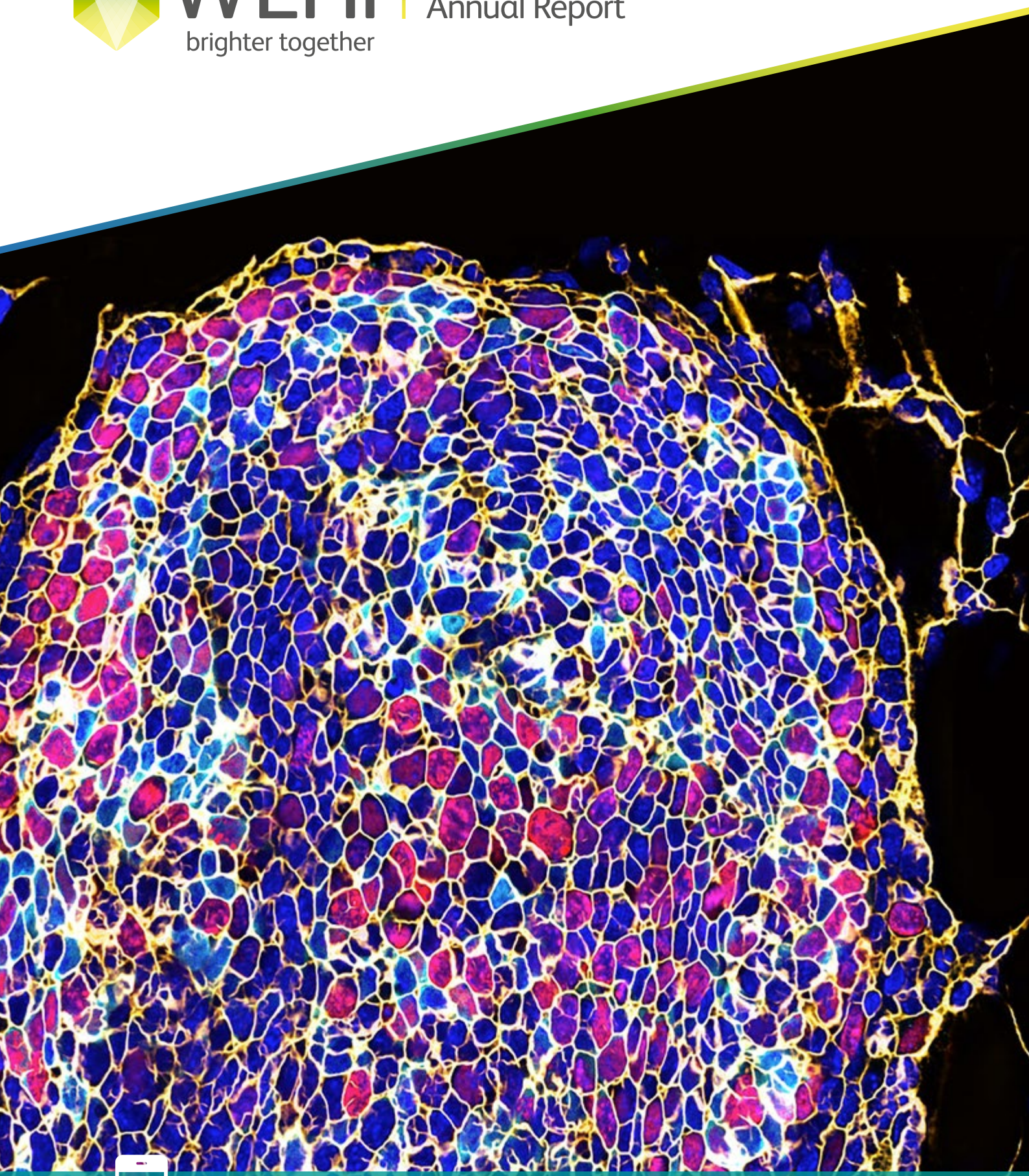
WEHI

brighter together

2021 Annual Report



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Produced by WEHI'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 WEHI

WEHI is where the world's brightest minds collaborate and innovate to make discoveries that will help us to live healthier for longer.

Our medical researchers have been serving the community for more than 100 years, making transformative discoveries in cancers, infectious and immune diseases, developmental disorders and healthy ageing. From complex, long-term medical problems to critical health challenges, we shine a light on the most pressing needs of the community.

At WEHI, we bring together people with different skills and expertise, working together for 10, 20 or even 50 years to solve some of the world's most complex health problems.

The spirit of collaboration is in our DNA. WEHI was established by a partnership between the University of Melbourne, The Royal Melbourne Hospital and the Walter and Eliza Hall Trust, bringing together the brightest research minds from across the globe, remarkable clinicians focused on the health of the community and the power of philanthropy.

Our passion for improving lives drives us forward, even when breakthroughs are decades in the making. These are the ingredients that make us special; shaping scientific thought, improving the health of the community and making WEHI a collaborative and energetic place to work.

We are driven by collaboration, curiosity and creativity. We are brighter because of our collaborations with hospitals, universities, research institutes and industry, because we have the support of our community, including philanthropists, donors, bequestors, alumni and consumers.

We are committed to making a positive difference to the lives of people in Australia and around the world. We are WEHI. We are brighter together.

Our research

Cancer – understanding the basic processes that are disrupted to generate cancer cells, and how these can be targeted to treat disease.

Immune health and infection – discovering how the body fights infection, and how errors in the immune system lead to disease.

Development and healthy ageing – studying how the biological foundations laid down during gestation and childhood affect development, and how our longer life expectancy presents new challenges for our ageing population.

New medicines and advanced technologies – a powerful hub for cutting-edge technologies underpinning biomedical discoveries and for the translation of these discoveries into new medicines and diagnostics.

Computational biology – developing and applying new tools to analyse the genomes of disease-causing parasites, as well as better understanding the immune system and genetic drivers of cancer.

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

Welcome to WEHI's 2021 *Annual Report*. You will see in this report that we have many new and exciting developments, partnerships and research advancements to celebrate. I am so proud of WEHI's staff, students and collaborators – all of whom have embraced 2021 with remarkable conviction and focus, despite the challenges posed by the continuing COVID-19 pandemic. This has been another year of exceptional work carried out under exceptional circumstances.

The advances WEHI has made in biomedical research to progress positive outcomes for patients would not have been possible without the Institute's strong supporter base. To our longstanding and loyal donors, and to those new to the WEHI community, thank you for your confidence in our institution and in our people. I am thrilled to report the Institute has had a record year for fundraising and philanthropy, generating vital funds to progress several important research programs.

In addition to our research efforts, WEHI is committed to advocate for the mitigation of global warming and this year, WEHI's Board endorsed our first Environmental Management and Sustainability Strategy 2021-2023. We committed to achieving carbon neutrality, reducing greenhouse gas emissions associated with our operations and enabling research that will address the health impacts of climate change. I am proud of the contribution WEHI is making on matters of national and global importance.

I would like to extend my sincere thanks to retired WEHI Board Vice President Mr Terry Moran AC for two years as Board Vice President and almost a decade of service on the Board. Terry brought experience in philanthropy, government relations and policy development to the table and his wise counsel has been invaluable. I am pleased that standing member Professor Sir John Savill became Vice President in March 2021 and has very capably carried on the impressive efforts of Terry.

I would also like to extend a warm welcome to Professor Jane Gunn and Mr Kee Wong who joined the Board in February and July respectively.

Jane, our new University of Melbourne representative, and the new Dean of the Faculty of Medicine, Dentistry and Health Sciences, is an accomplished clinician-researcher who will support WEHI to strengthen translational research capabilities.

Kee is an entrepreneur with expertise in start-ups and has established successful businesses across multiple industries and countries. As WEHI looks to increasingly leverage an entrepreneurial mindset in its activities, I look forward to Kee's contribution in this area.

Our WEHI family is known for its enduring relationships where past staff and students remain connected with WEHI long after they leave. In 2021 we celebrated a special anniversary – the 90th birthday of Sir Gustav Nossal AC, WEHI Honorary Governor and Patron and former Director (1965–1996). Sir Gustav Nossal is one of Australia's most distinguished scientists and has made an enormous contribution to medical research and Australian cultural life.

Having seen what we've been able to achieve during these uncertain times, my deep admiration and gratitude goes out to the entire WEHI community – from our international staff and students unable to visit their families, to our safety teams, who have worked tirelessly, and right across our research and professional services teams – I personally thank you for your passion, resilience and commitment.

My warmest wishes to our supporters and collaborators as we look forward to 2022. Stay safe and well.

Mrs Jane Hemstritch
President, WEHI

Director's report

It is always a great privilege to share what we have achieved as an organisation. I am in awe of the sheer drive and productivity demonstrated by WEHI's scientists, staff and students and I continue to be inspired by the passion of our collaborators and supporters.

Our researchers, enabled by our professional services teams, have published and communicated many hundreds of scientific papers and news stories. Throughout this report you will find examples of these such as potential new therapies for COVID-19 on pages 14 and 15, a discovery that could fast-track new treatments for Parkinson's disease on page 16 and some great outcomes for cancer patients, resulting from collaborations with our bioinformaticians, such as those on pages 21 and 25.

Reflecting on WEHI's tagline 'brighter together,' we have many exciting new ventures underway as we work to address unmet health needs. A highlight for me has been a new multidisciplinary initiative to tackle brain cancer – a devastating cancer with poor outcomes that have barely improved in decades. Founded by Carrie's Beanies 4 Brain Cancer and established in partnership with WEHI, in October we launched The Brain Cancer Centre. With support from the Victorian Government and partner organisations, our aim is to bring together Australia's brightest brain cancer researchers, with consumers and supporters, to end brain cancer as a terminal illness.

Leveraging our entrepreneurial spirit, WEHI and longstanding collaborator CSL have joined forces to establish the Centre for Biologic Therapies which aims to accelerate development of new medicines, addressing a significant gap in Australian research translation. WEHI also announced plans to create an incubator for biotech start-ups in partnership with CSL and the University of Melbourne. Supported by the Victorian Government through Breakthrough Victoria, this will be Australia's first incubator co-located with a leading biopharmaceutical company and help to translate research into positive outcomes for patients, as well as creating new businesses and in turn high-quality jobs.

The support WEHI receives from donors and philanthropists is critical to progressing our research program and this year WEHI received generous bequests from a number of WEHI supporters listed on page 12, including the Estate of Lesley Patricia Farrant and the Estates of John Thompson and Mary Helena Thompson featured on page 8.

While we could not physically welcome our supporters to WEHI for much of 2021, we were pleased to engage online with many of you. At our COVID-19 Q&A panel event, researchers shared insights into WEHI's COVID-19 research and the impact of COVID-19 and variants such as Omicron. We showcased WEHI as part of Open House Melbourne and held our annual *Art of Science* exhibition online for the first time. We also virtually welcomed inspiring guest speakers, such as blood cell researcher Professor Louise Purton for International Day of People with Disability, infectious diseases specialist Dr Kudzai Kanhutu for International Women's Day and Corey Tutt, CEO and founder of DeadlyScience, to deliver our National Reconciliation Week address.

Thank you to our extended WEHI family for your support and encouragement throughout the year. I hope that in 2022 we will be able to safely welcome you back to WEHI to meet our scientists and learn more about our latest research. Given the challenges of the past two years, it will be particularly meaningful to reconnect.

Professor Doug Hilton AO
Director, WEHI

Many minds. One focus.

A shared vision to end brain cancer as a terminal illness comes to life through the establishment of The Brain Cancer Centre.

United effort to end brain cancer

Brain cancer is a devastating illness and currently there is no cure. Brain cancer kills more children in Australia than any other disease, and more people under 40 than any other cancer. Eighty per cent of patients diagnosed with brain cancer will die within five years. Survival rates have barely changed in 30 years.

The Brain Cancer Centre was founded by Carrie's Beanies 4 Brain Cancer and established in partnership with WEHI.

Launched in October 2021, the Centre brings together the brightest medical research minds to end brain cancer as a terminal illness. Their focus will be to collaborate and translate their research discoveries into new treatments and trials so that patients diagnosed with brain cancer are given real hope.

The two organisations have been working closely together for many years, with a focus on investing in vital brain cancer research and with a shared vision: that one day no lives will be lost to brain cancer.

"Our shared aim is to develop new treatments that will be more effective and have fewer side-effects."

The Brain Cancer Centre was established with an initial commitment of $40 million, including a foundational gift from Carrie's Beanies 4 Brain Cancer, made possible thanks to the generosity of its donors and supporters. The remaining funding includes a $16 million commitment from the Victorian Government and additional support from WEHI and partner organisations.

Shared vision comes to life

WEHI Director and Head of The Brain Cancer Centre Professor Doug Hilton AO said improving outcomes for children and adults with brain cancer required a sustained, coordinated and long-term commitment to collaborative research and discovery.

"It will enable us to attract the best new talent and build our local capabilities in brain cancer research and translation to develop new treatments that will be more effective with fewer side-effects, improving quality of life," he said.

"The Brain Cancer Centre will provide the increased momentum and collaboration needed to take our vision of ending brain cancer as a terminal illness and make it a reality."

"By combining the scientific knowledge and clinical expertise of Australia's top brain cancer researchers and training the next generation of leading brain cancer experts, the Centre will have the best chance of making the long-term and transformative discoveries that will have a real impact on brain cancer patients, now and in the future."

Below: (from left) The Hon Jaala Pulford, Dr Jim Whittle, Carrie Bickmore, Associate Professor Misty Jenkins, Professor Doug Hilton

When Carrie's Beanies 4 Brain Cancer founder Carrie Bickmore OAM started her fundraising mission in 2015, her vision was to raise awareness and much-needed funding for vital brain cancer research.

Ms Bickmore said she was excited to see The Brain Cancer Centre brought to life after years of fundraising efforts.

"We want to see a day come when no family has to lose someone they love to brain cancer. We want to make sure that every Australian diagnosed with brain cancer will have access to the best treatments and be given real hope for a positive outcome."

"Establishing The Brain Cancer Centre is only possible because of the generosity of Australians who supported Carrie's Beanies 4 Brain Cancer and bought a beanie, held a fundraiser or donated," she said.

"We want to see a day come when no family has to lose someone they love to brain cancer. We want to make sure that every Australian diagnosed with brain cancer will have access to the best treatments and be given real hope for a positive outcome.

"I truly believe that together, we can achieve this."

Improving patient outcomes

Delivering on this vision requires a sense of urgency to improve patient outcomes and a commitment to long-term research that will provide life-saving treatments for future generations.

To be successful, a radically different approach to research is required. The shared aim is to develop a system that:

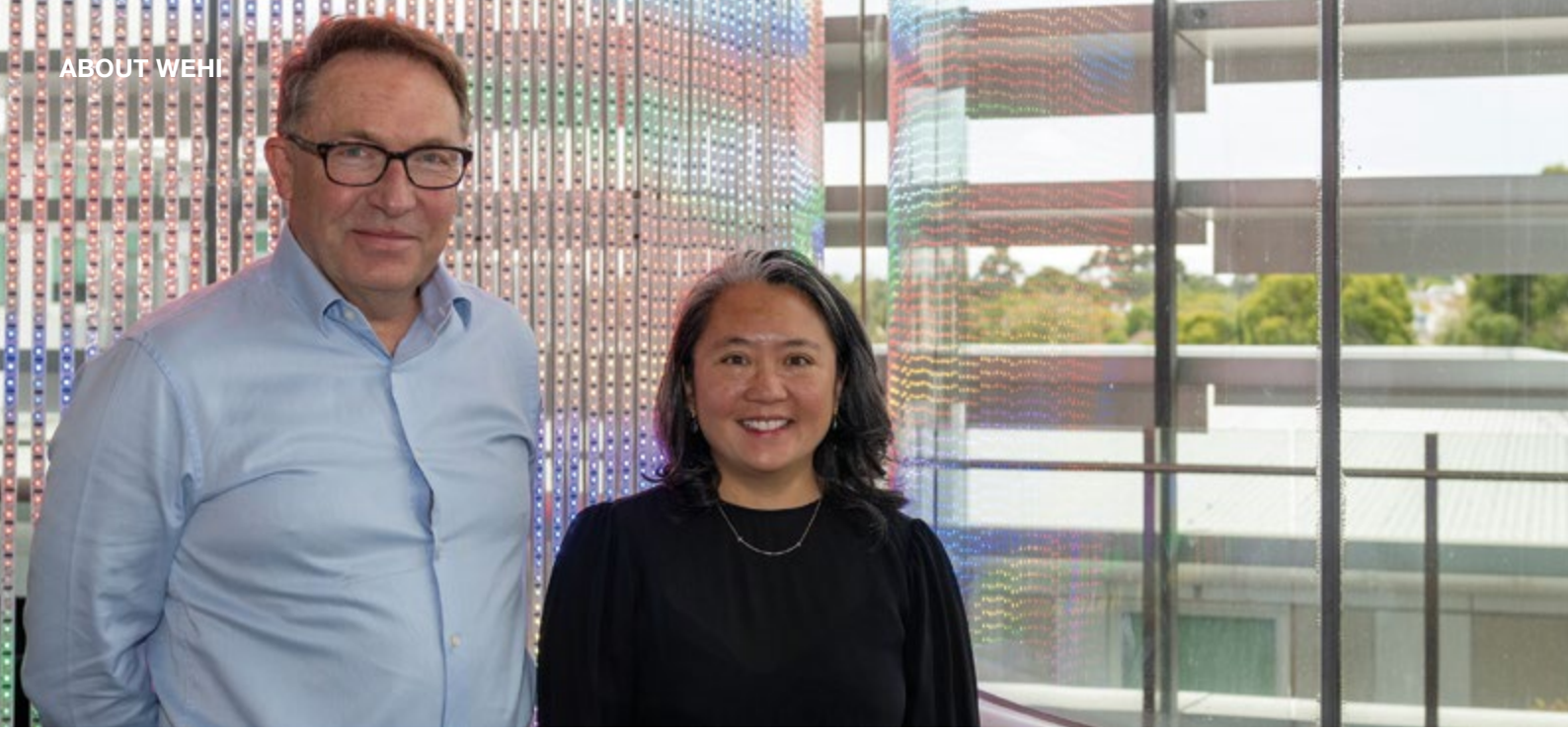
- has critical mass, significant funding, researchers and momentum driving us towards our mission;
- is comprehensive, spanning discovery, translational research, clinical trials, data and tissue and quality-of-life research;
- is collaborative, harnessing the expertise of multidisciplinary teams of scientists (biologists, chemists, mathematicians, computer scientists and technologists) and clinicians (oncologists, surgeons, radiation oncologists and immunotherapy specialists);
- is collegial, where up and coming researchers are attracted into the field to be inspired and mentored by experienced scientists; and
- is committed to long-term research underpinned by continuous funding.

The Brain Cancer Centre includes research collaborations between WEHI, Peter MacCallum Cancer Centre, The Royal Melbourne Hospital, the Royal Children's Hospital, Murdoch Children's Research Institute, Monash University, the University of Queensland and the Victorian Comprehensive Cancer Centre.

The Brain Cancer Centre will continue to drive outcomes in partnership with the Australian Brain Cancer Mission and Cancer Australia.

www.thebraincancercentre.org.au

Below: Brain cancer researcher Associate Professor Misty Jenkins (centre) with PhD Students Rebecca Abbott (right) and Hannah Hughes-Parry (left).



At the forefront of Australian biologics drug discovery

In an exciting new partnership with one of the world's leading biotech companies and our long-term collaborator, CSL, WEHI has launched the Centre for Biologic Therapies.

The transformational world of biologic therapies

Biologics are made in living systems and encompass a wide range of therapies including monoclonal antibodies, vaccines and cell therapies. Biologic therapies have had a transformational impact on preventions and treatments for cancer, inflammatory and immunological disorders and infectious diseases – most recently SARS-CoV-2.

The new centre combines WEHI's expertise in immunology, cancer, inflammatory disorders and infectious diseases with CSL's world-class human antibody library and experience in biologic drug discovery and development.

Based at WEHI, the Centre will provide access to expert biologic discovery and optimisation capabilities, accelerating drug development into the clinic, and ultimately addressing a current gap in Australian medical research.

The Centre aims to generate therapeutic antibodies against new targets in human disease. It complements WEHI's National Drug Discovery Centre by offering multiple translational paths for therapeutic and diagnostic discoveries.

The partners will contribute equal funding to the Centre, with a combined investment of $10 million for the next five years.

Expanding translation capability

WEHI director Professor Doug Hilton said the expansion to biologic therapeutic development capabilities that the Centre will provide will strengthen WEHI's existing translational capacity in small molecule drug discovery.

"The Centre is part of WEHI's commitment to collaborative, innovative research for discovery and clinical translation to improve disease prevention, diagnosis and treatment," he said.

"The current COVID-19 pandemic has shown us the great need for these types of facilities, which have helped us expedite the development of anti-viral treatments."

Local facility with a global impact

CSL's chief scientific officer, Dr Andrew Nash, said the effective translation of local discoveries into novel therapies for patients was vitally important.

"This expansion of our relationship with WEHI will help ensure that the long-term investment of public funds into medical research in Australia is translated into treatments, benefiting both patients and the Australian economy," he said.

"The Centre will offer a place of learning and bespoke training opportunities for the next generation of promising Australian scientists – the future of Australia's biologics workforce."

The development of the Centre for Biologic Therapies was made possible with the assistance of philanthropic support from the Estates of John Thompson and Mary Helena Thompson.

Above: Professor Ian Wicks (left) and Professor Wai-Hong Tham (right) are heading up WEHI's new Centre for Biologic Therapies.

New cancer strategy wins 2021 Victoria Prize

Congratulations to Professor Anne Voss and Associate Professor Tim Thomas for being jointly awarded the Victoria Prize for Science and Innovation in Life Sciences.

The $50,000 prize honours the duo's work that led to a new cancer treatment approach that doesn't trigger the harmful side-effects caused by conventional cancer treatments, such as chemotherapy and radiation.

Their work uncovered key functions of the MYST family of proteins – which includes oncogenes – and validated the proteins as novel targets for anti-cancer therapeutics.

They then worked with a collaborative team of 52 researchers from the Cancer Therapeutics CRC, Monash Institute of Pharmaceutical Sciences, CSIRO and St Vincent's Institute of Medical Research to develop a new type of anti-cancer compound that that puts cancer cells into a 'permanent sleep'.

The collaboration with the Cancer Therapeutics CRC yielded compounds that are now licenced to Pfizer with clinical trials that commenced in late 2020.

Above: Associate Professor Tim Thomas (left) and Professor Anne Voss (right)

Transformative acts of generosity

Generous gifts in Wills made to WEHI in 2021 are supporting our researchers in their vital work and facilitating an environment for transformative discoveries to be made.

Supporting WEHI at the cutting-edge of science

A $26 million gift from the Estate of Lesley Patricia Farrant will supercharge an area of ever-growing importance in health and medical science: data research. The funds from the 2021 bequest are strengthening computer science capabilities at WEHI, including in the areas of artificial intelligence and machine learning.

Lesley Patricia Farrant (Pat) passed away in 2019 at nearly 100 years of age. Pat and her late husband John Farrant had a passion for medical research and were dedicated and treasured supporters of WEHI.

"Pat and John would be so proud of the impact their gift will have on the future of medical research at WEHI, as was their intention."

According to joint executors of the Estate, Mr Peter Walsh and Mrs Norma Graves, John had worked at the CSIRO as a research scientist in the electron microscopy group, so an investment in supporting innovative and high impact scientific technologies is the ideal legacy for Pat and John.

"Pat and John would be so proud of the impact their gift will have on the future of medical research at WEHI, as was their intention," said Mrs Norma Graves.

Sibling legacy bolsters drug discovery

The development of Australia's new Centre for Biologic Therapies, based at WEHI, was made possible through $15 million in philanthropic support from the Estates of John Thompson and Mary Helena Thompson.

In October 2021, WEHI and its longstanding collaborator CSL announced a new centre that will revolutionise the treatment of cancer, inflammatory and immunological disorders, and infectious diseases including SARS-CoV-2. Read more about biologic therapies and the collaborative centre on page 6.

John Thompson and Mary Thompson were siblings who lived in Tamworth, NSW. The pair were very close and had no living relatives.

Mr Stephen Peel, executor of their Estates, said John and Mary had supported numerous charities in their lifetimes.

"John, the absolute gentleman, looked after the farm, Mary looked after the accounts, and they both looked after each other. They were wonderful people, and their legacy will have far-reaching impact."

WEHI director Professor Doug Hilton said philanthropic support elevates the Institute's ability to produce leading research, enabling investment in innovative new technologies that can be harnessed to deepen our understanding and find new treatments for disease.

"We're incredibly grateful to have funding from these Estates to accelerate discoveries and improve health outcomes," he said.

Below: Mary Thomson

Melbourne biotech incubator to drive medical advancements

An incubator for Australian biotech start-ups, to translate promising medical research into outcomes for patients, is coming soon to Melbourne's Biomedical Precinct.

Raising the biotech bar

Incubators reduce barriers for start-ups through an affordable 'one-stop shop' that provides access to technical support and sophisticated technology platforms, which can be expensive and cost-prohibitive for small companies.

WEHI, global biotech leader CSL, and the University of Melbourne have joined forces to create an incubator and commercial wet-lab space to help grow early-stage biotech companies. Scheduled to open in 2023, the incubator will accommodate up to 40 companies from across Australia.

The incubator will be located at CSL's new global corporate headquarters currently under construction in the Melbourne Biomedical Precinct in Parkville.

The $95 million project is backed by financial and in-kind support from WEHI, the University of Melbourne, CSL, together with investment partner Breakthrough Victoria, the independent investment manager of the Victorian Government's landmark $2 billion Breakthrough Victoria Fund.

Start-ups that are incubated have a much higher five-year survival rate and accelerated growth trajectory compared with standalone entities.

The new incubator will be open to applications from small biotech companies who have engaged in early research and are seeking to take their discoveries to the next stage of development.

A nurturing ecosystem

In addition to affordable, state-of-the-art wet-lab facilities, equipment and office space, the incubator will provide a range of services including commercialisation education programs, facilitated access to investors, industry mentoring and access to service providers.

"The new incubator will help to build a generation of corporate and management-skilled scientists."

WEHI director Professor Doug Hilton said the challenges facing research scientists when they spin out a company or biomedical start-up included skill gaps in translating their research into commercial products.

"The new incubator will help to build a generation of corporate and management-skilled scientists who have the knowledge and confidence to run a successful biomed or biotech company and raise the calibre and accelerate translational outputs from the Melbourne Biomedical Precinct."

The incubator will advance the Victorian biomedical ecosystem and boost Australia's commercialisation outputs.

Above: Located over two floors of CSL's new corporate headquarters being built in the Melbourne Biomedical Precinct, the incubator will have one floor of purpose-built wet-lab space and another for meetings and office space.

Our supporters

The supporters who make our discoveries possible.

The advances in medical science at WEHI are made possible by our generous supporters. We are proud to acknowledge these gifts, grants and bequests received from 1 January to 31 December 2021. Gifts of $1,000 or more are acknowledged, unless otherwise requested by our donors.

WEHI 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.

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Agnes Maude Reilly Charitable Trust
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International grants

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Friedrich's Ataxia Research Alliance
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Ludwig Institute for Cancer Research
Michael J. Fox Foundation for Parkinson's Research
National Institute of Health, US
Rivkin Center
The International Human Frontier Science Program Organization
Wellcome
World Health Organization
Worldwide Cancer Research

Australian Government grants

Australian Academy of Science
Australian Centre for HIV And Hepatitis Virology
CSIRO
Medical Research Future Fund
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Victorian grants

Victorian Cancer Agency
Victorian Comprehensive Cancer Centre
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Australian grants

Amelia Eliza Holland Trust
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Exceptional science and people

Laboratory head and immunologist Dr Vanessa Bryant is a lead investigator on WEHI's COVID PROFILE study, examining how the immune system responds to infection with COVID-19 over time.

Multidisciplinary response to combat COVID-19

WEHI's expertise in infectious diseases, immunology, bioinformatics and drug discovery are fuelling our efforts to find much-needed treatments, rapid diagnostic tools and optimal vaccine strategies for COVID-19.

Identifying new antibody therapies

Scientists from WEHI and the Doherty Institute last year found monoclonal antibodies that blocked the SARS-CoV-2 virus from entering cells – the first step in the infection cycle – in preclinical models of COVID-19 infection. Antibodies are naturally occurring proteins that play a crucial role in our immune system's ability to recognise and fight infections.

"Our research indicates these monoclonal antibodies are leading candidates to be developed into a treatment for COVID-19," said Professor Wai-Hong Tham, who co-led the study.

Monoclonal antibodies have emerged as powerful therapeutics both to prevent and treat a range of diseases including cancer, inflammatory and autoimmune conditions.

The treatment could be particularly useful in preventing severe COVID-19 disease in older people, and those who are immunocompromised and unable to mount a robust immune response from vaccination.

This research is part of a consortium-led effort bringing together Australian academic and industry leaders in infectious diseases and antibody therapeutics at WEHI, the Doherty Institute, the Burnet Institute, the Kirby Institute, CSL, Affinity Bio and CSIRO.

Nanobodies inhibit SARS-CoV-2 infection

In another research paper published last year, WEHI researchers identified neutralising nanobodies that block the SARS-CoV-2 virus from entering cells in preclinical models.

The discovery paves the way for further investigations into nanobody-based treatments for COVID-19. Nanobodies – tiny immune proteins – could provide an alternative to conventional antibody treatments.

The research combines the expertise of Australian academic leaders in infectious diseases and antibody therapeutics at WEHI, the Doherty Institute and the Kirby Institute.

By mapping the nanobodies, the researchers identified a nanobody that recognised the SARS-CoV-2 virus, including emerging global variants of concern. The nanobody also recognised the original SARS-CoV virus (which causes SARS), indicating it may provide cross-protection against these two human coronaviruses.

Professor Wai-Hong Tham, who led the research, said the establishment of a nanobody platform at WEHI allowed an agile response for the development of antibody-based therapies against COVID-19. "These could prove effective against future coronaviruses," she said.

Biomarkers suggest severity

Excessive inflammation in the lungs is a serious and potentially deadly complication in people with COVID-19. WEHI computational biology researchers and collaborators have discovered biomarkers that could assist in the early identification of people at high risk of developing severe COVID-19.

The scientists joined forces with researchers at The University of Queensland, Queensland University of Technology and Hospital Marcelino Champagnat in Curitiba, Brazil, to lead the study, which used new spatial transcriptomic technologies to study COVID-19 infection.

WEHI computational biologist Dr Chin Wee Tan said the presence of the *IFI27* gene was a reliable prediction of disease progression and is strongly associated with severe lung inflammation – a key indicator of severe COVID-19.

"When a patient presents to a clinic, we could assess how severe their symptoms will become by measuring the *IFI27* levels in the blood – regardless of the symptoms they're presenting."

These findings have the potential to revolutionise the way patients are treated and alleviate pressure on the nation's healthcare system. WEHI researchers are now in an international effort to translate the research into a diagnostic test.

Study probes immunity

People who have recovered from COVID-19, and their close contacts, could hold the key to understanding how immunity to the disease develops, how long it lasts and what happens when immunity is lost.

Study investigator Dr Vanessa Bryant said understanding immunity to COVID-19 was vital for developing vaccination and booster strategies for the community, as well as targeted strategies that may be needed for vulnerable groups.

"WEHI's COVID PROFILE study follows immune responses in adult COVID-recovered or vaccinated volunteers for 12 months. Our aim is to understand the duration of protective immunity to the virus and new variants, and to establish factors that contribute to both protective and waning responses.

A major area of work is measuring virus-specific antibody responses over time to current and emerging variants of concern and linking this data with national modelling efforts.

"Our research will help to identify the most vulnerable groups for targeted vaccination or booster strategies, and where early therapeutic interventions will be essential."

Wastewater reveals high-risk variants

Wastewater testing has been described as a 'game-changer' in Victoria's efforts to reduce the spread of SARS-CoV-2. It has led to the confirmed identification of previously undetected infection clusters throughout regional Victoria and metropolitan Melbourne.

Associate Professor Aaron Jex and his lab have played a key role in Victoria's wastewater testing programs for SARS-CoV-2, including developing new methods used to confirm the presence of viral fragments in test positive samples and working with the Victorian Department of Health to determine how to use this information in the public health response.

This program is also undertaking targeted surveillance for emerging, high-risk viral variants developing overseas, aiming to help prevent their introduction into Australia.

The Jex lab is leading efforts to develop and implement sensitive methods to identify these high-risk viral variants. Collaborating with the Victorian Department of Health, the Victorian water industry and commercial and non-profit organisations, these methods will be used in quarantine hotels and international ports of entry.

Antivirals target coronavirus machines

The coronavirus produces its own machinery in our cells to survive and thrive upon infecting us. Stopping these viral machines with a drug would kill the virus and curb infection.

WEHI researchers are engaged in drug discovery campaigns to discover new drug-like compounds to inhibit viral machines directly. Focusing on two coronavirus proteins named PLpro and Mpro, they have screened 800,000 new compounds since 2020 to identify new drugs for COVID-19. Such medicines would treat, but also prevent, COVID-19 and would be complementary to vaccines.

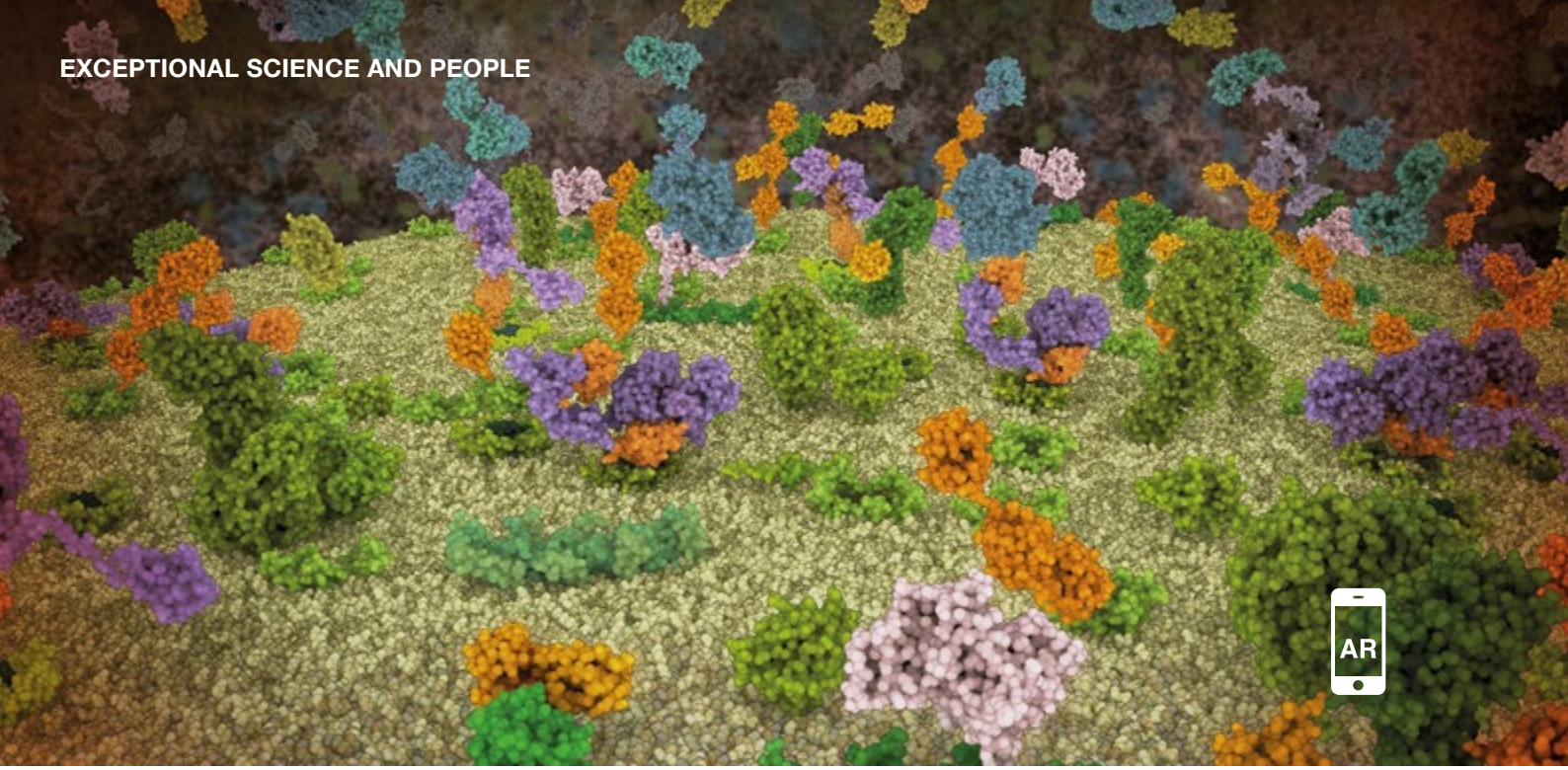
Drugs against PLpro and Mpro exploit a distinct vulnerability of the virus and would work for viral variants escaping from vaccine protection. PLpro and Mpro are present in all coronaviruses, and drugs would likely be useful for potential future coronavirus pandemics.

Working in the National Drug Discovery Centre at WEHI, researchers are currently refining drug candidates and carrying out tests with the aim of identifying broad-spectrum antivirals. While the research is currently at an early stage, the findings could help with responses to future pandemics.

The collective impact of supporters

WEHI would like to sincerely thank all our supporters who donated to our COVID-19 research. Every gift contributes to a significant 'collective impact' that truly makes a difference. Also critical for WEHI's COVID-19 research program is support from the Australian Government's Medical Research Future Fund, as well as the Victorian Government.

Below: Associate Professor Aaron Jex



‘Live action’ protein could fast-track Parkinson’s treatments

A discovery about a critical protein linked to Parkinson’s disease could underpin new treatments for the incurable disease.

Unprecedented view

Parkinson’s disease is a progressive neurodegenerative disease that currently impacts more than 10 million people worldwide. A cure for the condition is yet to be found, with available therapies only able to treat and alleviate symptoms.

WEHI researchers have visualised the entire process that leads to the activation of PINK1 – a protein directly linked to the early onset of Parkinson’s disease. The discovery solves a decade-long mystery and provides the first detailed blueprint for identifying potential treatments that could slow or even stop the progression of Parkinson’s disease.

“It is a great example of how innovative technologies can really drive forward research and lead to transformative discoveries.”

PhD student and first author Zhong Yan Gan said the research provided an unprecedented view of PINK1 with incredible molecular detail, leading to a better understanding of how defects in this protein could trigger Parkinson’s disease.

“Our research has essentially produced a ‘live action’ movie that reveals the entire activation process of PINK1. There are tens of thousands of papers on this protein family, but to visualise how PINK1 comes together and changes in the activation process, is a world-first,” Gan said.

Custom-built facility

Structural biologist Dr Alisa Glukhova said the discovery was made possible thanks to a new custom-built cryo-EM facility jointly funded by WEHI and the Bio21 Institute of the University of Melbourne, along with WEHI’s recruitment of structural biologists with expertise in using cryo-EM technology.

“The revolutionary technique has only been available in the past five years. It is a great example of how innovative technologies can really drive forward research and lead to transformative discoveries,” Dr Glukhova said.

Therapeutic potential

The head of WEHI’s Ubiquitin Signalling division Professor David Komander said his lab’s discovery paved the way for developing therapeutic agents that ‘switch on’ PINK1 to treat Parkinson’s disease.

“Biotech and pharmaceutical companies are already looking at PINK1 and this pathway as a therapeutic target for Parkinson’s disease, but they’ve been flying a bit blind,” he said.

“I think the new structures that our team has been able to produce using cryo-EM will provide that much-needed clarity. I’m really proud of this work and where it may lead.”

Above: A still from the ‘Ubiquitin and Parkinson’s disease’ animation created by Etsuko Uno at WEHI.TV.

New avenues for tuberculosis treatment

WEHI scientists are boosting the body's own disease-fighting immune pathway to fight tuberculosis. Using this approach, they have found new drugs that significantly reduce the amount of tuberculosis (TB) in preclinical models.

A challenging disease

Tuberculosis represents an enormous global disease burden and is one of the top 10 causes of death worldwide. It is caused by bacteria that infect the lungs, spreading from person to person through the air.

Unfortunately, the bacteria that cause the disease are rapidly developing resistance to many of the antibiotics we use to treat tuberculosis – new treatment approaches are needed.

A study led by WEHI infectious diseases researchers Dr Michael Stutz and Professor Marc Pellegrini uncovered how cells infected with tuberculosis bacteria are poised to die, and that using new medicines to enhance forms of cell death decreased the severity of the disease in a preclinical model.

New treatments revealed

Tuberculosis bacteria grow within immune cells in the lungs. One of the ways that cells protect against these 'intracellular' pathogens is to undergo a form of cell death called apoptosis – destroying the cell as well as the harmful microbes within it.

Researchers sequentially deleted key apoptosis effectors to demonstrate their roles in controlling tuberculosis infections. This showed that a proportion of tuberculosis-infected cells could die by apoptosis, opening new opportunities for controlling the disease.

Dr Stutz said researchers then tested new drugs that forced infected cells to die. This revealed that a drug, initially developed to kill cancer cells, which inhibits cell death regulatory proteins called IAPs, could promote the death of infected cells without damaging uninfected cells.

"When we treated our infection models with this compound, we were able to significantly reduce the amount of tuberculosis disease," he said.

"We then replicated these results using other IAP inhibitors. Excitingly, many of these compounds are already in clinical trials for other types of diseases and have proven to be safe and well-tolerated by patients."

Professor Pellegrini said that until now, antibiotics were the only treatment for tuberculosis.

"Unlike antibiotics, which directly kill bacteria, IAP inhibitors kill the cells that the tuberculosis bacteria hides, lives and multiplies in. By targeting the host rather than the microbe, the chances of resistance developing are incredibly low," he said.

"Our hope is that this research will lead to better treatments for tuberculosis."

Below: Joint head of WEHI's Infectious Diseases and Immune Defence division Professor Marc Pellegrini hopes the findings will lead to better treatments for tuberculosis.

Blood cancer research guides improved therapies

Associate Professor Gemma Kelly and her team are researching genes or proteins that blood cancer cells depend upon for growth. The findings are helping to identify new therapeutic targets that will inform the design of novel anti-cancer drugs and treatment regimes.

By enlisting cutting-edge molecular and cellular biology techniques, the researchers showed that the cell survival protein MCL-1 is critical for the survival of certain blood cancers called lymphomas. Similar studies showed that other types of blood cancers depend on the related survival protein BCL-2, including certain leukaemias.

Drug resistance is also a key focus of Associate Professor Kelly's work. She was an integral part of a WEHI-led collaboration that discovered some blood cancers that lack the p53 'tumour suppressor' protein are more likely to develop resistance to BH3-mimetic drugs, leading to poorer outcomes for patients.

Associate Professor Kelly said discovering that BH3-mimetic drugs worked less effectively for certain blood cancers that have mutated or lost p53 indicated that combination therapies could provide a better treatment approach.

"Clinical trials to test combinations of BH3-mimetics targeting BCL-2 and MCL-1 together are underway in acute myeloid leukaemia. Our research team is very excited to learn the outcomes of these trials," she said.

Associate Professor Kelly is a Victorian Cancer Agency Mid-Career Fellow, Dyson Bequest Fellow and laboratory head in the Blood Cells and Blood Cancer division at WEHI.

Above: Associate Professor Gemma Kelly

Immune cell insights could improve cancer treatment

WEHI researchers have made a surprise discovery about how immune 'sentinel' cells are maintained, which could have implications for drugs in development for treating cancer.

Unintended impact on immunity

The researchers were looking at the impact of deleting specific proteins that are responsible for controlling the ability of immune cells to 'switch off' genes. These are important processes to understand because our health relies on each cell's ability to use the appropriate combination of genes in the right place and at the right time.

Study co-lead and 2021 NHMRC Fellow Dr Michael Chopin said the researchers were surprised to find that one population of 'sentinel' immune cells was affected by deletion of a component of the machinery, causing the immune cells to disappear from the skin and lungs completely.

"This suggested that drugs which inhibit this component to treat diseases such as cancer could have unintended negative consequences for the immune system," Dr Chopin said.

The research team studied the role of the polycomb repressive complex 2 (PRC2) in frontline responder immune cells.

Dr Chopin said PRC2 was responsible for silencing genes, including in immune cells, which was essential for maintaining their numbers and normal function.

"We removed two components of the complex, an enzyme called *EZH2* and a structural protein called SUZ12, to see how immune cell development, populations and function were impacted," he said.

Deleting EZH2 had no impact with the cells still able to respond to viral infection effectively. In contrast, when *SUZ12* was deleted, certain populations of macrophages, such as those that reside in our skin and lungs, completely disappeared.

Dr Chopin said the disappearance of macrophages could have a negative impact on immunity. "Tissue-resident macrophages are responsible for detecting and ridding the body of a variety of infiltrating bacteria and virus-infected cells, and alerting the body that it is under attack."

Better understanding of drugs

Study co-lead Professor Stephen Nutt said it was important to understand the potential knock-on effects of drugs that interfere with the proteins that switch genes off.

"PRC2 has been implicated in many cancers, such as lymphoma. There is significant work being undertaken around the world to develop drugs that target components of the complex to treat cancer."

He said at least one drug already approved for treating a rare type of sarcoma inhibited components of the complex.

"We need to study more closely whether drugs that inhibit the function of EZH2 and SUZ12 could have unintended consequences for the immune system," he said.

On the flipside, it is also important to understand what might prevent drugs from having their desired effect. Professor Nutt said the current belief was that inhibiting EZH2 would dampen the immune response, for example if you are wanting to treat immune or inflammatory diseases.

"Our research shows that, at least with these specific frontline immune cells that are active early in infection, that is unlikely to be the case."

Above: Dr Michael Chopin

Investigating a culprit of inflammatory disease

An inflammatory form of cell death — called necroptosis — protects our bodies from infections, however, excessive necroptosis can lead to conditions such as inflammatory bowel disease and diabetes.

Freeze! It's the 'executioner'

A multidisciplinary team at WEHI led by Professor James Murphy and PhD students Sarah Garnish and Yanxiang Meng, is examining a key protein in necroptosis called MLKL. Known as the 'executioner', MLKL kills cells by making irreparable holes in their exterior cell membrane. The cell contents then leak out and this triggers inflammation.

"… we were able to reveal possible sites that could be targets for drugs. This could offer an exciting new approach to blocking necroptosis as a future treatment for inflammatory diseases."

The WEHI team collaborated with Assistant Professor Akiko Koide and Professor Shohei Koide from New York University in the US to capture 'freeze frames' of MLKL at key stages of the inflammatory cell death process. To do this they used a new technology — involving small proteins called monobodies — developed by Professor Koide's team. The novel approach revealed how MLKL changed as it moved from a dormant to an activated state.

Garnish said this was significant because, up until now, no one had been able to observe any detail about how MLKL changed at the structural level once it was activated. "It happens so fast that it's essentially a 'molecular blur'," she said.

It was thanks to the monobody technology, said Meng, that the researchers were able to produce 'freeze frames' of the MLKL protein at key points of its journey from a dormant to an activated state. "The monobodies bound to the different shapes of MLKL, 'freezing' them in place," he said.

"We then used structural biology to generate three-dimensional (3D) maps of these shapes which could be compared against each other. This showed that MLKL passed through distinct shape changes as it transitioned from being activated through to breaking the cell membrane."

Intervention potential

Professor Murphy said the 3D structures of MLKL provided the first formal evidence for how the protein changed shape after it was activated. "In the past we've speculated that this happens, but it was only with monobodies that we could actually prove it," he said.

"By studying the 3D maps of how MLKL changed as it moved from a dormant to an activated state, we were able to reveal possible sites that could be targets for drugs. This could offer an exciting new approach to blocking necroptosis as a future treatment for inflammatory diseases.

Above: PhD students Yanxiang Meng (left) and Sarah Garnish (right).

DNA changes drive fatal melanomas

Melanoma – the third most diagnosed cancer in Australia – is caused by damaging changes occurring in the DNA of skin cells, called melanocytes, usually because of exposure to ultraviolet (UV) radiation from sunlight. Melanomas can be surgically removed but not treated.

The chaos of melanomas

A major Australian collaboration co-led by WEHI has shown that melanoma cells are flooded with DNA changes as the skin cancer progresses from early, treatable stages through to fatal end-stage disease.

WEHI computational biologists studied DNA changes in melanoma samples donated by patients whose disease recurred and progressed after treatment, through to the time the patient died. This revealed dramatic and chaotic genetic changes that accumulated in the melanoma cells as the cancers progressed, providing clues for potential new approaches to treat the disease.

Addressing a devastating cancer

The research was led by Professor Tony Papenfuss, who heads WEHI's Computational Biology theme and holds a position at Peter MacCallum Cancer Centre; Dr Ismael Vergara, a computational biologist at WEHI, Peter MacCallum Cancer Centre and the Melanoma Institute Australia; and Professor Mark Shackleton, Director of Oncology at Alfred Health and Monash University.

The team created a new mathematical model that uncovered patterns in the mutations in genome sequencing data from the donated tumours. This revealed that as melanomas progress, they acquire increasingly dramatic genetic changes.

Deluge of DNA drives cancer

Professor Papenfuss said the research was the largest study into how melanoma genomes changed during cancer progression to late-stage disease.

"Every patient had melanoma cells in which the total amount of DNA had doubled, and large segments of DNA were rearranged or lost. We think this deluge of DNA changes supercharges the genes that drive cancer, making the disease more aggressive," he said.

The study's findings have provided an in-depth explanation of how melanomas change as they grow and the researchers hope that the insights gained will lead to better treatments for people with melanoma.

The research team extends their sincere gratitude to the patients and their families whose participation in Peter Mac's Cancer Tissue Collection After Death (CASCADE) program made this study possible.

Below: Professor Tony Papenfuss, head of WEHI's Computational Biology theme, is using mathematics to gain insights into melanomas.

Neonatal stroke cause pinpointed with blood discovery

Findings about the cause of neonatal strokes in the womb, or just after birth, could lead to new preventative therapies.

Crucial link made

A team led by blood stem cell researchers Dr Alison Farley and Dr Samir Taoudi investigated the role that tiny blood cells called platelets play in brain bleeds – a primary cause of neonatal strokes.

They identified that a low number of platelets in babies, either in the womb or in newborns, could cause bleeding in the brain, triggering strokes or neurological conditions such as cerebral palsy.

Dr Farley said thrombocytopenia – a reduction of platelets – could occur during foetal development, but the consequences of this had not been well studied until now.

"Thrombocytopenia is a reduction of platelets which can allow excessive bleeding to occur if blood vessels are already damaged. Our study pinpointed a clear link between low platelets and brain bleeds. We also showed that the time point at which thrombocytopenia occurs determines the region of the brain where the bleeding happens," she said.

"We are now trying to understand exactly when in foetal development platelets become important, so we can monitor and treat this condition during pregnancy."

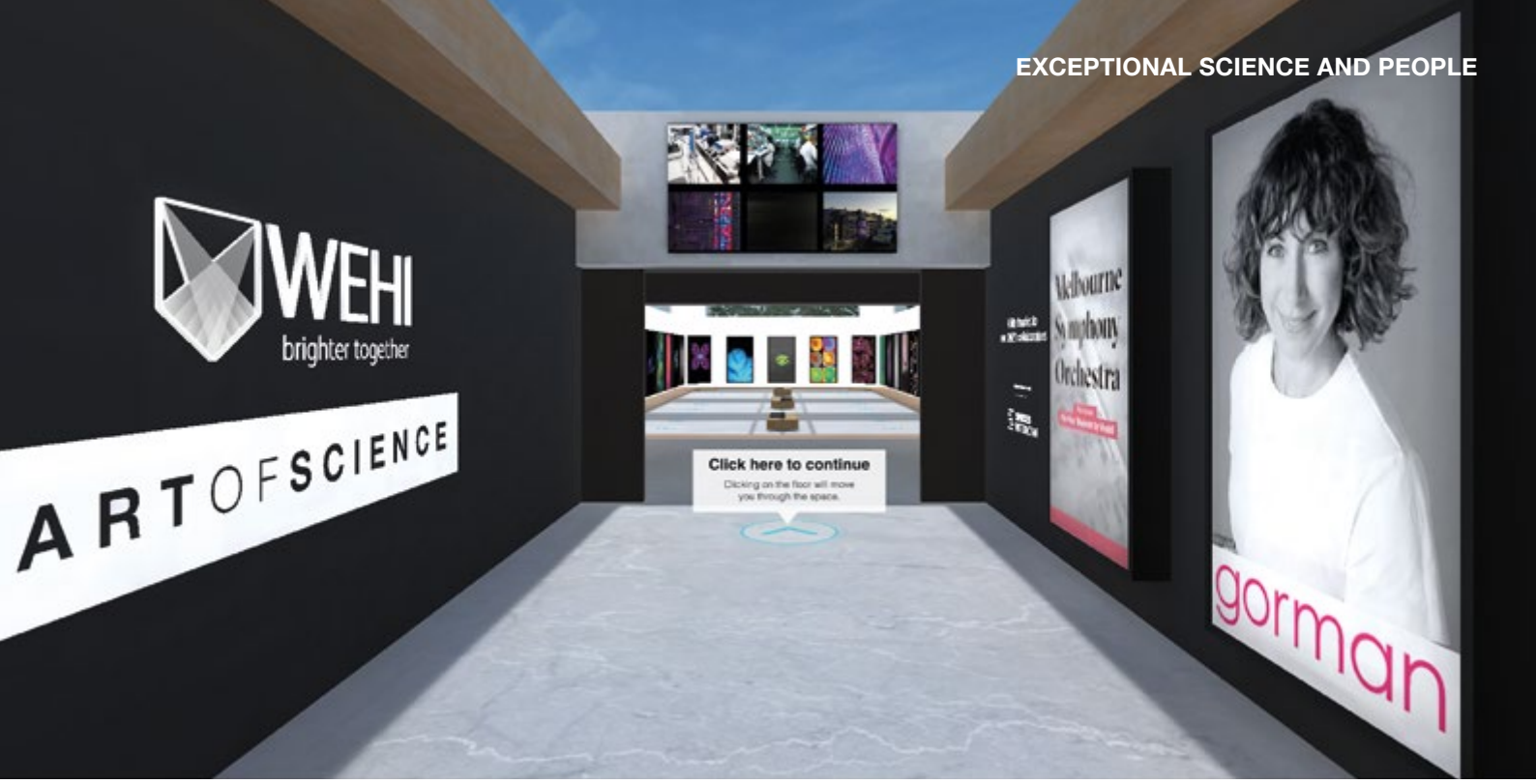
Prevention possibility

Dr Taoudi said while plenty remained unknown about treating thrombocytopenia in foetuses and newborn babies, the discovery could lead to improved screening and treatment during pregnancy and shortly after birth.

"Our next step is to identify the optimal window for when treatment should occur during pregnancy to prevent these strokes. The question we are now looking to answer is how low platelets need to get before you have a problem. The answer to that will be key in assessing treatment options," he said.

A major funder of the research was the Cerebral Palsy Alliance Research Foundation. One in every 700 babies born in Australia is diagnosed with cerebral palsy, which is suspected to be one of the conditions caused by foetal stroke. By understanding what causes these strokes the researchers hope to find ways of preventing neurological conditions, such as cerebral palsy.

Below: Dr Samir Taoudi (left) and Dr Alison Farley (right)



Art of Science goes virtual

The popular annual WEHI exhibition reached more people than ever before by moving online and welcoming Melbourne-based fashion and orchestral collaborators.

WEHI's 2021 *Art of Science* exhibition continued the tradition of showcasing captivating artworks created by researchers using WEHI's state-of-the-art imaging facilities and other cutting-edge technologies, such as artificial intelligence.

In keeping with tradition, the annual internal competition, which has run for more than two decades, generated many impressive entries from WEHI researchers with 25 still and moving images selected for the free public exhibition.

Enlisting innovative technology to create an interactive online gallery space was new for 2021, providing the opportunity to share the exhibition beyond Melbourne, reaching new national and international viewers.

A true collaboration of art and science

The exhibition went off with a bang thanks to Melbourne Symphony Orchestra (MSO) percussionists with visitors to the online exhibition welcomed with a recording of Vivaldi's *The Four Seasons*.

MSO managing director Sophie Galaise said it was wonderful to be able to combine the creative talents of two of Melbourne's most esteemed institutions.

"We are delighted to be involved in this unique exhibition," she said.

Designer judge

Each year, a guest judge is invited to select their favourite still and moving images from the displayed artwork.

Having spent her early career working as a nurse at The Royal Melbourne Hospital, fashion designer and entrepreneur Lisa Gorman brought her passion for science and flair for design to the task of judging in 2021.

"I've had a longstanding fascination with human biology since my high school days. There were so many magnificent, interesting and alluring works to choose from," she said.

Local celebration, international reach

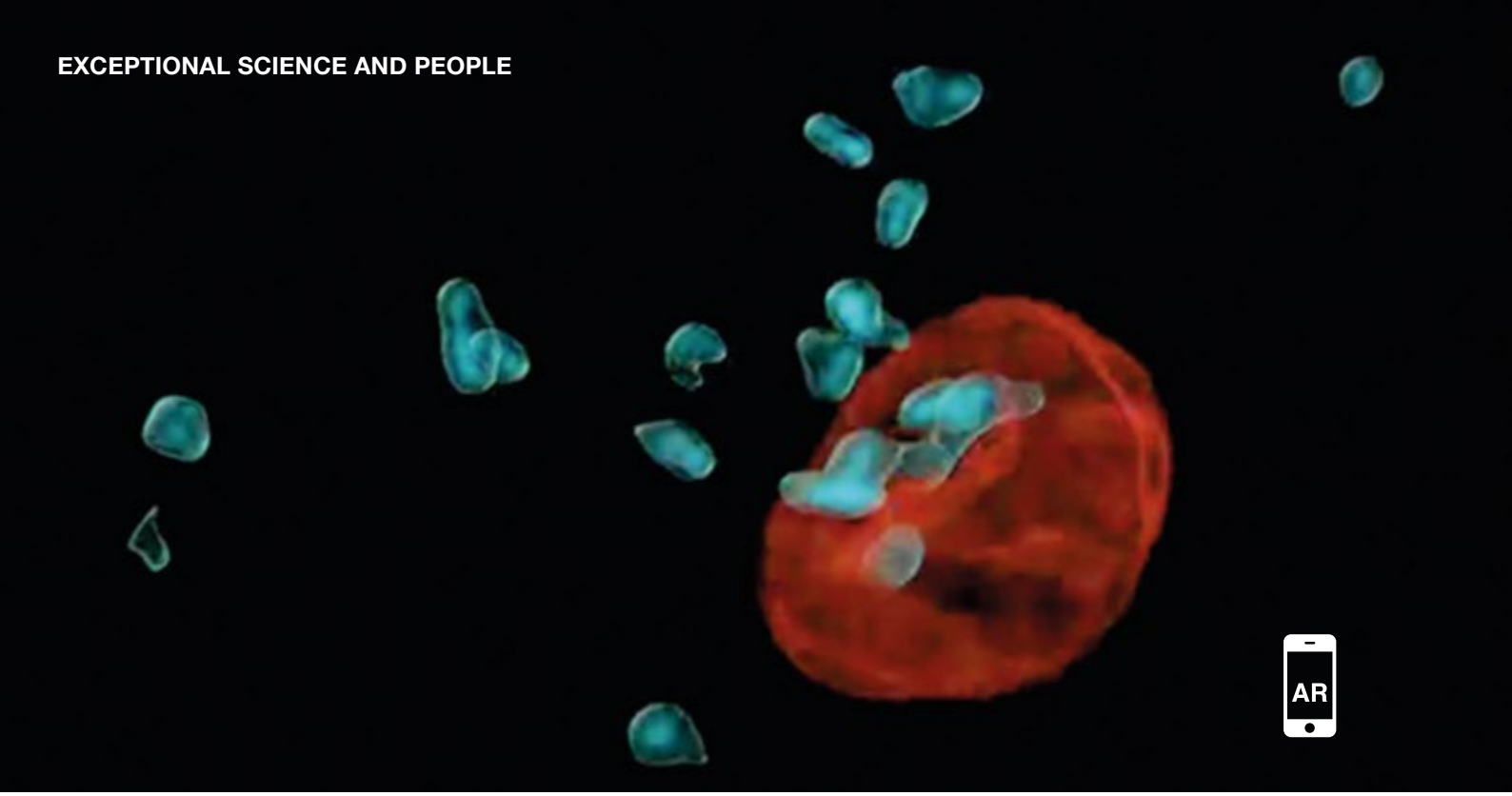
WEHI director and 2020 Melburnian of the Year Professor Doug Hilton said that working with Lisa Gorman and the MSO celebrated the best of Melbourne: biomedical research, fashion and the arts.

"It's wonderful to be able to collaborate in this way and, by holding the exhibition online this year, we hope more people are able to enjoy these rarely accessible and captivating images," he said.

The 2021 *Art of Science* exhibition remains accessible online until September 2022.

View the 2021
Art of Science Exhibition
wehi.edu.au/artofscience

Above: Screenshot from the online exhibition. For the best user experience please view the exhibition via your desktop/PC or laptop.



Microscopic 'CCTV' captures malaria invasion

Powerful, Australian-first video microscopy is enabling WEHI researchers to see intricate molecular details of how malaria parasites invade red blood cells – a key step in disease progression.

Focusing on a deadly parasite

Malaria is a mosquito-borne disease that kills around 400,000 people globally each year.

A new malaria study has used an advanced microscopy platform – called lattice light sheet microscopy (LLSM) – to capture high-resolution videos of individual parasites invading red blood cells.

Custom-built by researchers at WEHI, the new LLSM microscope was the first version of this technology in Australia. It enabled researchers to reveal key steps in the parasite invasion process – a critical point of the malaria lifecycle that underpins many symptoms of malaria.

Many of the serious symptoms of malaria occur because of the invasion and growth of the *Plasmodium* parasite in an infected person's red blood cells, said Dr Kelly Rogers, who is the head of WEHI's Centre for Dynamic Imaging.

"Understanding exactly how the parasite invades red blood cells is important for revealing new ways to stop this stage of the parasite lifecycle, potentially leading to new therapies," she said.

A fresh perspective

Cindy Evelyn, who began the research as an Honours student, said previously unrecognised aspects of parasite invasion were revealed.

"The videos we recorded showed the parasite as it landed on the red blood cell, and then entered an enclosed chamber – called a vacuole – where it grew and multiplied. There has long been contention in the field about whether the vacuole is derived from the parasite or the host cell. Our research resolved this question, revealing it was created from the red blood cell's membrane," she said.

Dr Rogers said by visualising these processes in more detail the researchers could potentially contribute in several ways to the development of new antimalarial therapies.

"For example, now that we know that the parasite vacuole relies on components of the red blood cell membrane, it might be possible to target these components with medicines to disrupt the parasite lifecycle. This host-directed approach could be one way to bypass the malaria parasite's propensity to rapidly develop drug resistance," she said.

Dr Niall Geoghegan, who custom built the microscope, said LLSM had transformed how cells could be studied.

"This powerful technology has enabled us to progress multiple areas of research. To achieve this, we brought together a multidisciplinary team with expertise in physics, engineering and biology – and the results of this current malaria study have vindicated our approach," he said.

Above: Still image captured from video microscopy showing molecular details of how malaria parasites invade red blood cells.

Anti-cancer drug hope for brain tumours in children

WEHI researchers are collaborating across Australia to combat the brain cancer medulloblastoma – one of the deadliest childhood cancers.

Genetic 'map' guides discovery

In partnership with The University of Queensland's Diamantina Institute, WEHI Centenary Fellow and joint head of Bioinformatics, Associate Professor Melissa Davis, co-led a team that developed a genetic 'map' of medulloblastoma.

The teams mapped the genetics of the aggressive brain tumours for five years to find new pathways that existing drugs could potentially target.

The research revealed that a drug called Ixabepilone, previously approved for use treating advanced breast cancer, blocked medulloblastoma growth significantly. The drug showed a 'dramatic survival benefit', with little sign of any remaining cancer following treatment in preclinical models.

This is the first time that this drug, already approved for other diseases and cancers, has been tested in paediatric brain tumours.

Promising results

The findings are a culmination of five years of collaborative work that sought to discover whether existing drugs could be modified to combat medulloblastoma.

Associate Professor Davis said the work provided a crucial head start for developing new treatments.

"Using the key findings of our study we will be able to work with drug companies to help develop cancer-killing medications…"

"The impact of the drug used in this research across our model systems gives hope for children diagnosed with highly aggressive forms of medulloblastoma," she said.

"Using the key findings of our study we will be able to work with drug companies to help develop cancer-killing medications. I believe we can do for brain cancer what has been done for leukaemia in terms of survival rates.

"We are also really excited about the potential our genetic map offers in finding other treatments for this disease that impacts children and adolescents at staggering rates."

Below: Associate Professor Melissa Davis, joint head of Bioinformatics at WEHI.

Iron supplements not linked to child brain development

A WEHI-led international study in rural Bangladesh has found that iron supplements have no impact on brain development in children.

Only anaemia improved

The randomised controlled trial of 3,300 children in rural Bangladesh provided iron to eight-month-old children, in the form of iron drops and micronutrient powders.

Study lead Professor Sant-Rayn Pasricha said the researchers measured children's cognitive, language and motor development, as well as behaviour and growth, including height and weight.

"While iron supplements improved anaemia in children, our study demonstrated that these interventions had no impact on growth, cognitive function, behaviour, or development," he said.

The study also evaluated adverse side-effects in children who took the iron supplements preventatively.

Study collaborator Dr Jena Hamadani from the International Center for Diarrheal Disease Research, Bangladesh said for some children, the supplements could be doing more harm than good.

"Children taking iron supplements who did not have anaemia had increased presentations to clinics due to episodes of diarrhoea, possibly indicating iron interventions were doing more harm than good," she said.

Guiding global policy

The World Health Organization (WHO) currently recommends iron supplements are given to all young children in low- and middle-income countries where anaemia is common.

Professor Pasricha said there was a need to carefully reconsider the use of these interventions based on the new study's findings.

"Children taking iron supplements who did not have anaemia had increased presentations to clinics due to episodes of diarrhoea, possibly indicating iron interventions were doing more harm than good."

"Anaemia in young children has long been linked with poor health outcomes and developmental delays. This led to policies of universal distribution of iron interventions to children, based on the assumption that iron would reverse poor child development. Our rigorous study shows this is not the case," he said.

Professor Pasricha said the research could lead to major changes in global nutrition policy.

"We have been administering iron supplements to young children worldwide for decades with the belief that it had a positive impact on their development, without proper evidence it was actually beneficial," he said.

"Our study could help to inform future global health policy guidelines about the use of iron interventions in young children."

Above: A mother and her child in Bangladesh, who are participating in a WEHI-led trial of iron supplementation.

Translating promising discoveries into new medicines

WEHI's innovative partnerships with global biopharmaceutical companies are advancing promising medical research towards new medicines, as well as upskilling the Australian medical research workforce.

WEHI and MSD – also known as Merck & Co Inc., based in Kenilworth, New Jersey, US – have established a three-year exchange program whereby WEHI researchers can be seconded to MSD's Research Laboratories in South San Francisco, US, to advance promising chemical biology research towards new medicines.

WEHI chemical biologist Dr Christoph Grohmann is using the latest technology at MSD's Research Laboratories to progress WEHI's research into potential new cancer therapeutic drug candidates.

More than a decade ago, WEHI's chemical biologists discovered a compound that showed selective toxicity to cancer cells. This was an exciting property, which suggested this compound may form the basis of a potential new anti-cancer medicine.

An extensive body of work, led by Dr Grohmann, has since used a range of approaches to investigate the compound's mode of action, and to develop derivative compounds with more optimal drug-like properties.

Dr Grohmann said his secondment would enable him to understand how this compound works – a critical step for it to be considered for progression to the clinic.

"By being able to access the latest technologies at MSD, I hope to solve the puzzle of how this compound works – thus opening new opportunities for pursuing this project towards potential new anti-cancer medicines."

Above: Dr Christoph Grohmann

Giving more women access to ovarian cancer drugs

More Australian women with ovarian cancer could gain access to game-changing treatments called PARP inhibitors.

‘Silencing’ key to drug response

Ovarian cancer is the sixth most common cause of cancer-related death in Australian women and for the past 30 years there has been little improvement in survival rates.

A WEHI-led collaboration with researchers in Australia and the US found tumours from some ovarian cancer patients had changes that silenced a gene involved in DNA repair called *RAD51C*, which made the tumours sensitive to PARP inhibitors. A PARP inhibitor is a type of targeted cancer therapy.

WEHI postdoctoral researcher Dr Ksenija Nesic said this revealed a new group of patients who could benefit from PARP inhibitor therapy.

“The silencing of *RAD51C* has to be complete for PARP inhibitors to work. If the cancer has any residual DNA repair capabilities, or if these epigenetic marks are lost during treatment, the cancer becomes resistant to PARP inhibitor therapy,” she said.

Unprecedented success

Professor Clare Scott is joint head of Clinical Translation at WEHI and an oncologist at The Royal Melbourne Hospital, the Royal Women’s Hospital and the Peter MacCallum Cancer Centre.

She said PARP inhibitors were currently approved in Australia for treating women with *BRCA1/2* mutated cancers, with unprecedented success.

> *“We’ve never been in a position to say the word ‘cure’ before, but I am confident we are curing some women with a BRCA1 or BRCA2 mutation who receive a PARP inhibitor as an initial treatment following chemotherapy.”*

“In these women, first cancer recurrence is delayed by three-and-a-half years and in advanced disease, progression-free survival is extended,” she said.

Professor Scott said PARP inhibitors needed to be more widely available to women with genetic mutations that inactivate *RAD51C*.

“We’ve never been in a position to say the word ‘cure’ before, but I am confident we are curing some women with a *BRCA1* or *BRCA2* mutation who receive a PARP inhibitor as an initial treatment following chemotherapy.”

Guiding personalised medicine

Dr Nesic said the involvement of a consumer buddy was invaluable to the research.

“In this context, a consumer is a person who has been impacted by a disease. Our research benefited from the involvement of Ms Janice Antony, an ovarian cancer survivor,” she said.

After many surgeries and rounds of chemotherapy, Ms Antony is among the few women who have survived the disease. She joined WEHI’s Consumer Buddy program to help advance ovarian cancer research and give hope to future patients.

Dr Nesic said Ms Antony’s contribution helped to influence the research. “Janice’s lived experience provided some useful insights that helped to guide and advance our research design.”

Below: WEHI Consumer Buddy, Ms Janice Antony.

Immunity and inflammation researchers win 2021 Burnet Prize

Dr Najoua Lalaoui and Dr Shalin Naik have been jointly awarded the 2021 Burnet Prize, WEHI's top science prize, for their pioneering research to understand cell death mechanisms and the behaviour of specialised immune cells, respectively.

Discovering a new disease

Dr Lalaoui was instrumental in discovering a new autoinflammatory disease called CRIA (cleavage-resistant RIPK1-induced autoinflammatory) syndrome caused by mutations in *RIPK1* gene which is a critical cell death player.

"Our bodies have developed a series of inbuilt mechanisms to ensure appropriate and timely inflammatory and cell death signals," Dr Lalaoui said.

"However in CRIA syndrome, mutations in *RIPK1* are overcoming all the normal checks and balances that exist, resulting in uncontrolled cell death and inflammation."

Dr Lalaoui said the research shed light on the role of cell death in inflammatory diseases, and identified RIPK1 inhibitors as a potential treatment for these conditions.

"RIPK1 inhibitors, which are in development, could be used as 'personalised medications' for people suffering from CRIA syndrome and other inflammatory diseases where the RIPK1 function is deregulated."

How immune cells are made

Dr Naik's research team developed a new barcoding technique called 'SIS-seq' to understand the programming behind how blood stem cells make dendritic cells – immune cells essential for responding to viral infections such as COVID-19 and some cancers.

Using this innovative approach, the team was able to observe how blood stem cells divided and became dendritic cells.

Dr Naik said understanding how individual blood stem cells behave, and the genes that control this behaviour, could allow scientific experts to one day manipulate the number of immune cells to their advantage.

"For example, based on this knowledge we could ramp up cell numbers to eventually boost the number of immune cell types that are low in some immune deficiencies, infections and cancers," he said.

Celebrating discovery

WEHI director Professor Doug Hilton commended the researchers for their valuable scientific contributions that could pave the way for improved treatments and diagnoses.

"Najoua and Shalin are outstanding scientists and worthy recipients of this award," he said.

"Both researchers embody the values of WEHI in their talent, pursuit of excellence, collaborative spirit and commitment to research."

The Burnet Prize was established in 1987 from a bequest of former WEHI director Sir Frank Macfarlane Burnet.

Above: Dr Shalin Naik (left) and Dr Najoua Lalaoui (right) have been jointly awarded the 2021 Burnet Prize.

Cancer researcher awarded CSL Centenary Fellowship

Dr Stephin Vervoort was awarded a 2022 CSL Centenary Fellowship to fund research to find new treatments for leukaemia and other types of cancers.

Dr Vervoort received the $1.25 million, five-year fellowship in October 2021. He is using the funding to establish a laboratory at WEHI, where he will explore fundamental steps in transcription of DNA into mRNA. The knowledge gained will help to identify new drug targets to attack acute myeloid leukaemia (AML) and other hard-to-treat cancers.

Gene regulation used to be regarded as a fairly simple on/off system, Dr Vervoort said. “Now we understand that there’s a multilayered regulatory network that controls when and where genes should be activated. It’s critical for normal development,” he said.

“What we’ve also come to realise is that recurrent mutations in the key components that regulate genes can lead to the development of many blood cancers, in particular AML.”

Dr Vervoort said AML was difficult to manage and treat, resulting in a poor prognosis for adult patients in particular.

“I hope the findings from my lab will lead to the development of novel therapeutics for treating AML and other cancers, increasing survival rates and improving the overall quality of life for patients.”

Dr Vervoort’s multidisciplinary research brings together molecular biology, state-of-the-art genomics, bioinformatics and cancer biology.

The CSL Centenary Fellowships provide funding stability for leading mid-career Australian researchers and in turn support the delivery of CSL’s promise to patients by fostering a thriving medical research community.

Above: Dr Stephin Vervoort

Cell investigation technique could advance cancer treatment

WEHI researchers have developed a new single-cell technique to understand how vital cells are made in the body. The team focused on dendritic immune cells that have the potential to be harnessed against cancer.

Immunotherapy potential

Using their new 'SIS-seq' technique, the team outlined the processes involved in kick-starting the generation of dendritic cells driven by the hormone Flt3 ligand. They then used CRISPR gene editing technology to test 500 genes that predicted dendritic immune cell fate. From this, they discovered 30 new genes responsible for enabling dendritic cells to be made.

Immunologist and developmental biology researcher Dr Shalin Naik said understanding how certain immune cells were made was crucial information for being able to harness the body's immune system against disease.

"We've now got a list of genes to try and generate or boost human dendritic cells in a petri dish for immunotherapy," he said.

"Our plan is to expand the use of SIS-seq technology to find the genes that program the generation of each of the different human immune cell types."

'Big bang' of cancer initiation

By examining cells at the single-cell level using SIS-seq, the researchers intend to find the 'big bang' moment in cancer development.

Dr Naik said he hoped this would lead to the discovery of new drug targets to fight cancer and improve immunotherapy.

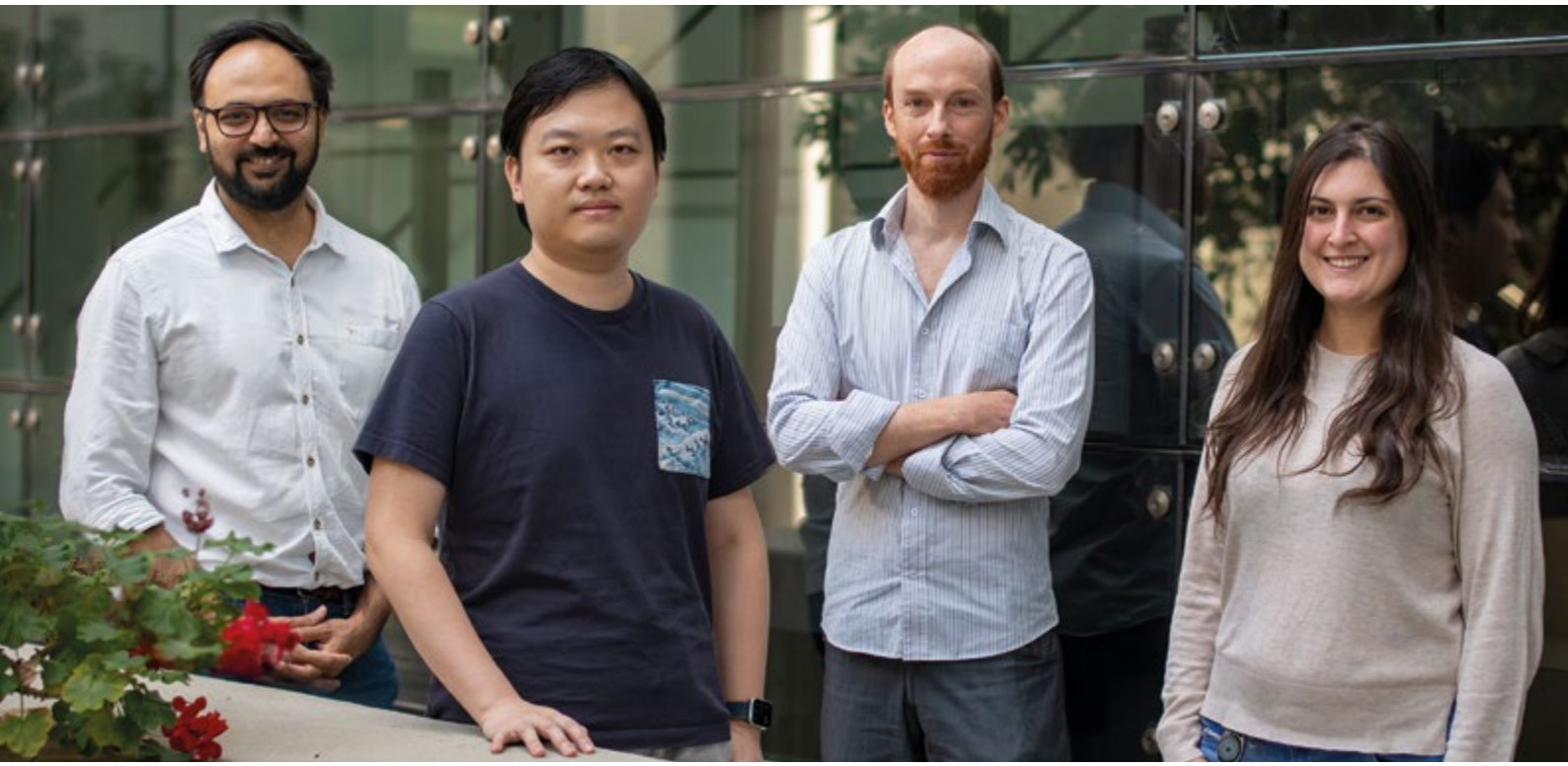
"Understanding how these processes go awry at the single-cell level will offer powerful new insights for finding potential new drug targets and harnessing the immune system against cancer."

"Using our new technique, we hope to pinpoint which of the normal programs in tissue generation are hijacked by cancer-causing genes in single cells," he said.

"Understanding how these processes go awry at the single-cell level will offer powerful new insights for finding potential new drug targets and harnessing the immune system against cancer.

"It's really exciting because our findings could pave the way for advancing cancer treatment."

Below: (left to right) Dr Shalin, Luyi Tian, Dr Tom Weber and Sara Tomei



Biomarker predicts bowel cancer recurrence

A biomarker in the blood of patients with bowel cancer is providing valuable insights into the risk of cancer relapse after surgery and chemotherapy.

Prognostic impact of ctDNA

A study led by WEHI's Associate Professor Jeanne Tie, who is also a medical oncologist at Peter Mac and Western Health, followed a group of patients with metastatic bowel cancer who had secondary cancer in the liver that had been removed by surgery.

By measuring levels of circulating tumour DNA (ctDNA) present in the blood of these patients before and after surgery, the research team was able to predict the likelihood of the cancer recurring.

Associate Professor Tie said the study reinforced the prognostic impact of ctDNA.

"We found that if ctDNA is present after surgery, it predicts an almost 100 per cent recurrence rate for these patients. In contrast, for patients who were ctDNA-negative after surgery, the likelihood of the cancer reoccurring was far lower, about 25 per cent."

Measuring chemotherapy success

Associate Professor Tie said ctDNA also provided an indication of the effectiveness of chemotherapy.

"Until now, we had no way of measuring the effectiveness of chemotherapy in real time. The usual process is to do the surgery to remove the cancer metastases, give the patient chemotherapy, and then follow up with CT scans every six to 12 months, to see if the cancer comes back.

"By measuring the ctDNA in the blood, we could immediately see whether the chemotherapy had cleared the cancer and were therefore able to predict the likelihood of the cancer recurring."

"If we are able to detect microscopic disease that we can't pick up on a CT scan, we can intervene earlier and potentially still offer the patient a chance of a cure."

Associate Professor Tie said ctDNA biomarkers might allow clinicians to intervene earlier.

"If we are able to detect microscopic disease that we can't pick up on a CT scan, we can intervene earlier and potentially still offer the patient a chance of a cure."

Promising future of treatment

Associate Professor Tie said while ctDNA technology was already being used in the US, further research was needed before it could be rolled out in Australia.

"The test needs to be very sensitive to be able to pick up microscopic cancer cells. I am hopeful the new technology coming through will have enough sensitivity for us to be able to use this technique in the years ahead to improve patient care and treatment."

Above: Associate Professor Jeanne Tie

Research Assistant Association Individual Achievement Awards

The Individual Achievement Awards were established by WEHI's Research Assistant Association (RAA) to recognise outstanding research assistants at WEHI. The annual award acknowledges the scientific contributions made by research assistants within the Institute as well as any significant positive impacts on their team, the Institute and the wider community.

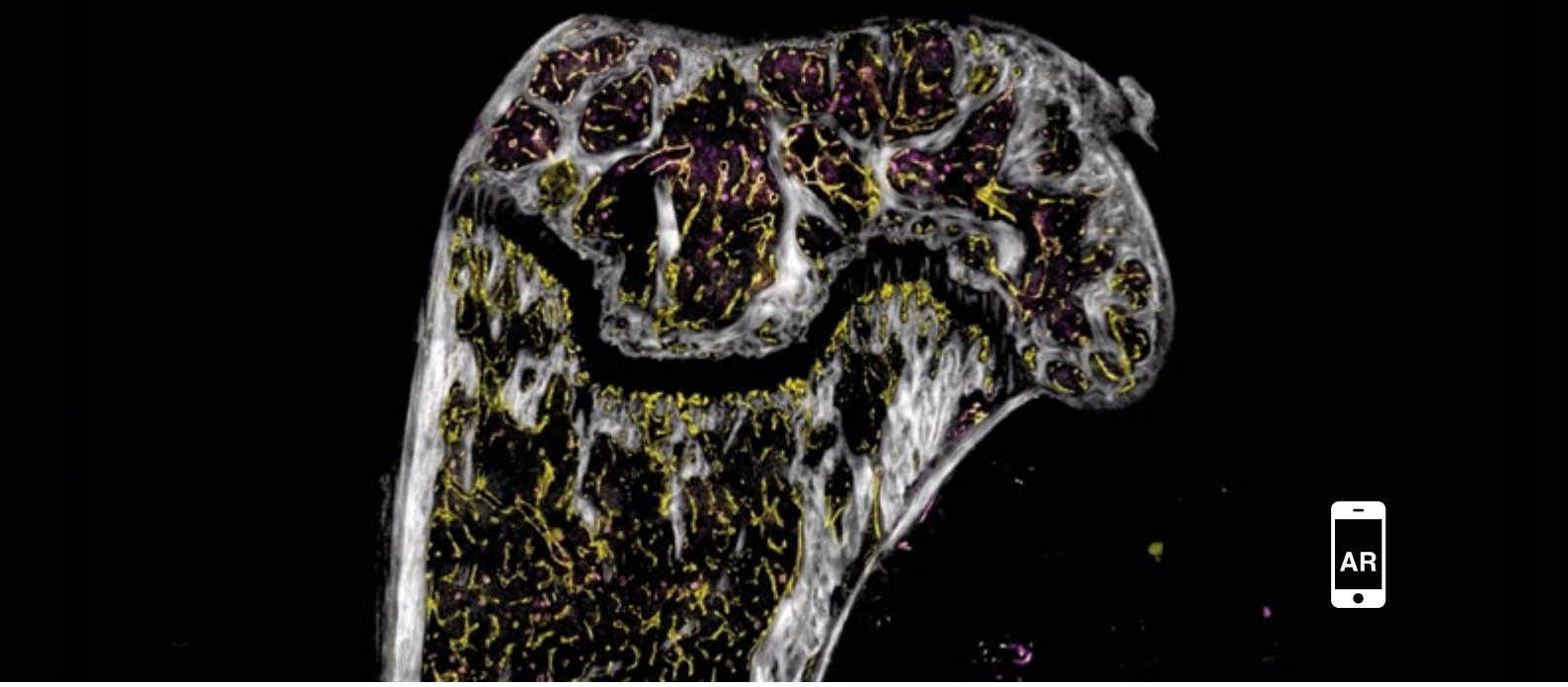
The winners of the 2021 Individual Achievement Awards were Cindy Evelyn and Yumiko Hirokawa, who were nominated anonymously by WEHI staff and students and selected by a panel of senior WEHI staff.

Cindy Evelyn was nominated for her outstanding contributions as both a researcher and Centre for Dynamic Imaging facility staff member, where she trained and provided support to numerous facility users and staff members. As a researcher, she pioneered the use of lattice light sheet microscopy to study and decipher the invasion of malaria parasites into human red blood cells. This led to a publication in *Nature Communications* in which Cindy was a co-first author. Cindy's nominators highlighted her technical skills as well as the positive and vibrant dynamic she brings to the team.

An anonymous voter said it was a difficult task to juggle both research and facility responsibilities. "Cindy Evelyn has done both masterfully," they said. "She is always positive and a joy to be around. Her reliability, hard work and dedication have been crucial to keeping the facility running during a challenging year."

Yumiko Hirokawa was nominated for her exceptional work on organoid cultures and providing outstanding support to other staff members. Yumiko invented and optimised an organoid culture method that significantly reduced culture costs while increasing the scale and ease of organoid production. This innovative technique led Yumiko to be an inventor on a patent and a first author on a publication in *Communications Biology*. Yumiko's nominators described her as an invaluable support to her laboratory where she consistently went above and beyond to facilitate her team in achieving their goals.

Above: Cindy Evelyn



Cutting-edge 3D models reveal breast cancer spread

An innovative three-dimensional (3D) imaging technique developed by WEHI researchers has revealed how breast cancer spreads into bone and continues to grow.

Radical remodelling

Understanding how breast cancer spreads into bone is vital because bone metastasis impacts up to 70 per cent of breast cancer patients. The spread of cancers to secondary organs such as the bone is often incurable.

The WEHI study found that tumour spread occurs at specific locations in the bone and that breast cancer cells 'renovate' the bone to create an environment that fuels their spread, while starving the body of essential nutrients.

Immunologist Associate Professor Edwin Hawkins said the idea that cancer cells remodel their environment wasn't new, however, it hadn't been explored in a "tricky organ" like bone marrow until now.

"We saw that when breast cancer cells metastasise to the bone marrow, they release 'tumour-derived growth factors' that enable them to create a favourable environment that further facilitates their growth – unfortunately to the detriment of the whole body," he said.

Innovative technology

The team made the discovery using WEHI's Centre for Dynamic Imaging, where they were able to capture hundreds of images to create 3D models of bone marrow.

Breast cancer researcher Dr Raymond Yip said the imaging approach revealed fascinating details about the spread and growth of breast cancer.

"Our research shows breast cancer cells preferentially reside near a specific blood vessel subtype in the bone called the type H vessels. The breast tumour cells selectively home to a specialised vasculature, suggesting type H vessels are supplying certain growth factors to nurture breast cancer cell growth in bone," he said.

Future discoveries

Joint head of WEHI's Australian Cancer Research Foundation (ACRF) Cancer Biology and Stem Cells division Professor Jane Visvader said the mechanisms used by cancer cells to enhance their growth could be a target for future therapeutic discovery.

"Cancer therapeutic discovery has expanded over past decades to not only target cancer cells directly, but also to target the mechanisms used by cancer cells to enhance their growth," she said.

"It will be important to further understand the mechanisms by which tumour-derived factors remodel blood vessels, as this could help define new therapies for patients in the future. We also hope to take the innovative 3D imaging technique that we have developed and extend it to other diseases involving bone metastases."

Above: A still image taken from the 3D imaging technology developed by the researchers.

3D imaging insights could improve vaccine strategies

A new three-dimensional (3D) imaging technique developed by WEHI researchers is shining a light on immune responses and setting the scene for enhancing immune memory to optimise vaccine strategies.

Understanding immunity

By imaging intact lymphoid organs in 3D, researchers have been able to identify specialised niches, which can determine how immune T cells function. The approach is helping researchers to better understand T cells, which are critical for developing strong immune responses.

PhD student Brigette Duckworth said the new technique could be applied to many different settings, including informing and optimising vaccine strategies.

"Previously, we have focused on the overall immune response, but our data suggests that may not be the best strategy."

"We now have the power to visualise how and where immune cells decide their fate. Understanding these mechanisms give us clues about how we can therapeutically target them and utilise them for a host of applications, including vaccine development."

The team studied two types of immune cell: effector cells, which fight infections, and memory cells, which 'remember' how to fight specific infections, such as viruses, so they can be rapidly cleared if they return in the future.

Duckworth said the memory cells were particularly important because they kept chronic infections and cancers in check and acted rapidly if they saw the virus a second time.

"This work opens the door to harnessing vaccines to alter immune cell positioning in the lymph node and direct the exact type of immune response we would like to generate," she said.

Optimising vaccine strategies

Immunologist Associate Professor Joanna Groom said COVID-19 had highlighted the importance of having a better understanding of our immune response to vaccination.

"Previously, we have focused on the overall immune response, but our data suggests that may not be the best strategy," she said.

"A more efficient response might be to specifically direct vaccines towards memory formation because we want those cells to remain long after vaccination and to react when we come in contact with a virus."

"We are now looking at these targets to identify the therapeutic window of opportunity to pinpoint which cells will be most effective and have the most impact in future vaccination strategies."

Below: Associate Professor Joanna Groom

Dietary changes could protect pregnant women with diabetes

A link has been found between type 1 diabetes and changes in the gut microbiome during pregnancy that could contribute to complications in both the mother and baby.

Clues in the microbiome

The study revealed pregnant women with type 1 diabetes had a decrease in 'good' gut bacteria that normally protect against inflammation and an increase in 'bad' gut bacteria that promote intestinal inflammation and damage to the intestinal lining.

These changes could contribute to the increased risk of pregnancy complications seen in women with type 1 diabetes and could potentially be modified by dietary changes.

The research was part of the ENDIA (Environmental Determinants of Islet Autoimmunity) study, investigating genetic and environmental factors that may contribute to the development of islet autoimmunity and type 1 diabetes in children. The observational study recruited 1,500 babies from pregnancy who have an immediate relative with type 1 diabetes and is following them through childhood.

WEHI clinician-scientist Professor Len Harrison, who led the research, said women with type 1 diabetes had a higher frequency of complications in pregnancy.

"We decided to study the gut microbiome because there was evidence of systemic and intra-uterine inflammation in pregnancy for women with type 1 diabetes that could conceivably be related," he said.

Together with colleagues in bioinformatics at WEHI, as well as ENDIA partners, the study team undertook whole genome sequence analysis of samples from pregnant women. The samples were taken from groups of women at different stages of pregnancy.

"In women with type 1 diabetes, we observed changes in their gut microbiome, including a decrease in 'good' gut bacteria and an increase in 'bad' gut bacteria," he said.

"The 'good' bacteria make substances that prevent inflammation and the 'bad' bacteria release substances that activate the immune system to trigger inflammation."

Restoring health through diet

Professor Harrison said the next stage of the project was to identify markers that would determine which women with type 1 diabetes might benefit from safe interventions during pregnancy, including dietary changes.

"We believe that if these women made some safe dietary modifications it could help to restore the health of their microbiome and lower their risk of complications during pregnancy."

Below: WEHI clinician-scientist Professor Len Harrison with a patient.

Top honours students recognised for exceptional work

Each year the Colman Speed Honours Award is presented to the top Honours student at WEHI. In 2021, there were two winners - Pailene Lim and Vanessa Cincotta.

Pailene Lim's thesis titled 'Investigating the essential role of novel *Plasmodium falciparum* invasion ligands' examined the novel proteins that are essential for the malaria parasite to infect red blood cells.

Pailene's research showed that antibodies and immune proteins specific to these parasite proteins were able to inhibit parasites from invading our red blood cells, meaning that these invasion proteins could prove to be better vaccine candidates.

"I was fortunate to use the Australian Synchrotron to determine the structure of an invasion protein complexed with an inhibitory immune protein. In doing so, we were able to reveal the 3D blueprint necessary for future vaccine design," she said.

Vanessa Cincotta's honours project titled 'Uncovering the intra-tumoural heterogeneity and metastatic tropisms of small cell lung cancer' will hopefully contribute to the development of more personalised therapeutic approaches.

"The research conducted by Vanessa gives a good foundation to explore further research questions surrounding small cell lung cancer ranging from novel ways to detect the complexity at diagnosis, to understanding why this cancer can metastasise in different parts of the body," said Associate Professor Kate Sutherland, who was one of Vanessa's supervisors.

Vanessa has now embarked on additional postgraduate studies in law at the University of Melbourne whilst Pailene is continuing her research as a research assistant at WEHI, with hopes of completing her PhD in the future.

Above: Pailene Lim

2021 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 in 2021.

Doctor of Philosophy, University of Melbourne

Dr Philip Arandjelovic
Professor Marc Pellegrini, Dr Cody Allison
Advancing a functional cure for HIV by identifying therapeutics that promote the death of latently infected cells

Dr Wing Fuk Chan
Associate Professor Rhys Allan, Dr Tim Johansson, Professor Stephen Nutt
Genome in 3D – regulation of lymphocyte development by genome architect

Dr Nicholas Chandler
Associate Professor Matthew Call, Associate Professor Melissa Call
Investigating the role of oligomeric state in chimeric antigen receptor function using de novo designed transmembrane structures

Dr Edward Chen Hsung Chew
Professor Andrew Roberts, Professor Warren Alexander, Associate Professor Ian Majewski
Identification of novel genetic drivers in the development of acute myeloid leukaemia

Dr Elise Clayer
Dr Philippe Bouillet, Professor Andreas Strasser
The role of ZC3H12C in the posttranscriptional regulation of *Tnf*

Dr Daniel Frank
Associate Professor James Vince, Professor James Murphy, Dr Jarrod Sandow
The role of RIPK3 ubiquitylation and MLKL signalling during cell death and autophagy

Dr Diane Hanna
Dr Seong Lin Khaw, Professor Andrew Roberts, Dr Ashley Ng
Identifying and overcoming therapeutic resistance in high-risk acute lymphoblastic leukaemia

Dr Miles Horton
Professor Phil Hodgkin, Dr Shalin Naik, Dr Suzanne Heinzel
A quantitative framework for lymphocyte fate decisions

Dr Qiutong (Angela) Huang
Professor Gabrielle Belz, Dr Lisa Mielke, Dr Tracy Putzocki
Transcriptional regulation of ILC development and function

Dr Shuai Huang
Associate Professor Grant Dewson, Professor David Huang, Dr Mark van Delft
Identifying novel regulators of intrinsic apoptosis

Dr Sophia Mah
Professor Anne Voss, Associate Professor Tim Thomas
The role of ING4 and ING5 in cardiac development

Dr Kimberly Morgan
Associate Professor Joan Heath, Dr Karen Doggett
Identification of synthetic lethal interactions with the KRAS oncogene for targeted cancer treatment

Dr Catia Pierotti
Professor Guillaume Lessene, Dr Mark van Delft, Professor James Murphy
Mechanism of action of two small molecule necroptosis inhibitors

Dr Samyuktha Ramesh
Associate Professor Matthew Call, Associate Professor Melissa Call
The transmembrane organisation of the B cell antigen receptor

Dr Alissa Robbins
Associate Professor Daniel Gray, Professor Andreas Strasser, Dr Charis Teh
Cell death mechanisms in T cell differentiation and homeostasis

Dr Amania Sheikh
Associate Professor Joanna Groom, Professor Gabrielle Belz
Transcriptional and migration regulation of T follicular helper cell differentiation

Dr Jeffrey Smith
Associate Professor Andrew Webb, Associate Professor Melissa Davis, Associate Professor Aaron Jex
The purification, identification, and measurement of RNA-binding protein

Dr Peggy Teh
Professor Axel Kallies, Associate Professor Daniel Gray, Professor Marc Pellegrini
The ontogeny of effector regulatory T cells

Dr Luyi Tian
Associate Professor Matthew Ritchie, Dr Shalin Naik, Professor Terry Speed
New protocols and computational tools for scRNAseq analysis

Dr Stephanie Trezise
Professor Stephen Nutt, Dr Simon Willis, Professor Marco Herold
Identification of novel regulators of B lymphocyte biology

Dr Swarna Vijayaraj
Associate Professor James Vince, Professor James Murphy, Dr Kate Lawlor
Regulation of the pro-inflammatory cytokine IL-1β by ubiquitination and its role in modulating IL-1β activity

Dr Chamilia Wanigasuriya
Professor Marnie Blewitt, Dr Andrew Keniry, Associate Professor Matthew Ritchie
Unravelling the epigenetic modifier Smchd1

Dr Johannes Wichmann
Professor Anne Voss, Associate Professor Tim Thomas
The role of the MYST lysine acetyltransferase TIP60 in human cells and mice

Master of Biomedical Science, University of Melbourne

Yanie Tayipto
Dr Rhea Longley, Professor Ivo Mueller
Antibodies for malaria surveillance

Master of Philosophy, University of Melbourne

Satyasai Aravind Prasad Manda
Professor Melanie Bahlo, Dr Brendan Ansell
Understanding retinal diseases with genotypic and transcriptomic data analysis

Master of Research, University of Melbourne

Zhuofan Xu
Professor David Huang, Dr Mary Ann Anderson, Dr Mark van Delft
Identifying novel strategies to enhance the anti-cancer activity of Venetoclax by manipulating NOXA expression

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

Ling Min Amelia Ang
Professor Clare Scott, Dr Holly Barker, Dr Kristy Shield-Artin
Characterising the tumour-immune microenvironment in patients with multiple primary cancers

Natalie Cerovac
Dr Shazia Ruybal, Professor Ivo Mueller, Associate Professor Leanne Robinson, Dr Rhea Longley
Application of serological markers for the assessment of spatial transmission of *Plasmodium vivax* infections in Papua New Guinea

Catherine Chen
Dr Emily Eriksson, Professor Ivo Mueller, Dr Anna Coussens
Investigation of autoantibodies and other co-morbidities as interacting mechanisms of a heterogenous COVID-19 prognosis

Vanessa Cincotta
Associate Professor Kate Sutherland, Dr Jin Ng
Uncovering the intratumoural heterogeneity and metastatic tropisms of small cell lung cancer

William Clow
Professor Marc Pellegrini, Dr Kathryn Davidson
Harnessing TNF-mediated extrinsic apoptosis as a novel therapeutic target for COVID-19

Harry Dempsey
Professor Phil Hodgkin, Dr Susanne Heinzel, Dr Mark Dowling
How are memory CD8+ T cells formed?

Coco Dong
Dr Rebecca Feltham, Dr Charlene Magtoto
Characterisation of the tag-Targeting Protein Degrader (tTPD) system *in vivo* using a novel tTPD reporter mouse

Callum Goddard
Dr Shalin Naik, Dr Cindy Audiger, Professor Guillaume Lessene
Identifying the molecular target of novel inhibitors of plasmacytoid dendritic cell development

Anthony Hadla
Professor Clare Scott, Dr Holly Barker, Dr Genevieve Dall
Characterisation of epithelial-to-mesenchymal transition in ovarian carcinosarcoma

Max Jordan
Associate Professor Rhys Allan, Dr Christine Keenan
A nuclear targeted CRISPR screen for novel regulators of T-Helper 1 and 2 lineage development

Tyler Leyden
Professor Marc Pellegrini, Dr Kathryn Davidson
The role of host inflammation and cell death signalling pathways in SARS-CoV-2 pathogenesis

Jose Lin
Professor Stephen Nutt, Dr Michael Chopin
Defining the molecular mechanisms underpinning RUNX2 activity in Plasmacytoid Dendritic Cells

Pailene Lim
Professor Alan Cowman, Dr Julie Healer, Dr Stephen Scally
Investigating the essential role of novel *Plasmodium falciparum* invasion ligands

Stella Liu
Dr Sarah Best, Associate Professor Kate Sutherland
Targeting pro-tumorigenic macrophages to treat KRAS-mutant lung adenocarcinoma

Shihab Deen Mohamed
Associate Professor Justin Boddey, Professor Alan Cowman, Dr Ryan Steel
Elucidating the role of C-mannosylation in the stability and trafficking of *P. falciparum* invasion proteins

Olivia Moscatelli
Associate Professor Jason Tye-Din, Dr Vanessa Bryant
Remembering a forgotten organ: B cell memory and the spleen in coeliac disease

Ryan Munnings
Dr Vanessa Bryant, Associate Professor Joanna Groom
Unravelling T Follicular Helper Cell diversity in humans

William Vo
Dr Anna Coussens, Dr Dylan Sheerin
Exploring the interaction between Mycobacterium tuberculosis and SARS coronavirus-2 co-infection in human macrophages

Patents Granted in 2021

Patents protect unique inventions made by WEHI scientists. These facilitate collaborations between WEHI and commercial organisations to progress the development of new medicines and diagnostics, a key step towards clinical translation.

Patents ensure that WEHI 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.

A malaria vaccine and methods for producing same

Inventors: A Cowman, W De Jongh, J Healer, T Jorgensen, T Sogaard, V Soroka

USA

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

Inventors: M Bruncko, H Ding, G Doherty, S Elmore, T Hansen, L Hasvold, L Hexamer, A Kunzer, R Mantei, X Song, A Souers, G Sullivan, ZF Tao, G Wang, L Wang, X Wang, M Wendt

Japan, Slovakia,Uruguay

Barley with low levels of hordeins

Inventors: C Howitt, G Tanner

Brazil

Benzodiazepines as Bromodomain inhibitors

Inventors: C Burns, A Cuzzupe, J Feutrill, J-M Garnier, P Sharp

Australia

Inhibition of cytokine-induced sh2 protein in NK cells

Inventors: J Babon, N Huntington, T Kolesnik, S Nicholson

USA

Inventors: N Huntington, S Nicholson

Japan, USA

Method of treating intracellular infection

Inventors: G Begley, G Ebert, M Pellegrini

China, Hong Kong, Mexico

Parasite Vaccine

Inventors: M Blume, M McConville, C Tonkin, A Uboldi

New Zealand

Soluble mediator

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

USA

Inventors: L Harrison, M Rashidi, Y Zhang

Canada, Europe (France, Germany, Italy, Spain, United Kingdom)

Use of therapeutic agents

Inventors: L Coultas, G Dewson, E Watson

USA

A remarkable place

Head of Research Grants and Development, Dr Sejal Kendal was a winner of WEHI's Kellaway Excellence Director's Awards for transforming the Research Grants and Development Office.

Operational overview

Guided by WEHI's values and strategic goals, we successfully navigated another year of caring for the wellbeing and safety of our people while optimising our operations and productivity in an environment changed by COVID-19.

WEHI has remained steadfast in our commitment to collaborate, innovate and make transformative discoveries and we have even found a COVID-19 silver lining in our ability to leverage technology, work more flexibly and build our workforce's capability.

Adapting to a changed environment

In step with rapid global advances to combat COVID-19, we entered a new phase of the pandemic following the arrival of vaccines. WEHI focused on adjusting our processes and requirements to meet the evolving situation, communicating regularly with staff and students to ensure clarity around COVID-19 impacts and mitigating risks to research and business continuity with the ultimate goal of keeping the WEHI community and broader community safe. You can read more about WEHI's workplace responses to the pandemic, including our continuation of pandemic leave and the advancement of flexible work arrangements on page 44.

As part of the global effort to tackle COVID-19, several WEHI research groups have applied their expertise to improve the prevention, diagnosis and treatment of the virus, as well as collect critical information needed to inform future vaccine strategies. These projects are outlined on pages 14 and 15.

Building clinical translation capability

The COVID-19 pandemic has highlighted the importance of clinician-scientists and the role they play in clinical translation.

Clinical translation of WEHI research is essential in our endeavours to improve health outcomes. In 2021, a new initiative, Attracting and Retaining Clinician Scientists (ARCS), was established. ARCS aims to increase the breadth and depth of clinical research at the Institute by facilitating increased engagement with clinician-scientists and providers; and fostering the development of translational research programs.

Enhancing the opportunities for clinician-scientists to develop their skills in research at WEHI is an important aspect of ARCS. The new initiative has seen five clinician-scientists receive NHMRC postgraduate scholarships, which support them to undertake PhD studies within WEHI research groups. The skills and connections developed through PhD studies are an important factor in enabling clinicians to continue their involvement in research, whether they ultimately choose to continue as clinician-scientists or return to a clinical career path.

Technology-driven science

Technology plays a critical role in WEHI's capacity to answer the most pressing biomedical research questions and translate these discoveries into meaningful therapeutic outcomes. Our investments in WEHI's Centre for Dynamic Imaging and National Drug Discovery Centre are two such examples that are reaping enormous rewards and facilitating important research.

In 2021, WEHI developed a 10-year Technology Strategy, which sets out a roadmap to strengthen our technology-driven research and facilitate our ability to leverage technology now and in the future. It defines how we will assess the impact of our technology platform facilities and ensure their continuous improvement. The Technology Strategy underpins the future creation of strategies for each of WEHI's key technology areas and will be overseen by the Technology Strategy Committee.

Other achievements in the field of technology-driven research in 2021 included the establishment of a Protein Production Facility at WEHI's Bundoora campus and the expansion of WEHI's genomics platform.

Strategic support for grant applications

Our professional services teams have remained committed to enabling WEHI scientists to maximise their time spent on research through strategic support and effective advice. In 2021, WEHI's Research Grants and Development Office (RGDO) was bolstered with a new strategy, additional resourcing and a new approach for providing tailored support for researchers applying for NHMRC funding.

WEHI's Investigator Grant Support (WIGS) program continued to enhance the quality of grant applications with increases in both the number of NHMRC applications submitted and the funding awarded in 2021. WEHI's RGDO will build on this support program in 2022.

Workday project to streamline and strengthen resource systems

WEHI's Research Support Program, which started with the introduction of electronic lab notebooks, aims to give researchers more time to focus on their research, simplifying workflow processes and providing greater visibility of information.

A new enterprise resource planning system was implemented as a key enabler of WEHI's Research Support Program in 2021. The Workday system is an integrated finance, procurement and human resource system for staff and students in one location, enhancing system compliance and optimising user convenience and workflow simplicity.

A sustainable organisation

The Board endorsed WEHI's first Environmental Management and Sustainability Strategy 2021-2023, formulated through consultation with experts in environmental management, as well as our staff and students led by WEHI's Environmental and Sustainability Management Committee. The new strategy will guide WEHI's actions towards achieving carbon neutrality, addressing areas including energy, water and waste management, sustainable investment and procurement practices, as well as compliance with environmental legislation.

WEHI also made a public statement acknowledging the scientific consensus on climate change and recognising it as an issue of national and global concern, requiring urgent action. The statement demonstrates WEHI's commitment to advocate for meaningful reductions in global greenhouse gas emissions across Australia. Importantly, WEHI supports a robust evidence-based discussion about the best pathway to rapidly reduce greenhouse gas emissions, ensuring that diverse voices are heard — including those of First Nations peoples in Australia.

Culture survey makes WEHI a better place to work and study

WEHI's 2021 culture survey provided the opportunity for staff and students to provide open and honest feedback on what they think of WEHI and ideas about how to make it a better place to work or study.

This feedback generates valuable information about what needs to be done to ensure that everyone has the skills, support and direction they need to perform at their best, driving future people-related strategies and initiatives.

Sixty-six per cent of WEHI's staff and students completed the anonymous survey.

Enduring spirit of collaboration

Our enduring spirit of collaboration remains strong at WEHI – within our labs, between our teams in research and professional services and with our many external partners and the broader community.

Many of our researchers work with 'consumer buddies'. In this context, a consumer is a person who has been impacted by a disease.

The 2021 evaluation of WEHI's Consumer Buddy program, the first structured consumer program of its kind in Australia, positioned WEHI as a leader in consumer engagement.

To date we have 89 consumers in the program with participants involved in all of WEHI's research themes, 90 per cent of the divisions and 46 per cent of the labs. Consumers also participate on research panels, committees and in focus groups.

We are especially proud of the way we have navigated COVID-19 impacts to maintain highly effective working relationships inside and outside of the Institute to continue to advance WEHI's ability to produce quality research.

Above: Chief People Officer, Elizabeth McMahon.

A sustained response to the COVID-19 pandemic

2021 saw Australians gain access to effective vaccines, antiviral therapies and rapid antigen home tests – all helping to reduce the burden of COVID-19 in the community. WEHI entered a new phase of the pandemic, supporting our staff, students and community during this transitional time.

Supporting our staff and community

Using WEHI's values and strategic goals as our guide, we prioritised staff and community safety by encouraging vaccination through internal and external advocacy while providing a safe environment for our staff and students to work onsite and at home.

To work onsite, staff and students must be fully vaccinated against COVID-19 in line with government directives. This requirement safeguards the health of WEHI staff and students, as well as the broader community.

With new variants emerging, we adjusted our response to address higher transmissibility and increased community infection rates. We adapted and enhanced our range of safety measures and contact tracing systems, while supporting staff and students in a complex and changing environment.

We introduced our special 'Pandemic Leave' in 2020 to financially support staff who were unable to perform their regular duties due to COVID-19. We continued this leave in 2021, as well as our support for students at the University of Melbourne, including allowing extensions to students' candidature and scholarships if their research progress had been impacted by the pandemic.

Advancing flexible work

For many years, WEHI has facilitated flexible working arrangements. The pandemic provided an additional opportunity for WEHI to consider further flexible working solutions for the future.

We developed a flexible working plan after consultation with staff and students. This plan provides a framework for flexible working that meets the diverse needs and roles of all staff and students, including parenting and caring responsibilities.

Looking to the future

With continued advancements in the prevention and treatment of COVID-19, we hope there are more opportunities to come together as a community, including onsite work and in-person events and tours.

Above: WEHI implemented various protocols to create a safe and sustainable work environment for students and staff during the pandemic.

Building our connection with alumni

While we experienced another difficult year due to the pandemic, we are grateful that the sense of community among WEHI alumni prevailed.

1,629 members	89 alumni donors	$82,945 donated	35 countries

Staying connected in 2021

In November, WEHI launched its inaugural alumni newsletter. This publication provides an opportunity to showcase and celebrate the achievements of our alumni across the globe, share news and updates from the Institute and provide opportunities for alumni to stay in touch with one another. If you would like to receive your copy, please email our Alumni team at alumni@wehi.edu.au

We also launched a standalone LinkedIn page especially for alumni, with more than 500 alumni having already connected. Search 'WEHI alumni' on LinkedIn to connect.

Alumni also continued to remain in touch and celebrate Institute milestones through the WEHI alumni Facebook page.

Celebrating our WEHI connection in 2021

North America alumni online event

More than 35 alumni residing in North America joined WEHI online on 17 March to connect with each other and hear from our three alumni speakers: Kim Newton, principal scientist, Genentech; Bali Pulendran, the Violetta L. Horton Professor of Microbiology and Immunology, Stanford University; and Edwina Naik, associate director, Immuno-Oncology Research, Five Prime Therapeutics.

New York City alumni reunion

WEHI was delighted to host its only in-person alumni event during 2021 in New York City on 27 October. Whilst international travel from Australia was restricted, alumna Kathy Potts (WEHI 2009-17) was our host on the evening.

Held at one of New York City's newest rooftop bars, the Daintree, the event provided an opportunity for alumni to come together and celebrate their WEHI connection.

WEHI Alumni Insights

In November, four alumni guest speakers joined us online for WEHI Alumni Insights: Making the move to industry. Our guest speakers were: Alex Delbridge, investment associate at Omega Funds; Marthe D'Ombrain, senior director and head, Global Research Innovation at CSL; Susan Johnson, senior scientist at Vaxart Inc; and Kurt Lackovic, chief executive officer at Cancer Trials Australia. Each speaker reflected on their transition from academic research to senior industry roles, which was followed by a lively Q&A. The breakout rooms afterwards provided an opportunity for the speakers and attendees to connect with each other.

Below: Alumni enjoyed the opportunity to come together in-person in New York City and celebrate their WEHI connection. (Left to right): Matt Witkowski, Sara Lustigman, Richard Stanley, Rebecca Delconte, Kathy Potts, Pamela Stanley, Cyril Clybouw and Jess Bridgford.

Diversity and inclusion

WEHI embraces and celebrates diversity amongst our people and recognises the importance of a positive, inclusive workplace culture to the success of the organisation.

Progressing gender equality

Celebrating International Women's Day

WEHI was privileged to welcome Dr Kudzai Kanhutu, infectious diseases specialist and deputy chief medical information officer at The Royal Melbourne Hospital, to deliver our International Women's Day address. Speaking from both the heart and an evidence base, Dr Kanhutu spoke about how gender inequality, cultural bias and discrimination exacerbate challenges for women from minority cultural backgrounds, as researchers, clinicians and the recipients of healthcare.

Safety, respect and equality

In 2021, WEHI took steps to improve our ability to respond directly to sexism and sexual harassment – to make our workplace safer and more effectively hold those who harass and abuse to account. In July, we ran an all-staff session on safety, respect and equality to strengthen our ability to proactively and transparently respond to all forms of inappropriate workplace behaviour. WEHI reported on its action plan to address and prevent sexual harassment and provided a report back on the findings of a 2020 survey of staff and students about how sexism and sexual harassment impacted them when working remotely during the pandemic. This was followed up with a student-focused session in October to understand particular issues and challenges faced by our WEHI student community.

Flexibility at WEHI

WEHI is capitalising on the acceleration towards a new world of work that offers increased flexibility and different ways of working to benefit individuals, teams and the Institute. Harnessing these benefits, WEHI set up a Flexibility Reference Group, with representation from a cross-section of WEHI staff. Maintaining the momentum of change, in 2021 the group provided immediate and practical advice on the development of new flexibility principles and a flexible work policy.

Raising awareness on disability inclusion

Director's Seminar: 2021 International Day of People with Disability

In late 2021, WEHI held its inaugural Director's Seminar that marked International Day of People with Disability. Guest speaker Professor Louise Purton, head of the Stem Cell Regulation Laboratory at St Vincent's Institute and Professor, Department of Medicine at St Vincent's Hospital, spoke about her experiences of discrimination and career barriers due to having a profound bilateral hearing impairment since childhood. Her presentation helped to raise awareness about the importance of fostering an inclusive work environment.

Below: In May 2021 members of WEHI's LGBTQIA+ network, WE-Pride, marched alongside WEHI friends and colleagues including WEHI director Doug Hilton in solidarity with LGBTQIA+ people.

WE-Pride

Midsumma Festival Pride March

In May, WEHI marched for the fourth time at the Midsumma Festival Pride March to show our support for our LGBTQIA+ community. WEHI is committed to demonstrating that our workplace is a safe and welcoming place for all. Director Professor Doug Hilton joined the march, alongside our LGBTQIA+ network, WE-Pride.

Wear it Purple Day

In August, WEHI invited staff and students to commemorate international Wear it Purple Day, founded in response to young LGBTQIA+ people taking their own lives following bullying and harassment. Staff and students wore purple in support of our LGBTQIA+ community.

A global community

Overseas Staff and Student Engagement group (OSSE)

Diversity at WEHI comes in many forms. Each year the Institute attracts staff and students from all over the world. Given the unique challenges caused by the pandemic, in 2021 WEHI established OSSE, a group to support staff and students working away from their home country.

Reconciliation

WEHI's first Indigenous Employment Strategy

In 2021, WEHI launched its first Indigenous Employment Strategy (IES), which aims to support and increase the participation of Aboriginal and Torres Strait Islander peoples at all levels of WEHI, in both research and professional services, and as staff and students. The IES is comprised of four key areas of focus that include actions designed to 'build the pipeline' to inspire and support Aboriginal and Torres Strait Islander peoples to enter the sector by providing a culturally safe environment, strengthening relationships, and increasing opportunities for Aboriginal and Torres Strait Islander peoples across WEHI. To support the strategy implementation, WEHI developed a four-year evidence-based action plan.

National Reconciliation Week

WEHI was delighted to host Corey Tutt, proud Kamilaroi man and CEO and founder of DeadlyScience Ltd, to deliver our National Reconciliation Week seminar 'Education and bringing STEM into classrooms for Indigenous kids'. Corey spoke about his work with DeadlyScience, which provides science resources, mentoring and training to more than a hundred remote and regional schools across Australia.

NAIDOC Week 2021

The 2021 NAIDOC theme was Heal Country – a call for the nation to better protect Aboriginal and Torres Strait Islander lands, waters, sacred sites and cultural heritage from exploitation, desecration and destruction.

Guest speaker for the WEHI 2021 NAIDOC Week Seminar was Professor Gail Garvey, a proud Kamilaroi woman from north-west New South Wales. Before moving to The University of Queensland, at the time of her presentation, Professor Garvey was a Senior Principal Research Fellow and deputy division leader, Wellbeing and Preventable Chronic Diseases at the Menzies School of Health Research. Professor Garvey spoke passionately about her research relating to cancer and its disproportionate impact on Aboriginal and Torres Strait Islander peoples.

Above: For WEHI's 2021 National Reconciliation Week Seminar, guest speaker Corey Tutt, proud Kamilaroi man and CEO and founder of DeadlyScience Ltd, spoke about bringing STEM into classrooms for remote and regional communities.

The wonderful world of WEHI.TV

Combining cinema and science, WEHI's biomedical animators reveal the microscopic world of human biology through accurate and entertaining 3D animation.

Bringing science to the screen

WEHI has been at the forefront of biomedical animation for more than 25 years. Led by world-renowned biomedical animator Dr Drew Berry, the WEHI.TV team produces visualisations of the cellular and molecular action that governs health and disease in our bodies.

Dr Berry has received numerous accolades for his work over the years including BAFTA and Emmy awards. His animations have been exhibited at international museums, universities, festivals and even in a music video by the Icelandic singer-songwriter, Björk. In 2010, a *New York Times* journalist wrote: "If there is a Steven Spielberg of molecular animation, it is probably Drew Berry."

Biological education brought to life

The WEHI.TV team are passionate about the power of animation in science education.

In 2021, Dr Berry completed a three-year project, working with the Howard Hughes Medical Institute in the US to create a series of animations revealing the key molecular steps of cell respiration – how our cells convert energy from food and oxygen.

"At every stage, we're guided by what science has discovered. The enzymes involved in respiration have an inherent beauty and are mind-boggling to watch," Dr Berry said.

"WEHI.TV animations are a captivating and effective way to teach the fundamentals of biology."

In December 2021, WEHI.TV animator Etsuko Uno completed a project working with WEHI researchers to develop an animation showing a key molecular driver of Parkinson's disease.

Etsuko said the current pace of scientific discovery was incredibly fast. "Our goal is to keep abreast of these developments across all fields and bring the richness of their complexity to life," she said.

Etsuko and Drew are supported by specialist computer programmer, Justin Muir.

Available under Creative Commons license, WEHI.TV animations provide free, high-quality resources for biology education in Australia and around the world.

The full catalogue can be found at wehi.edu.au/wehi.tv

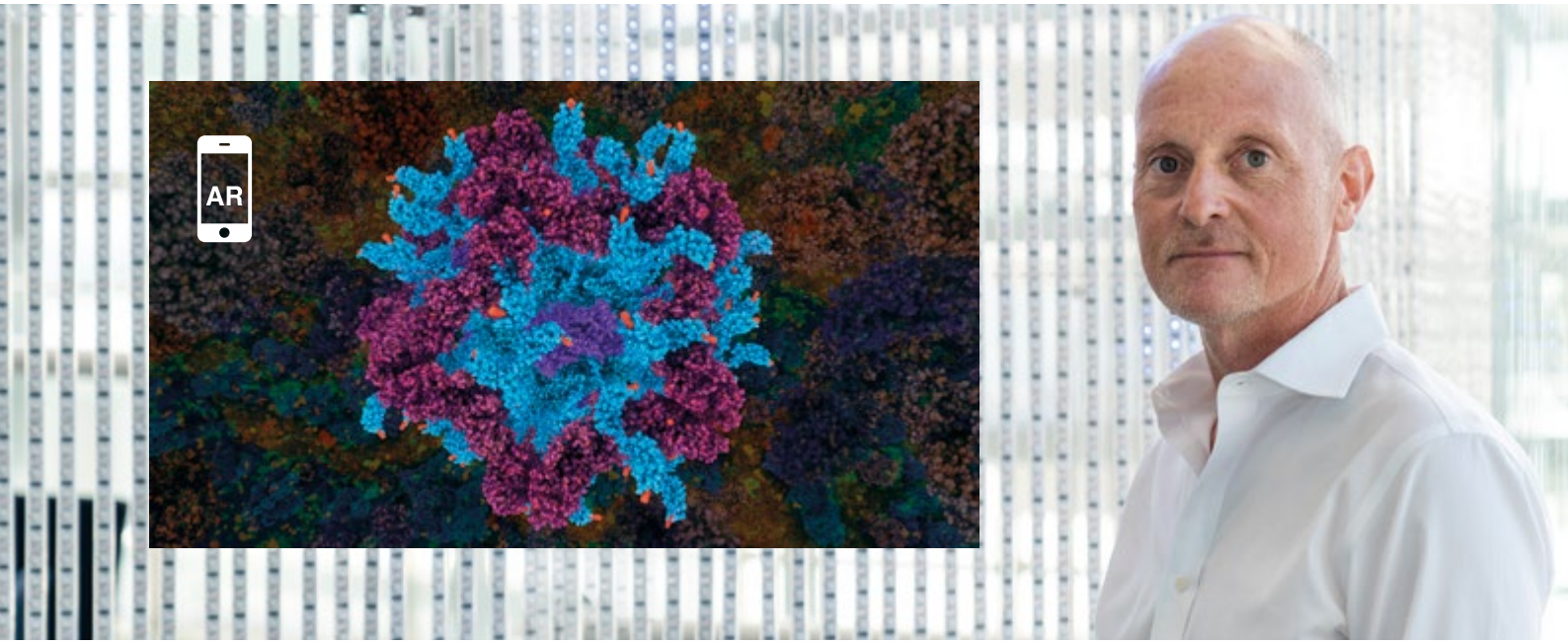
'Let there be light' at WEHI

October 2021 saw the relaunch of WEHI's much-loved Illuminarium – a multi-story light installation displaying a non-stop collection of scientific imagery that is visible to those passing WEHI's Parkville campus.

"The Illuminarium is a symbolic beacon to draw people's attention to WEHI and the amazing science taking place here. I'm excited that the upgrade has made it less energy intensive and more reliable," Dr Berry said.

Below: Dr Drew Berry

Animation 'Pyruvate Dehydrogenase Complex' by Dr Drew Berry (2021).



Organisation and governance

Head of Legal and Licensing Chela Niall and laboratory head Associate Professor Justin Boddey (right) co-chair WEHI's Environmental Management and Sustainability Committee.

WEHI Board

The directors of the Walter and Eliza Hall Institute of Medical Research Board
31 December 2021

WEHI Board members 2021 (from left): Associate Professor Pippa Connolly, Mr Peter Collins, Professor Christine Kilpatrick AO, Professor Sir John Savill, Professor James McCluskey AO, Mr John Dyson, Mrs Jane Hemstritch, Mr Robert Wylie, Professor Jane Gunn, Mr Malcolm Broomhead AO, Ms Marie McDonald.

President
Mrs Jane Hemstritch
BSc (Hons) *London University*
FICAEW FICAANZ FAICD
Appointed: October 2013
Appointed President: May 2019

Vice President
Professor Sir John Savill
BA *Oxford* MBChB *Sheffield* PhD *London*
FRCP FRCPE FRCSEd (Hon) FRCPCH(Hon)
FASN FRSE FMedSci FAHMS FRS
Appointed: June 2018
Appointed Vice-President: March 2021

Honorary Treasurer
Mr Robert Wylie
FCA FAICD
Appointed: April 2014
Appointed Honorary Treasurer: April 2014

Mr Malcolm Broomhead AO
BE (Civil) MBA *UQ* FIE (Aus) FAusIMM FAIM
MICE (UK) FAICD
Appointed: July 2014

Mr Peter Collins
BA (Hons) *Melbourne* BTheology
MCD Masters *Oxford and HEC Paris*
Appointed: May 2018

Associate Professor
(Practice) Pippa Connolly
MEng *Leeds* GAICD CPEng FIEAust
Appointed: April 2019

Mr John Dyson
BSc *Monash* Grad Dip Fin Inv SIA
MBA *RMIT*
Appointed: May 2016

Professor Jane Gunn
MBBS PhD *Melbourne* FAHMS FRACGP
DRANZCOG
Appointed: February 2021

Professor Christine Kilpatrick AO
MBBS MBA MD DMedSci (Hons) *Melbourne*
FRACP FRACMA FAICD FAHMS
Appointed: May 2017

Board members not present in group photograph: Mr Kee Wong (top right) and Ms Carolyn Viney (bottom right).

Professor James McCluskey AO
BMedSc MBBS MD *UWA* FRACP FRCPA FAA FAHMS
Appointed: April 2011

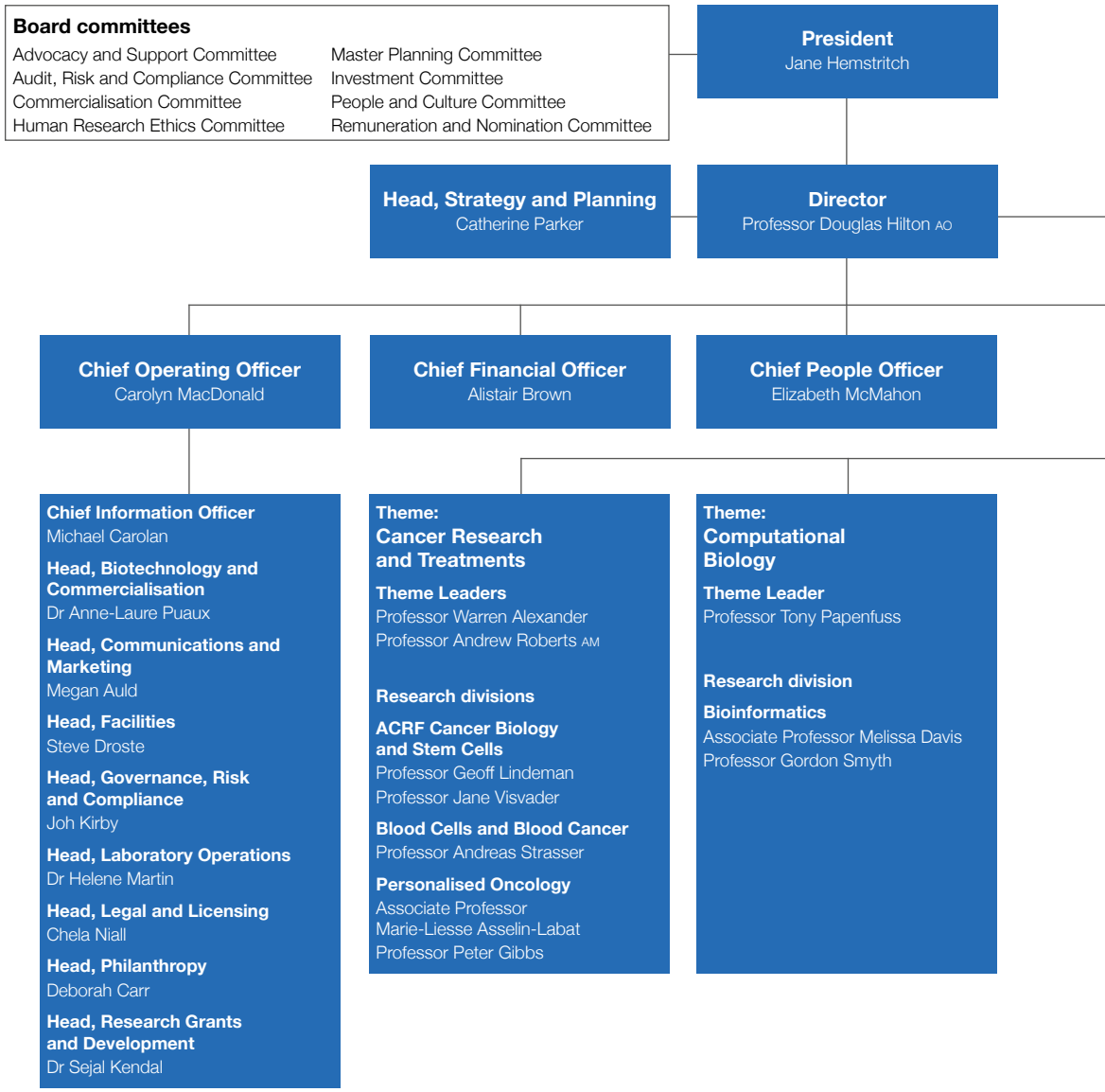
Ms Carolyn Viney
LLB/BA *Monash*
Appointed: December 2016

Vice President
Mr Terry Moran AC
BA (Hons) *LaTrobe* FIPAA
Resigned: March 2021

Ms Marie McDonald
BSc (Hons) LLB (Hons) *Melbourne*
Appointed: October 2016

Mr Kee Wong
BE (Hons) Grad Dip Computing MBA FAICD
Appointed: July 2021

WEHI organisation 31 December 2021



Laboratory heads

ACRF Cancer Biology and Stem Cells
Professor Geoff Lindeman
Professor Clare Scott
Associate Professor Kate Sutherland
Professor Jane Visvader

ACRF Chemical Biology
Associate Professor Ethan Goddard-Borger
Professor Guillaume Lessene
Associate Professor Isabelle Lucet
Dr Brad Sleebs

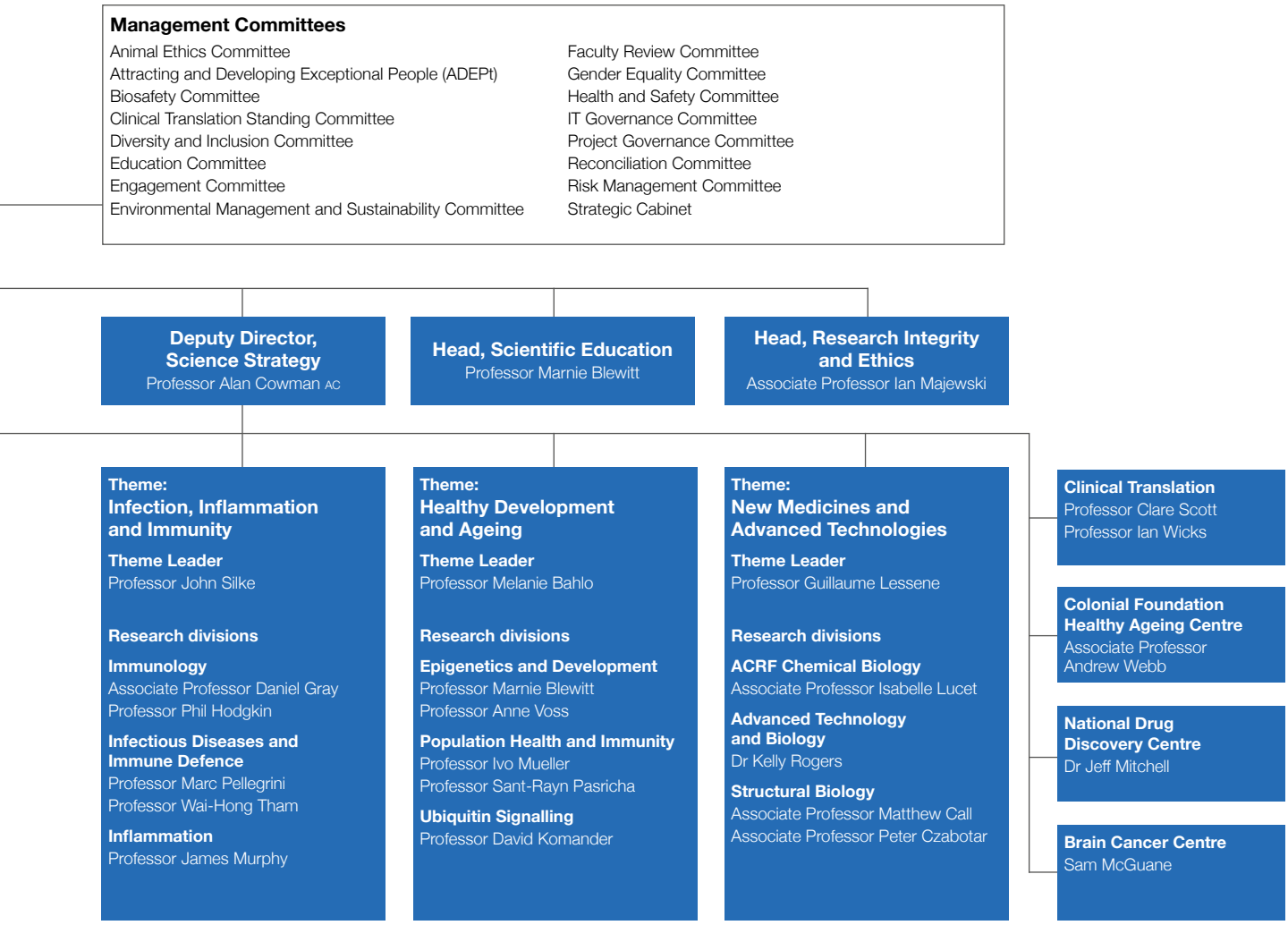
Advanced Technology and Biology
Dr Rory Bowden
Dr Marija Dramicanin
Dr Kym Lowes
Mr Simon Monard
Dr Kelly Rogers
Associate Professor Andrew Webb
Kaye Wycherley

Bioinformatics
Associate Professor Melissa Davis
Professor Tony Papenfuss
Professor Gordon Smyth
Professor Terry Speed

Blood Cells and Blood Cancer
Professor Jerry Adams
Professor Warren Alexander
Professor Suzanne Cory AC
Professor Marco Herold
Professor Douglas Hilton AO
Professor David Huang
Associate Professor Gemma Kelly
Associate Professor Ruth Kluck
Associate Professor Ian Majewski
Professor Andrew Roberts AM
Professor Andreas Strasser

Clinical Translation
Professor Clare Scott
Professor Ian Wicks

Epigenetics and Development
Professor Marnie Blewitt
Associate Professor Joan Heath
Associate Professor Matthew Ritchie
Dr Samir Taoudi
Associate Professor Tim Thomas
Professor Anne Voss



Immunology
Associate Professor Rhys Allan
Dr Vanessa Bryant
Associate Professor Daniel Gray
Associate Professor Joanna Groom
Professor Phil Hodgkin
Associate Professor Misty Jenkins
Dr Shalin Naik
Professor Stephen Nutt
Dr Charlotte Slade
Associate Professor Jason Tye-Din

Infectious Diseases and Immune Defence
Associate Professor Justin Boddey
Professor Alan Cowman AC
Dr Anna Coussens
Associate Professor Diana Hansen
Professor James McCarthy
Professor Marc Pellegrini
Professor Wai-Hong Tham
Associate Professor Chris Tonkin
Professor Deborah Williamson

Inflammation
Dr Philippe Bouillet
Associate Professor Edwin Hawkins
Associate Professor Seth Masters
Professor James Murphy
Associate Professor Sandra Nicholson
Professor John Silke
Associate Professor James Vince
Professor Ian Wicks

Personalised Oncology
Associate Professor Marie-Liesse Asselin-Labat
Dr Sarah Best
Professor Peter Gibbs
Dr Tracy Putoczki
Associate Professor Oliver Sieber
Dr Jim Whittle

Population Health and Immunity
Professor Melanie Bahlo
Professor Len Harrison
Associate Professor Aaron Jex
Professor Ivo Mueller
Professor Sant-Rayn Pasricha
Professor Leanne Robinson
Associate Professor Rosie Watson
Associate Professor Nawaf Yassi

Structural Biology
Associate Professor Jeff Babon
Associate Professor Matthew Call
Dr Melissa Call
Professor Peter Colman AC
Associate Professor Peter Czabotar
Dr Alisa Glukhova
Dr Jacqui Gulbis
Professor Mike Lawrence
Dr Shabih Shakeel

Ubiquitin Signalling
Associate Professor Grant Dewson
Dr Rebecca Feltham
Professor David Komander
Dr Bernhard Lechtenberg

Members of WEHI to 31 December 2021

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
Mrs Lisa Bardas
Mr Paul Barnett
Ms Helen Barry
Mrs Ann Bates
Mr Robert Bates
Mr Lance Bauer
The Walter and Eliza Hall Trust
Dr Elsmaree Baxter
Dr Glenn Begley
Professor Claude Bernard
Mr Marc Besen AC
Professor Rufus Black
Ms Ngaree Blow
Mr Malcolm Broomhead AO
Professor Graham Brown AM
Mrs Rosalind Brown
Mrs Beverley Brownstein
Dr Gerard Brownstein
Mrs Sally Bruce
Mr Ian Brumby
Mr John Brumby AO
Dr Margaret Brumby AM
Professor Tony Burgess AC
Professor Christopher Burrell AO
Mr Greg Camm
Mr Terry Campbell AO
Ms Kate Cannon
Mr Saul Cannon
Dr Amanda Caples
Mrs Gill Carter
Mr Pat Cashin
Emeritus Professor Colin Chapman
Mr John Chatterton AM
Dr Julian Clark
Lady Susannah Clarke
Mr Peter Collins
Ms Pippa Connolly
Mrs Jacqui Cooper
Associate Professor Paul Cooper
Mr Glenn Corke
Mr Ian Coulson
Dr Nicholas Crosbie
Mrs Joan Curtis
Professor Andrew Cuthbertson AO
Mr John Dahlsen
Mr Stephen Daley
Mrs June Danks
Mrs Annette Davis
Mr Leon Davis AO
Mrs Liz Dawes OAM
Professor Karen Day
Dr Simon de Burgh
Professor David de Kretser AC
Professor John Denton
Mr Mick Dexter
Mr Angelo Di Grazia
Mrs Helen Diamond
Ms Melda Donnelly OAM
Professor Ashley Dunn
Mr John Dyson
Ms Roz Edmond
Dr Martin Elhay
Mr Garry Emery
Dr Peter Eng
Professor Sir Marc Feldmann AC
Mr Mike Fitzpatrick AO
Mrs Pauline Flanagan
Dr Sue Forrest
Professor Richard Fox AM
Mrs Nolene Fraser
Mr Paul Fraser
Professor Ian Frazer AC
Mrs Pamela Galli AO
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
Mrs Andrea Gowers
Mr John Grace AO
Mrs Maureen Grant
Mr Tony Gray
Sir Andrew Grimwade CBE
Professor Jane Gunn
Mrs Jean Hadges
Col Tom Hall CVO, OBE
Professor Emanuela Handman
Mr Michael Harris
Mr Harry Hearn AM
Mrs Jane Hemstritch
Ms Deborah Henderson
Professor David Hill AO
Mrs Janet Hirst
Mr Jon Isaacs
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 AO
Emeritus Professor Frank Larkins AM
Professor Richard Larkins AC
Mrs Belinda Lawson
Mr Gary Liddell

Dr Rowena MacKean OAM
Dr Alexander Macphee
Ms Eve Mahlab AO
Mrs Robyn Male
Mrs Lorrie Mandel
Mr John Marshall AM
Ms Josephine Marshall
Emeritus Professor Jack Martin AO
Mr Erich Mayer AM
Mrs Netta McArthur
Professor James McCluskey AO
Ms Marie McDonald
Professor John McKenzie AM
Mrs Kate McMahon
Mr Tim McMahon
Professor Kathryn McPherson
Professor Frederick Mendelsohn AO
Ms Jo Metcalf
Ms Kate Metcalf
Professor Jacques Miller AC
Professor John Mills AO
Mr Robert Minter
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 John Murphy
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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 AM
Professor David Penington AC
Emeritus Professor Roger Pepperell AM
Mrs Gayle Petty
Lady Primrose Potter AC
Mr John Prescott AC
Mr John Pye
Mrs Cathy Quilici
Mr Denis Quilici
Professor Peter Rathjen
Ms Kate Redwood AM
Mr Dieter Rinke
Associate Professor Ken Roberts AM
Ms Linda Rodger
Mrs Mary Rodger
Mrs Ellie Rogers
Mrs Margaret Ross AM
Mr Fergus Ryan
Professor Emeritus Graeme Ryan AC
Mr Colin Sakinofsky
Professor Nick Samaras
Mr Keith Satterley
Professor Sir John Savill
Professor Carl Schedvin
Ms Anne Schumacher
The Walter and Eliza Hall Trust
Mrs Carol Schwartz AO
Dr Roland Scollay
Mr Andrew Scott
Professor John Scott AO
Dr Paul Scown
Mrs Sam Sharman OAM
Mrs Lousje Skala
Mr Steven Skala AO
Professor Stephen Smith
Mr Jack Smorgon AO
Mrs Sally Speed
Professor Terry Speed
Miss Ann Sprague
Mr Geoffrey Stewardson
Dr John Stocker AO
Ms Jennifer Strangward
Mr John Stratton
Ms Kate Summers
Ms Helen Sykes
Ms Jenny Tatchell
Mr Bruce Teele
Mrs Cheryl Thomas
Mr Christopher Thomas AM
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
Mr Kevin Weight
Professor Richard Wettenhall
Dr Senga Whittingham
Dr Mark Wickham
Mr David Williamson
Mr Malcolm Williamson
Professor Robert Williamson AO
Professor Ingrid Winship AO
Mr Kee Wong
Ms Sally Wood
Mr Peter Worcester
Mr Rob Wylie
Professor Quan Zhao

WEHI remembers those members who passed away in 2021

Mr Darvell Hutchinson AM

Supporting organisations

WEHI acknowledges the support of the following organisations

Australian Cancer Research Foundation

Australian Government

Carrie's Beanies 4 Brain Cancer

CSL

The Royal Melbourne Hospital

The Walter and Eliza Hall Trust
Helping Australians in need since 1912

Victoria State Government

In-kind support was received from:

CCB 中国建设银行 China Construction Bank

Harry M. Hearn AM
Solicitor

Below: WEHI laboratory supported by Australian Cancer Research Foundation.

WEHI is associated with the following organisations

2021 Board subcommittees 31 December 2021

Advocacy and Support Committee

John Dyson (chair)
Megan Auld
Alistair Brown
Deborah Carr
Joel Chibert
Associate Professor Paul Cooper
Michael Daddo
Mark Eaton
Hugh Hodges
Jaci Hoysted
Caroline Johnston
Andrea Lapidge
Carolyn MacDonald
Catherine Robson
Liz Williams
Kelly Rodger (minutes)

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Robert Wylie (chair)
Tracey Baldwin
Gery Bicos (Deloitte)
Alistair Brown
Lauren Brown (Protiviti)
Malcolm Broomhead AO
Joel Chibert
Pippa Connolly
Anneke du Toit (Deloitte)
Jane Hemstritch
Professor Doug Hilton AO
Joh Kirby
Carolyn MacDonald
Shashi Stevering
Elly Maddy (Protiviti)
Emma Booth (minutes)

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Marie McDonald (chair)
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Professor Peter Colman AC
Professor Alan Cowman AC
Dr Leigh Farrell
Lisa Hennessy (independent member)
Professor Doug Hilton AO
Associate Professor Isabelle Lucet
Carolyn MacDonald
Chela Niall
Dr Anne-Laure Puaux
Professor Sir John Savill
Professor John Silke

Human Research Ethics Committee

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Reverend Father Michael Elligate (deputy chair)
Dr John Bonacci
Dr Vanessa Bryant
Jane Fiske
David Freeman
Sarah Galbraith
Terri Lourey
Associate Professor Ian Majewski
Professor Marc Pellegrini
Bree Ridgeway
Louise Steinfort
Associate Professor Jeanne Tie

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Sally Auld (JBWere)
Adam Blennerhassett (JBWere)
Malcolm Broomhead AO
Alistair Brown
Joel Chibert
Mark Eaton
Professor Doug Hilton AO
Jane Hemstritch
Carolyn MacDonald
Stephen Merlicek
Stephen Milburn-Pyle
Curtis Reid (JBWere)
Andrew Scott
Fiona Trafford-Walker
Shashi Stevering (minutes)
Joh Kirby (minutes)

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James Cain (M21 Advisory)
Joel Chibert
Pippa Connolly
Professor Alan Cowman AC
Mark Eaton
Steve Droste
Professor Doug Hilton AO
Carolyn MacDonald
Dan McLennan (Partner Developments)
Catherine Parker
Emma Booth (minutes)

People and Culture Committee

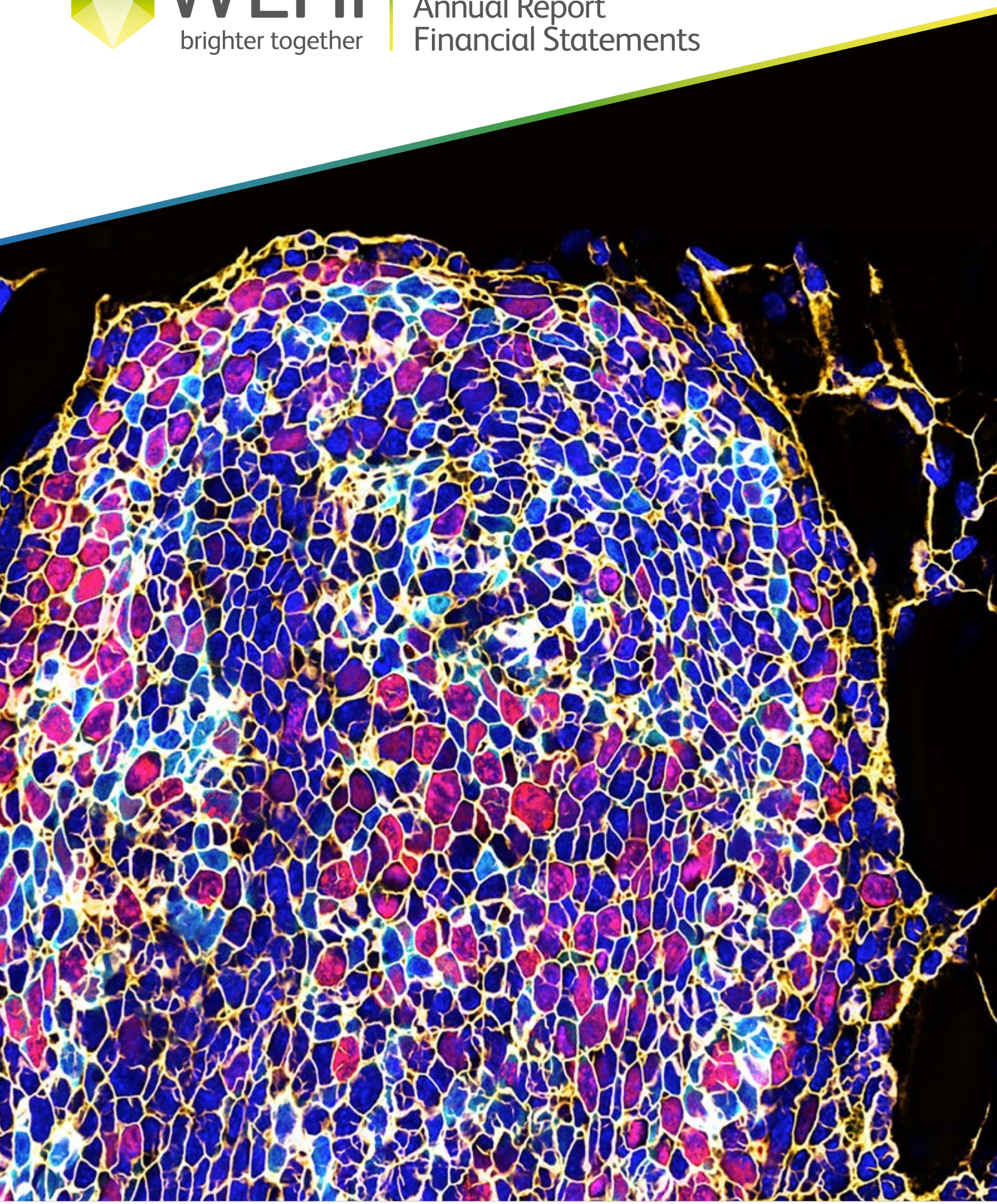
Jane Hemstritch (chair)
Doug Hilton - WEHI Director
Marnie Blewitt
Professor Alan Cowman AC
Professor Doug Hilton AO
Carolyn MacDonald
Elizabeth McMahon
Professor Sir John Savill
Carolyn Viney
Kelly Rodger (minutes)

Remuneration and Nomination Committee

- ceased May 2021
Terry Moran AC (chair)
Marie McDonald
Carolyn Viney

WEHI
brighter together

2021 Annual Report Financial Statements



Financial statements contents

NOTE

Statement of profit or loss and other comprehensive income for the year ended 31 December 2021

Operating revenue	Note	2021 $'000	2020 $'000
Government revenue			
National Health and Medical Research Council		41,820	40,087
Cooperative Research Centres		-	1,386
Other Australian Government grants	2(a)	17,830	23,316
Other Australian Government fellowships		250	9
Victorian Government grants		9,883	10,311
Foreign Government grants and fellowships		35	-
		69,818	**75,109**
Other grant revenue			
Industrial grants and contracts		12,181	13,439
Philanthropic grants and fellowships – Australia		12,563	9,870
Philanthropic grants and fellowships – International		2,885	4,649
		27,629	**27,958**
Other revenue			
Investment income	2(b)	29,518	19,996
Royalty income		770	1,654
General income		9,105	6,842
Donations and bequests		26,767	11,569
		66,160	**40,061**
Total operating revenue before monetisation		**163,607**	**143,128**
Royalty monetisation income (venetoclax)	5	27,590	38,961
Total operating revenue		**191,197**	**182,089**

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

Operating expenditure	Note	2021 $'000	2020 $'000
Scientific laboratories			
Staff costs		68,687	67,601
Apparatus and equipment		6,139	3,178
Consumable supplies		9,852	9,131
Other expenses		4,388	3,961
		89,066	**83,871**
Support laboratories			
Staff costs		14,290	14,125
Apparatus and equipment		2,144	900
Consumable supplies		1,747	1,347
Other expenses		292	1,695
		18,473	**18,067**
Professional services			
Staff costs		15,303	13,898
Furniture & equipment		88	74
Building operating costs and maintenance		5,413	5,092
Other expenses		14,298	6,202
		35,102	**25,266**
Strategic initiatives			
Staff costs		10,213	6,923
Furniture & equipment		432	20
Other expenses		10,956	8,451
		21,601	**15,394**
Allowance for credit loss (decrease)	9	(32)	(30)
Unrealised foreign exchange (Gain)/loss		(4,669)	10,282
Total operating expenditure before monetisation		**159,541**	**152,850**
Royalty monetisation (venetoclax)			
Commerical income distribution expense		(4,418)	2,239
Total operating expenditure		**155,123**	**155,089**
Surplus from operations		**36,074**	**27,000**
Other (loss)/income	3	161	(135)
Depreciation and amortisation - property, plant and equipment	4	(12,908)	(11,818)
Depreciation and amortisation - right of use assets	18	(51)	(53)
Impairment of property, plant and equipment	4	(4,422)	-
Gain on financial assets taken to profit or loss (FVTPL Instruments)		10,549	816
Bequests, donations and grants for capital works		1,460	14,953
Bequests, donations and grants for allocation to permanent funds		26,659	673
Net surplus for the period	16(a)	**57,522**	**31,436**
Other comprehensive income			
Items that will not be reclassified subsequently to profit or loss			
Gain on financial assets taken to equity (FVTOCI equity Instruments)	16(g)	52,363	68
Items that may be reclassified subsequently to profit or loss			
(Loss)/gain on financial assets taken to equity (FVTOCI debt Instruments)	16(g)	(422)	322
Cumulative gain reclassified to profit or loss on sale of financial assets (FVTOCI Debt Instruments)	16(g)	60	137
Total comprehensive income for the year		**109,523**	**31,963**

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 2021

Assets	Note	2021 $'000	2020 $'000
Current assets			
Cash and cash equivalents	17(a)	76,751	70,442
Tax assets	8	8,260	5,425
Trade and other receivables	9	41,995	53,310
Prepayments		1,138	2,254
Total current assets		**128,144**	**131,431**
Non-current assets			
Other financial assets	10	673,211	561,431
Property, plant and equipment	11	194,690	196,314
Right of use assets	18	2,632	2,683
Total non-current assets		**870,533**	**760,428**
Total assets		**998,677**	**891,859**
Liabilities			
Current liabilities			
Trade and other payables	12	13,921	18,479
Provisions	13	27,562	37,448
Unearned grants and fellowships	14	56,138	45,627
Other liabilities	15	361	330
Total current liabilities		**97,982**	**101,884**
Non-current liabilities			
Provisions	13	33,708	32,511
Total non-current liabilities		**33,708**	**32,511**
Total liabilities		**131,690**	**134,395**
Net assets		**866,987**	**757,464**
Funds			
Permanent invested funds	16(b)	229,672	202,322
General funds	16(c)	419,077	383,847
Royalty fund	16(d)	56,389	56,135
Leadership fund	16(e)	30,225	28,927
Discovery fund	16(f)	5,746	5,484
Investment revaluation reserve	16(g)	125,878	80,749
Total funds		**866,987**	**757,464**

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 2021

	Note	2021	2020
Cash flows from operating activities		**$'000**	**$'000**
Donations and bequests		26,137	11,599
General income		14,675	7,705
Receipts from granting bodies		105,071	95,250
Payments to suppliers and employees		(172,143)	(140,204)
Royalty receipts		39,701	37,309
Dividends received		21,520	13,399
Interest and bill discounts received		2,189	7,363
Net cash from operating activities	17(b)	**37,150**	**32,421**
Cash flows from investing activities			
Payment for other financial assets		(94,953)	(104,000)
Proceeds on sale of other financial assets		72,902	83,133
Net exchange differences from other financial assets		4,615	845
Grants and donations for property, plant and equipment		1,460	14,953
Payment for property, plant and equipment		(15,710)	(24,246)
Net cash used in investing activities		**(31,686)**	**(29,315)**
Cash flows from financing activities			
Donations and bequests to permanent invested funds		227	673
Net cash from financing activities		**227**	**673**
Net increase in cash and cash equivalents		**5,691**	**3,779**
Cash and cash equivalents at the beginning of the year		**70,112**	**69,163**
Effects of exchange rate changes on the balance of cash held in foreign currencies		587	(2,830)
Cash and cash equivalents at the end of the year	17(a)	**76,390**	**70,112**

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	Investment revaluation reserve	Total
Balance at 31 December 2019 (as previously reported)	**198,833**	**371,193**	**55,039**	**27,965**	**5,271**	**67,200**	**725,501**
Restatement - transfers from Investment revaluation reserve on sale of investment	-	(7,008)	-	-	-	7,008	**-**
Balance at 1 January 2020 (restated)	**198,833**	**364,185**	**55,039**	**27,965**	**5,271**	**74,208**	**725,501**
Restatement - transfers from Investment revaluation reserve on sale of investment	-	(3,430)	-	-	-	3,430	**-**
Transfers from Investment revaluation reserve on sale of investment	-	(2,584)	-	-	-	2,584	**-**
Surplus for the year	3,489	25,676	1,096	962	213	-	**31,436**
Other comprehensive income for the year							
Revaluation gain on investments for the period	-	-	-	-	-	527	**527**
Total comprehensive income / (loss) for the year	**3,489**	**19,662**	**1,096**	**962**	**213**	**6,541**	**31,963**
Balance at 31 December 2020 (restated)	**202,322**	**383,847**	**56,135**	**28,927**	**5,484**	**80,749**	**757,464**
Transfers from Investment revaluation reserve on sale of investment	-	6,872	-	-	-	(6,872)	**-**
Surplus for the year	27,350	28,358	254	1,298	262	-	**57,522**
Other comprehensive income for the year							
Revaluation gain on investments for the period	-	-	-	-	-	52,001	**52,001**
Total comprehensive income for the year	**27,350**	**35,230**	**254**	**1,298**	**262**	**45,129**	**109,523**
Balance at 31 December 2021	**229,672**	**419,077**	**56,389**	**30,225**	**5,746**	**125,878**	**866,987**

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 2021

1. Statement of significant accounting policies

The Walter and Eliza Hall Institute of Medical Research ('WEHI') is a company limited by guarantee registered with the Australian Charities and Not-for-profits Commission. WEHI has 224 members, and the guarantee is limited to two dollars per member.

The financial statements include all the activities of WEHI.

The principal address of WEHI is:

1G Royal Parade
Parkville, Victoria, 3052

(a) Statement of compliance

This general purpose financial report has been prepared in accordance with the Australian Accounting Standards, other authoritative pronouncements of the Australian Accounting Standards Board, International Financial Reporting Standards (IFRS) and the *Australian Charities and Not-for-profits Commission (ACNC)* Act 2012 (Cth). WEHI is a not-for-profit entity and is exempt from taxation.

The financial report has been prepared on a going concern basis using historical cost conventions, except for certain financial instruments, which have been measured at fair value. Cost is based on the fair values of consideration given in exchange for assets.

WEHI has assessed the impact that the Coronavirus (COVID-19) pandemic has had, or may have on the financial statements based on known information. There does not currently appear to be either any significant impact upon the financial statements or any significant uncertainties with respect to events or conditions which may impact WEHI's ongoing financial viability unfavourably as at the reporting date or subsequently as a result of the pandemic.

The financial report is presented in Australian dollars, which is WEHI's functional and presentation currency. WEHI 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.

The financial statements were authorised for issue by the directors on 24 March 2022.

The principal accounting policies adopted in the preparation of the financial statements are set out below. These policies have been consistently applied to all the years presented, unless otherwise stated.

(b) Source of capital funds

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

(i) Permanent Invested Funds originate from donations and bequests, the income from which is applied as stipulated by the donor, or to general research where there is no specific stipulation. These donations 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 WEHI to support specialist research and will be applied based on the merits of submissions to WEHI Director. There are three areas of focus: early drug discovery, blue sky basic biological research and technical innovation.

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

(c) Revenue recognition

WEHI recognises income from its main revenue/income streams, as listed below:

- Research grants
- Infrastructure grants
- Donations and bequests
- Capital grants - buildings and equipment
- Royalty Income
- Sales of goods/services

Research grants, Infrastructure grants, donations and bequests

When WEHI receives government grants, donations and bequests that are within the scope of AASB 1058 (being a transaction where the consideration paid to acquire an asset is significantly less than fair value principally to enable WEHI to further its objectives), it performs an assessment to determine if the contract is 'enforceable' and contains 'sufficiently specific' performance obligations.

In cases where there is an 'enforceable' contract with a customer with 'sufficiently specific' performance obligations, the transaction is accounted for under AASB 15 where income is recognised when (or as) the performance obligations are satisfied.

In all other cases (where the contract is not 'enforceable' or the performance obligations are not 'sufficiently specific'), the transaction is accounted for under AASB 1058, unless where WEHI has recognised this under AASB 9 Financial Instruments, as a financial liability on contract inception.

In these instances WEHI:

- Recognises the asset in accordance with the requirements of other relevant applicable Australian Accounting Standards (e.g. AASB 9, AASB 16, AASB 116 and AASB 138)
- Considers whether any other financial statement elements should be recognised ('related amounts') in accordance with the relevant applicable Australian Accounting Standard including:
  - contributions by owners (AASB 1004)
  - a lease liability (AASB 16)
  - a financial instrument (AASB 9)
  - a provision (AASB 137)
- Recognises income immediately in profit or loss for the excess of the initial carrying amount of the asset over any related amounts recognised.

Capital grants – Buildings and Equipment

For capital grants received under an enforceable agreement where it includes a transfer to enable WEHI to acquire or construct a recognisable non-financial asset to identified specifications which will be controlled by WEHI when completed, WEHI recognises a liability for the excess of the fair value of the transfer over any related amounts recognised and recognises income as it satisfies its obligations under the transfer. As the capital grants received by WEHI are primarily for buildings works and scientific equipment, WEHI recognises income as the building works are completed and as equipment is purchased/constructed (when it satisfies its obligations).

Royalty Income

Royalty income is accounted for under AASB 15 and is recognised when there is an enforceable right to receive income.

Sales of goods/services

Revenue is recognised when control of the goods has been transferred to the customer or the service/performance obligation has been provided.

(d) Property, plant and equipment

Property, plant and equipment held for use in research, or for administrative purposes, are recorded at historical cost, less accumulated depreciation. Cost comprises expenditure that is directly attributable to the acquisition of the item and subsequent costs incurred to replace parts that are eligible for capitalisation.

Depreciation is on a straight-line basis over the estimated useful life of the asset. 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.

Items of property, plant and equipment are derecognised upon disposal or when no further economic benefits are expected from their use or disposal. Gains and losses on disposals of items of property, plant and equipment are determined by comparing proceeds with carrying amounts and are included in the statement of comprehensive income when realised.

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

Buildings	20 - 40 years
Plant and equipment	3 - 20 years
Furniture and fittings	5 - 20 years

(e) Financial instruments – initial recognition and subsequent measurement

A financial instrument is any contract that gives rise to a financial asset of one entity and a financial liability or equity instrument of another entity. Financial assets and liabilities are recognised in the statement of financial position when WEHI becomes party to the contractual provisions within the contract.

Financial assets

(i) Initial measurement and recognition

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

Purchases or sales of financial assets that require delivery of assets within a time frame established by regulation or convention in the market place are recognised on the trade date, that is, the date that WEHI commits to purchase or sell the asset. 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, WEHI may make the following irrevocable election/designation at initial recognition of a financial asset:

- WEHI may irrevocably elect to present subsequent changes in fair value of an equity investment in other comprehensive income if certain criteria are met; and
- WEHI 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 allowances. WEHI'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 WEHI are classified as FVTOCI. Subsequently, changes to the carrying value due to foreign exchange, impairment and interest income are recognised in profit or 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.

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

On initial recognition, WEHI 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 or loss in accordance with AASB 9. This is included in the "investment income" line item (note 2).

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. WEHI's investment in hybrid instruments and managed international share fund fall within this category.

(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

WEHI 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.

WEHI 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, WEHI 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, WEHI 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, WEHI 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.

Financial liabilities

(i) Initial measurement and derecognition

Financial liabilities are classified, at initial recognition, as financial liabilities at fair value through profit or loss, loans and borrowings, payables, or as derivatives designated as hedging instruments in an effective hedge, as appropriate.
All financial liabilities are recognised initially at fair value and, in the case of loans and borrowings and payables, net of directly attributable transaction costs.
The WEHI's financial liabilities include trade and other payables and unearned grants and fellowships."

(ii) Subsequent measurement

For purposes of subsequent measurement, financial liabilities are classified in two categories:

- Financial liabilities at fair value through profit or loss, which WEHI does not have any.

- Financial liabilities at amortised cost (Trade and other payables, Unearned grants and fellowships).

Financial liabilities at amortised cost

After initial recognition, financial liabilities at amortised cost are measured using the effective interest rate (EIR) method. Gains and losses are recognised in profit or loss when the liabilities are derecognised as well as through the EIR amortisation process.

Amortised cost is calculated by taking into account any discount or premium on acquisition and fees or costs that are an integral part of the EIR. The EIR amortisation is included as finance costs in the statement of profit or loss.

WEHI administers some of its research grant contracts on behalf of its researchers whilst retaining substantially all the risks and rewards of ownership of the funds associated with the research grants. Accordingly WEHI recognises the transferred asset, being the grant funds, in its entirety as a financial asset, and recognises an equal amount as a financial liability for the consideration received.

In subsequent periods, WEHI recognises an income as and when the funds are expended, representing the relinquishment of that portion of WEHI's obligation to refund advances of research funding previously held on the statement of financial position.

(f) 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.

(g) Trade and other receivables

Trade and other receivables are initially recorded at fair value and are generally due for settlement within 30 days from date of invoice. A provision for expected credit loss (ECL) is recognised in accordance with AASB 9. ECLs are based on the difference between the contractual cash flows due in accordance with the contract and all the cash flows that WEHI expects to receive, discounted at an approximation of the original effective interest rate. Cash flows relating to short-term receivables are not discounted if the effect of discounting is immaterial. When a trade receivable for which a provision for expected credit loss has been recognised becomes uncollectible in a subsequent period, it is written off against the provision.

WEHI applies a simplified approach in calculating ECLs. Therefore, WEHI does not track changes in credit risk, but instead recognises a loss allowance based on lifetime ECLs at each reporting date. WEHI has established a provision matrix that is based on its historical credit loss experience, adjusted for forward-looking factors specific to the debtors and the economic environment.

(h) Trade and other payables

Trade and other payables represent amounts reflected at notional amounts owed to suppliers for goods and services provided to WEHI prior to the end of the financial year that are unpaid. Trade and other payables are non-interest bearing and have various repayment terms but are usually paid within 30 to 60 days of recognition.

(i) Research costs

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

(j) 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.

(k) Provisions

Provisions are recognised when all three of the following conditions are met:

- WEHI has 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
- A reliable estimate can be made of the amount of the obligation.

Provisions are not recognised for future operating losses.

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).

(l) 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. These are included in the current provision for employee benefits.

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 WEHI in respect of services provided by employees up to the reporting date. These are included in the non-current provision for employee benefits.

(m) Foreign currency

All transactions in foreign currency 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.

(n) Leased assets

WEHI as lessee

WEHI assesses whether a contract is or contains a lease, at contract inception. WEHI recognises a right-of-use asset and a corresponding lease liability with respect to all lease arrangements in which it is the lessee, except for short-term leases (defined as leases with a lease term of 12 months or less) and leases of low value assets (such as tablets and personal computers, small items of office furniture and telephones). For these leases, WEHI recognises the lease payments as an operating expense on a straight-line basis over the term of the lease unless another systematic basis is more representative of the time pattern in which economic benefits from the leased assets are consumed.

Right-of-use asset

Right-of-use assets comprise the initial measurement of the corresponding lease liability, lease payments made at or before the commencement day, less any lease incentives received and any initial direct costs. They are subsequently measured at cost less accumulated depreciation and impairment losses.

If WEHI incurs an obligation for costs to dismantle and remove a leased asset, restore the site on which it is located or restore the underlying asset to the condition required by the terms and conditions of the lease, a provision is recognised and measured. To the extent that the costs relate to a right-of-use asset, the costs are included in the related right-of-use asset.

Right-of-use assets are depreciated over the shorter period of the lease term and useful life of the underlying asset. If a lease transfers ownership of the underlying asset or the cost of the right-of-use asset reflects that WEHI expects to exercise a purchase option, the related right-of-use asset is depreciated over the useful life of the underlying asset. The depreciation starts at the commencement date of the lease.

The right-of-use assets are presented as a separate line in the statement of financial position. WEHI reviews right-of-use assets for impairment annually.

Variable rents that do not depend on an index or rate are not included in the measurement of the lease liability and the right-of-use asset. The related payments are recognised as an expense in the period in which the event or condition that triggers those payments occurs and are included in "Other expenses" in profit or loss.

Lease liability

At the commencement date of the lease, WEHI recognises lease liabilities measured at the present value of the lease payments to be made over the lease term, discounted by using the rate implicit in the lease. If this rate cannot be readily determined, WEHI uses its incremental borrowing rate.

Lease payments included in the measurement of the lease liability comprise:

- Fixed lease payments (including in-substance fixed payments), less any lease incentives receivable;
- Variable lease payments that depend on an index or rate;
- The amount expected to be payable by the lessee under residual value guarantees;
- The exercise price of purchase options, if the lessee is reasonably certain to exercise the options; and
- Payments of penalties for terminating the lease, if the lease term reflects the exercise of an option to terminate the lease.

The lease liability is included within 'Trade and other payables' in the statement of financial position. The lease liability is subsequently measured by increasing the carrying amount to reflect interest on the lease liability (using the effective interest method) and by reducing the carrying amount to reflect the lease payments made.

WEHI reviews and remeasures the lease liability (and makes a corresponding adjustment to the related right-of-use asset) where required.

Concessionary leases

WEHI has several leases for premises which are provided at significantly below-market terms and conditions, principally to enable WEHI to further its medical research objectives.

WEHI is dependent on these leases as the premises are used to run its operations to deliver medical research outcomes. WEHI is restricted on the use of these premises by the lease providers and may not utilise the premises for other purposes. WEHI measures concessionary leases at cost.

A summary of concessionary leases held by WEHI is located in note 26.

WEHI as lessor

WEHI enters into sub-lease agreements as a lessor with respect to the Parkville and Bundoora premises.

Leases for which WEHI is a lessor are classified as finance or operating leases. Whenever the terms of the lease transfer substantially all the risks and rewards of ownership to the lessee, the contract is classified as a finance lease. All other leases are classified as operating leases. WEHI is currently not the lessor in any finance leases.

Rental income from operating leases is recognised on a straight-line basis over the term of the relevant lease. Initial direct costs incurred in negotiating and arranging an operating lease are added to the carrying amount of the leased asset and recognised on a straight-line basis over the lease term.

When a contract includes both lease and non-lease components, WEHI applies AASB 15 to allocate the consideration under the contract to each component.

(o) 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.

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

In the application of WEHI'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, the carrying value of provisions for royalties and revenue recognition assessment (refer to respective notes).

(q) Comparatives

Comparative figures can be adjusted to conform to changes in presentation for the current financial period where required by accounting standards or as a result of changes in accounting policy. Where necessary, comparatives have been reclassified and repositioned for consistency with current period disclosure.

(q) Comparatives (Continued)

Prior period restatement

An extensive review of the investment accounts was undertaken during the 2021 year and identified an understatement of the Investment Revaluation Reserve due to prior period misallocations from General Funds. It is noted that the prior period misallocations did not impact previously reported surplus amounts, however, reserve & fund balances were incorrectly disclosed.

As a consequence of the above, the prior period disclosures in the statement of changes in equity and capital movements were incorrect, management consider the cumulative misallocation to be material. As such, the misallocation was corrected by restating each of the affected financial statement line items for prior periods in accordance with AASB 108 Accounting Policies, Changes in Accounting Estimates and Errors. The Institute's assessment of the impact of the misallocation for prior periods, are outlined in the table below.

			Impact of restatement on prior periods
Impact of restatement on 2019 financial period	Previously reported	Adjustment	Restated
General Fund at 31 December 2019	371,193	(7,008)	364,185
Investment Revaluation Reserve at 31 December 2019	67,200	7,008	74,208
Total Funds & Reserves at 31 December 2019	**725,501**	**-**	**725,501**

Impact of restatement on 2020 financial period	Previously reported	Adjustment	Restated
General Funds at 31 December 2020	394,285	(10,438)	383,847
Investment Revaluation Reserve at 31 December 2020	70,311	10,438	80,749
Total Funds & Reserves at 31 December 2020	**757,464**	**-**	**757,464**

2. Operating revenue	2021 $'000	2020 $'000
Operating revenue includes of:		
(a) Other Australian Government grants		
JobKeeper income	4,140	19,970
Other Government grants	13,690	3,346
Total as per statement of profit or loss and other comprehensive income	**17,830**	**23,316**

The receipts from the Federal Government's JobKeeper Program in response to the COVID-19 pandemic are accounted for as government grants under AASB 120: Accounting for government grants and disclosure of government assistance and have been presented in Other Australian Government grants.

(b) Investment income		
Dividends and distributions income on financial assets	28,354	12,482
Interest income on financial assets	2,184	5,643
Realised foreign exchange gain	533	4,284
	31,071	**22,409**
Less transfer to grants and fellowships	(1,553)	(2,413)
Total as per statement of profit or loss and other comprehensive income	**29,518**	**19,996**

3. Other (loss) / income

Gain/(loss) on sale of investments	140	(135)
Gain on sale of assets	21	-
Total other income	**161**	**(135)**

4. Operating expenses

The following items of expense are included in the net surplus:

Employee benefits expense		
Employee benefits expense	109,662	102,547
Depreciation of property, plant and equipment		
Buildings	5,234	5,300
Plant and equipment	7,521	6,415
Furniture and fittings	153	103
Total depreciation	**12,908**	**11,818**
Impairment of property, plant and equipment	4,422	-

5. Venetoclax monetisation

On 14 June 2017, WEHI entered into an agreement with CPPIB Credit Europe S.a`.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 WEHI 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.

During the year WEHI recognised the following monetisation income and associated costs:

Royalties earned	**27,590**	**38,961**
Less associated costs:		
Net commercial income distribution expense	3,164	(2,239)
Net Monetisation income	**30,754**	**36,722**

As a result of the venetoclax monetisation transaction and WEHI'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 $13,000,000. Refer to note 13 for further details.

6. Directors' remuneration

The directors of WEHI during the period were:

P Collins	C Kilpatrick	JS Savill	RH Wylie
P Connolly	J McCluskey	C Viney	MW Broomhead
J Dyson	ME McDonald	JS Hemstritch	

J Gunn (appointed 25 Feb 2021)
K Wong (appointed 27 July 2021)
T Moran (resigned 23 Mar 2021)

The aggregate income paid or payable, or otherwise made available, in respect of the financial period, to all directors of WEHI, directly or indirectly, by WEHI or by any related party was nil (2020: nil).

Aggregate retirement benefits paid to all directors of WEHI, by WEHI or by any related party was nil (2020: nil).

	Note	2021	2020
7. Auditors' remuneration		**$**	**$**
Auditing the financial report		70,000	65,500
Non audit services*		-	63,733
		70,000	**129,233**

* During the prior year, Deloitte were engaged to provide workplace relations advice.

	2021	2020
8. Current tax assets	**$'000**	**$'000**
Franking credits receivable	8,254	5,595
Current tax liability	6	(170)
	8,260	**5,425**

9. Trade and other receivables

Sundry debtors		4,728	3,041
Accrued income		9,677	11,340
Royalty income receivable (venetoclax monetisation)	5	27,590	38,961
		41,995	**53,342**
Allowance for credit losses		-	(32)
		41,995	**53,310**
Movement in the allowance for credit losses			
Balance at beginning of the year		32	62
Impairment losses reversed		(24)	(30)
Amounts written off during the year as uncollectible		(8)	-
Balance at end of the year		**-**	**32**
Impairment expense			
Allowance for credit losses credit / (expense)		(32)	(30)

WEHI 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.

WEHI 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.

10. Other financial assets	2021 $'000	2020 $'000
Investments in debt instruments classified as FVOCI		
Corporate bonds	96,535	105,426
Investments in equity instruments designated as FVOCI		
Domestic equities	286,286	238,238
International equities	158,926	113,113
Other Investments classified as FVTPL		
Domestic managed fund	6,324	9
International managed fund	42,430	16,637
Hybrid instruments	81,193	85,663
Total Investments	**671,694**	**559,086**
Investments in associates		
Unquoted shares	1,517	2,345
Total Investments	**673,211**	**561,431**

(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

Financial assets measured at fair value	Level 1 $'000	Level 2 $'000	Level 3 $'000	31 December 2021 Total $'000
Quoted shares	493,966	-	-	493,966
Floating rate securities	81,193	72,241	-	153,434
Fixed rate securities	-	24,294	-	24,294
Unquoted shares*	-	-	1,517	1,517
Total	**575,159**	**96,535**	**1,517**	**673,211**

*As at 31 December 2021, WEHI held a 49% (2020: 49%) share of equity in Catalyst Therapeutics Pty Ltd, with a carrying value of $1,020,000 (2020: $1,397,000). Anaxis Pharma Pty Ltd is a wholly owned subsidiary of Catalyst Therapeutics Pty Ltd. WEHI also held a 48.5% share of the equity in Murigen Pty Ltd, with nil carrying value, until the voluntary deregistration of the entity on 1 June 2021 (2020: 48.5% share of the equity and nil carrying value). WEHI's investment in VCCC is detailed in note 25.

(b) Reconciliation of level 3 fair value measurements of financial assets

	Unquoted equities	
	2021 $'000	2020 $'000
Opening balance	2,345	2,034
Revaluation	(828)	311
Closing balance	**1,517**	**2,345**

11. Property, plant and equipment

	Buildings	Work in progress	Plant and equipment	Furniture and fittings	Total
	$'000	$'000	$'000	$'000	$'000
Gross carrying amount					
Balance at 31 December 2020	195,911	13,764	87,689	2,624	299,988
Additions at cost	58	8,015	7,575	62	15,710
Transfers	51	(2,430)	2,332	47	-
Disposals	-	-	(122)	-	(122)
Impairment of property, plant and equipment	-	(4,422)	-	-	(4,422)
Balance at 31 December 2021	**196,020**	**14,927**	**97,474**	**2,733**	**311,154**
Accumulated depreciation					
Balance at 31 December 2020	(57,544)	-	(44,330)	(1,800)	(103,674)
Disposals	-	-	118	-	118
Depreciation expense	(5,234)	-	(7,521)	(153)	(12,908)
Balance at 31 December 2021	**(62,778)**	**-**	**(51,733)**	**(1,953)**	**(116,464)**
Carrying amounts					
As at 31 December 2020	**138,367**	**13,764**	**43,359**	**824**	**196,314**
As at 31 December 2021	**133,242**	**14,927**	**45,741**	**780**	**194,690**

	2021 $'000	2020 $'000
12. Trade and other payables		
Trade creditors	8,951	12,299
Accrued expenses	4,970	6,180
	13,921	**18,479**
13. Provisions		
Provision for net commercial income distribution	3,757	14,874
Provision for employee benefits*	23,805	22,574
Current provisions	**27,562**	**37,448**
Provision for employee benefits	2,348	2,221
Provision for net commercial income distribution	31,360	30,290
Non current provisions	**33,708**	**32,511**
	61,270	**69,959**

* Included in current employee provisions are $12,376,000 (2020: $12,487,000) of long service leave for which a current entitlement exists.

As a result of the venetoclax monetisation transaction and WEHI's net commercial 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 WEHI, the number of eligible employees within the distribution period and Board approval.

WEHI finalised its net commercial income distribution policy in 2018, which resulted in an increase to the nominal amounts that may be payable in future years (no amount has been recognised as a liability) below:

Potential payments by WEHI arising from royalty distributions to staff:		
Payable within 1 year	1,450	1,750
Payable between 1-5 years	6,000	6,000
Payable 5+ years	5,550	7,000
	13,000	**14,750**
Number of employees at end of financial period (full time equivalents)		
Staff	819	746
Visiting scientists	8	32
	827	**778**
14. Unearned grants and fellowships		
Grants and fellowships already committed and applicable to future periods:		
Grants	51,687	36,713
Fellowships	1,450	1,666
Capital Grants	3,001	7,248
	56,138	**45,627**
15. Other liabilities		
Monies Held in Trust:		
Staff Salary Packaging deposits	361	330
	361	**330**

16. Capital movements

	Note	2021 $'000	2020 $'000
(a) The net surplus for the financial period is $57,522,000 (2020: surplus $31,436,000)			
This has been appropriated as follows:	Note		
Transfer to Permanent Invested Fund	16(b)	27,350	3,489
Transfer to General Fund	16(c)	28,358	25,676
Transfer to Royalty Fund	16(d)	254	1,096
Transfer to Leadership Fund	16(e)	1,298	962
Transfer to Discovery Fund	16(f)	262	213
Total appropriations to funds		**57,522**	**31,436**
(b) Permanent Invested Fund			
Balance at beginning of period		202,322	198,833
Net surplus for period transferred from statement of profit or loss and other comprehensive income		27,350	3,489
Total Permanent Invested Fund		**229,672**	**202,322**
(c) General Fund			
Balance at beginning of period (restated 2020)		383,847	364,185
Transfers from Investment revaluation reserve on sale of investment (restated 2020)		6,872	(6,014)
Net surplus for period transferred from statement of profit or loss and other comprehensive income		28,358	25,676
Total General Fund		**419,077**	**383,847**
(d) Royalty Fund			
Balance at beginning of period		56,135	55,039
Net surplus for period transferred from statement of profit or loss and other comprehensive income		254	1,096
Total Royalty Fund		**56,389**	**56,135**
(e) Leadership Fund			
Balance at beginning of period		28,927	27,965
Net surplus for period transferred from statement of profit or loss and other comprehensive income		1,298	962
Total Leadership Fund		**30,225**	**28,927**
(f) Discovery Fund			
Balance at beginning of period		5,484	5,271
Net surplus for period transferred from statement of profit or loss and other comprehensive income		262	213
Total Discovery Fund		**5,746**	**5,484**
(g) Investment revaluation reserve			
Balance at beginning of period (restated 2020)		80,749	74,208
Revaluation gain recognised for the period (FVTOCI equity Instruments)		52,363	68
Revaluation gain recognised for the period (FVTOCI debt Instruments)		(422)	322
Transfers to profit and loss on sale of investments (FVTOCI debt Instruments)		60	137
Transfers to profit or loss on sale of investments (FVTOCI equity Instruments) (restated 2020)		(6,872)	6,014
Total investment revaluation reserve (restated 2020)		**125,878**	**80,749**
Total funds		**866,987**	**757,464**

17. Notes to statement of cash flows

	2021 $'000	2020 $'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	21,296	19,485
Deposits at call	40,455	45,957
Term Deposits	15,000	5,000
	76,751	**70,442**
Represented by:		
Cash for Institute operations (as per Cash Flow Statement)	76,390	70,112
Cash balances not available for use		
Monies Held in Trust - Staff Salary Packaging Deposits	361	330
	76,751	**70,442**
(b) Reconciliation of net surplus to net cash flows from operating activities		
Net surplus	57,522	31,436
Depreciation	12,959	11,871
Impairment of property, plant and equipment	4,422	-
(Gain) / Loss on disposal of property, plant and equipment	(21)	(5)
Donations and bequests moved to Permanent funds	(227)	(673)
Loss on sale of investments	(140)	135
Fair value adjustment for investments (FVTPL)	(10,549)	(816)
Increase in investments – dividend reinvestment plans	-	(9)
Grants and donations for capital works	(1,460)	(14,953)
(Gain)/loss on foreign exchange	(5,153)	10,282
Donated financial assets	(27,063)	-
	30,290	**37,268**
Changes in net assets and liabilities:		
(Increase) / decrease in assets:		
Tax assets	(2,835)	(4,185)
Trade and other receivables	11,315	5,416
Prepayments	1,116	(7,997)
Net movement in Monies Held in Trust	-	555
Increase / (decrease) in liabilities:		
Trade and other payables	(4,558)	8,424
Current provisions	(9,886)	(404)
Unearned grants and fellowships	10,511	(4,304)
Non-current provisions	1,197	(2,353)
Net cash provided / (used) from operating activities	**37,150**	**32,420**

(c) Non-cash financing and investing activities

During the financial period:

Dividends of nil (2020: $8,846) were reinvested as part of dividend and distribution reinvestment plans.

18. Right of use assets

	2021 $'000	2020 $'000
Carrying amounts		
Buildings		
At cost	3,200	3,200
Accumulated depreciation	(703)	(671)
	2,497	**2,529**
Equipment		
At cost	198	198
Accumulated depreciation	(63)	(44)
	135	**154**
Total	**2,632**	**2,683**
Buildings	32	33
Equipment	19	20
Total depreciation	**51**	**53**

Low value and short term leases

For short-term leases (lease term of 12 months or less) and leases of low-value assets, WEHI has opted to recognise a lease expense on a straight-line basis as permitted by AASB 16. The total expense relating to low value and short term leases is as follows:

Low value leases	-	5
Total	**-**	**5**

19. Economic dependency

WEHI is reliant upon grants from the Australian Government National Health and Medical Research Council for 25.4% of operating expenditure (2020: 24.9%) and the Victorian Government Department of Health and Human Services, Department of State Development, Business and Innovation for 5.9% of operating expenditure (2020: 5.7%) for support of its basic research activities.

20. Segment information

WEHI is a medical research organisation focussed on the nationally and globally significant areas of health being Cancer Research and Treatments, Healthy Development and Ageing, Infection, Inflammation and Immunity, Computational Biology and New Medicines and Advanced Technologies. All operations are predominantly in Australia.

21. Capital expenditure commitments

	2021 $'000	2020 $'000
Not longer than 1 year	2,414	3,813
After 1 year but not more than 5 years	-	28
Total commitments	**2,414**	**3,841**

22. Related party disclosures

(a) Transactions with associates

WEHI received fees during the year from Catalyst Therapeutics Pty Ltd and Anaxis Pharma Pty Ltd totalling $1,310,882 (2020: $2,722,035 for services rendered on normal commercial terms.

WEHI did not receive any royalties during the year from Anaxis Pharma Pty Ltd (2020: nil).

WEHI had a loan receivable from Murigen Pty Ltd of $25,000, in March 2021 this was repaid to the value of $16,486, and a corresponding bad debt was incurred totalling $8,514.

WEHI made no equity contributions during the year to Catalyst Therapeutics Pty Ltd (2020: nil).

WEHI received no return of capital during the year, from either Catalyst Therapeutics Pty Ltd or Anaxis Pharma Pty Ltd (2020: nil).

WEHI made membership contributions to the Victorian Comprehensive Cancer Centre (VCCC) totalling $155,340 (2020: $138,111). WEHI also received fees from the VCCC for collaborate initiatives undertaken during the year of $128,150 (2020: $292,888).

(b) Transactions with directors and director-related entities

During the year various Directors and Director-related entities made donations to WEHI totalling $195,300 (2020: $515,450).

(c) Compensation for key management personnel	2021	2020
The aggregate compensation of the key management personnel of WEHI is set out below:		
Short-term employee benefits	2,163,026	2,245,092
Post-tax employment benefits	330,388	355,460
	2,493,414	**2,600,552**

23. 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 WEHI 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 2021 was 59 (2020: 66).

(v) New employees who commenced after 1 July 2003 currently have a minimum contribution of 10% of their annual salary contributed by WEHI 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 WEHI during the period in respect to the above plans were:	**2021 $'000**	**2020 $'000**
UniSuper – Defined Benefit Division	1,341	1,455
UniSuper – Accumulation Super (2)	287	313
UniSuper – Accumulation Super (1)	8,677	8,130
Other superannuation funds	2,010	1,666
Total	**12,315**	**11,564**

24. Financial Risk Management

(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

WEHI does not enter into or trade derivative financial instruments.

(c) Capital risk management

WEHI 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 WEHI. The capital structure consists of permanent funds, retained earnings and reserves.

(d) Financial risk management

WEHI minimises financial risk through the charter given to the investment sub-committee. In line with this charter, WEHI invests short term funds in an appropriate combination of fixed and floating instruments.

(e) Interest rate risk management

WEHI 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-21	**Dec-20**	**Dec-21**	**Dec-20**
	$000's	**$000's**	**$000's**	**$000's**
Effect on surplus - rate decrease	(576)	(605)	(2,303)	(2,416)
Effect on surplus - rate increase	576	605	2,303	2,416

(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 Dec 2021 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 $22.3 million (Dec 2020: $17.7 million) mainly as a result of the changes in fair value of these equity investments.

WEHI'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 WEHI. WEHI has adopted a policy of only dealing with creditworthy counter parties as a means of mitigating the risk of financial loss from defaults. WEHI's exposure is continuously monitored and reviewed. Trade receivables consist of a large number of customers including granting bodies. WEHI 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 WEHI'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 WEHI's short, medium and long-term funding and liquidity management. WEHI 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. WEHI does not have any interest bearing liabilities. The remaining contractual maturity for its non-interest-bearing financial liabilities is $8.686 million payable within 3 months of 31 Dec 2021 (2020: $9.84 million).

(j) Fair value

The carrying amount of WEHI'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.

24. Financial Risk Management (continued)

(k) Interest rate risk

The following table details WEHI's exposure to interest rate risk as at 31 Dec 2021 and 31 Dec 2020.

	Average interest rate	Variable interest rate	Fixed Less than 1 year	Fixed 1 to 5 years	Fixed More than 5 years	Non-Interest Bearing	TOTAL
31 December 2021		$'000	$'000	$'000	$'000	$'000	$'000
Financial assets							
Cash and cash equivalents	0.16%	61,751	-	-	-	-	**61,751**
Tax assets		-	-	-	-	8,260	**8,260**
Sundry debtors		-	-	-	-	4,728	**4,728**
Prepayments		-	-	-	-	1,138	**1,138**
Accrued income		-	-	-	-	37,267	**37,267**
Term Deposits	0.14%	-	15,000	-	-	-	**15,000**
Shares		-	-	-	-	445,212	**445,212**
Managed funds		-	-	-	-	48,754	**48,754**
Floating rate securities	2.98%	-	7,729	73,092	72,613	-	**153,434**
Fixed rate securities	3.31%	-	1,031	14,546	8,717	-	**24,294**
Non listed shares		-	-	-	-	1,517	**1,517**
		61,751	**23,760**	**87,638**	**81,330**	**546,876**	**801,355**
Financial liabilities							
Trade payables		-	-	-	-	13,921	**13,921**
Other liabilities		-	-	-	-	361	**361**
Unearned grants and fellowships		-	-	-	-	56,138	**56,138**
		-	**-**	**-**	**-**	**70,420**	**70,420**

	Average interest rate	Variable interest rate	Less than 1 year	1 to 5 years	More than 5 years	Non-Interest Bearing	TOTAL
31 December 2020			$'000	$'000	$'000	$'000	$'000
Financial assets							
Cash and cash equivalents	0.16%	65,442	-	-	-	-	**65,442**
Tax assets		-	-	-	-	5,425	**5,425**
Sundry debtors		-	-	-	-	3,009	**3,009**
Prepayments		-	-	-	-	2,254	**2,254**
Accrued income		-	-	-	-	50,301	**50,301**
Term Deposits	1.92%	-	5,000	-	-	-	**5,000**
Shares		-	-	-	-	351,359	**351,359**
Managed funds		-	-	-	-	16,637	**16,637**
Floating rate securities	2.76%	-	13,770	94,116	63,370	-	**171,256**
Fixed rate securities	3.74%	-	-	14,164	5,670	-	**19,834**
Non listed shares		-	-	-	-	2,345	**2,345**
		65,442	**18,770**	**108,280**	**69,040**	**431,330**	**692,862**
Financial liabilities							
Trade payables		-	-	-	-	18,479	**18,479**
Other liabilities		-	-	-	-	330	**330**
Unearned grants and fellowships		**-**	**-**	**-**	**-**	**45,627**	**45,627**
		-	**-**	**-**	**-**	**64,436**	**64,436**

25. Jointly controlled operations and assets

	2021	2020
Victorian Comprehensive Cancer Centre Limited (VCCC)	10.0%	10.0%

WEHI is a Member of the Victorian Comprehensive Cancer Centre Joint Venture (the VCCC) and WEHI 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 WEHI. 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.

WEHI'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 2021.

WEHI's interest in the above jointly controlled operations is detailed below.

	2021	2020
Assets	**$'000**	**$'000**
Current Assets		
Cash and cash equivalents	559	1,057
Trade and other receivables	13	31
Prepayments	8	34
Total current assets	**580**	**1,122**
Non-current Assets		
Investment in Cancer Therapeutics CRC	-	2
Property, plant and equipment	17	17
Total non-current assets	**17**	**19**
Share of total assets	**597**	**1,141**
Liabilities		
Current liabilities		
Trade and other payables	49	127
Employee benefits	34	42
Total current liabilities	**83**	**169**
Non-current liabilities		
Employee benefits	18	24
Total non-current liabilities	**18**	**24**
Share of total liabilities	**101**	**193**
Net Assets	**496**	**948**
Share of VCCC's net assets	**496**	**948**

26. Concessionary leases

Lease	Description of underlying assets	Lease payments	Lease term	WEHI's dependence on leases to further its objectives	Restrictions on the use of the underlying assets specific to WEHI
Parkville crown land	The sub-lease is made on 23 Nov 2011 between Department of Health (Head landlord), and Melbourne Health (Landlord) and WEHI (Tenant). The Department of Health leases Parkville crown land to Melbourne Health for 99 years. Melbourne Health leases Parkville crown land to WEHI for 99 years payable on demand.	$104 per annum, payable on demand	99 years	The lease provides the land on which WEHI was built to perform medical research.	The crown land is used only for community purposes.
Early Learning and Child Care Centre land *	The sub-lease is made on 31 August 2018 between Department of Health (Head landlord), and Melbourne Health (Landlord) and WEHI (Tenant). The Department of Health leases the land (196 m2 in area at ground level) to Melbourne Health. Melbourne Health leases Parkville crown land to WEHI, payable on demand.	$104 per annum, payable on demand	21 years	The lease provides the land on which the Early Learning and Child Care Centre was built. This centre was constructed to address one of the most significant barriers to an ongoing career and advancement at WEHI, being access to adequate childcare.	The crown land is used only for community purposes.
Bundoora*	La Trobe University (Landlord) commenced the lease on 31 March 2000 for the former Rio Tinto Building at La Trobe University Campus, Bundoora to WEHI (Tenant).	$6.25M – paid upfront	99 years	The lease provides the premises for medical research facilities for the Bundoora campus.	Assignment, sublease, mortgage or license is not permitted without La Trobe University's consent.
Wards 8 North and 8 East RMH	Melbourne Health (Landlord) commenced the lease on 16 March 2015 for the areas located on the 8th floor, main block of The Royal Melbourne Hospital to WEHI (Tenant).	nil per annum	6 years	The lease provides the area on which WEHI is located to perform medical research in conjunction with the Hospital.	Assignment, sublease, mortgage or license is not permitted without Melbourne Health's consent.
Ward 7 north RMH	Melbourne Health (Landlord) commenced the lease on 10 June 2011 for the premises on the plan known as "Ward 7 North" of The Royal Melbourne Hospital to WEHI (Tenant). The rent is payable on demand.	$1 per annum, payable on demand	21 years	The lease provides the area on which WEHI is located to perform medical research in conjunction with the Hospital.	Assignment, sublease, mortgage or license is not permitted without Melbourne Health's consent.

* The following concessionary leases are subject to sub-lease arrangements with third parties.

27. Contingent liability

Currently WEHI is defending claims being heard in an arbitration under the rules of the American Arbitration Association, the outcome of which is not expected until later this year.

Separately, other legal claims and exposures may arise from the ordinary course of business. There is significant uncertainty as to whether any such future liability may arise, or the amount of any such liability.

28. Events after the reporting period

The directors are not aware of any other matter of circumstance which has arisen since the end of the financial year which has significantly affected or may significantly affect the operations of WEHI, results of those operations or the state of affairs of WEHI in subsequent financial years.

Governance statement

WEHI is a Public Company Limited by Guarantee registered with the ACNC. WEHI abides by the ACNC Governance Standards.

Ultimate responsibility for the governance of the WEHI 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 WEHI's activities are directed towards its purpose under its Constitution. The Board ensures that this 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 WEHI's Director;
- approving WEHI's strategic plan developed in conjunction with the WEHI Director, staff and students;
- approving operating and capital budgets proposed by the WEHI Director with the support of Management;
- monitoring Management's adherence to operating and capital budgets;
- monitoring Management's progress in achieving the Strategic Plan;
- ensuring the integrity of internal control, risk management and management information systems;
- ensuring members receive and annual report and financial statement;
- ensuring WEHI complies with relevant legislation and regulations; and
- acting as an advocate for the WEHI whenever and wherever possible.

Management's Responsibility

WEHI's day-to-day operations and administration are the responsibility of the WEHI Director..

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 various Committees of the Board responsibility to oversee aspects of the WEHI's operations and administration.

Each Board Committee operates under 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.

Appointments to the Board are made to ensure the Board has the right mix of skills and expertise. One Board Member is appointed by the Trustees of the Walter and Eliza Hall Trust and two Board Members are appointed by The University of Melbourne and two by The Royal Melbourne Hospital (Melbourne Health) and up to a further 13 by the Board.

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.

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 WEHI'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 WEHI'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, Risk and Compliance Committee is responsible for monitoring the effectiveness of the risk management system between annual reviews.

Ethical Standards

Board Members, Senior Executives and staff are expected to comply with relevant laws and the codes of conduct of relevant professional and research bodies, and to act consistent with WEHI's values ofintegrity, compassion, fairness and honesty at all times when dealing with colleagues, and others who are stakeholders in our mission.

Involving Stakeholders

WEHI 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

WEHI 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 WEHI submit this Annual Financial Report of the Company for the year ended 31 December 2021. The Directors report is 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 2021 are:

		Joined Board	Meetings held while a Director	Meetings Attended
Jane S Hemstritch *Chairperson and President of WEHI*	BSc(Hons) FAICD FICAEW,FICAANZ	2013	6	6
Terence F Moran AC *Vice President of WEHI*	BA(Hons)	2013	1	1
Robert H Wylie *Honorary Treasurer*	FCA FAICD	2014	6	5
Malcolm W Broomhead AO	MBA BE(Civil) FIE(Aus) FAusIMM FAIM MICE(UK) FAICD	2014	6	6
John Dyson	BSc Grad Dip Fin Inv MBA	2016	6	6
Jane Gunn	HMS, FRACGP, PhD, DRANZCOG, MBBS	2021	6	3
James McCluskey AO	BMedSci MBBS MD FRACP FRCPA	2011	6	6
Marie McDonald	BSc (Hons) LLB (Hons)	2016	6	6
Carolyn Viney	LLB/BA	2016	6	4
Christine Kilpatrick AO	MBBS, MBA, MD, FRACP, FRACMA, FAICD, FAHMS, DMedSci (Hons)	2017	6	5
Pippa Connolly	MEng, CPEng, FIEAust, GAICD	2019	6	6
Peter Collins	BA(Hons) BTheolMCD, MBA,HEC, DPhil *Oxford* (Candidate)	2018	6	5
Sir John Savill	BA MBChB PhD FRCP FRCPE FRCSEd (Hon) FRCPCH(Hon) FASN FRSE F.MedSci FRS	2018	6	4
Kee Wong	BEng (Hons), MBA, GradDipComp (Distinction), FAICD	2021	3	1

The Audit, Risk and Compliance Committee

The role of the Audit, Risk and Compliance Committee is to assist the Board in fulfilling its statutory and fiduciary responsibilities with regard to the review and preparation of its annual accounts, risk management and internal control systems of the WEHI. The Committee met four times during the period under review.

Principal Activities

The WEHI's principal activity in 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 $36,074,000 (31 December 2020 net surplus of $27,000,000). 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 $57,522,000 (31 December 2020 surplus of $31,436,000). 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 WEHI is included in the detailed scientific reports.

Environmental Regulations

WEHI aims to achieve a high standard in environmental matters. WEHI complies with the Environmental Protection Act (Vic) 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 WEHI.

Appreciation

The Board wishes to extend its appreciation to the Members of the various Committees (People and Culture Committee, Human Research Ethics Committee, Investment Committee, Advocacy and Support Committee, Audit, Risk and Compliance Committee, Master Planning Committee and the Commercialisation Committee) as well as the many other people including the WEHI Director, staff, students, overseas visitors and honorary workers, who work so tirelessly to advance the institutes 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	4
Associate Professor Pippa Connolly	4	4
Commercialisation Committee		
Ms Marie McDonald (Chair)	4	4
Dr Leigh Farrell	4	4
Dr Lisa Hennessey	4	4
Mr Saul Cannon	4	1
Professor Sir John Savill	4	4
Advocacy and Support Committee		
Mr John Dyson (Chair)	4	4
Dr Paul Cooper	4	4
Mr Michael Daddo	4	2
Mr Hugh Hodges	4	4
Ms Caroline Johnston	4	4
Ms Andrea Lapidge	4	4
Ms Catherine Robson	4	2
Remuneration and Nomination Committee *– ceased May 2021*		
Ms Marie McDonald	0	0
Ms Carolyn Viney	0	0
People and Culture Committee (established 2021)		
Mrs Jane Hemstrich (Chair)	3	3
Professor Doug Hilton	3	3
Professor Sir John Savill	3	2
Ms Carolyn Viney	3	3

Committee attendance	Meetings held while a member	Meetings attended
Human Research Ethics Committee		
Mr Peter Collins (Chair)	5	5
Rev Father Michael Elligate (Deputy Chair)	5	2
Dr John Bonacci	5	5
Dr Vanessa Bryant	5	4
Mr David Freeman	5	5
Mr John Bonacci	5	5
Dr Ian Majewski	5	3
Professor Marc Pellegrini	5	5
Dr Jeanne Tie	5	3
Ms Sarah Galbraith	5	5
Ms Terri Lourey	5	5
Ms Bree Ridgeway	5	3
Ms Louise Steinfort	5	4
Ms Jane Fiske	5	4
Investment Committee		
Mr Robert Wylie (Chair)	5	5
Mr Malcom Broomhead AO	5	5
Mr Stephen Merlicek	5	3
Mr Stephen Milburn-Pyle	5	4
Mr Andrew Scott	5	5
Ms Fiona Trafford-Walker	5	3
Master Planning sub-committee		
Ms Carolyn Viney (Chair)	5	5
Associate Professor Pippa Connolly	5	5

Auditors' independence declaration

The Auditors' independence declaration is included on page 29 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. In particular Note 1 (a) includes WEHI's assessment of the impacts of the Coronavirus pandemic on its activities.

(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

Jane Hemstritch
President
Melbourne, 29 March 2022

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.

Jane Hemstritch
President
Melbourne, 29 March 2022

Robert Wylie
Treasurer

Deloitte.

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29 March 2022

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 2021, 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

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Independent Auditor's Report to the Members of Walter and Eliza Hall Institute of Medical Research

Report on the Audit of the Financial Report

Opinion

We have audited the financial report of Walter and Eliza Hall Institute of Medical Research ("WEHI" or the "Entity") which comprises the statement of financial position as at 31 December 2021, the statement of profit or loss and other comprehensive income, the statement of changes in equity and the 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 of the Entity is in accordance with Division 60 of the *Australian Charities and Not-for-profits Commission Act 2012* (the "ACNC Act"), including:

(i) giving a true and fair view of the Entity's financial position as at 31 December 2021 and of its financial performance for the year then ended; and
(ii) complying with Australian Accounting Standards and Division 60 of the *Australian Charities and Not-for-profits Commission Regulation 2013*.

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 & Ethical Standards Board's APES 110 *Code of Ethics for Professional Accountants (including Independence Standards)* (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 the auditor's report comprises the Directors' Report, Statistical summary and Capital Funds included in the Entity's annual report for the year ended 31 December 2021 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.

Deloitte.

Other Information (continued)

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.

Responsibilities of the directors for the Financial Report

The directors of the Entity are responsible for the preparation of the financial report that gives a true and fair view in accordance with Australian Accounting Standards and the ACNC Act and for such internal control as the directors determine is necessary to enable the preparation of the financial report that gives a true and fair view and is free from material misstatement, whether due to fraud or error.

In preparing the financial report, the directors are responsible for assessing the ability of the Entity to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless the directors either intend to liquidate the Entity or to cease operations, or has 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.

- 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.

Deloitte.

Auditor's Responsibilities for the Audit of the Financial Report (continued)

- 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 the directors 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, 29 March 2022

Statistical summary for the year ended 31 December 2021

	2021 $'000s	2020 $'000s	2019 $'000s	2018 $'000s	2017 $'000s
Operating revenue					
Australian Government	59,900	64,798	46,298	45,057	45,163
Victorian Government	9,883	10,311	10,513	10,909	12,739
Foreign governments	35	-	70	22	243
Government revenue	**69,818**	**75,109**	**56,881**	**55,988**	**58,145**
Industrial grants and contracts	12,181	13,439	8,689	7,182	4,044
Philanthropic grants and fellowships - Australia	12,563	9,870	13,399	15,759	7,444
Philanthropic grants and fellowships - international	2,885	4,649	3,343	6,824	6,468
Investment income	29,518	19,996	24,156	30,063	12,118
Royalty income	770	1,654	7,483	4,027	11,059
General revenue	9,105	6,842	8,916	8,260	7,560
Donations and bequests	26,767	11,569	10,373	13,568	9,327
Royalty monetisation revenue	27,590	38,961	35,633	-	331,082
Non-government revenue	**121,379**	**106,980**	**111,992**	**85,683**	**389,102**
Total revenue	**191,197**	**182,089**	**168,873**	**141,671**	**447,247**
Operating expenditure					
Staff costs	109,662	102,547	98,340	90,493	85,944
Laboratory operating costs	16,279	16,134	19,870	20,038	20,756
Laboratory equipment	8,282	4,078	3,565	3,352	4,047
Building operations	5,585	5,092	5,908	5,801	4,849
Administration	14,716	11,520	8,648	6,715	3,718
Fundraising	518	502	620	475	487
Business development	9,200	2,725	1,219	1,261	997
Allowance for credit loss increase / (decrease)	(32)	(30)	62	188	(47)
Royalty monetisation costs	(4,418)	2,239	10,104	4,755	51,143
Unrealised foreign exchange loss / (gain)	(4,669)	10,282	477	(4,998)	-
Total expenditure	**155,123**	**155,089**	**148,813**	**128,080**	**171,894**
Results from operating activities	**36,074**	**27,000**	**20,060**	**13,591**	**275,353**
Other income					
Profit or (loss) on sale of long-term assets	161	(135)	297	2	5,002
Fair value gain or (loss) on investments	10,549	816	5,261	(589)	-
Donations and bequests capitalised to Permanent Funds	26,659	673	1,359	6,510	2,877
Grants and donations for capital works	1,460	14,953	5,076	1,198	4,330
Total other income	**38,829**	**16,307**	**11,993**	**7,121**	**12,209**
Other expenses					
Depreciation and amortisation	(12,959)	(11,871)	(10,941)	(9,368)	(9,044)
Impairment of property, plant and equipment	(4,422)	-	-	-	-
Total other expenses	**(17,381)**	**(11,871)**	**(10,941)**	**(9,368)**	**(9,044)**
Net operating surplus	**57,522**	**31,436**	**21,112**	**11,344**	**278,518**
Capital funds					
Permanent invested capital funds	229,672	202,322	198,833	194,181	185,610
General funds	419,077	394,285	371,193	377,710	378,204
Royalty fund	56,389	56,135	55,039	48,054	44,410
Leadership fund	30,225	28,927	27,965	26,557	24,562
Discovery fund	5,746	5,484	5,271	4,961	4,545
Investment revaluation reserve	125,878	70,311	67,200	8,211	40,853
Total funds	**866,987**	**757,464**	**725,501**	**659,674**	**678,184**
Capital expenditure					
Property, plant and equipment	15,710	24,195	12,252	22,029	16,078
Staff numbers: (equivalent full-time)	2021	2020	2019	2018	2017
Scientific research staff:					
- Senior faculty	74	85	87	80	78
- Postdoctoral scientists	252	224	213	199	183
- Visiting scientists	8	32	34	36	48
- Other laboratory research staff	313	234	235	241	241
Supporting staff:					
- Other support services	180	204	202	196	180
Total staff and visiting scientists	**827**	**778**	**771**	**752**	**730**
Students	**194**	**159**	**206**	**192**	**180**
Papers published	**477**	**424**	**388**	**417**	**419**

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, 2021.

*New donations of capital received in current financial period.

	2021 $
Adair John Bequest (ex DW)	403,304
Adair John Bequest (ex MF)	76,573
Alexander R Estate	160,812
Allison-Levick J & H	90,264
Alston Peter and Julie Florence Fellowship Fund	1,377,562
Amey AM Estate	38,832
Anderson KA Estate	288,654
Anderson NM Estate	17,492
Angus Dorothy Irene Estate	284,056
Anonymous	363,596
Anonymous	4,093,596
Anonymous – Tasmania	62,108
Anonymous – Victoria	7,479
Anonymous – Victoria	201,297
Arnel Florence Janet Maude Estate	58,744
Arter Myra G Estate	90,315
Ashford Ivy A Estate	35,752
Attwell Samuel E Estate	69,949
Atyeo George & Isobel Fund	51,385
Baker Alice Lillian Estate	85,147
Ballantyne JW Estate	814,249
Barfield WG Estate	55,273
Barry Joan Elaine Memorial Fund	59,576
Bartlett Mary V Estate	39,168
*Bates Tim Memorial Diabetes Research Fund	212,908
Charles L Bartholomew Estate	162,526
Bauer Dr Franz Estate	66,897
Bell Valerie Amy	94,763
Benjamin EG Estate	62,690
Bennett LM Estate	39,649
Berry Ruby C Estate	167,287
Biderman Cyla Estate	79,844
Blain BE Estate	127,852
Bland RT Estate	384,490
Bock Lindsay William Estate	33,847
Boothman Alva Estate	785,825
Borrett M A Estate	610,765
Bran EG Estate	222,308
Brennan EM Estate	69,395
The Ruby Bryan Memorial Fund	758,177
Brittain W & VI Mem Fund	81,777
Brockhoff Nyon Trust	256,812
Brough AV Estate	88,343
Brown Isabelle A Estate	92,015
Bruce RH Estate	40,356
Buckland William Foundation Fund	236,749
Buckman Olive Estate	28,047
Bult C G Estate	511,368
Brumloop LAA Estate	88,085
Burley Stanley Estate	71,736
Burnet Sir Macfarlane Estate	150,943
Burns JC Estate	189,272
Cahill JL Estate	26,208
Callaway LJ Estate	50,185
Cambridge Beresford Estate	207,872
Carlin Freda Evelyn Estate	102,824
Carling DM Estate	183,700
Carlson Catherine Estate	92,230
Carlson Elizabeth F Estate	104,240
Carty LEW Charitable Fund	44,333
Cato EA Estate	909,541
Cato MC Estate	739,274
*Chapman Debbie Memorial Fund	20,506
Chatfield SL Estate	124,781
Claridge John PG Estate	37,192
Clark Lindesay Fund	1,009,257
Cockburn Clarice BP Estate	27,967
Cole DE Estate	801,765
Coles GO Estate	38,996
Collie Barbara Estate	155,271
Collie Betty Rae	217,720
Collie George Estate	2,436,351
Colliver Len Estate	57,389
Connolly Grace C Estate	132,151
Cormack Margaret Mary	98,588
Cory Joy & Desmond Cancer Research Fund	133,512
Coultass Hylda M Estate	132,474
Courtney Gwendoline Vera Estate	283,566
Coutts Dr ELA Estate	133,005
Coutts IBM Estate	28,204
*Craven DA Memorial Fund	1,364,407
JE Craven & MA Shearer Estates	50,399,543
Crawford Duncan Estate	17,346
Criswick R M Estate	528,974
Critchlow Ronald P Estate	309,528
Crowley MM Estate	216,290
Cubbins SG Estate	92,087
Cummings ED Estate	163,954
Cutter BE Estate	17,040
Darbyshire EJ (Ted) Estate	356,614
Davey Dorothy Estate	315,533
Davidson BI Estate	26,776
Davidson EE Estate	30,390
Davis FLG Estate	60,761
Dawson Anne Marie Estate	8,123
Del Cott RAM Estate	267,851
Deryk SD Estate	72,444
Sir Harold Dew and Family Estate	863,613
Dick MRK (Ray) Estate	224,774
Dickie Phoebe Estate	46,061
Dimsey WE Estate	231,818
Dobbie Myrtle M Estate	42,309
Dodgshun GM Estate	168,162
Dossetor Catherine L Estate	36,584
Dowie S Estate	23,750
Drakensberg Trust	2,553,476
Drury Evelyn Ann Fund	607,824
Duncan PH Estate	100,371
East James Douglas Estate	191,041
Edwards Allen Richard Estate	200,926
Edwards HHW Estate	256,014
Eisner KR	98,864
Ellis GM Estate	3,881,676
Emery Harriet Anne Estate	22,037
Eva Michael Ross Estate	4,621,215
Facey Mary Bethune Estate	16,884
Fagg Maude V Estate	105,044
Fields Ernest Estate	295,306
Findlay Winifred Gertrude Estate	147,512
Fitzgerald Sheila Mary Estate	45,170
Ford Ada Joyce Estate	20,702
Fraser K Estate	2,139,581
Galbraith DA & DV Estate	116,655
Gerdts Sheila Lesley G Estate	70,046
Gibb Geo & Bennett Wm A	432,754
Gilbert Augusta Estate	391,045
Gilder CH Estate	17,245
Gillon AM Estate	3,261,650
Gilmore Trakka Fund	10,523
Girdwood J Estate	257,030
Goldman Sachs JB Were Foundation	793,313
Gordon H & T Estate	115,152
Graves GC Estate	28,530
Gray Bessie Mavis Fund	27,101
Gray Clara Estate	77,838
Greig Harry Douglas Estate	543,759
Grubb Walter Joseph Estate	40,237
Guest Doris Rose Estate	16,924
Hackett Dorothy Estate	6,967
Hadfield RCS Estate	122,754
Hadley AN Estate	1,224,690

Hamilton M Estate	49,005
Harrap FM Estate	145,032
Harrap LM Estate	31,274
Harris John D & Lyla Foundation	920,060
Hartlett K Estate	1,057,308
Haydon Michael JM Memorial Fund	64,690
Hearse JD	1,286,484
Hemphill Olive May Estate	71,244
Henderson AN Estate	27,166
Henderson Joan Estate	138,847
Henry MA Estate	682,729
Heron Thelma Hope Estate	101,339
Highton GAN Estate	582,433
Hill Ramon Bruce Estate	163,994
Hind Ruby F Estate	35,378
Hocking Helen Estate	387,098
Holmes EM Estate	86,566
Hope Irene Estate	455,620
Hooper Nancy Hilda	120,309
Hosier MM Estate	162,407
Hurry M Estate	32,862
Inglis Dulcie M Estate	121,605
Ironside WH Estate	71,736
Jackson Catherine M Estate	207,158
Johnson Daphne Adele Estate	8,446
Johnson Ethel Grace Estate	49,126
Johnson Sydney Robert Estate	56,046
Johnstone Reginald Ben Estate	14,958
Judd Anita Estate	64,656
Kayler-Thomson Marion Estate	55,986
Keating L Estate	1,458,494
Keats LCA Estate	1,379,136
Kellock TH Estate	1,943,589
Kendall Nanyce Douglas	50,712
Kerr HM Estate	116,728
King DM Estate	44,507
Knight FF Estate	32,495
Lang John Murray Estate	798,846
Lanigan Annie Maria (Nance) & Janet Mary Fund	43,281
Lanteri Gwen Estate	1,675,828
Larard DV Estate	13,814
Leckie Winifred Estate	231,868
Lilford VM Estate	511,337
Lins RD Estate	28,695
Little Mabel B Estate	69,998
Lyddon Pauline M Estate	1,286,991
Lyell Alexia Bequest	466,011
MacAskill WG & I	28,695
Mace Nina May Estate	310,283
MacDonald Elsie May Estate	193,594
Macindoe Jock & Diana Fund	43,042
MacIntosh Elizabeth H Estate	25,850
*Mackay, Ian	213,460
Mackie-Smith CM Estate	393,191
Macleay The Lillian & Kenneth Bequest	450,590
MacNamara Jean Fund	1,059
Mahoney Florence Cancer Fund	181,325
Malcolm Phyllis Elizabeth Estate	290,568
Maloney Kathleen Margaret Estate	23,915
Mann David Memorial Research Fund	49,698
Mansfield Trevor Geoffrey Estate	10,682
Marguccio R Estate	14,347
Mariner Barry Leonard Estate	66,293
McArthur Nellie M Estate	114,123
McCooke Miss MH Estate	360,424
McDonald Charles Thomas	19,560
McDougall Phyllis Mable Estate	135,616
McGhee ME Estate	78,122
McGregor Amy VK Estate	132,110
McGregor Elvira Ruth Estate	24,344
McGregor KB Estate	191,003
Mckay C N Fund	282,867
McKinnon Sheila May Estate	48,165
McLean Ada Myee Dutton Estate	568,140
McLennan B Estate	102,605
McNab M Estate	25,920
McNeill Sir James Fund	22,316
McRorie Ruby A Estate	83,906
Menagh Thelma Marie Estate	19,524
Miller Lorna May Estate	936,361
Miller MA Estate	67,152
Miller Violet Isabella Estate	78,147
Minney DW & NR Fund	14,347
Mitchell, Bettye Victoria Fund	4,708,374
Mitchell Doris Georgina Mildred	71,736
Mitchell G Fund	55,606
Moden FHW Estate	138,284
Moody E Vaughan Estate	1,370,645
Moon Ida Alice Estate	54,174
Mooney Carmel Mary, Estate of	180,312
Moore Phyllis Estate	14,347
Morgan DM Estate	423,093
Morris Foundation of Medical Research	181,344
Moss EE Estate	276,774
Muller FG Estate	20,485
Murray Alan Ambrose Estate	36,881
Murray Gwendoline Mary Fund	1,279,376
Must Mary Kathleen Bequest	1,121,245
Myer Dame Merlyn Estate	15,455
Myer Pam Sallmann Foundation	31,289
Nevill Melanie Joy	86,247
Newton Evelyn	20,048
Newton EM Estate	19,488
Nicholas Harold George Estate	342,140
Norins Leslie Fund	317,887
Norton M Estate	907,661
Nossal Sir Gustav Fund	336,473
Nottingham SG Estate	37,107
Palmer DE Estate	28,004
Palmer Ethel Fund	337,214
Parker Barbara Memorial Fund	76,863
Parker Mabel V Estate	86,589
Parsons Kathleen FB Estate	43,838
Patten Ralph & Etty Bequest	326,150
Patterson Gerard A Estate	20,498
Paulin Leukaemia Fund	236,519
Paulin SC Estate	29,705
Payne Henry and Charlotte Fund	1,022,250
Peterson Vera Estate	612,738
Petley Francis Estate	162,770
Pierce John Lindsay Estate	1,307,215
Pietsch Dr CH Fund	218,122
Porter Florence JA Estate	140,163
Prater Mabel Edward	14,877
Pritchard DG Estate	36,825
Pyke MA Estate	17,217
Qualtrough Research Fund	2,960,651
Rae Olive Estate	1,198,083
Reeves Jessie Estate	67,274
Reid John T Charitable Trusts	8,986,357
Reiser Erwin Estate	28,695
Richardson DLK Estate	91,749
Ricker EM Fund	82,553
Roberts JI Charitable Fund	8,752
Robertson AT Estate	14,347
Rose Norma J Estate	14,504
Ruppel FE Estate	166,312
Salemann CW Estate	14,347
Sallmann L & E Memorial Fund	28,004
Santos TS Estate	929,160
Schack Elsie Edith Estate	135,771
Scott Annie May Estate	176,964
Sharp II Estate	22,554
Shaw Eileen Coryn Estate	25,124
Shelton Edgar Estate	880,634
Sidwell OB Estate	2,069,617
Skea Lyndal and Jean Leukaemia Fund	1,091,746
Skinner Phyllis Maye Estate	90,950
Smith Elsie Violet Estate	18,329
Smorgon Robert & Jack Family Foundation	403,875
Snow Freda Estate	65,250
Spence Frank Meldrum	37,192
Spencer Stanley L Estate	19,837
Stanbrough AE Estate	114,372

Stephens L Estate	119,006
Stevens SA Estate	135,565
Stevenson Dame Hilda Estate	97,082
Stewardson Family Trust	148,794
Stewart Jean Elma	91,410
Swingler Maxwell & Mary Bequests	2,745,761
Sydserff Charles SB Estate	18,049
Syme David Farnell Estate	1,048,509
Talbot P Estate	447,930
Taws M Estate	143,473
Taws GE Arthritis Fund	27,101
Taylor Sarah McQuillan Estate	66,779
Thomas JC Estate	330,282
Thompson O Estate	31,779
Thorpe Doris EB	97,975
Tink RM Estate	333,112
Tinkler VF Estate	64,329
Tomasetti John T Estate	455,940
Thompsom LW Estate	2,372,436
Tressider Edith Kathleen Estate	588,555
Trezise KW Estate	20,676
Tropical Diseases Fund	100,714
Turnbull JG Estate	84,329
Van Leeuwen GH Estate	509,726
Vincent-Smith IG Fund	205,729
Vogel Herta & FB Estate	14,504
Walker CM Estate	236,399
Walker Dorothy Hope Estate	2,526,546
Wallace Nancy Jeanie Estate	223,971
Walsh Dr William Butler Memorial Fund	924,420
Walter Ailsa Amy Mary Estate	174,967
Warnock EMC nee Riddle Estate	1,832,246
Watson MR Estate	16,419
Waxman Elizabeth H Estate	79,071
Wedge Erica Estate	362,671
Webb NJ Estate	291,232
Weeks Thelma Estate	14,877
Wekwerth Hilda Frances Estate	35,563
West John James Estate	110,009
Westcott Ita E Estate	23,096
White Morris G Estate	46,127
Wicks LR Estate	14,347
Williams AM Estate	95,025
Williams Irene E Estate	345,054
Wilson DE Estate	89,778
Wilson MML Estate	101,028
Wilson NF Estate	14,347
Wilson V M (Sunny) Estate	147,981
Wolstonecroft WW Estate	40,969
Wright Lynette Oreti Estate	207,842
Zillman Dudley V Estate	57,668

Fellowship and Scholarship Funds

Farrant Patricia & John Scholarship Fund	243,951
*Harris Alan Scholarship Fund	33,410
JHA Munro Foundation	1,207,276
Macphee Avis Permanent Fund	57,307
Mathison G C Research Scholarship	235,413
*Metcalf Donald Scholarship Fund	1,339,196
Moffatt Edith Scholarship Fund	2,013,526
The Sir Clive McPherson Family Centenary Fellowships	7,482,191
*Wendy Dowsett Scholarship Fund	18,981

PhD Scholarship Funds

Carty EM Fund	497,039
Mackay Dr Ian Fund	405,580
Pearl Paddy Fund	1,748,567
*Speedy Pauline Scholarship Fund	634,684
Syme Colin Fund	2,524,902
Wilson Ed Memorial Fund	2,225,282
*The John and Margaret Winterbottom Bequest	835,896

Other Funds

Anonymous Seminar Award	19,769
Balderstone Award	52,543
Begley - Scientific Integrity and Ethics	78,634
Gideon Goldstein Fund	1,722,930
*John and Patricia Farrant Bequest Fund	26,442,419
Speedy Pauline Innovation Grant Fund	756,645

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 similar to donations):

The George Thomas & Lockyer Potter Charitable Trust

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

Irene and Ronald MacDonald Foundation

Albert H Maggs Charitable Trust

Mrs AM Reilly

Miss ML Reilly

The Stang Bequest

Florence Mary Young Charitable Trust

Hazel and Pip Appel Fund

Estate Lindsay James Baldy

Estate of Emily Vera Winder

Harold & Cora Brennen Benevolent Trust

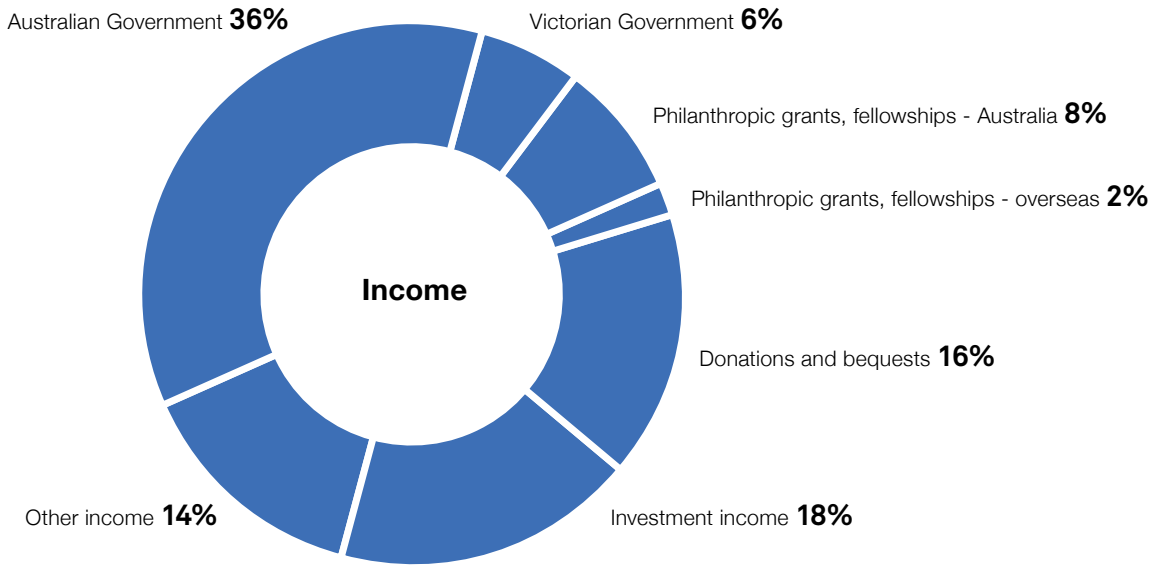
Leadership Fund 2021

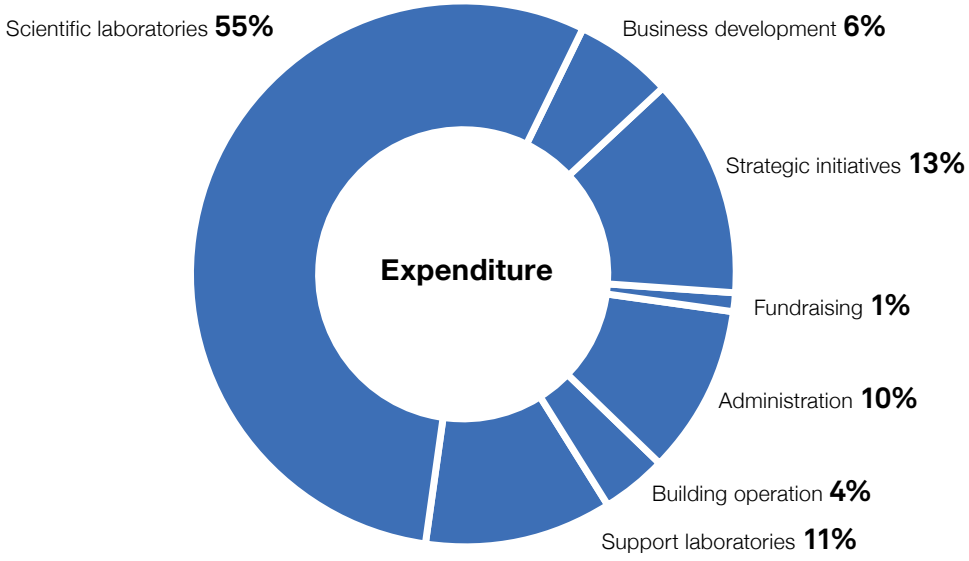
The Leadership Fund was established in honour of Professors Gustav Nossal, Donald Metcalf, Jacques Miller and Suzanne Cory to provide named Fellowships to nurture the development of outstanding young scientists with the potential to be future leaders of biomedical research. The Cory Fellowship is currently held by Misty Jenkins until 2021.

The Leadership Fund at 31 December 2021 included the following permanent funds ($10,000 and over):

Sir Harold Dew and Family Estate	8,811,510
Chugai Pharmaceutical Co Ltd	1,834,090
The Ian Potter Foundation	1,834,090
L M Archibald Estate	1,222,727
Albert H Maggs Charitable Trust	1,196,017
Helen Macpherson Smith Trust	733,636
Anonymous	611,363
Anonymous	611,363
E Vaughan Moody Estate	611,363
The Broken Hill Proprietary Company Limited	611,363
J B Were & Son Charitable Fund	611,363
Eunice L Lambert Estate	601,404
Betty Eunice Stephens Estate	411,751
National Australia Bank	366,819
Victor Smorgon Charitable Fund	268,999
The Sidney Myer Fund	220,092
Leslie D W Stewart Estate	179,942
Joe White Bequest	166,292
Krongold Foundation Pty Limited	122,273
Professor Sir Gustav Nossal	122,273
The Scobie and Claire MacKinnon Trust	122,273
The R & J Law-Smith Gift	73,364
National Mutual Holdings Limited	73,364
Pacific Dunlop Ltd	73,364
Sheila R White Estate	72,337
Coles Myer Ltd	61,135
James Kirby Foundation	61,135
Arthur Andersen & Co Foundation	48,907
Arthur Robinson & Hedderwicks	48,907
H B Kay Estate	24,455
Stephelle Pty Ltd	24,455
C M Walter	24,455

The period at a glance (Excluding monetisation and unrealised foreign exchange losses)

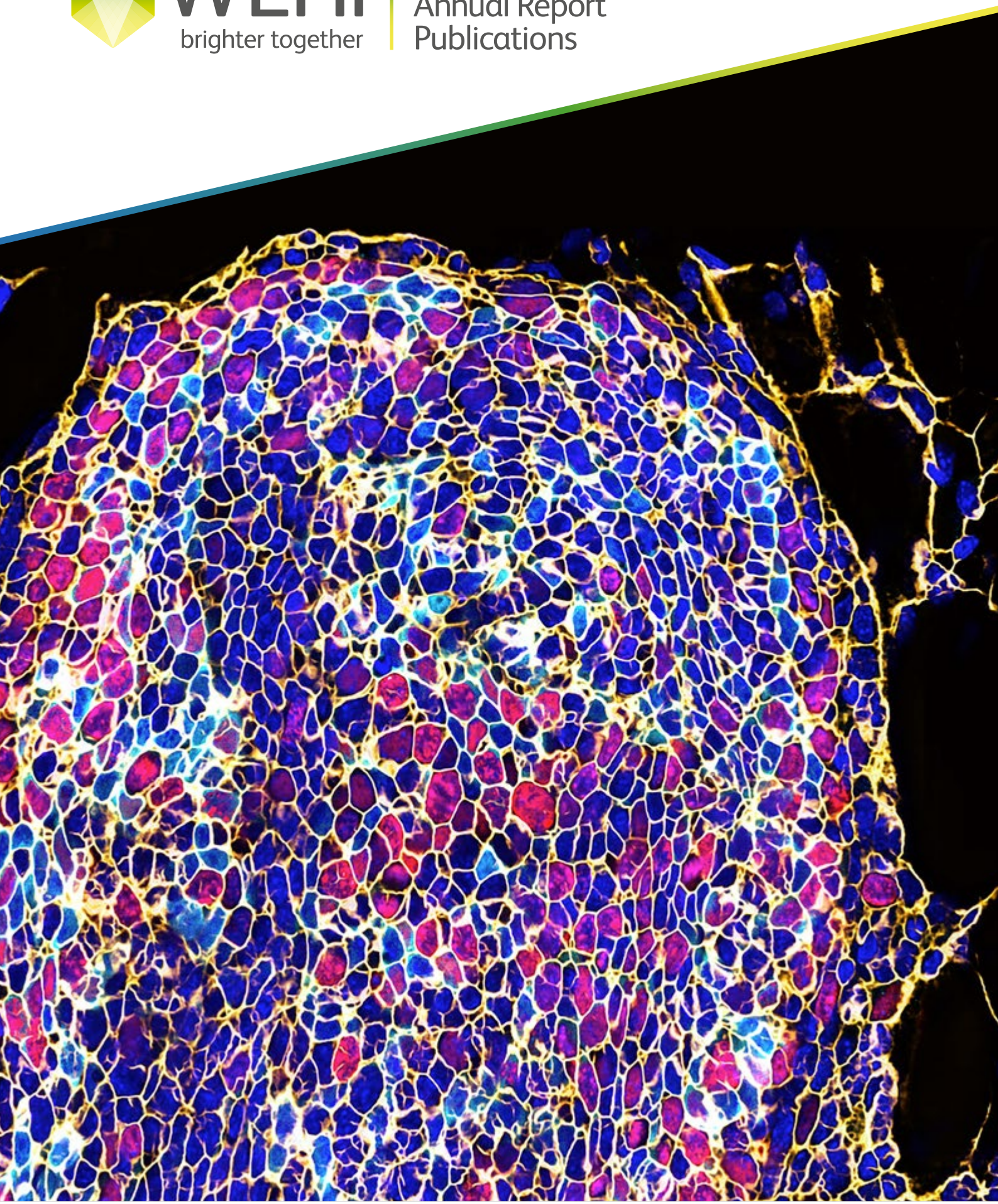




The Year In Brief	2021 $'000	2020 $'000
Income for operations	**191,197**	**182,089**
Expenditure in operations	**155,123**	**155,089**
Net surplus (deficit) from operations	**36,074**	**27,000**
Number of staff and visiting scientists	**827**	**778**
Number of postgraduate students	**194**	**159**
Total staff and students (EFT)s	**1,021**	**937**

WEHI
brighter together

2021 Annual Report Publications



Publications

ATB Advanced Technology and Biology division
BIO Bioinformatics division
BCBC Blood Cells and Blood Cancer division
CBSC ACRF Cancer Biology and Stem Cells division
CBD ACRF Chemical Biology division
EDD Epigenetics and Development division
IMM Immunology division
IDID Infectious Diseases and Immune Defence division
INFL Inflammation division
PONC Personalised Oncology division
PHI Population Health and Immunity division
SBD Structural Biology division
USD Ubiquitin Signalling division

Number of publications:

Primary: 362
Review: 115
Total: 477

Primary

1. Abbott RC, Verdon DJ, Gracey FM, Hughes-Parry HE, Iliopoulos M, Watson KA, Mulazzani M, Luong K, D'Arcy C, Sullivan LC, Kiefel BR, Cross RS, Jenkins MR. Novel high-affinity EGFRvIII-specific chimeric antigen receptor T cells effectively eliminate human glioblastoma. *Clinical & Translational Immunology.* 2021 10(5):e1283. IMM
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Stop a ‘silent killer’ by supporting ovarian cancer research

Ovarian cancer is a very complex disease with many subtypes. Sadly, most women diagnosed with the disease will die within five years of diagnosis and survival rates have not improved at the rate of more common cancers, such as breast cancer.

Professor Clare Scott is joint head of clinical translation at WEHI and leads our ovarian cancer research program. Her work focuses on developing personalised therapies for patients with ovarian cancer.

“Ovarian cancer is exceedingly difficult to diagnose and treat. Our aim is to change the current treatment paradigm from ‘one size fits all’ to a more personalised, targeted approach.”

In a recent research development, Professor Scott and her team have identified a new group of ovarian cancer patients that could benefit from a game-changing cancer drug called PARP inhibitors. You can read more about this exciting study on page 28.

Professor Scott and her team are now working on identifying groups of patients who would benefit from alternative or combination PARP therapies.

With your vital support, you are enabling WEHI’s scientists to develop more personalised treatments. Together, we have the potential to drastically improve health outcomes for women with ovarian cancer.

Ovarian cancer researcher Professor Clare Scott

With your vital support, WEHI’s researchers can move even closer to improving the lives of people living with ovarian cancer.

For more information about supporting WEHI please contact:

Deborah Carr
Head of Philanthropy

03 9345 2100 or carr.d@wehi.edu.au

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Please help stop ovarian cancer as a terminal illness

Ovarian cancer is a silent killer. The majority of women diagnosed with this disease will die within five years of diagnosis. Developing personalised therapies is urgently needed to stop ovarian cancer as a terminal disease.

The work of WEHI's researchers will inform personalised treatment plans, which has the potential to significantly improve health outcomes for ovarian cancer patients.

Your support will enable WEHI's researchers to find better personalised treatments that will give hope to women diagnosed with this insidious disease.

To donate today, please complete and return this coupon.

You can also call the Fundraising and Philanthropy Team on 03 9345 2403 or visit wehi.edu.au

Ovarian cancer researchers Ksenija Nesic (left) and Professor Clare Scott (right)

Yes, I want to help stop ovarian cancer

☐ $100 ☐ $250 ☐ $500 ☐ $1000 ☐ $2500 **My choice $** .....

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WEHI protects your privacy in accordance with the Information Privacy Principles of the Information Privacy Act 2000. WEHI's privacy policy is available at www.wehi.edu.au.

Augmented reality

Unlocking the experience is easy:

Step 1:
Search for the free WEHI AR app on the Apple or Google Play store, and download to your smartphone or tablet. If you downloaded a previous verion of the app, you may need to update it. (Check store for phone and OS requirements.)

Links to the app are also provided at wehi.edu.au/wehiar

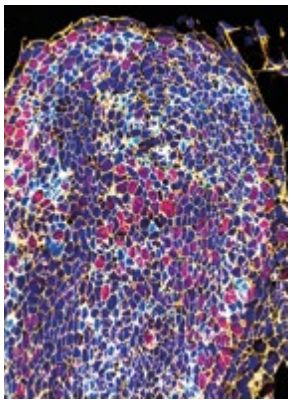
Step 2:
Open the WEHI AR app and allow camera access. NB: The app cannot work without access to your smartphone's camera. If permission is rejected or missed, you will need to grant access in your phone's system preferences before you can use the app.

Step 3:
Hold your mobile device over the cover image while the app is active and watch the cover image come to life.

Want more?
There are additional augmented reality experiences embedded in images on pages 16, 24, 34 and 48. Just look for the augmented reality symbol.

Questions?
Email communityrelations@wehi.edu.au or visit wehi.edu.au/wehiar

What is augmented reality?
Augmented reality is an interactive experience adding layers of digital information such as videos, graphics and sound to our view of the real world.



Cover image

2021 *Art of Science* People's Choice Award Winner
Leadlighting the mammary
Nina Tabau and Bianca Capaldo

This image is taken from a movie depicting the developing mammary gland as a beautiful mosaic of flashing and changing colours. As the image builds, the fast-growing cells of the epithelial tissue (red, with yellow edges) emerge layer upon layer.

Data analyst Nina and researcher Bianca used artificial intelligence (AI) to pull apart these layers, revealing each individual cell and its unique characteristics for the first time. They teased out detailed information about each cell that would be otherwise inaccessible: their shape and size, how active they are, where they exist and how they weave together in the dense tissue.

This technology represents a major advancement in the field. Through AI, researchers can capture vast amounts of information on thousands of cells at once, then use sophisticated computational biology to extract critical information.

Being able to fundamentally understand how normal tissue is constructed, the way cells grow and come together, will help us to better understand how cancers form and spread.

All photos used in this annual report were taken following the recommended social distancing and mask-wearing guidelines applicable at the time of the photo.