of share-based payment transactions. The amendments provide requirements on the accounting for:

- The effects of vesting and non-vesting conditions on the measurement of cash settled share-based payments
- Share-based payment transactions with a net settlement feature for withholding tax obligations
- A modification to the terms and conditions of a share-based payment that changes the classification of the transaction from cash-settled to equity settled.

Interpretation 22 Foreign Currency Transactions and Advance Consideration

Interpretation 22 addresses how to determine the 'date of transaction' for the purpose of determining the exchange rate to use on initial recognition of an asset, expense or income, when consideration for that item has been paid or received in advance in a foreign currency which resulted in the recognition of a non-monetary asset or non-monetary liability (for example, a non-refundable deposit or deferred revenue).

The Interpretation specifies that the date of transaction is the date on which the entity initially recognises the non-monetary asset or non-monetary liability arising from the payment or receipt of advance consideration. If there are multiple payments or receipts in advance, the Interpretation requires an entity to determine the date of transaction for each payment or receipt of advance consideration.

Standards and interpretations issued not yet effective

At the date of authorisation of the financial report, the standards and interpretations that are relevant to the Institute, listed below, were on issue but not yet effective.

The Institute is currently performing an assessment of the financial impacts and disclosures from the application of the new standards and their amendments on the financial reports.

Standard	Effective for annual reporting periods beginning on or after	Expected to be initially applied in the financial year ending
AASB 16 'Leases'	1 January 2019	31 December 2019
AASB 16 distinguishes leases and service contracts on the basis of whether an identified asset is controlled by a customer. Distinctions of operating leases (off balance sheet) and finance leases (on balance sheet) are removed for lessee accounting, and is replaced by a model where a right-of-use asset and a corresponding liability have to be recognised for all leases by lessees (i.e. all on balance sheet) except for short-term leases and leases of low value assets. The right-of-use asset is initially measured at cost and subsequently measured at cost (subject to certain exceptions) less accumulated depreciation and impairment losses, adjusted for any re-measurement of the lease liability. The lease liability is initially measured at the present value of the lease payments that are not paid at that date. Subsequently, the lease liability is adjusted for interest and lease payments, as well as the impact of lease modifications, amongst others. Furthermore, the classification of cash flows will also be affected as operating lease payments under AASB 117 are presented as operating cash flows; whereas under the AASB 16 model, the lease payments will be split into a principal and an interest portion which will be presented as financing and operating cash flows respectively. For Not For Profit (NFP) entities with leases that have significantly below-market terms and conditions principally to enable the entity for further its objectives (commonly known as concessionary or peppercorn leases), AASB 1058 and AASB 16 required NFP entities to measure right-of-use assets at initial recognition at fair value per AASB 13, the lease liability per AASB 16 and the difference to be accounted as income upfront. The Institute has conducted a high-level analysis of the lease arrangements as at 31 December 2018 and note that some of its leases are at-market and some are significantly below-market terms and conditions (peppercorn leases). The Institute intends to adopt the temporary relief under AASB 2018-8 to measure the right of use assets at cost on initial recognition. The Institute is currently undertaking a detailed assessment to determine the impact for the 2019 financial year.		

Standard	Effective for annual reporting periods beginning on or after	Expected to be initially applied in the financial year ending
AASB 15 'Revenue from Contracts with Customers' - AASB 2014-5 Amendments to Australian Accounting Standards arising from AASB 15 - AASB 2015-8 Amendments to Australian Accounting Standards – Effective date of - AASB 15 2016-3 Amendments to Australian Accounting Standards – Clarifications to AASB 15 AASB 15 replaces all existing revenue requirements in Australian Accounting standards and applies to all revenue arising from contracts with customers, unless the contracts are in scope of other standards, such as AASB 117 (or AASB 16 Leases, once applied). The core principle of AASB 15 is that an entity should recognise revenue to depict the transfer of promised goods or services to customers in an amount that reflects the consideration to which the entity expects to be entitled in exchange for those goods or services. AASB 15 introduces a 5-step approach to revenue recognition. AASB 15 uses the terms 'contract asset' and 'contract liability' to describe what might more commonly be known as 'accrued revenue' and 'deferred revenue', however the Standard does not prohibit an entity from using alternative descriptions in the statement of financial position. The Institute is currently in the process of undertaking a detailed assessment to identify the impact and implement these changes to current policies and processes. The focus of the assessment is around grant and philanthropic funding.	1 January 2019	31 December 2019
AASB 1058 'Income of Not-for-Profit Entities' - AASB 2016-7 Amendments to Australian Accounting Standards – Deferral of AASB 15 for Not-for-Profit Entities - AASB 2016-8 Amendments to Australian Accounting Standards – Australian Implementation Guidance for Not-for-Profit Entities AASB 1058 clarifies the income recognition requirements applying to not-for-profit entities in conjunction with AASB 15 Revenue from Contracts with Customers. The standard establishes principles applying to transactions where the consideration to acquire an asset is significantly less than fair value principally to enable a not-for-profit entity to further its objectives and the receipt of volunteer services. The standard also amends the application date of AASB 15 for not-for-profit entities to annual reporting periods beginning on or after 1 January 2019 instead of 1 January 2018 and add Australian implementation guidance for not-for-profit entities to AASB 9 Financial Instruments and AASB 15. The institute is reviewing AASB 1058 in conjunction with AASB 15, as above.	1 January 2019	31 December 2019
AASB 2017-1 'Amendments to Australian Accounting Standards – Transfers of Investment Property, Annual Improvements 2014-2016 Cycle and Other Amendments' Amends the following standards: - AASB 140 Investment Property – change in use. - AASB 1 First-time Adoption of Australian Accounting Standards – deletion of exemptions for first-time adopters and addition of an exemption arising from Interpretation 22 Foreign Currency Transactions and Advance Consideration. - AASB 128 Investments in Associates and Joint Ventures – measuring an associate or joint venture at fair value.	1 January 2019	31 December 2019

2. Income	2018 $'000	2017 $'000
The following has been prepared in support of the items of income shown in the statement of profit or loss and other comprehensive income.		
Investment income from investments received during the period:		
Recognised in surplus or deficit:		
Dividends and distributions income on financial assets	22,792	10,013
Interest income on financial assets	9,736	4,148
Realised foreign exchange gain / (loss)	2,550	(10)
	35,078	**14,151**
Less transfer to grants and fellowships	(5,015)	(2,033)
Total as per statement of profit or loss and other comprehensive income	**30,063**	**12,118**

3. Other income		
Gain / (Loss) on sale of investments	2	5,002
Total other income	**2**	**5,002**

4. Operating expenses

The following items of expense are included in the net surplus

Employee benefits expense		
Employee benefits expense	90,493	85,944
Depreciation of non-current property, plant and equipment		
Buildings	5,091	4,916
Plant and equipment	4,203	4,058
Furniture and fittings	74	70
Total depreciation	**9,368**	**9,044**
Operating lease		
Operating lease expense	32	32

5. Venetoclax monetisation

On 14 June 2017, the Institute entered into an agreement with CPPIB Credit Europe S.á r.l., a wholly owned subsidiary of Canada Pension Plan Investment Board (CPPIB), for the partial sale of royalty rights in an anti-cancer treatment known as Venetoclax. Venetoclax is the result of a research collaboration with Genentech, a member of the Roche Group, and Abbvie and is based on ground-breaking scientific discoveries made at the Institute over three decades ago.

The monetisation arrangement resulted in a transaction that included a cash payment of US$250 million upfront and potential future milestone payments of up to US$75 million. The upfront cash payment has been recognised as income in the statement of profit or loss and other comprehensive income for the year ended 31 December 2017. A number of significant costs associated with the monetisation income have also been included in the statement of profit or loss and on the statement of financial position. These are detailed below:

Royalties Received	-	331,082
Less associated costs:		
Provision for distributions to inventors and staff	(4,755)	(41,930)
Unrealised foreign exchange loss	-	(4,130)
Adviser and legal fees	-	(3,830)
Consultants and other expenses	-	(1,253)
Net Monetisation income	**(4,755)**	**279,939**

As a result of the Venetoclax monetisation transaction and the Institute's net commercial income policy, commitments for payments to employees may be payable in future years, subject to Board approval. The nominal amount of the future commitments is $18,000k. Refer to note 13 for further details.

6. Directors' remuneration

The directors of the Walter and Eliza Hall Institute of Medical Research during the period were:

CW Thomas	P Collins	C Kilpatrick	TF Moran
JS Hemstritch	R Doyle	J McCluskey	JS Savill
RH Wylie	J Dyson	ME McDonald	C Viney
MW Broomhead	S Kapur	GF Mitchell	

The aggregate income paid or payable, or otherwise made available, in respect of the financial period, to all directors of the Institute, directly or indirectly, by the company or by any related party was nil (2017: nil).

Aggregate retirement benefits paid to all directors of the Institute, by the Institute or by any related party was nil (2017: nil).

7. Auditors' remuneration	2018 $	2017 $
Auditing the financial report	61,800	60,000
Non audit services*	366,732	28,675
	428,532	**88,675**

* During the year, a review of the Institute's strategic plan was undertaken. Deloitte Consulting were engaged to provide services to perform an environmental scan and assessment of the Institute's operating model.

8. Current assets	2018 $'000	2017 $'000
(a) Current tax assets		
Franking credits receivable	5,778	2,029
Current tax asset / (liability)	(500)	(642)
	5,278	**1,387**
(b) Trade and other receivables*		
Sundry debtors	2,369	3,344
Accrued income	10,858	3,401
	13,227	**6,745**
Allowance for credit losses**	(191)	(3)
	13,036	**6,742**

* Trade and other receivables are measured at amortised cost

** Movement in the allowance for credit losses		
Balance at beginning of the year	3	50
Impairment losses recognised	191	-
Impairment losses reversed	(3)	(47)
Balance at end of the year	**191**	**3**

** Impairment expense		
Allowance for credit losses credit / (expense)	(188)	47

The Institute always measures the loss allowance for trade receivables at an amount equal to the lifetime expected credit loss (ECL). The expected credit losses on trade receivables are estimated using a provision matrix by reference to past default experience of the debtor and analysis of the debtors current financial position, adjusted for factors that are specific to the debtors general economic conditions of the industry in which the debtors operate and assessment of both the current as well as forecast direction of conditions at the reporting date.

The Institute writes off a trade receivable when there is information indicating that the debtor is in severe financial difficulty and there is no realised prospect of recovery.

9. Operating leases

Operating leases relate to research facilities with lease terms of between 5 to 99 years, with an option to extend. All operating lease contracts contain market review clauses in the event that the Institute exercises its option to renew. The Institute does not have an option to purchase the leased asset at the expiry of the lease period. The operating leases are prepaid.

	2018	2017
	$'000	$'000
Non-cancellable operating leases		
Not longer than 1 year	32	32
Longer than 1 year and not longer than 5 years	128	128
Longer than 5 years	2,416	2,448
	2,576	**2,608**

10. Other financial assets

Investments in debt instruments classified as FVTOCI		
Corporate bonds	147,991	5,146
Investments in equity instruments designated at FVTOCI		
Domestic equities	197,354	157,574
International equities	44,129	-
Other Investments classified as FVTPL		
International managed fund	11,823	12,049
Hybrid instruments	62,149	56,862
Total Investments - AASB 9	**463,446**	**231,631**
Investments in associates		
Unquoted shares	2,067	1,781
Total Investments	**465,513**	**233,412**

(a) Fair value measurements recognised in the statement of financial position

The following table provides an analysis of financial instruments that are measured subsequent to initial recognition at fair value, grouped into levels 1 to 3 based on:

- Level 1 fair value measurements are those derived from quoted prices (unadjusted) in active markets for identical assets or liabilities.
- Level 2 fair value measurements are those derived from inputs other than those quoted prices included within level 1 that are observable for the asset, either directly (i.e. as prices) or indirectly (i.e. derived from prices)
- Level 3 fair value measurements are those derived from valuation techniques that include inputs for the asset that are not based on observable market data

	Level 1	Level 2	Level 3	31 December 2018
Total				**Total**
Financial assets measured at fair value	**$'000**	**$'000**	**$'000**	**$'000**
Quoted shares	253,306	-	-	253,306
Floating rate securities	62,149	133,191	-	195,340
Fixed rate securities	-	14,800	-	14,800
Unquoted shares*	-	-	2,067	2,067
Total	**315,455**	**147,991**	**2,067**	**465,513**

*As at 31 December 2018, the Institute held a 49% (2017: 49%) share of equity in Catalyst Therapeutics Pty Ltd, with a carrying value of $305k (2017: $1,195k). Anaxis Pharma Pty Ltd is a wholly owned subsidiary of Catalyst Therapeutics Pty Ltd. The Institute also held a 48.5% (2017: 16.2%) share of the equity in Murigen Pty Ltd, with a carrying value of $113k (2017: $61k). The Institute's investment in VCCC is detailed in note 24.

(b) Reconciliation of level 3 fair value measurements of financial assets

	Unquoted equities	
	2018	2017
	$'000	$'000
Opening balance	1,781	338
Purchases	-	-
Impairment	-	-
Revaluation	286	1,443
Closing balance	**2,067**	**1,781**

11. Property, plant and equipment

	Buildings	Work in progress	Plant and equipment	Furniture and fittings	Land Lease	Total
	$'000	$'000	$'000	$'000	$'000	$'000
Gross carrying amount						
Balance at 1 January 2017	178,780	2,079	57,631	2,009	16,200	256,699
Additions at cost	-	16,078		-	-	16,078
Transfers	2,604	(9,350)	6,708	38	-	-
Disposals	-	-	(1,851)	-	-	(1,851)
Balance at 31 December 2017	**181,384**	**8,807**	**62,488**	**2,047**	**16,200**	**270,926**
Additions at cost	-	22,029	-	-	-	22,029
Transfers	9,146	(17,050)	7,904	-	-	-
Disposals	-	-	(7,304)	-	-	(7,304)
Balance at 31 December 2018	**190,530**	**13,786**	**63,088**	**2,047**	**16,200**	**285,651**
Accumulated depreciation						
Balance at 1 January 2017	(36,962)	-	(37,619)	(1,478)	-	(76,059)
Disposals	-	-	1,778	-	-	1,778
Depreciation expense	(4,916)	-	(4,058)	(70)	-	(9,044)
Balance at 31 December 2017	**(41,878)**	**-**	**(39,899)**	**(1,548)**	**-**	**(83,325)**
Disposals	-	-	6,199	-	-	6,199
Depreciation expense	(5,091)	-	(4,203)	(74)	-	(9,368)
Balance at 31 December 2018	**(46,969)**	**-**	**(37,903)**	**(1,622)**	**-**	**(86,494)**
Carrying amounts						
As at 31 December 2017	**139,506**	**8,807**	**22,589**	**499**	**16,200**	**187,601**
As at 31 December 2018	**143,561**	**13,786**	**25,185**	**425**	**16,200**	**199,157**

Aggregate depreciation allocated, whether recognised as an expense or capitalised as part of the carrying amount of other assets during the period:

	2018	2017
	$'000	$'000
Buildings	5,091	4,916
Plant and equipment	4,203	4,058
Furniture and fittings	74	70
Total depreciation	**9,368**	**9,044**

	2018	2017
	$'000	$'000
12. Trade and other payables		
Trade creditors	3,474	3,529
Accrued expenses	11,265	6,647
	14,739	**10,176**
13. Provisions		
The aggregate provisions recognised and included in the financial statements are as follows:		
Provision for net commercial income distribution	10,396	6,683
Provision for employee benefits*	18,282	16,909
Current provisions	**28,678**	**23,592**
Provision for employee benefits	2,723	2,271
Provision for net commercial income distribution	33,040	39,600
Non current provisions	**35,763**	**41,871**
	64,441	**65,463**

* Included in current employee provisions are $10,737K (2017: $10,015K) of long service leave for which a current entitlement exists.

As a result of the Venetoclax monetisation transaction and the Institute's net commerical income distribution policy relating to distributions to employees, commitments may be payable in future years.

The extent to which an outflow of funds under these commitments, will be required is dependent on: staff members remaining employed by the Institute, the number of eligible employees within the distribution period and Board approval.

During 2018, the Institute finalised its net commerical income distribution policy, which resulted in an increase to the nominal amounts that may be payable (no amount has been recognised as a liability) below:

Potential payments by the Institute arising from royalty distributions to staff:		
Payable within 1 year	1,500	1,500
Payable between 1-5 years	6,000	5,043
Payable 5+ years	10,500	12,000
	18,000	**18,543**
Number of employees at end of financial period (full time equivalents)		
Staff	716	682
Visiting scientists	36	48
	752	**730**
14. Unearned grants and fellowships		
Grants and fellowships already committed and applicable to future periods:		
Grants	13,831	19,885
Fellowships	1,390	3,458
	15,221	**23,343**
15. Other liabilities		
Monies Held in Trust:		
Staff Salary Packaging deposits	270	310
	270	**310**

16. Capital movements		2018 $'000	2017 $'000
(a) The net surplus for the financial period is $11,344K (2017: $278,518K)			
This has been appropriated as follows:	Note		
Transfer to Permanent Invested Fund	16(b)	8,571	4,448
Transfer to/(from) General Fund	16(c)	(3,282)	260,927
Transfer to Royalty Fund	16(d)	3,644	9,429
Transfer to Leadership Fund	16(e)	1,995	981
Transfer to Discovery Fund	16(f)	416	1,863
Transfer to Child Care Centre Fund	16(g)	-	870
Total appropriations to funds		**11,344**	**278,518**
(b) Permanent Invested Fund			
Balance at beginning of period		185,610	181,162
Net surplus for period transferred from statement of profit or loss and other comprehensive income		8,571	4,448
Total Permanent Invested Fund		**194,181**	**185,610**
(c) General Fund			
Balance at beginning of period		378,204	114,306
Equity transfer on initial adoption of AASB 9		7,969	-
Transfers not reflected in current year surplus		-	2,971
Transfers from Investment revaluation reserve on sale of investment		(5,181)	-
Net surplus for period transferred from statement of profit or loss and other comprehensive income		(3,282)	260,927
Total General Fund		**377,710**	**378,204**
(d) Royalty Fund			
Balance at beginning of period		44,410	34,981
Net surplus for period transferred from statement of profit or loss and other comprehensive income		3,644	9,429
Total Royalty Fund		**48,054**	**44,410**
(e) Leadership Fund			
Balance at beginning of period		24,562	23,581
Net surplus for period transferred from statement of profit or loss and other comprehensive income		1,995	981
Total Leadership Fund		**26,557**	**24,562**
(f) Discovery Fund			
Balance at beginning of period		4,545	2,682
Net surplus for period transferred from statement of profit or loss and other comprehensive income		416	1,863
Total Discovery Fund		**4,961**	**4,545**
(g) Child Care Centre Fund			
Balance at beginning of period		-	2,101
Transfer of funds for child care centre construction		-	(2,971)
Net surplus for period transferred from statement of profit or loss and other comprehensive income		-	870
Total Child Care Centre Fund		**-**	**-**
(h) Investment revaluation reserve			
Balance at beginning of period		40,853	34,393
Equity transfer on initial adoption of AASB 9		(7,969)	-
Valuation gain/(loss) recognised for the period (FVTOCI equity Instruments)		(28,996)	-
Valuation gain/(loss) recognised for the period (FVTOCI debt Instruments)		(858)	-
Transfers to general funds on sale of investments (FVTOCI equity Instruments)		5,181	-
Valuation gain/(loss) recognised for the period - Available for sale		-	11,551
Transfers to gain on sale of investment		-	(5,091)
Total investment revaluation reserve		**8,211**	**40,853**
Total funds		**659,674**	**678,184**

17. Notes to statement of cash flows

	2018 $'000	2017 $'000
(a) Reconciliation of cash		
For the purposes of the statement of cash flows, cash includes cash on hand, cash at bank, monies held at trust (salary packaging bank account for staff) and investments in money market instruments, net of outstanding bank overdrafts.		
Cash at the end of the financial period as shown in the statement of cash flows is reconciled to the related items in the statement of financial position as follows:		
Cash	23,278	89,505
Deposits at call	44,465	5,847
Term Deposits	-	249,394
	67,743	**344,746**
Represented by:		
Cash for Institute operations (as per Cash Flow Statement)	67,473	344,436
Cash balances not available for use		
Monies Held in Trust - Staff Salary Packaging Deposits	270	310
	67,743	**344,746**
(b) Reconciliation of net surplus to net cash flows from operating activities		
Net surplus	11,344	278,518
Depreciation	9,368	9,044
Gain on disposal of property, plant and equipment	248	-
Donations and bequests moved to Permanent funds	(6,510)	(2,877)
Gain / (Loss) on sale of investments	(2)	(5,002)
Fair value adjustment for investments (FVTPL)	589	-
Increase in investments – dividend reinvestment plans	(5)	(6)
Grants and donations for capital works	(1,198)	(4,330)
Donated financial assets	(3)	(1,430)
Prepaid operating leases	32	32
	13,863	**273,949**
Changes in net assets and liabilities:		
(Increase) / decrease in assets:		
Tax assets	(3,749)	575
Sundry debtors and prepayments	1,101	(692)
Income receivable	(7,457)	(2,105)
Foreign exchange gain/loss	(4,998)	4,140
Increase / (decrease) in liabilities:		
Trade payables	(55)	557
Accrued expenses	4,618	4,116
Tax liabilities	(142)	773
Current provisions	5,086	3,360
Other current liabilities (Grants)	(8,122)	(1,182)
Non-current provisions	(6,108)	39,969
Net cash provided / (used) from operating activities	**(5,963)**	**323,460**

(c) Non-cash financing and investing activities

During the financial period:

Dividends of $5,247 (2017: $6,372) were reinvested as part of dividend and distribution reinvestment plans.

18. Economic dependency

The Institute is reliant upon grants from the Australian Government National Health and Medical Research Council for 32.3% of operating expenditure (2017: 32.8%) and the Victorian Government Department of Health and Human Services, Department of State Development, Business and Innovation for 7.2% of operating expenditure (2017: 9.0%) for support of its basic research activities.

19. Segment information

The Institute is a medical research organisation focussed on the nationally and globally significant areas of health being cancer, immune disorders and infectious diseases. All operations are predominantly in Australia.

20. Capital expenditure commitments

	2018 $'000	2017 $'000
Not longer than 1 year	2,885	4,307
Total commitments	**2,885**	**4,307**

21. Related party disclosures

(a) Transactions with associates

The Institute received fees during the year from Catalyst Therapeutics Pty Ltd and Anaxis Pharma Pty Ltd totalling $2,358,999 (2017: $260,262) for services rendered on normal commercial terms.

The Institute received royalties during the year from Anaxis Pharma Pty Ltd and Murigen Pty Ltd totalling $1,357,019 (2017: $834,281).

The Institute made no equity contributions during the year to Catalyst Therapeutics Pty Ltd (2017: $147,000).

The Institute received no return of capital during the year, from either Catalyst Therapeutics Pty Ltd or Anaxis Pharma Pty Ltd (2017: $763,641)

The Institute made membership contributions to the Victorian Comprehensive Cancer Centre (VCCC) totalling $135,921 (2017: $131,818). The Institute also received fees from the VCCC for collaborative initiatives undertaken during the year of $831,383 (2017: $1,272)

(b) Transactions with directors and director-related entities

During the year various Directors and Director-related entities made donations to the Institute totalling $860,000 (2017: $605,659).

(c) Key management personnel compensation	2018	2017
The aggregate compensation of the key management personnel of the Institute is set out below:	$	$
Short-term employee benefits	1,826,243	1,708,099
Post-tax employment benefits	311,461	268,014
	2,137,704	**1,976,113**

22. Superannuation commitments

(a) Institute employees are members of a range of superannuation funds, which are divided into the following categories:

Those operative and open to membership by new employees:

- UniSuper – Accumulation Super (1)
- Other superannuation funds chosen by employees.

Those closed to future membership by Institute employees:

- Unisuper – Defined Benefit Division
- Unisuper – Accumulation Super (2)

(b) UniSuper plans

UniSuper is a multi employer superannuation fund operated by UniSuper Limited as the corporate trustee and administrated by UniSuper Management Pty Ltd, a wholly owned subsidiary of UniSuper Limited. The operations of UniSuper are regulated by the Superannuation Industry (Supervision) Act 1993.

(i) The UniSuper schemes known as the Defined Benefit Division or Accumulation Super (2) were only available to contributing members of the Walter and Eliza Hall Institute of Medical Research Superannuation Fund (1979) which closed in 2003.

(ii) The maximum contribution rate to the schemes is 25.25% of member's salary of which the member contributes 8.25% after tax and the Institute 17%.

(iii) UniSuper has advised that the Accumulation Super (2) and Defined Benefit Division plans are defined as multi-employer defined contribution schemes in accordance with AASB 119 Employee Benefits. AASB 119 Employee Benefits states that this is appropriate for a defined benefit plan where the employer does not have access to the information required and there is no reliable basis for allocating the benefits, liabilities, assets and costs between employers.

(iv) The number of members of the Walter and Eliza Hall Institute of Medical Research Superannuation Fund (1979) who became members of the UniSuper – Defined Benefit Division when the fund closed in 2003 was 204. The number of Institute employees who are members of the Defined Benefit Division as at 31 December 2018 was 78 (2017: 78).

(v) New employees who commenced after 1 July 2003 currently have a minimum contribution of 9.5% of their annual salary contributed by the Institute to Accumulation Super (1) or to a fund of their choice prescribed under the Superannuation Guarantee Charge Act (1992).

(c) The total superannuation contributions by the Institute during the period in respect to the above plans were:	2018 $'000	2017 $'000
UniSuper – Defined Benefit Division	1,564	1,605
UniSuper – Accumulation Super (2)	335	344
UniSuper – Accumulation Super (1)	6,953	6,411
Other superannuation funds	960	562
Total	**9,812**	**8,922**

23. Financial instruments

(a) Significant accounting policies

Details of the significant accounting policies and methods adopted, including the criteria for recognition, the basis of measurement and the basis on which revenues and expenses are recognised, in respect of each class of financial asset and financial liability are disclosed in note 1 to the financial statements.

(b) Significant terms, conditions and objectives of derivative financial instruments

The Institute does not enter into trade derivative financial instruments.

(c) Capital risk management

The Institute manages its capital to ensure it will be able to continue as a going concern whilst maximising its return on investment within the risk profile maintained by the Institute. The capital structure consists of permanent funds, retained earnings and reserves.

(d) Financial risk management

The Institute minimises financial risk through the charter given to the investment sub-committee. In line with this charter, the Institute invests short term funds in an appropriate combination of fixed and floating instruments.

(e) Interest rate risk management

The Institute is exposed to interest rate risk as it invests funds at both fixed and floating interest rates. The majority of financial assets in this class are bank accounts, bank bills and fixed interest securities with varying interest rates.

(f) Interest rate sensitivity analysis

The sensitivity analysis below has been determined based on the exposure to interest rates at the reporting date and the stipulated change taking place at the beginning of the financial year and held constant throughout the reporting period. A 25 basis point variation was used as the minimum point and 100 basis point variation as the maximum point. This is consistent with the management's view of interest rate sensitivity. A change in interest rates would impact net surplus as follows:

Interest rate risk	Minimum 25bp (+/-)		Maximum 100bp (+/-)	
	Dec 2018	Dec 2017	Dec 2018	Dec 2017
	$000's	$000's	$000's	$000's
Effect on surplus - rate decrease	(658)	(1,016)	(2,634)	(4,068)
Effect on surplus - rate increase	658	1,016	2,634	4,068

(g) Equity price sensitivity analysis

The sensitivity analysis below has been determined based on the exposure to equity price risks at the reporting date.

At reporting date, if the equity prices had been 5% higher or lower:

- net surplus for the year ended 31 December 2018 would have been unaffected as the equity investments are classified as not held for trading and the fair value through other comprehensive (FVTOCI) election has been made under AASB 9.
- investment revaluation reserve would increase or decrease by $12.2 million (Dec 2017: $8.5 million) mainly as a result of the changes in fair value of these equity investments.

The Institute's sensitivity to equity prices has not changed significantly from the prior year.

(h) Credit risk management

Credit risk refers to the risk that a counterparty will default on its contractual obligations resulting in a financial loss to the Institute. The Institute has adopted a policy of only dealing with creditworthy counter parties as a means of mitigating the risk of financial loss from defaults. The Institute's exposure is continuously monitored and reviewed. Trade receivables consist of a large number of customers including granting bodies. The Institute does not have a significant credit exposure to any single party or any group of counter parties having similar characteristics. The carrying amount of financial assets recorded in the financial statements represents the Institute's maximum exposure to credit risk.

(i) Liquidity risk management

Ultimate responsibility for liquidity risk management rests with the board of directors, who have built an appropriate risk management framework for the management of the Institute's short, medium and long-term funding and liquidity management. The Institute manages the liquidity risk by maintaining adequate cash reserves, and by continuously monitoring forecast and actual cash flows while matching the maturity profiles of financial assets. Given the current surplus cash assets, liquidity risk is minimal. The Institute does not have any interest bearing liabilities. The remaining contractual maturity for its non-interest-bearing financial liabilities is $14.739 million payable within 3 months of 31 Dec 2018 (2017: $10.176 million).

(j) Fair value

The carrying amount of the Institute's financial assets and financial liabilities recorded in the financial statements approximates their fair values. The fair value of financial assets with standard terms and conditions and traded on active liquid markets are determined with reference to quoted market prices.

(k) Interest rate risk

The following table details the Institute's exposure to interest rate risk as at 31 December 2018 and 31 December 2017.

	Average interest rate	Variable interest rate	Less than 1 year	1 to 5 years	More than 5 years	Non-Interest Bearing	TOTAL
31 December 2018		$'000	$'000	$'000	$'000	$'000	$'000
Financial assets							
Cash and cash equivalents	1.54%	67,743	-	-	-	-	67,743
Tax assets		-	-	-	-	5,278	5,278
Sundry debtors		-	-	-	-	2,178	2,178
Prepayments		-	-	-	-	1,042	1,042
Accrued income		-	-	-	-	10,858	10,858
Shares		-	-	-	-	253,305	253,305
Floating rate securities	3.75%	-	14,599	119,318	61,423	-	195,340
Fixed rate securities	4.11%	-	1,031	5,621	8,148	-	14,800
Non listed shares		-	-	-	-	2,067	2,067
		67,743	**15,630**	**124,939**	**69,571**	**274,728**	**552,611**
Financial liabilities							
Trade payables		-	-	-	-	14,739	14,739
Other liabilities		-	-	-	-	270	270
Grants carried forward		-	-	-	-	15,221	15,221
		-	**-**	**-**	**-**	**30,230**	**30,230**

	Average interest rate	Variable interest rate	Less than 1 year	1 to 5 years	More than 5 years	Non-Interest Bearing	TOTAL
31 December 2017		$'000	$'000	$'000	$'000	$'000	$'000
Financial assets							
Cash and cash equivalents	0.33%	344,746	-	-	-	-	344,746
Tax assets		-	-	-	-	1,387	1,387
Sundry debtors		-	-	-	-	3,344	3,344
Prepayments		-	-	-	-	980	980
Accrued income		-	-	-	-	3,401	3,401
Shares		-	-	-	-	169,623	169,623
Floating rate securities	3.84%	-	-	18,821	43,187	-	62,008
Non listed shares		-	-	-	-	1,781	1,781
		344,746	**-**	**18,821**	**43,187**	**180,516**	**587,270**
Financial liabilities							
Trade payables		-	-	-	-	10,176	10,176
Other liabilities		-	-	-	-	310	310
Grants carried forward		-	-	-	-	23,343	23,343
		-	**-**	**-**	**-**	**33,829**	**33,829**

24. Jointly controlled operations and assets

	2018	2017
Victorian Comprehensive Cancer Centre Limited (VCCC)	10.0%	10.0%

The Institute is a Member of the Victorian Comprehensive Cancer Centre Joint Venture (the VCCC) and the Institute retains joint control over the arrangement, which it has classified as a Joint Operation. The vision for the VCCC is to save lives through the integration of cancer research, education and patient care. Through innovation and collaboration, the VCCC will drive the next generation of improvements in prevention, detection and cancer treatment. This vision will further the objectives of the Institute. The VCCC is a not-for-profit organisation and has been recognised by the Australian Taxation Office as a Health Promotion Charity.

All Members hold an equal 1/10th share in the assets, liabilities, expenses and income of the VCCC. The members own the VCCC assets as tenants in common; and are severally responsible for the joint venture costs – in the same proportions as their interests.

Interests in the VCCC are not transferrable and forfeited on withdrawal from the joint venture. Distributions are not able to be paid to Members and excess property on winding up will be distributed to other charitable organisations with objects similar to those of the VCCC.

The principal place of business for the VCCC is Level 10, 305 Grattan Street, Melbourne, Victoria.

The Institute's policy is to value its proportionate member interest based on the most recent audited accounts of the VCCC. The last audited accounts received are dated 30 June 2018.

The Institute's interest in the above jointly controlled operations is detailed below.

	2018	2017
Assets	**$'000**	**$'000**
Current Assets		
Cash and cash equivalents	1,586	566
Trade and other receivables	8	3
Prepayments	101	-
Total current assets	**1,695**	**569**
Non-current Assets		
Investment in Cancer Therapeutics CRC	1	1
Property, plant and equipment	18	3
Total non-current assets	**19**	**4**
Share of total assets	**1,713**	**573**
Liabilities		
Current liabilities		
Trade and other payables	44	23
Employee benefits	11	8
Total current liabilities	**54**	**31**
Non-current liabilities		
Employee benefits	10	6
Total non-current liabilities	**10**	**6**
Share of total liabilities	**64**	**37**
Net Assets	**1,649**	**536**
Share of VCCC's net assets	**1,649**	**536**

Governance statement

The Walter and Eliza Hall Institute of Medical Research is a Public Company Limited by Guarantee. Ultimate responsibility for the governance of the Institute rests with the Board of Directors. This Governance Statement outlines how the Board meets that responsibility.

Achieving the Mission

The Board's primary role is to ensure that the Institute's activities are directed towards achieving its mission of 'Mastery of Disease through Discovery'. The Board must ensure that this mission is achieved in the most efficient and effective way.

Specific Responsibilities of the Board

The Board fulfils its primary role by:

- selecting, appointing, guiding and monitoring the performance of the Institute Director;
- formulating the Institute's strategic plan in conjunction with the Chief Executive and Senior Management;
- approving operating and capital budgets formulated by the Institute Director and Management;
- monitoring Management's progress in achieving the Strategic Plan;
- monitoring Management's adherence to operating and capital budgets;
- ensuring the integrity of internal control, risk management and management information systems;
- ensuring stakeholders receive regular reports, including financial reports;
- ensuring the Company complies with relevant legislation and regulations; and
- acting as an advocate for the Institute whenever and wherever possible.

Management's Responsibility

The Institute's day-to-day operations and administration are the responsibility of the Institute Director and Executive Management.

Board Oversight

The Board oversees and monitors Management's performance by:

- meeting at least four times during the year;
- receiving detailed financial and other reports from management at these meetings;
- receiving additional information and input from management when necessary; and
- assigning to the Audit and Risk, Commercialisation and Investment Committees of the Board responsibility to oversee particular aspects of the Institute's operations and administration.

Each Board Committee operates under a Terms of Reference or a Charter approved by the Board. These are reviewed and updated as necessary.

Board Members

All Board Members are Non-Executive Directors and receive no remuneration for their services. The Company's Constitution specifies:

- there must be no less than 12 and no more than 18 Directors;
- Directors (except those appointed by The University of Melbourne) are appointed for a maximum of four terms of three years each, after which Directors may be reappointed annually with the unanimous agreement of all other Board Members; and
- the President or Vice President may hold office for an additional period or periods not exceeding six years.

Appointments to the Board are made to ensure the Board has the right mix of skills, experience and expertise. One Board Member is appointed by the Trustees of the Institute and four Board Members are appointed by the Company's founding members, The University of Melbourne and The Royal Melbourne Hospital (Melbourne Health) (two members each) and up to a further 13 by the Board.

Board and Committee Members receive advice of the terms and conditions of their appointment. Board and Committee Members' knowledge of the business is maintained by visits to the Institute's operations and management presentations.

The performance of individual Board and Committee Members and the Board and Board Committees is assessed regularly.

Risk Management

The Board oversees the Institute's risk management system, which is designed to protect the Organisation's reputation and manage those risks that might preclude it from achieving its goals.

Management is responsible for establishing and implementing the risk management system, which assesses monitors and manages operational, financial reporting and compliance risks. The Audit and Risk Committee is responsible for monitoring the effectiveness of the risk management system between annual reviews.

Ethical Standards and Code of Conduct

Board Members, Senior Executives and staff are expected to comply with relevant laws and the codes of conduct of relevant professional bodies, and to act with integrity, compassion, fairness and honesty at all times when dealing with colleagues, and others who are stakeholders in our mission.

Involving Stakeholders

The Institute has many stakeholders, including our donors and benefactors, our staff, and students, the broader community, the government agencies who provide us funds and regulate our operations, and our suppliers.

We adopt a consultative approach in dealing with our stakeholders. We get involved in industry forums to ensure governments at all levels are aware of our concerns and our achievements and to remain abreast of industry developments.

Indemnification and Insurance

The Institute insures Directors (and the Company Secretary and Executives) against liabilities for costs and expenses incurred by them in defending any legal proceedings arising out of their conduct while acting in the capacity of Director (or Company Secretary or Executive) of the Company, other than conduct involving a wilful breach of duty in relation to the Company.

Directors' report

The Directors of the Walter and Eliza Hall Institute of Medical Research submit herewith the Annual Financial Report of the Company for the year ended 31 December 2018. In order to comply with the provisions of the Australian Charities and Not-for-Profits Commission Act 2012 the Directors report as follows:

Directors and Board Meetings

The names and particulars of the Directors of the Company during or since the end of the financial year and attendance at Board meetings in the year ended 31 December 2018 are:

		Joined Board	Meetings held while a Director	Meetings Attended
Christopher W Thomas AM *Chairman and President of the Institute* (elected February 2013)	BCom(Hons) MBA *Melb* FAICD	2001	5	5
Jane S Hemstritch *Vice President of the Institute* (elected July 2016)	BSc(Hons) FCA FAICD	2013	5	4
Robert H Wylie *Honorary Treasurer*	FCA FAICD	2014	5	4
Malcolm W Broomhead AO	MBA BE(Civil) *Qld* FIE(Aus) FAusIMM FAIM MICE(UK) FAICD	2014	5	4
John Dyson	BSc *Monash* Grad Dip Fin Inv *SIA* MBA *RMIT*	2016	5	5
James McCluskey AO	BMedSci MBBS MD *UWA* FRACP FRCPA	2011	5	4
Marie McDonald	BSc (Hons) LLB (Hons) *Melbourne*	2016	5	4
Graham F Mitchell AO	RDA BVSc *Syd* FACVSc PhD *Melb* FTSE FAA	2007	5	5
Terence F Moran AC	BA(Hons) *Latrobe*	2013	5	5
Carolyn Viney	LLB/BA *Monash*	2016	5	4
Shitij Kapur	MBBS, PhD, FRCPC, FMedSci	2017	5	4
Christine Kilpatrick	MBBS, MBA, MD, FRACP, FRACMA, FAICD. FAHMS, DMedSci (Hons)	2017	5	4
Robert Doyle AC (resigned 5 February 2018)	BA BEd HonLLD	2017	0	0
Peter Collins	BA(Hons) *Melb* BTheolMCD, MBA *Oxford* and HEC *Paris*	July 2018	3	3
Sir John Savill	BA *Oxford* MBChB *Sheffield* PhD *London* FRCP FRCPE FRCSEd (Hon) FRCPCH(Hon) FASN FRSE F.MedSci FRS	July 2018	3	2

The Audit and Risk Committee

The role of the Audit and Risk Committee is to assist the Board in fulfilling its statutory and fiduciary responsibilities with regard to accounting and financial reporting practices and internal control systems of the Company. The Committee met four times during the period under review.

Principal Activities

The Company's principal activity in the course of the financial year was medical research and there has been no significant change in that activity during the financial year.

Financial Results

The financial result from operations was a net surplus of $13,591K (31 Dec 2017 net surplus of $275,353K). After allowing for the gains from the sale of investments and other grants, donations and bequests, depreciation and amortisation the overall result for the period was a surplus of $11,344K (31 December 2017 surplus of $278,517K). Tax is not applicable. The Company is Limited by Guarantee, has no share capital and declares no dividends.

Operations

A review of operations of the Company is included in the detailed scientific reports.

Environmental Regulations

The Institute aims to achieve a high standard in environmental matters. The Institute complies with the Environmental Protection Act in respect of its operations. Discharges to air and water are below specified levels of contaminants and solid waste is disposed of in an appropriate manner. Biomedical waste and sharps are disposed of through appropriately licensed contractors. The Directors have not received notification nor are they aware of any breaches of environmental laws by the Institute.

Appreciation

The Board wishes to extend its appreciation to the Members of the various Committees (Remuneration and Nomination Committee, Human Research Ethics Committee, Investment Committee, Advocacy and Support Committee, Audit and Risk Committee and the Commercialisation Advisory Committee) as well as the many other people including the Institute Director, staff, students, overseas visitors and honorary workers, who work so tirelessly to advance the Company's world-wide reputation for excellence in medical research. A table of attendance at the various committees is listed below.

Committee attendance	Meetings held while a member	Meetings attended
Audit and Risk Committee		
Mr Robert Wylie (Chair)	4	4
Mr Malcolm Broomhead AO	4	2
Mrs Jane S Hemstritch	4	3
Commercialisation Advisory Committee		
Dr Graham Mitchell AO (Chair)	3	3
Dr Leigh Farrell	3	0
Dr Lisa Hennessey	3	3
Professor George Morstyn	3	2
Mr Saul Cannon	3	3
Advocacy and Support Committee		
Mr John Dyson (Chair)	5	2
Dr Paul Cooper	5	5
Mr Michael Daddo	5	1
Mr Hugh Hodges	5	3
Ms Caroline Johnston	5	3
Ms Andrea Lapidge	5	5
Ms Catherine Robson	5	3
Remuneration and Nomination Committee		
Mr Christopher Thomas AM (Chair)	4	4
Mr Terrance Moran AC	4	4
Ms Marie McDonald	3	3

Committee attendance	Meetings held while a member	Meetings attended
Human Research Ethics Committee		
Mr Peter Collins (Chair) (Appointed Chair – September 2018)	2	2
Dr John Bonacci	5	5
Dr Vanessa Bryant	5	4
Rev Father Michael Elligate (Deputy Chair)	5	3
Mr David Freeman	5	4
Mrs Netta McArthur	5	2
Ms Moira Rayner	5	2
Ms Kimberley Walsh	5	5
Investment Committee		
Mr Robert Wylie (Chair)	4	3
Mr Malcom Broomhead AO	4	3
Mr Stephen Merlicek	4	4
Mr Stephen Milburn-Pyle	4	2
Mr Andrew Scott	4	3
Ms Fiona Trafford-Walker	4	2

Auditors' independence declaration

The Auditors' independence declaration is included on page 94 of the financial report.

Other Matters

(a) During the financial year there was no significant change in the Company's state of affairs other than that referred to in the accounts or the notes thereto.

(b) There has not been any other matter or circumstance that has arisen since the end of the financial year, that has significantly affected, or may significantly affect the operations of the Company, the results of those operations, or the state of affairs of the Company in future financial years.

(c) Disclosure of information regarding likely developments in the operations of the Company in future years and the expected results of those operations is likely to result in unreasonable prejudice to the Company. Accordingly, this information has not been disclosed in this report.

(d) During the financial year the Company paid a premium in respect of a contract insuring the Directors and Officers of the Company against liability incurred as such a Director or Officer to the extent permitted by the Corporations Act 2001. The contract of insurance prohibits disclosure of the nature of the liability and the amount of the premium. The Company has not otherwise, during or since the financial year, indemnified or agreed to indemnify an Officer or Auditor of the Company or any related body corporate against a liability incurred as such an Officer or Auditor.

(e) The Company is a Company of the kind referred to in ASIC Class Order 98/100, dated 10 July 1998, and in accordance with that Class Order amounts in the Directors' report and the financial report are rounded off to the nearest thousand dollars.

Signed in accordance with a resolution of the directors made pursuant to s.298(2) of the Corporations Act 2001.

On behalf of the directors

Christopher Thomas AM
President
Melbourne, 11 APRIL 2019

Robert Wylie
Treasurer

Directors' declaration

Directors' Declaration - per section 60.15 of the Australian Charities and Not-for-Profits Commission Regulation 2013.

The Directors declare that in the Directors' opinion:

(a) there are reasonable grounds to believe that the registered entity is able to pay all of its debts, as and when they become due and payable; and;

(b) the financial statements and notes satisfy the requirements of the Australian Charities and Not-for-Profits Commission Act 2012.

Signed in accordance with subsection 60.15(2) of the Australian Charities and Not-for-Profits Commission Regulation 2013.

Christopher Thomas AM
President
Melbourne, 11 APRIL 2019

Robert Wylie
Treasurer

Deloitte.

Deloitte Touche Tohmatsu
ABN 74 490 121 060

550 Bourke Street
Melbourne VIC 3000
GPO Box 78
Melbourne VIC 3001 Australia

DX 111
Tel: +61 (0) 3 9671 7000
Fax: +61 (0) 3 9671 7001
www.deloitte.com.au

11 April 2019

The Board of Directors
The Walter and Eliza Hall Institute of Medical Research
1G Royal Parade
PARKVILLE VIC 3052

Dear Board Members

The Walter and Eliza Hall Institute of Medical Research

In accordance with the Subdivision 60-C of the *Australian Charities and Not-for profits Commission Act 2012*, I am pleased to provide the following declaration of independence to the directors of The Walter and Eliza Hall Institute of Medical Research.

As lead audit partner for the audit of the financial statements of The Walter and Eliza Hall Institute of Medical Research for the year ended 31 December 2018, I declare that to the best of my knowledge and belief, there have been no contraventions of:

(i) the auditor independence requirements as set out in the *Australian Charities and Not-for profits Commission Act 2012* in relation to the audit; and

(ii) any applicable code of professional conduct in relation to the audit.

Yours sincerely

Deloitte Touche Tohmatsu

DELOITTE TOUCHE TOHMATSU

Anneke Du Toit
Partner
Chartered Accountants

Deloitte Touche Tohmatsu
A.B.N. 74 490 121 060

550 Bourke Street
Melbourne VIC 3000
GPO Box 78
Melbourne VIC 3001 Australia

DX 111
Tel: +61 (0) 3 9671 7000
Fax: +61 (0) 3 9671 7001
www.deloitte.com.au

Independent Auditor's Report to the Members of The Walter and Eliza Hall Institute of Medical Research

Opinion

We have audited the financial report of the Walter and Eliza Hall Institute of Medical Research ("WEHI"), which comprises the statement of financial position as at 31 December 2018, the statement of comprehensive income, statement of changes in equity and statement of cash flows for the year then ended, and notes to the financial statements, including a summary of significant accounting policies, and the declaration by the Directors.

In our opinion, the accompanying financial report presents fairly, in all material respects, the Entity's financial position as at 31 December 2018, and of its financial performance and its cash flows for the year then ended in accordance with Australian Accounting Standards and Division 60 of the *Australian Charities and Not-for-profits Commission Act 2012* (the ACNC Act).

Basis for Opinion

We conducted our audit in accordance with Australian Auditing Standards. Our responsibilities under those standards are further described in the *Auditor's Responsibilities for the Audit of the Financial Report* section of our report. We are independent of the Entity in accordance with the auditor independence requirements of the ACNC Act and the ethical requirements of the Accounting Professional and Ethical Standards Board's APES 110 *Code of Ethics for Professional Accountants* (the Code) that are relevant to our audit of the financial report in Australia. We have also fulfilled our other ethical responsibilities in accordance with the Code.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

Other Information

The Directors are responsible for the other information. The other information obtained at the date of this auditor's report comprises Directors' Report, Statistical summary for the year ended 31 December 2018 and Capital Funds included in the annual report for the year ended 31 December 2018, but does not include the financial report and our auditor's report thereon.

Our opinion on the financial report does not cover the other information and we do not and will not express any form of assurance conclusion thereon.

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In connection with our audit of the financial report, our responsibility is to read the other information and, in doing so, consider whether the other information is materially inconsistent with the financial report or our knowledge obtained in the audit, or otherwise appears to be materially misstated. If, based on the work we have performed on the other information that we obtained prior to the date of this auditor's report, we conclude that there is a material misstatement of this other information, we are required to report that fact. We have nothing to report in this regard.

Those Charged with Governance's for the Financial Report

Those Charged with Governance are responsible for the preparation of the financial report that gives a true and fair view in accordance with Australian Accounting Standards – Reduced Disclosure Regime and the ACNC Act and for such internal control as Those Charged with Governance determine is necessary to enable the preparation and fair presentation of the financial report and is free from material misstatement, whether due to fraud or error.

In preparing the financial report, Those Charged with Governance are responsible for assessing the Entity's ability to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless Those Charged with Governance either intend to liquidate the Entity or to cease operations, or have no realistic alternative but to do so.

Auditor's Responsibilities for the Audit of the Financial Report

Our objectives are to obtain reasonable assurance about whether the financial report as a whole is free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with the Australian Auditing Standards will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of this financial report.

As part of an audit in accordance with the Australian Auditing Standards, we exercise professional judgement and maintain professional scepticism throughout the audit. We also:

- Identify and assess the risks of material misstatement of the financial report, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for our opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control.

- Obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Entity's internal control.

- Evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by the Directors.

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- Conclude on the appropriateness of the Directors' use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the Entity's ability to continue as a going concern. If we conclude that a material uncertainty exists, we are required to draw attention in our auditor's report to the related disclosures in the financial report or, if such disclosures are inadequate, to modify our opinion. Our conclusions are based on the audit evidence obtained up to the date of our auditor's report. However, future events or conditions may cause the Entity to cease to continue as a going concern.

- Evaluate the overall presentation, structure and content of the financial report, including the disclosures, and whether the financial report represents the underlying transactions and events in a manner that achieves fair presentation.

We communicate with Those Charged with Governance regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that we identify during our audit.

Deloitte Touche Tohmatsu

DELOITTE TOUCHE TOHMATSU

Anneke Du Toit
Partner
Chartered Accountants
Melbourne, 11 April 2019

Statistical summary for the year ended 31 December 2018

	2018	2017	2016	2015	6 months to 31 December 2014
	$'000s	$'000s	$'000s	$'000s	$'000s
Operating revenue					
Australian Government	45,057	45,163	51,079	48,492	25,569
Victorian Government	10,909	12,739	7,753	7,419	3,078
Foreign governments	22	243	1	495	47
Government revenue	**55,988**	**58,145**	**58,833**	**56,406**	**28,694**
Industrial grants and contracts	7,182	4,044	3,227	4,691	1,058
Philanthropic grants and fellowships – Australia	15,759	7,444	8,804	8,062	4,659
Philanthropic grants and fellowships – international	6,824	6,468	5,805	7,386	4,056
Investment income	30,063	12,118	13,463	13,172	7,074
Royalty income	4,027	11,059	12,328	2,262	4,727
General revenue	8,260	7,560	5,746	4,430	1,077
Donations and bequests	13,568	9,327	8,816	7,297	4,126
Royalty monetisation revenue	-	331,082	-	-	-
Non-government revenue	**85,683**	**389,102**	**58,190**	**47,300**	**26,773**
Total revenue	**141,671**	**447,247**	**117,021**	**103,706**	**55,467**
Operating expenditure					
Staff costs	90,493	85,944	80,652	76,570	38,544
Laboratory operating costs	20,038	20,756	19,025	18,327	9,326
Laboratory equipment	3,352	4,047	3,610	2,284	1,105
Building operations	5,801	4,849	4,673	4,712	2,424
Administration	6,715	3,718	5,258	2,501	1,451
Fundraising	475	487	387	219	106
Business development	1,261	997	747	825	390
Allowance for credit loss increase / (decrease)	188	(47)	(115)	-	201
Royalty monetisation costs	4,755	51,143	-	-	-
Unrealised foreign exchange loss / (gain)	(4,998)	-	-	-	-
Total expenditure	**128,080**	**171,894**	**114,237**	**105,438**	**53,547**
Results from operating activities	**13,591**	**275,353**	**2,785**	**(1,732)**	**1,920**
Other income					
Profit or (loss) on sale of long-term assets	2	5,002	8,671	9,512	2,170
Fair value gain or (loss) on investments	(589)	-	-	-	-
Donations and bequests capitalised to Permanent Funds	6,510	2,877	5,162	719	137
Grants and donations for capital works	1,198	4,330	1,733	6,071	870
Total other income	**7,121**	**12,209**	**15,566**	**16,302**	**3,177**
Other expenses					
Loss on impairment write down of long-term investments	-	-	(709)	(4,808)	(391)
Depreciation and amortisation	(9,368)	(9,044)	(8,556)	(8,512)	(4,486)
Total other expenses	**(9,368)**	**(9,044)**	**(9,265)**	**(13,320)**	**(4,877)**
Net operating surplus	**11,344**	**278,518**	**9,086**	**1,250**	**220**
Capital funds					
Permanent invested capital funds	194,181	185,610	181,162	168,392	159,027
General funds	377,710	378,204	114,306	130,122	143,126
Royalty fund	48,054	44,410	34,981	26,169	24,387
Leadership fund	26,557	24,562	23,581	21,682	19,724
Discovery fund	4,961	4,545	2,682	2,362	2,109
Centenary fund	-	-	2,101	1,000	104
Investment revaluation reserve	8,211	40,853	34,393	35,305	47,755
Total funds	**659,674**	**678,184**	**393,206**	**385,032**	**396,232**
Capital expenditure					
Property, plant and equipment	**22,029**	**16,078**	**9,960**	**5,062**	**1,484**
Staff numbers: (equivalent full-time)					
Scientific research staff:					
– Senior faculty	80	78	78	79	77
– Postdoctoral scientists	199	183	188	176	190
– Visiting scientists	36	48	39	23	12
–Other laboratory research staff	241	241	252	238	269
Supporting staff:					
– Other support services	196	180	162	146	144
Total staff and visiting scientists	**752**	**730**	**719**	**662**	**692**
Students	192	180	173	169	159
Papers published	**417**	**419**	**429**	**410**	**167**

Capital Funds

Permanent Named Capital Funds

The following is a complete listing of all permanent funds held and invested by the Institute at 31 December, 2018.

*New donations of capital received in current financial period.

	2018 $
Adair John Bequest (ex DW)	395,310
Adair John Bequest (ex MF)	75,055
Alexander R Estate	157,625
Allison-Levick J & H	88,475
Alston Peter and Julie Florence Fellowship Fund	1,449,928
Amey AM Estate	38,063
Anderson KA Estate	282,933
Anderson NM Estate	17,146
Angus Dorothy Irene Estate	278,426
Anonymous	356,390
Anonymous	3,486,192
Anonymous – Tasmania	60,877
Anonymous – Victoria	7,331
Anonymous – Victoria	197,308
Arnel Florence Janet Maude Estate	57,579
Arter Myra G Estate	88,525
Ashford Ivy A Estate	35,043
Attwell Samuel E Estate	68,562
Atyeo George & Isobel Fund	50,366
Baker Alice Lillian Estate	83,459
Ballantyne JW Estate	798,111
Barfield WG Estate	54,177
*Barry Joan Elaine Memorial Fund	34,351
Bartlett Mary V Estate	38,392
*Bates Tim Memorial Diabetes Research Fund	185,893
Charles L Bartholomew Estate	159,305
Bauer Dr Franz Estate	65,571
Bell Valerie Amy	92,885
Benjamin EG Estate	61,448
Bennett LM Estate	38,863
Berry Ruby C Estate	163,971
Biderman Cyla Estate	78,262
Blain BE Estate	125,318
Bland RT Estate	376,870
Bock Lindsay William Estate	33,176
Boothman Alva Estate	770,251
Borrett M A Estate	598,659
Bran EG Estate	217,902
Brennan EM Estate	68,020
The Ruby Bryan Memorial Fund	743,150
Brittain W & VI Mem Fund	80,156
Brockhoff Nyon Trust	251,722
Brough AV Estate	86,592
Brown Isabelle A Estate	90,191
Bruce RH Estate	39,556
Buckland William Foundation Fund	232,057
Buckman Olive Estate	27,491
Bult C G Estate	501,232
Brumloop LAA Estate	86,339
Burley Stanley Estate	70,315
Burnet Sir Macfarlane Estate	137,272
Burns JC Estate	185,521
Cahill JL Estate	25,689
Callaway LJ Estate	49,191
Cambridge Beresford Estate	203,752
Carlin Freda Evelyn Estate	100,786
Carling DM Estate	180,059
Carlson Catherine Estate	90,402
Carlson Elizabeth F Estate	102,174
Carty LEW Charitable Fund	43,454
Cato EA Estate	891,514
Cato MC Estate	724,622
*Chapman Debbie Memorial Fund	15,177
Chatfield SL Estate	122,307
Claridge John PG Estate	36,455
Clark Lindesay Fund	989,254
Cockburn Clarice BP Estate	27,412
Cole DE Estate	785,874
Coles GO Estate	38,223
Collie Barbara Estate	152,193
Collie Betty Rae	213,405
Collie George Estate	2,388,063
Colliver Len Estate	56,252
Connolly Grace C Estate	129,532
Cormack Margaret Mary	96,634
Cory Joy & Desmond Cancer Research Fund	130,866
Coultass Hylda M Estate	129,849
Courtney Gwendoline Vera Estate	277,946
Coutts Dr ELA Estate	130,369
Coutts IBM Estate	27,645
*Craven DA Memorial Fund	1,273,653
JE Craven & MA Shearer Estates	49,400,643
Crawford Duncan Estate	17,002
Criswick R M Estate	518,490
Critchlow Ronald P Estate	303,394
Crowley MM Estate	212,003
Cubbins SG Estate	90,262
Cummings ED Estate	160,704
Cutter BE Estate	16,703
Darbyshire EJ (Ted) Estate	349,546
Davey Dorothy Estate	309,279
Davidson BI Estate	26,246
Davidson EE Estate	29,788
Davis FLG Estate	59,557
Dawson Anne Marie Estate	7,962
Del Cott RAM Estate	262,542
Deryk SD Estate	71,008
Sir Harold Dew and Family Estate	846,496
Dick MRK (Ray) Estate	220,319
Dickie Phoebe Estate	45,148
Dimsey WE Estate	227,223
Dobbie Myrtle M Estate	41,470
Dodgshun GM Estate	164,829
Dossetor Catherine L Estate	35,859
Dowie S Estate	23,280
Drakensberg Trust	2,502,867
Drury Evelyn Ann Fund	122,407
Duncan PH Estate	98,381
East James Douglas Estate	187,255
Edwards Allen Richard Estate	196,943
Edwards HHW Estate	250,940
Eisner KR	96,904
Ellis GM Estate	3,804,743
Emery Harriet Anne Estate	21,601
Eva Michael Ross Estate	4,529,624
Facey Mary Bethune Estate	16,549
Fagg Maude V Estate	102,962
Fields Ernest Estate	289,453
Findlay Winifred Gertrude Estate	144,588
Fitzgerald Sheila Mary Estate	44,274
Ford Ada Joyce Estate	20,291
Fraser K Estate	2,097,175
Galbraith DA & DV Estate	114,343
Gerdts Sheila Lesley G Estate	68,658
Gibb Geo & Bennett Wm A	424,177
Gilbert Augusta Estate	383,295
Gilder CH Estate	16,903
Gillon AM Estate	3,197,005
Girdwood J Estate	251,936
Goldman Sachs JB Were Foundation	777,590
Gordon H & T Estate	112,870
Graves GC Estate	27,964
Gray Bessie Mavis Fund	26,564
Gray Clara Estate	76,296
Greig Harry Douglas Estate	532,982
Grubb Walter Joseph Estate	39,440
Guest Doris Rose Estate	16,589
Hackett Dorothy Estate	6,829
Hadfield RCS Estate	120,321
Hadley AN Estate	1,200,417
Hamilton M Estate	48,033

Harrap FM Estate	142,158
Harrap LM Estate	30,654
Harris John D & Lyla Foundation	901,825
Hartlett K Estate	1,036,353
Haydon Michael JM Memorial Fund	63,408
Hearse JD	1,260,986
Hemphill Olive May Estate	69,832
Henderson AN Estate	26,628
Henderson Joan Estate	136,095
Henry MA Estate	669,197
Heron Thelma Hope Estate	99,331
Highton GAN Estate	570,889
Hill Ramon Bruce Estate	160,744
Hind Ruby F Estate	34,676
Hocking Helen Estate	379,426
Holmes EM Estate	84,850
Hope Irene Estate	446,589
Hooper Nancy Hilda	117,924
Hosier MM Estate	159,188
Hurry M Estate	32,211
Inglis Dulcie M Estate	119,195
Ironside WH Estate	70,315
Jackson Catherine M Estate	203,052
Johnson Daphne Adele Estate	8,279
Johnson Ethel Grace Estate	48,152
Johnson Sydney Robert Estate	54,935
Johnstone Reginald Ben Estate	14,662
Judd Anita Estate	63,375
Kayler-Thomson Marion Estate	54,876
Keating L Estate	1,429,587
Keats LCA Estate	1,351,802
Kellock TH Estate	1,905,068
Kendall Nanyce Douglas	49,707
Kerr HM Estate	114,415
King DM Estate	43,625
Knight FF Estate	31,851
Lang John Murray Estate	783,013
Lanigan Annie Maria (Nance) & Janet Mary Fund	32,520
Lanteri Gwen Estate	1,642,614
Larard DV Estate	13,540
Leckie Winifred Estate	227,272
Lilford VM Estate	501,203
Lins RD Estate	28,126
Little Mabel B Estate	68,610
Lyddon Pauline M Estate	1,261,483
Lyell Alexia Bequest	456,775
MacAskill WG & I	28,126
Mace Nina May Estate	304,133
MacDonald Elsie May Estate	189,757
Macindoe Jock & Diana Fund	42,189
MacIntosh Elizabeth H Estate	25,337
Mackie-Smith CM Estate	385,398
Macleay The Lillian & Kenneth Bequest	441,659
MacNamara Jean Fund	1,038
Mahoney Florence Cancer Fund	177,732
Malcolm Phyllis Elizabeth Estate	284,809
Maloney Kathleen Margaret Estate	23,441
Mann David Memorial Research Fund	48,713
Mansfield Trevor Geoffrey Estate	10,470
Marguccio R Estate	14,063
Mariner Barry Leonard Estate	64,979
McArthur Nellie M Estate	111,861
McCooke Miss MH Estate	353,281
McDonald Charles Thomas	19,172
McDougall Phyllis Mable Estate	132,928
McGhee ME Estate	76,574
McGregor Amy VK Estate	129,491
McGregor Elvira Ruth Estate	23,861
McGregor KB Estate	187,217
Mckay C N Fund	277,261
McKinnon Sheila May Estate	47,211
McLean Ada Myee Dutton Estate	556,879
McLennan B Estate	100,571
McNab M Estate	25,406
McNeill Sir James Fund	21,873
McRorie Ruby A Estate	82,243
Menagh Thelma Marie Estate	19,137
Miller Lorna May Estate	917,803
Miller MA Estate	65,822
Miller Violet Isabella Estate	76,598
Minney DW & NR Fund	14,063
Mitchell, Bettye Victoria Fund	4,615,055
Mitchell Doris Georgina Mildred	70,315
Mitchell G Fund	54,504
Moden FHW Estate	135,544
Moody E Vaughan Estate	1,343,480
Moon Ida Alice Estate	53,100
Mooney Carmel Mary, Estate of	176,739
Moore Phyllis Estate	14,063
Morgan DM Estate	414,707
Morris Foundation of Medical Research	177,750
Moss EE Estate	271,288
Muller FG Estate	20,079
Murray Alan Ambrose Estate	36,150
Murray Gwendoline Mary Fund	1,254,020
Must Mary Kathleen Bequest	1,099,022
Myer Dame Merlyn Estate	15,149
Myer Pam Sallmann Foundation	30,668
Nevill Melanie Joy	84,538
Newton Evelyn	19,651
Newton EM Estate	19,102
Nicholas Harold George Estate	335,359
Norins Leslie Fund	286,452
Norton M Estate	889,671
Nossal Sir Gustav Fund	329,805
Nottingham SG Estate	36,371
Palmer DE Estate	27,449
Palmer Ethel Fund	330,531
Parker Barbara Memorial Fund	75,339
Parker Mabel V Estate	84,873
Parsons Kathleen FB Estate	42,969
Patten Ralph & Etty Bequest	319,686
Patterson Gerard A Estate	20,092
Paulin Leukaemia Fund	231,832
Paulin SC Estate	29,116
Payne Henry and Charlotte Fund	1,001,990
Peterson Vera Estate	600,593
Petley Francis Estate	159,544
Pierce John Lindsay Estate	1,281,307
Pietsch Dr CH Fund	213,799
Porter Florence JA Estate	137,385
Prater Mabel Edward	14,582
Pritchard DG Estate	36,095
Pyke MA Estate	16,876
Qualtrough Research Fund	2,801,859
Rae Olive Estate	1,174,337
Reeves Jessie Estate	65,941
Reid John T Charitable Trusts	8,227,064
Reiser Erwin Estate	28,126
Richardson DLK Estate	89,931
Ricker EM Fund	80,917
Roberts JI Charitable Fund	8,578
Robertson AT Estate	14,063
Rose Norma J Estate	14,216
Ruppel FE Estate	163,016
Salemann CW Estate	14,063
Sallmann L & E Memorial Fund	27,449
Santos TS Estate	910,744
Schack Elsie Edith Estate	133,080
Scott Annie May Estate	173,456
Sharp II Estate	22,107
Shaw Eileen Coryn Estate	24,626
Shelton Edgar Estate	863,180
Sidwell OB Estate	2,028,598
Skea Lyndal and Jean Leukaemia Fund	1,070,108
Skinner Phyllis Maye Estate	89,148
Smith Elsie Violet Estate	17,965
Smorgon Robert & Jack Family Foundation	395,871
Snow Freda Estate	63,957
Spence Frank Meldrum	36,455
Spencer Stanley L Estate	19,443
Stanbrough AE Estate	112,105
Stephens L Estate	116,648

Stevens SA Estate	132,878
Stevenson Dame Hilda Estate	95,158
Stewardson Family Trust	145,845
Stewart Jean Elma	89,598
Swingler Maxwell & Mary Bequests	2,691,341
Sydserff Charles SB Estate	17,691
Syme David Farnell Estate	1,027,727
Talbot P Estate	439,052
Taws M Estate	140,629
Taws GE Arthritis Fund	26,564
Taylor Sarah McQuillan Estate	65,456
Thomas JC Estate	323,736
Thompson O Estate	31,149
Thorpe Doris EB	96,033
Tink RM Estate	326,510
Tinkler VF Estate	63,054
Tomasetti John T Estate	446,903
Thompsom LW Estate	2,325,415
Tressider Edith Kathleen Estate	576,890
Trezise KW Estate	20,266
Tropical Diseases Fund	98,718
Turnbull JG Estate	82,658
Van Leeuwen GH Estate	499,624
Vincent-Smith IG Fund	201,651
Vogel Herta & FB Estate	14,216
Walker CM Estate	231,714
Walker Dorothy Hope Estate	2,476,471
Wallace Nancy Jeanie Estate	219,532
Walsh Dr William Butler Memorial Fund	906,099
Walter Ailsa Amy Mary Estate	171,499
Warnock EMC nee Riddle Estate	1,795,932
Watson MR Estate	16,094
Waxman Elizabeth H Estate	77,504
Wedge Erica Estate	355,483
Webb NJ Estate	285,459
Weeks Thelma Estate	14,582
Wekwerth Hilda Frances Estate	34,858
West John James Estate	107,829
Westcott Ita E Estate	22,639
White Morris G Estate	45,212
Wicks LR Estate	14,063
Williams AM Estate	93,142
Williams Irene E Estate	338,215
Wilson DE Estate	87,999
Wilson MML Estate	99,026
Wilson NF Estate	14,063
Wilson V M (Sunny) Estate	145,048
Wolstonecroft WW Estate	40,157
Wright Lynette Oreti Estate	203,722
Zillman Dudley V Estate	56,525

Fellowship and Scholarship Funds

Farrant Patricia & John Scholarship Fund	219,786
Harris Alan Scholarship Fund	95,315
JHA Munro Foundation	1,048,064
*Macphee Avis Permanent Fund	55,828
Mathison G C Research Scholarship	206,492
*Metcalf Donald Scholarship Fund	1,091,728
Moffatt Edith Scholarship Fund	2,065,513
*McPherson Family Centenary Fellowships	5,500,000

PhD Scholarship Funds

Carty EM Fund	435,489
Mackay Dr Ian Fund	340,442
Pearl Paddy Fund	1,523,583
*Speedy Pauline Scholarship Fund	549,675
Syme Colin Fund	2,156,644
Wilson Ed Memorial Fund	1,918,415
*The John and Margaret Winterbottom Bequest	700,307

Other Funds

Anonymous Seminar Award	20,930
Balderstone Award	46,213
*Begley - Scientific Integrity and Ethics	77,076
Gideon Goldstein Fund	1,512,107
Speedy Pauline Innovation Grant Fund	700,707

The following Estates in which the Institute had an interest, were managed during the year by Trustees. (Income received by the Institute in the financial period is treated similarly to donations and bequests):

CH Boden Memorial Trust

John Frederick Bransden Memorial Fund

Frank Broadhurst Estate

Thomas, Annie & Doris Burgess Charity Trust

Miss EM Drummond Estate

Frederick and Winifred Grassick Memorial Fund

Estate of Maxwell Gardiner Helpman

Estate of Shelia Mary Helpman

The Mackie Bequest

Irene and Ronald MacDonald Foundation

Albert H Maggs Charitable Trust

Mrs AM Reilly

Miss ML Reilly

The Stang Bequest

Emily Vera Winder Estate

Florence Mary Young Charitable Trust

Hazel and Pip Appel Fund

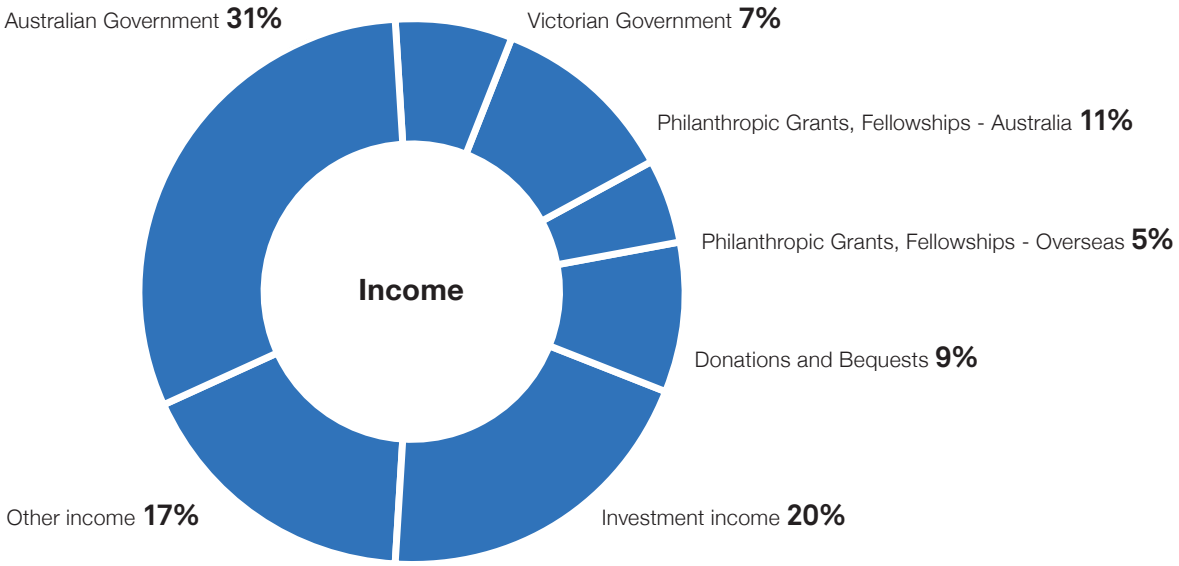
Leadership Fund

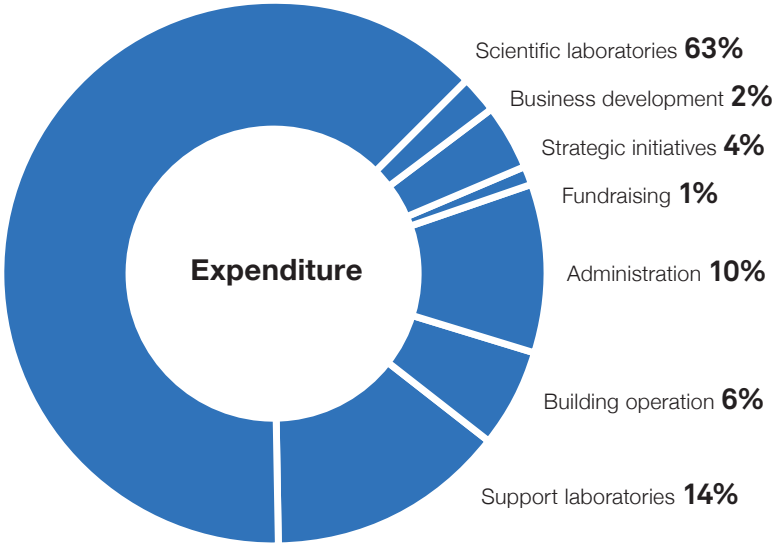
The Leadership Fund was established in honour of Professors Gustav Nossal, Donald Metcalf, Jacques Miller and Suzanne Cory to provide named Fellowships to nurture the development of outstanding young scientists with the potential to be future leaders of biomedical research. The Cory Fellowship is currently held by Misty Jenkins until 2021.

The Leadership Fund at 31 December 2018 included the following permanent funds ($10,000 and over):

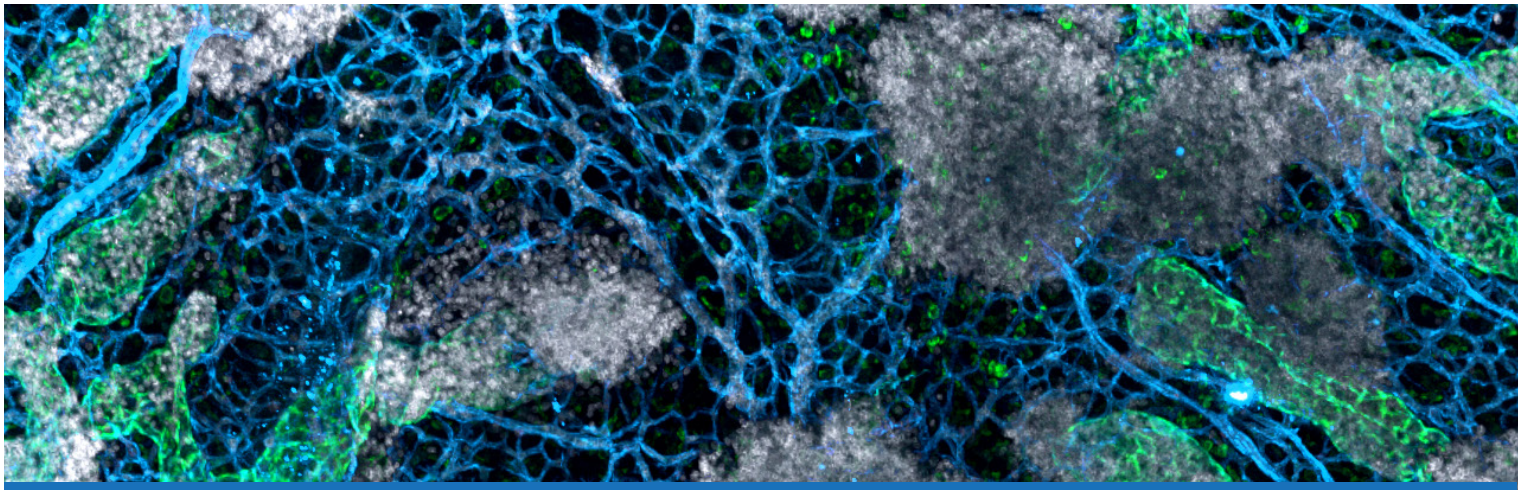
Sir Harold Dew and Family Estate	7,549,605
Chugai Pharmaceutical Co Ltd	1,571,428
The Ian Potter Foundation	1,571,428
L M Archibald Estate	1,047,619
Albert H Maggs Charitable Trust	1,024,734
Helen Macpherson Smith Trust	628,571
Anonymous	523,809
Anonymous	523,809
E Vaughan Moody Estate	523,809
The Broken Hill Proprietary Company Limited	523,809
J B Were & Son Charitable Fund	523,809
Eunice L Lambert Estate	515,277
Betty Eunice Stephens Estate	352,784
National Australia Bank	314,286
Victor Smorgon Charitable Fund	230,476
The Sidney Myer Fund	188,573
Leslie D W Stewart Estate	154,172
Joe White Bequest	142,477
Krongold Foundation Pty Limited	104,762
Professor Sir Gustav Nossal	104,762
The Scobie and Claire MacKinnon Trust	104,762
The R & J Law-Smith Gift	62,858
National Mutual Holdings Limited	62,858
Pacific Dunlop Ltd	62,858
Sheila R White Estate	61,977
Coles Myer Ltd	52,379
James Kirby Foundation	52,379
Arthur Andersen & Co Foundation	41,903
Arthur Robinson & Hedderwicks	41,903
H B Kay Estate	20,953
Stephelle Pty Ltd	20,953
C M Walter	20,953

The period at a glance (net monetisation)





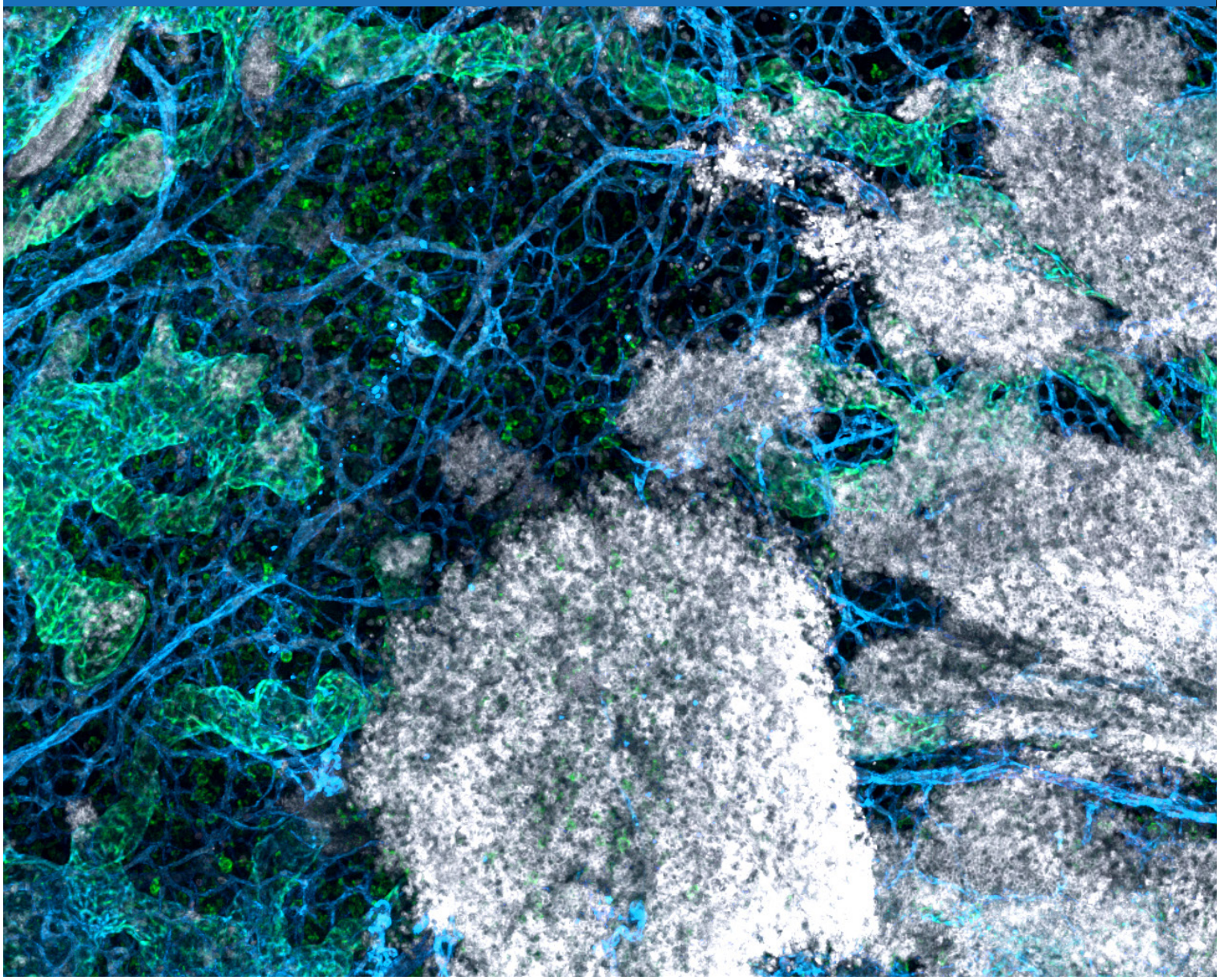
The Year In Brief	2018	2017
Income for operations	**141,671**	**447,247**
Expenditure in operations	**128,080**	**171,894**
Net surplus from operations	**13,591**	**275,353**
Number of staff and visiting scientists	**752**	**730**
Number of postgraduate students	**192**	**180**
Total staff and students (EFT)s	**944**	**910**



Walter+Eliza Hall
Institute of Medical Research

DISCOVERIES FOR HUMANITY

ANNUAL REPORT
2018 PUBLICATIONS



Publications

BIO	**Bioinformatics division**
CBD	**ACRF Chemical Biology division**
CHD	**Cancer and Haematology division**
CSCD	**Cell Signalling and Cell Death division**
DCD	**Development and Cancer division**
IMM	**Immunology division**
INF	**Infection and Immunity division**
INFL	**Inflammation division**
MGC	**Molecular Genetics of Cancer division**
MIMM	**Molecular Immunology division**
MMD	**Molecular Medicine division**
PHI	**Population Health and Immunity division**
SBD	**Structural Biology division**
SBPM	**Systems Biology and Personalised Medicine division**
SCC	**ACRF Stem Cells and Cancer division**

Number of Publications

Primary: 320

Review: 88

Book/Chapter: 9

Total: 417

Primary

1. Abayakoon P, Jin Y, Lingford JP, Petricevic M, John A, Ryan E, Wai-Ying Mui J, Pires DEV, Ascher DB, Davies GJ, Goddard-Borger ED, Williams SJ. Structural and biochemical insights into the function and evolution of sulfoquinovosidases. *ACS Central Science.* 2018 4(9):1266-1273. CBD

2. Abayakoon P, Lingford JP, Jin Y, Bengt C, Davies GJ, Yao S, Goddard-Borger ED, Williams SJ. Discovery and characterization of a sulfoquinovose mutarotase using kinetic analysis at equilibrium by exchange spectroscopy. *Biochemical Journal.* 2018 475(7):1371-1383. CBD

3. Achuthan A, Aslam ASM, Nguyen Q, Lam PY, Fleetwood AJ, Frye AT, Louis C, Lee MC, Smith JE, Cook AD, Olshansky M, Turner SJ, Hamilton JA. Glucocorticoids promote apoptosis of proinflammatory monocytes by inhibiting ERK activity. *Cell Death & Disease.* 2018 9(3):267. INFL

4. Agarwal R, Chan YC, Tam CS, Hunter T, Vassiliadis D, Teh CE, Thijssen R, Yeh P, Wong SQ, Ftouni S, Lam EYN, Anderson MA, Pott C, Gilan O, Bell CC, Knezevic K, Blombery P, Rayeroux K, Zordan A, Li J, Huang DCS, Wall M, Seymour JF, Gray DHD, Roberts AW, Dawson MA, Dawson SJ. Dynamic molecular monitoring reveals that SWI-SNF mutations mediate resistance to ibrutinib plus venetoclax in mantle cell lymphoma. *Nature Medicine.* 2019 25(1):119-129. (epub 2018 Nov 19) IMM MGC CHD

5. Agthe M, Brugge J, Garbers Y, Wandel M, Kespohl B, Arnold P, Flynn CM, Lokau J, Aparicio-Siegmund S, Bretscher C, Rose-John S, Waetzig GH, Putoczki T, Grotzinger J, Garbers C. Mutations in craniosynostosis patients cause defective Interleukin-11 receptor maturation and drive craniosynostosis-like disease in mice. *Cell Reports.* 2018 25(1):10-18 e15. INFL

6. Akinduro O, Weber TS, Ang H, Haltalli MLR, Ruivo N, Duarte D, Rashidi NM, Hawkins ED, Duffy KR, Lo Celso C. Proliferation dynamics of acute myeloid leukaemia and haematopoietic progenitors competing for bone marrow space. *Nature Communications.* 2018 9(1):519. IMM

7. Alhallaf R, Agha Z, Miller CM, Robertson AAB, Sotillo J, Croese J, Cooper MA, Masters SL, Kupz A, Smith NC, Loukas A, Giacomin PR. The NLRP3 inflammasome suppresses protective immunity to gastrointestinal helminth infection. *Cell Reports.* 2018 23(4):1085-1098. INFL

8. Almeida ACG, Kuehn A, Castro AJM, Vitor-Silva S, Figueiredo EFG, Brasil LW, Brito MAM, Sampaio VS, Bassat Q, Felger I, Tadei WP, Monteiro WM, Mueller I, Lacerda MVG. High proportions of asymptomatic and submicroscopic *Plasmodium vivax* infections in a peri-urban area of low transmission in the Brazilian Amazon. *Parasites & Vectors.* 2018 11(1):194. PHI

9. Almeida FF, Tognarelli S, Marçais A, Kueh AJ, Friede ME, Liao Y, Willis SN, Luong K, Faure F, Mercier FE, Galluso J, Firth M, Narni-Mancinelli E, Rais B, Scadden DT, Spallotta F, Weil S, Giannattasio A, Kalensee F, Zöller T, Huntington ND, Schleicher U, Chiocchetti AG, Ugolini S, Herold MJ, Shi W, Koch J, Steinle A, Vivier E, Walzer T, Belz GT, Ullrich E. A point mutation in the Ncr1 signal peptide impairs the development of innate lymphoid cell subsets. *OncoImmunology.* 2018 7(10):e1475875. MIMM MGC BIO

10. Ameratunga R, Woon ST, Bryant VL, Steele R, Slade C, Leung EY, Lehnert K. Clinical implications of digenic inheritance and epistasis in primary immunodeficiency disorders. *Frontiers in Immunology.* 2017 8:1965. IMM

11. Anania JC, Trist HM, Palmer CS, Tan PS, Kouskousis BP, Chenoweth AM, Kent SJ, Mackay GA, Hoi A, Koelmeyer R, Slade C, Bryant VL, Hodgkin PD, Aui PM, van Zelm MC, Wines BD, Hogarth PM. The rare anaphylaxis-associated FcgammaRIIa3 exhibits distinct characteristics from the canonical FcgammaRIIa1. *Frontiers in Immunology.* 2018 9:1809. IMM

12. Anderton H, Bandala-Sanchez E, Simpson DS, Rickard JA, Ng AP, Di Rago L, Hall C, Vince JE, Silke J, Liccardi G, Feltham R. RIPK1 prevents TRADD-driven, but TNFR1 independent, apoptosis during development. *Cell Death and Differentiation.* 2019 26(5):877-889. (epub 2018 Sep 5) CSCD PHI INFL CHD

13. Andreani V, Ramamoorthy S, Pandey A, Lupar E, Nutt SL, Lammermann T, Grosschedl R. Cochaperone Mzb1 is a key effector of Blimp1 in plasma cell differentiation and β1-integrin function. *Proceedings of the National Academy of Sciences of the United States of America.* 2018 115(41):E9630-E9639. MIMM

14. Annibaldi A, Wicky John S, Vanden Berghe T, Swatek KN, Ruan J, Liccardi G, Bianchi K, Elliott PR, Choi SM, Van Coillie S, Bertin J, Wu H, Komander D, Vandenabeele P, Silke J, Meier P. Ubiquitin-mediated regulation of RIPK1 kinase activity independent of IKK and MK2. *Molecular Cell.* 2018 69(4):566-580.e565. CSCD

15. Ansell BRE, Pope BJ, Georgeson P, Emery-Corbin SJ, Jex AR. Annotation of the *Giardia* proteome through structure-based homology and machine learning. *GigaScience.* 2019 8(1):giy150,110.1093/gigascience/giy1150. (epub 2018 Dec 6) PHI

16. Anstee NS, Bilardi RA, Ng AP, Xu Z, Robati M, Vandenberg CJ, Cory S. Impact of elevated anti-apoptotic MCL-1 and BCL-2 on the development and treatment of MLL-AF9 AML in mice. *Cell Death and Differentiation.* 2018 Nov 23. (epub ahead of print) MGC CHD

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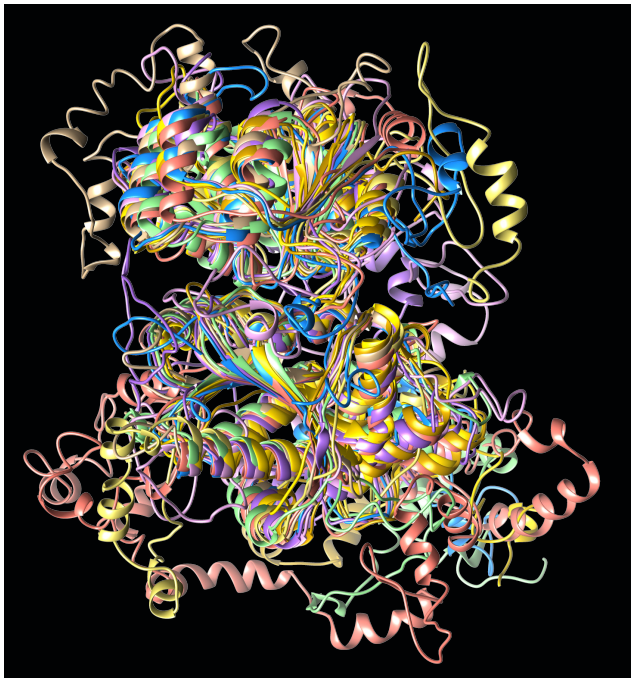
Cover image

The cover features *Art of Science* finalists Dr Brendan Ansell (centre left), Dr Alison Farley (centre right) and Mr Balu Balan (far right), with Mr Balan's PhD co-supervisor Dr Samantha Emery (far left).

Gobstopper by Dr Brendan Ansell, Mr Balu Balan and Associate Professor Aaron Jex

This image shows the overlapping structures of several proteins that transform the *Giardia* parasite into a dormant cyst stage. *Giardia* is a prevalent cause of diarrhoea, particularly in children in developing countries. Cysts are the infectious form of the parasite, surviving for long periods in food, soil and water. Our researchers are using these protein structures to identify ways to prevent *Giardia* cysts from forming, potentially halting transmission of the parasite.



Bird's eye view by Dr Alison Farley

Networks of blood vessels (blue) and lymphatic vessels (green) are found throughout the body. Dr Farley, who works with Dr Samir Taoudi, is studying how platelets – cells that help blood to clot – aid vessel development. Normally blood and lymphatic vessels separate during development, but without platelets this process goes awry. As a result, lymphatic vessels fill with blood (white), they rupture, and blood spills across the tissue.