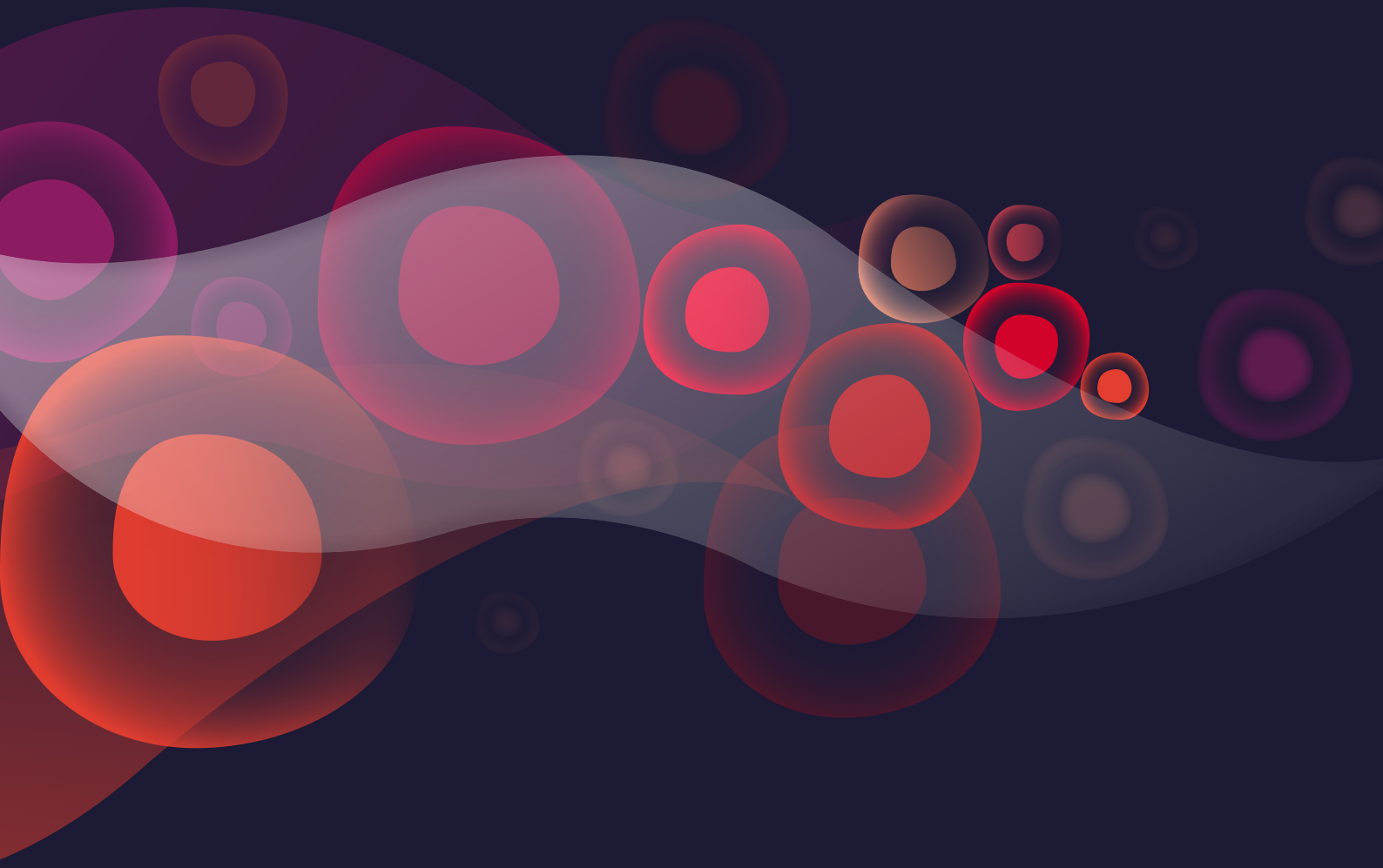
Australian Regenerative Medicine Institute

ANNUAL REPORT 2021



MONASH University | ARMI AUSTRALIAN REGENERATIVE MEDICINE INSTITUTE

ACKNOWLEDGMENTS

The Australian Regenerative Medicine Institute
Annual Report 2021

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2022

Image front cover – Graphical representation of blood cells.

The Australian Regenerative Medicine Institute acknowledges the people of the Kulin Nations on whose land our institute is located and pays our respects to Elders past, present and emerging.

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ARMI is supported by grants from the State Government of Victoria and the Australian Government

EMBL Australia

ARMI is proud to host EMBL Australia Partner Laboratory Research Groups

CONTENTS

ABOUT THE INSTITUTE
CHAIR'S REPORT

Professor Andrew Dyer

2021 was another successful year for the Institute, despite the ongoing challenging circumstances of the COVID-19 pandemic.

Under the leadership of Professor Peter Currie, the Institute has continued to build its reputation globally as one of the world's leading regenerative medicine research organisations. These significant achievements reflect incredible talent across the Institute, and I thank our outstanding students and research and professional staff for their contributions.

Key to the Institute's success has been ARMI's ability to generate outcomes from our research, enabling increased engagement with industry partners, who are pivotal to facilitating translation and commercialisation of ideas into therapies.

We are well progressed in delivering on our Strategic Plan 2020–2025. The strategic intent of the plan is to provide a "decade of delivery" for regenerative medicine. This will improve quality of life and create positive health impacts by linking research excellence to the clinic and achieving translational aims by expanding relationships with industry.

In 2021, the Institute continued to create closer ties with industry. A recent example includes the new collaboration arrangement among ARMI, Cartherics Pty Ltd and the Centre for Commercialisation of Regenerative Medicine (CCRM) Australia. These collaborations improve commercialisation opportunities and benefits for staff and students by providing more opportunities for closer associations with the expanding regenerative medicine industry sector, especially through our linkages with the global CCRM network.

Strong clinical connections are also critical enablers of translating research into therapeutic outcomes. ARMI has significant opportunities to increase our clinical connections and relationships with the establishment of the new Victorian Heart Hospital on the Clayton campus.

Proximity to the new hospital is essential. I am pleased to report that initial work on developing a new building to accommodate a growing ARMI continues. Current plans are for our new facility to be located close to the Victorian Heart Hospital, paving the way for our increased, effective engagement with leading clinicians.

ARMI's continued success is made possible by the exceptional support from Monash University. We are very fortunate indeed to have such support across the university, including External Relations, Development and Alumni, philanthropy and fundraising, the Provost, the Global Engagement team, the Industry Engagement team and the Monash Research Office.

ARMI greatly appreciates the sage advice and leadership provided by Professor Christina Mitchell AO, Dean of Monash University's Faculty of Medicine, Nursing and Health Sciences. We are also deeply appreciative of the ongoing support from the Victorian Government and the Australian Government.

In 2021, Mr Tim Murphy retired as Chair. Tim facilitated material contributions to ARMI during his tenure and was instrumental in developing the ARMI Strategic Plan 2020–2025.

Also, in 2021, we formally recognised four emeritus Board members as ARMI Ambassadors – Hon. John Brumby AO, Dr Janine Kirk AO, Dr Kay Patterson AO and Dr Zita Unger. We are truly delighted that John, Janine, Kay and Zita will continue their advocacy and support for our Institute.

Finally, I would like to thank all my colleagues for their dedicated service to the Board – Emeritus Professor Claude Bernard, Professor Kim Cornish, Professor Peter Currie, Dr Peter Rogers and Ms Sonya Walker, along with recently appointed new members Dr Patrick Hughes, Dr Meroula Richardson and Dr Duncan Thomson.

Members who departed the Board in 2021 are Mr Andrew Brough, Mr Jeremy Nestel, Associate Professor David Rhodes, Mr Tim Murphy and Dr Zita Unger. On behalf of the Board, I thank the departing members for their material contributions.

A special recognition also to our current subcommittee Chairs – Emeritus Professor Claude Bernard (Strategy), Dr Peter Rogers (Development) and Mr Duncan Thomson (Industry) and to the many volunteer members of those subcommittees. The subcommittees play an essential role in supporting ARMI achieve its goals.

The Board is pleased and privileged to be able to support this exciting field of research and work with such outstanding talent. ARMI's ongoing place as a global leader in regenerative medicine remains both exciting and challenging. We look forward to ARMI's continued success and the potential for new therapies based on translating ARMI's cutting-edge academic research through clinical and industry partnerships.

Professor Andrew Dyer, Chair

Microscopy in the ARMI laboratory.

ABOUT THE INSTITUTE
DIRECTOR'S REPORT

Professor Peter Currie

Even though 2021 presented continuing pandemic challenges for people and organisations worldwide, I'm pleased and proud to report that 2021 was an excellent year for our Institute.

In 2021, our research discovery and publication output had more impact than at any other time in our history. In the ever-changing and complex research environment, people at ARMI pulled together with a real focus on their work, resulting in outstanding research productivity.

We continued our excellent record with several publications representing high-impact advancements in their fields, reflected in their publication in prestigious journals.

The beating heart of our research team of 20 groups remained steadfast, striving for scientific excellence, even during the challenges of 2021.

Some people struggled with the existential threat of the pandemic's unique environment. I especially felt for our diverse set of international staff and students who were living in times of uncertainty and, in some cases, were unable to see their families across the globe for an extended period.

To respond to this situation, ARMI provided plenty of mentoring, which helped many of our people focus on the practicalities of vaccination and work. Most of the researchers in our Institute adapted to changed circumstances in a way typical for scientists trained to work around obstacles to get the job done.

As in 2020, a top priority for 2021 was assisting our students to continue their research and learning. Again, the Student Program Committee and the group leaders put in outstanding work steering our student population to help achieve their goals.

Again, ARMI students and early-career researchers responded magnificently with their approach to research and support of each other. PhD student Rebecca Dale won ARMI's inaugural Crilley Prize for her fierce advocacy in raising awareness of mental illness. She drove change in the Institute to better support staff and students, especially during the pandemic. I would also like to congratulate Dr Xiaodong (Ethan) Liu, whose cutting-edge work led to a paper in *Nature* and resulted in him winning ARMI's inaugural Rosenthal Prize.

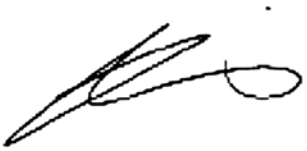
I am also pleased to report that ARMI continues to deliver on our Strategic Plan 2020–2025, and I was especially impressed with our engagement with industry in 2021. Collaborating with industry is such an important stepping stone towards translating our leading-edge science into new therapies that improve people's health and quality of life.

Clinical collaboration is also crucial to developing therapies, and I am excited about the new era of opportunity that will emerge when the Victorian Heart Hospital is completed in 2022.

I would like to thank our new and expanded Executive Team, which assisted me throughout 2021 and provided an excellent forum to bounce around ideas to best support our strategic decisions.

I would especially like to thank the Leadership Advisory Board for its support and welcome the new Chair, Professor Andrew Dyer.

I feel privileged to work with such a fantastic team of people. I assure you that we will continue to build upon our research excellence and strive toward delivering therapies based on outstanding regenerative medicine research.



Professor Peter Currie, Director

Staff in AquaCore, the ARMI Aquatics Research Facility.

ABOUT THE INSTITUTE
INTRODUCTION TO REGENERATIVE MEDICINE

Regenerative medicine is a new approach to understanding development, ageing and disease.

Over the past 100 years, medical research has transformed human lives. As a result, people are living longer and better. For example, children rarely die of preventable infectious diseases; cancer survival rates are improving, and people can live for decades after a heart attack.

However, although scientific discoveries have enabled doctors to replace organs or use drugs to compensate for organ disease, medicine still can't provide treatments that help hearts repair themselves or help nerves regrow after a spinal cord injury.

As a relatively new field of research, regenerative medicine seeks to unlock the body's remarkable innate ability to repair, restore and replace various tissues and organs damaged by age, injury or disease. The US Department of Health and Human Services has called regenerative medicine the "next evolution of medical treatments".

Regenerative medicine approaches aim to regain the remarkable regenerative capacity humans have before birth. The techniques include injecting or implanting cells that can regenerate or re-engineer tissues to stimulate endogenous stem cell pools or reprogram existing differentiated cells to proliferate.

Researchers in this exciting and unique field of science look to exploit the body's capacity to heal and repair. Exploring this fundamental biological challenge is enriched in an extraordinary environment that brings together different scientific disciplines working in tandem.

The animal kingdom provides inspiration for what is possible. As Australia's first institute dedicated to regenerative medicine, ARMI's work studying axolotls has identified the critical role of an immune cell in the animal's ability to regrow limbs and regenerate the spinal cord, brain and heart tissue. Meanwhile, the zebrafish is also revealing how it regenerates new fins, skin, heart and brain.

ARMI's transgenic quail facility provided more opportunities to leverage the unique characteristics of birds to help researchers understand potential regenerative therapies for humans, especially in skeletal muscle.

From exotic animals to therapeutic applications, regenerative medicine promises to assist human cells, limbs and organs to do the same as these animals. Moreover, it can revolutionise health care for an ageing population facing many years living with degenerative conditions.

An ARMI laboratory.

ABOUT THE INSTITUTE

THE AUSTRALIAN REGENERATIVE MEDICINE INSTITUTE – DRIVING REGENERATIVE MEDICINE

ARMI is Australia's first research institute dedicated to delivering on the promise of the field of regenerative medicine. Regenerative medicine aims to unlock the healing power of the body to heal and regenerate organ or tissue damage caused by disease, injury or genetic conditions.

The six ARMI themes (for highlights, see page 12) are designed to augment Australia's capacity to drive and translate the potential of regenerative medicine to create health impacts for Australian and global communities.

- Research – realising the potential of regenerative medicine (see page 14). Five discovery pipelines (see page 43) support the research theme and drive innovation in regenerative medicine.
- Teaching – harnessing scientific passion (see page 20). Our teaching program will deliver Australia's next generation of scientific and clinical regenerative medicine researchers.
- Clinical impacts – driving research advances towards treatments (see page 24). ARMI's research aims to develop new therapies for conditions such as heart disease, muscular dystrophy, diabetes, multiple sclerosis, Alzheimer's disease, brain injury and autoimmune disorders.
- Industry partnerships – cutting barriers to commercialisation (see page 28). ARMI partners with industry to fast-track research translation and the development of future therapies.
- International collaborations – fostering global linkages (see page 34). ARMI builds opportunities and programs to ensure we are part of an international network specialising in regenerative medicine.
- Outreach – engaging with the public (see page 38). Our outreach program is designed to help the public, policymakers, industry, and undergraduate and school students to learn about and engage with the concepts of regenerative medicine and the people pursuing new knowledge and tools.

ARMI's research agenda has adopted a multidisciplinary approach to investigating the science of regeneration, designed to seed and foster collaboration and to pursue rapid translation of basic research into clinical knowledge and treatments. Our five discovery pipelines (see page 43) are supported by outstanding research groups in the fields of:

- heart and muscle development and regeneration
- immunity and regeneration
- stem cells, cancer and regeneration
- neural regeneration
- organ engineering and synthetic biology.

The Institute's dynamic and collaborative research culture is redefining how regenerative medicine is approached worldwide. Our researchers have access to key research platforms – molecular genetics, stem cell biology and animal modelling – to deliver technologies with medium- to long-term application for treating diseases of social, medical and economic importance and unmet clinical need.

ABOUT ARMI

ARMI is part of Monash University's Faculty of Medicine, Nursing and Health Sciences, located at one of the world's largest regenerative medicine and stem cell research centres at Clayton in Victoria, Australia.

The Institute was established through a joint venture between Monash University and the Victorian State Government with additional funding from the Australian Commonwealth Government. Today ARMI acts as a focus for public engagement in regenerative medicine and is the source of advice for policymakers.

Most ARMI researchers are based at Monash University's Clayton campus, with some having joint appointments with other Monash academic departments and the CSIRO. Some of the Institute's research is undertaken through participation in national initiatives, including the Centre for Commercialisation of Regenerative Medicine (CCRM) Australia and the European Molecular Biology Laboratory (EMBL) Australia Partner Laboratory.

ARMI'S FUTURE

The activities and themes outlined in this annual report are all aligned with core values and strategic focus areas distilled in the ARMI Strategic Plan 2020–2025. Concerted effort in the six strategic focus areas will ensure the long-term success of the Institute.

STRATEGIC FOCUS AREAS

VISION

Improved quality of life by unlocking the body's innate regenerative potential.

MISSION

To discover new regenerative therapies by conducting cutting-edge research and forming collaborative networks with the best scientists and clinicians worldwide.

ABOUT THE INSTITUTE
DONATING TO ARMI

ARMI researchers are at the cutting edge of regenerative research, seeking to find effective treatments for a range of diseases and conditions.

Our researchers are among the best minds in the world and are working towards finding answers in areas such as:

- ageing and degenerative diseases
- diabetes
- heart diseases
- arthritis
- neurotrauma in the brain, such as stroke or blindness
- multiple sclerosis (MS)
- Alzheimer's disease.

ARMI relies on the support of the community to continue this critical work. Your donation goes towards research and treatments for these diseases and degenerative conditions.

HOW TO SUPPORT ARMI

Donors can choose to support ARMI in a variety of ways:

1. Visit us online: http://www.armi.org.au/donate
2. If it is more convenient to donate by cheque or money order, donations can be mailed to:

Monash University Advancement
PO Box 197
Caulfield East, Vic, 3145
Australia

Cheques should be made payable to "Monash University". You will also need to provide your name, contact details, donation amount, whether you wish to remain anonymous and instructions to direct the gift to ARMI.

3. Direct deposit
4. Make a gift by phone

Credit card donations, including single gifts and ongoing pledges, can be made by calling +61 9903 1608.

Please note that we are unable to take direct debits over the phone.

All donations over $2 are tax-deductible. A letter and receipt will acknowledge all donations.

ACKNOWLEDGMENTS

Major gifts

Metals Manufacturers Ltd

Corporate sponsors

ARMI would like to thank the following sponsors for their contribution in 2021 and would encourage you to support them.

Inkube8 Design

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Individual donors

Staff – Anonymous
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Vicky Spanidis
Kris Meade
Jane Court
Niki Platis
Peter Rogers
Vicky Kambilafkas
Sofia Alexiou
Jim Syrrakos
Andriana Petinarias
Georgia Danos
Barbara Kikiras
Theodore Papazoglou

HIGHLIGHTING ARMI'S STRATEGIC FOCUS AREA:
INVESTMENT, ENGAGEMENT AND FUNDING

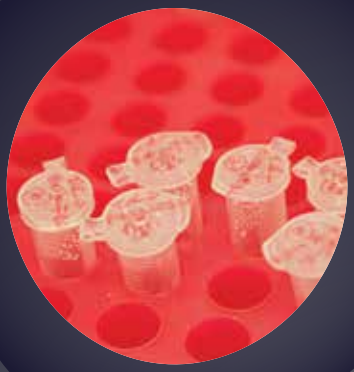
Attracting investment and funding remains a cornerstone of cutting-edge biomedical research in regenerative medicine during our decade of delivery.

ARMI Strategic Plan 2020–2025

A quail egg is used in an experiment.

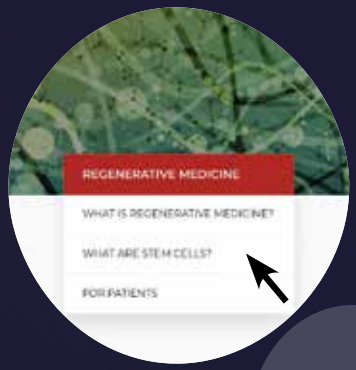
ARMI THEMES – HIGHLIGHTS

ARMI's six themes are designed to augment Australia's capacity to drive and translate the potential of regenerative medicine to create health impacts for Australian and global communities.



RESEARCH – REALISING THE POTENTIAL OF REGENERATIVE MEDICINE	TEACHING – HARNESSING SCIENTIFIC PASSION	CLINICAL IMPACTS – DRIVING RESEARCH ADVANCES TOWARDS TREATMENTS
53 publications	48 PhD students	10 diseases impacted by ARMI research
18 publications with an impact factor >10	14 Masters students	Australian-Lebanese collaboration to improve clinical genetic diagnostics for congenital heart disease
5.023 million in total grant income	9 Honours students	Clinician–researcher joins international regenerative medicine network
A naturally occurring protein could reverse severe muscle wasting in disease, ageing and trauma	25 graduating students	
Innovative technologies improve image analysis of developing bone	1 student award	
3D gaming modelling gives a spatial view of genes expressed in the heart	19 publications with student authors	
	Azelle Hawdon – taking the wheel as the ARMI social media ambassador for 2021	
	Former ARMI PhD student takes on the world of translational research in industry	
(see page 14)	*(see page 20)*	*(see page 24)*

From left to right: Axolotls are an animal model of regeneration; ARMI lab – working to unlock the regenerative capabilities of the human body; Samples awaiting testing.



INDUSTRY PARTNERSHIPS – CUTTING BARRIERS TO COMMERCIALISATION

ARMI has access to diverse infrastructure, specialised manufacturing capabilities, industry partners and networks to accelerate commercialisation

New agreement promotes innovation and commercialisation ties between academia and industry

New innovation boost for ARMI's Industry Advisory Committee

Workshop series will discuss introducing advanced therapies into the market

New Clarity Unit enhances thought leadership and analysis for the commercialisation of regenerative medicine in Australia

(see page 28)

INTERNATIONAL COLLABORATIONS – FOSTERING GLOBAL INITIATIVES

Launch of FAMOUS program unites scientists from Australia and Brazil

Monash University – Osaka University collaborations power regenerative medicine innovation

Network expands to include researchers from more South American countries

(see page 34)

OUTREACH – ENGAGING WITH THE PUBLIC

Social media activity
Followers:

- Facebook 9.4K
- twitter 3.5K
- LinkedIn 2.0K
- Instagram 701

"Regenerative medicine looks like a game-changer" – Dr Patrick Hughes, new Leadership Advisory Board member

Expertise in talent acquisition and forging new relationships – an excellent addition to ARMI's Development Engagement Committee

ARMI's connections and support for people crosses global and sector boundaries

(see page 38)

THEMES IN FOCUS

RESEARCH – REALISING THE POTENTIAL OF REGENERATIVE MEDICINE

Regenerative medicine represents a revolution in human health and has the potential to reverse tissue damage, repair traumatic injuries and improve the health of an ageing population. It seeks to repair, replace, restore and regenerate tissues and organs damaged by age, injury and genetic and degenerative conditions.

With a total of 6000 fish tanks ranging from one litre to 10 litres, AquaCore is the largest aquatics research laboratory of its type in the southern hemisphere.

RESEARCH – REALISING THE POTENTIAL OF REGENERATIVE MEDICINE

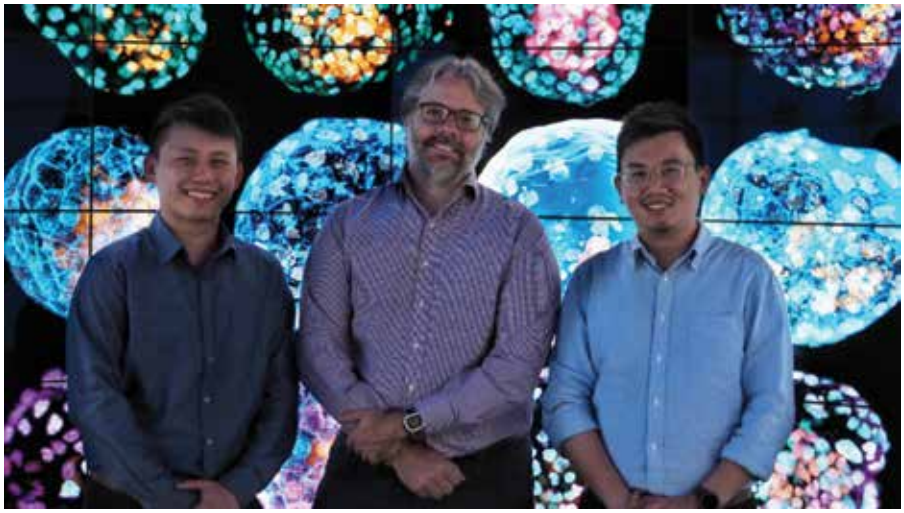
HIGH-IMPACT RESEARCH NEEDS HIGH-IMPACT PEOPLE

In 2021, ARMI's excellence grew from the focus and persistence of everyone associated with our Institute. Our researchers' scientific excellence resulted in one of the most high-impact years our Institute has recorded to date.

In a celebration of former and current staff members, ARMI was happy to award two inaugural new prizes – The Rosenthal Prize and the Crilley Prize.

The annual Rosenthal Prize is in honour of our Founding Director, Professor Nadia Rosenthal. It will be awarded to a postdoctoral researcher who has exhibited exceptional academic performance in the previous 12 months along with an excellent publication record and/or exhibiting excellence in the dissemination of their science.

In 2021, the award was presented to Dr Xiaodong (Ethan) Liu for his work developing the iBlastoid's technology, which resulted in a publication in *Nature* in March 2021 (see reference 28, Appendix 1).



iBlastoid researchers (L–R): Mr Jia Ping Tan (PhD student, Polo Group) Professor José Polo, Dr Xiaodong (Ethan) Liu.

The annual Crilley Prize is named in honour of founding staff member Laura Crilley in recognition of her longstanding service and demonstrated adherence to the Institute's core values. The Crilley Prize will be awarded to a staff member or student who has demonstrated an exceptional contribution to one or more of the Institute's core values outside of scientific excellence. Examples of activities undertaken by staff or students may include but are not limited to community engagement, support of diversity and inclusion at ARMI and/or industry engagement.

In 2021, the Crilley Prize was awarded to PhD student Ms Rebecca Dale whose exceptional contribution to the Institute included:

- championing mental health first aid and awareness in the Institute
- taking the mental health initiative to the Diversity and Inclusion committee to incorporate into ARMI's Wellbeing program
- organising the ARMI Internal Seminar Series for two years.

Ms Rebecca Dale accepts the Crilley Prize from ARMI Director Professor Peter Currie.

RESEARCH – REALISING THE POTENTIAL OF REGENERATIVE MEDICINE

HIGH-IMPACT PUBLICATIONS

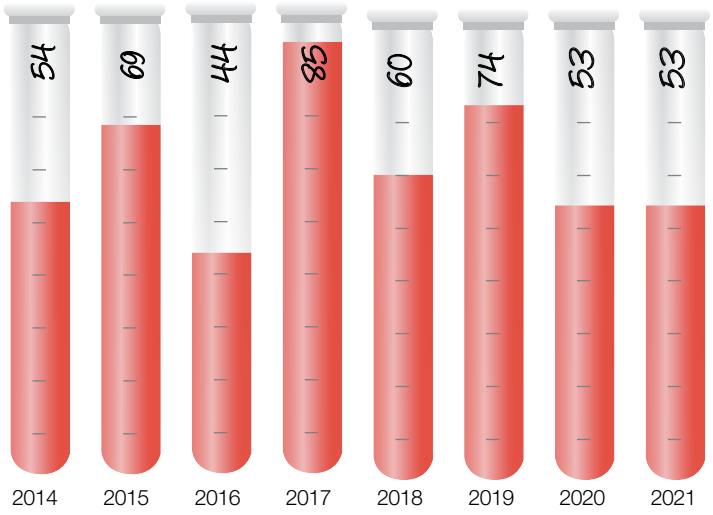
ARMI researchers had another outstanding year in 2021, with 53 publications in global high-impact journals. Eighteen publications were in journals with an impact factor greater than 10 and of those four were in journals with an impact factor greater than 20.

HIGHLIGHTING ARMI'S STRATEGIC FOCUS AREA: *RESEARCH EXCELLENCE*

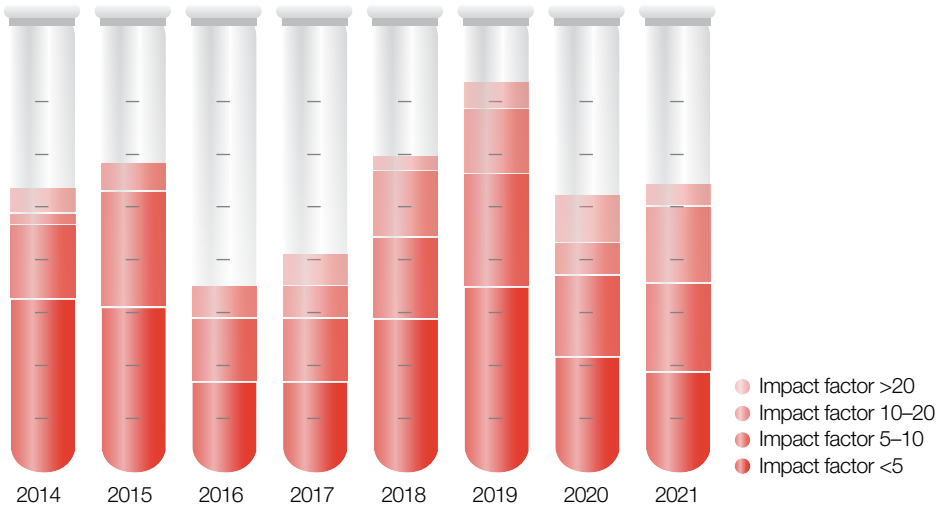
Research excellence is at the heart of our strategy to both build a strong Institute for the future and ensure high-quality external engagement.

ARMI Strategic Plan 2020–2025

NUMBER OF PUBLICATIONS



HIGH-IMPACT RESEARCH



GRANTS AND FUNDING SUCCESS

In 2021, ARMI attracted $5.023 million in competitive and non-competitive research funding. Most funds came from the National Health and Medical Research Council and Australian Research Council. The Institute continues to have an active research program, thoughtful mentoring of applicants, and a rigorous pre-application grant development program overseen by Institute Director, Professor Peter Currie.

ARMI'S TOTAL INCOME FROM RESEARCH FUNDING IN 2021 WAS

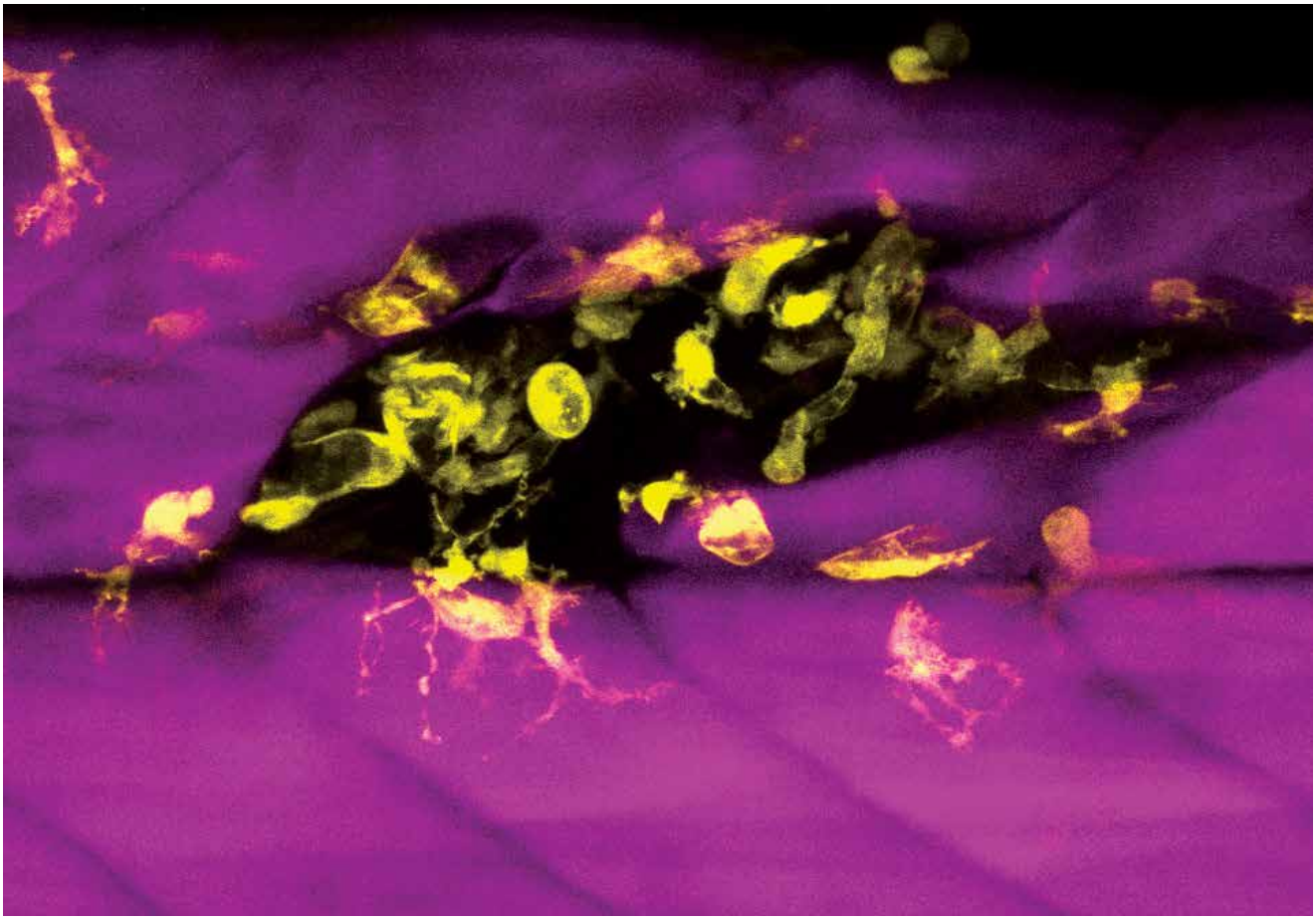
$5.023m

NUMBER OF PUBLICATIONS WITH IMPACT FACTOR >10

18

RESEARCH – REALISING THE POTENTIAL OF REGENERATIVE MEDICINE

A NATURALLY OCCURRING PROTEIN COULD REVERSE SEVERE MUSCLE WASTING IN DISEASE, AGEING AND TRAUMA



Macrophages (yellow) are drawn to the site of an injury.

Researchers have found a protein secreted from immune cells that heals muscle cells and could be used to assist in faster recovery from muscle injury and wasting diseases.

Research group leader Professor Peter Currie said macrophages are the clean-up crew of the immune system, flocking to any injury or infection site in the body, removing debris and promoting healing.

Scientists have been unable to find the signal that caused the wound-healing cell interactions because they could not see them.

In research published in the prestigious journal *Nature* (see reference 41, Appendix 1), the researchers were able to see what was going on at the muscle injury site using the transparent zebrafish as a model.

Researchers previously believed that two types of macrophages exist, but Professor Currie's group used zebrafish and found eight genetically different types of macrophages at the injury site.

One type called a "dwelling" macrophage, secreted a protein called NAMPT that could be a long sought-after wound signal to promote healing.

"We saw macrophages literally cuddling the muscle stem cells, which then started to divide and proliferate. Once they started this process, the macrophage would move on and cuddle the next muscle stem cell, and pretty soon, the wound would heal," Professor Currie said.

The scientists removed the "dwelling" macrophages from the zebrafish, added the NAMPT to the aquarium water and were still able to stimulate the muscle stem cells to grow and heal.

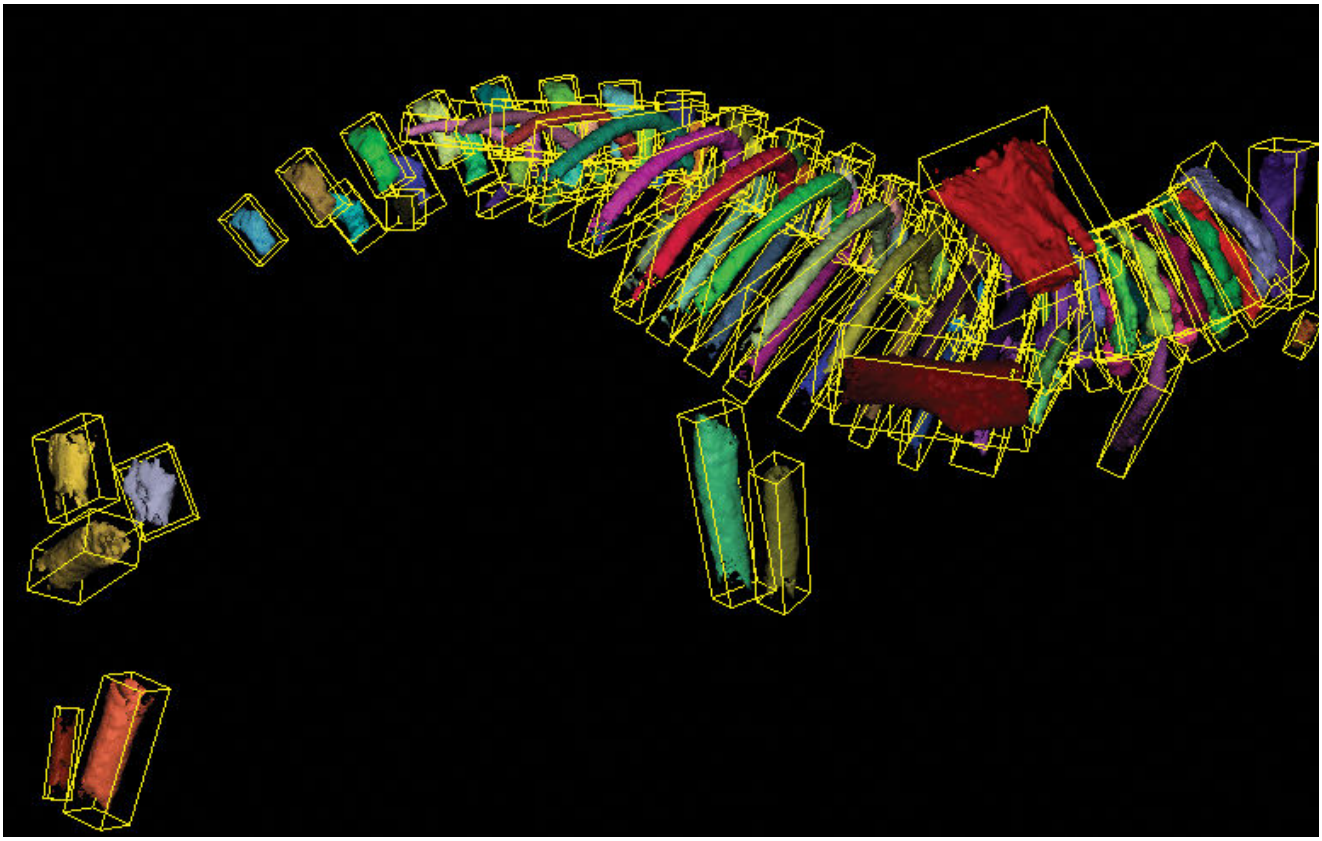
This showed that NAMPT effectively replaced the need for the macrophages to promote healing.

The researchers also used a hydrogel patch containing NAMPT in a mouse model of severe muscle wasting. This led to what Professor Currie called a "significant" replacement of the damaged muscle.

The researchers are now in discussions with biotech companies about taking NAMPT to clinical trials to use this compound in the treatment of muscle disease and injury.

RESEARCH – REALISING THE POTENTIAL OF REGENERATIVE MEDICINE

INNOVATIVE TECHNOLOGIES IMPROVE IMAGE ANALYSIS OF DEVELOPING BONE



Typical 3D view after applying a pipeline analysis tool to a whole-body scan of a mouse.

A new technology pipeline to obtain specific bone measurements from imaging scans could enhance accuracy and efficiency for developmental biologists and evolutionary researchers.

The work, led by ARMI group leader Dr Alberto Roselló-Díez, was recently published in *Frontiers in Cell and Developmental Biology* (see reference 9, Appendix 1).

Dr Roselló-Díez said the researchers developed the user-friendly semi-automatic method to obtain bone-length measurements from whole-body micro-CT scans in mice.

"It has certainly revolutionised our research in terms of speed and reproducibility as compared to traditional methods, and we hope that it will be helpful for many other researchers," he said.

Measuring skeletons is a cornerstone of developmental studies, including investigating limb patterning and growth or generating new disease models.

Traditional methods involve staining bone and cartilage and then imaging analysis, but these methods are unfortunately destructive, time-consuming and inconsistent.

Dr Roselló-Díez said their new technology pipeline addresses these weaknesses.

"The major advantage of this new method is that it gives us a fast and robust characterisation of long-bone length and uses XMT [X-ray microtomography], which is non-destructive, meaning that the samples can be used afterwards for histology or other applications."

The researchers are now looking to expand their pipeline to include shape distortion to enable the study of genetic changes affecting bone development and apply the method also to measure the width of bones.

The team has collected enough scans that could also be used for training for a fully automated deep learning approach.

"It is exciting to combine different emerging technologies to improve and accelerate the work we and many others do in the lab."

The study involved a collaborative approach from researchers in the Roselló-Díez Group, the City University of Hong Kong, Monash Biomedical Imaging and the Monash Biomedicine Discovery Institute.

RESEARCH – REALISING THE POTENTIAL OF REGENERATIVE MEDICINE

3D GAMING MODELLING GIVES A SPATIAL VIEW OF GENES EXPRESSED IN THE HEART

3D-cardiomics gives a 3D spatial view of the adult heart transcriptome with gene expression levels ranging from low (blue) through to high (red).

A high-resolution three-dimensional (3D) view of genes expressed in the heart has been visualised using cutting-edge genomics and 3D gaming.

Using the technology, researchers have modelled where in the heart genes are turned on and produce mRNA molecules, the first step of gene expression.

The full range of mRNA molecules expressed in a tissue such as the heart is called a transcriptome.

Associate Professor Mirana Ramialison said detecting up and down-regulation of gene expression in many tissues at different times has already been achieved.

"But what is more complicated is understanding the spatial relationships in three dimensions. This is key to uncovering developmental and physiological processes of the heart, during both homeostasis and disease," she said.

The research team microdissected and sequenced transcriptome-wide anatomical sections of the adult mouse heart to understand the spatial relationships.

This revealed both known and novel genes displaying complex spatial expression across the heart sub-compartments and shed light on the complex genetic networks that regulate and coordinate cardiac function.

Researcher Dr Fernando Rossello said the spatial transcriptomic approach allowed the team to demonstrate that most of the variability among the heart sections is because of the differences among the atria, significant vessels and ventricles.

The next step was for students Nathalia Tan and Alex Tokolyi to use "gaming" technology to generate a 3D model of the heart called 3D-cardiomics.

PhD student Monika Mohenska said 3D-cardiomics is a fantastic and easy-to-use online tool for anyone wishing to build hypotheses and explore how genes are regulated across the heart.

The study was published in the *Journal of Molecular and Cellular Cardiology* (see reference 32, Appendix 1) and involved international collaborators from ARMI, Monash Biomedicine Discovery Institute, Monash Bioinformatics Platform, the Faculty of Information Technology at Monash University, CSIRO, Murdoch Children's Research Institute, the University of Melbourne, the Jackson Laboratory (USA), Academic Medical Centre (the Netherlands) and Imperial College London (UK).

TEACHING – HARNESSING SCIENTIFIC PASSION

While 2021 was a challenging year, looking after our young scientists to ensure they could continue their education and training was a crucial focus towards investing in and nurturing Australia's innovation.

A core element of the mission at ARMI is keeping Australia at the forefront of science and technology innovation is embraced.

ARMI actively recruits young, creative scientists from all corners of the world to share and inspire differing approaches to some of the most perplexing biological questions of the 21st century. They are highly motivated and nurtured in a collaborative working environment to approach complex biological problems with ingenuity and passion.

In 2021, ARMI enrolled more students than ever before. The internationalisation and uniqueness of student opportunities offered at ARMI sets the Institute apart and is a key reason students select ARMI for their undergraduate and postgraduate training.

ARMI group leaders and research fellows teach in undergraduate courses, and the Institute also offers international students and undergraduates a variety of opportunities to experience research firsthand.

Ms Laura Galvis from the Marcelle Group (in red) teaching Master of Biotechnology students ovo chicken embryo electroporation and embryonic microsurgery techniques.

TEACHING – HARNESSING SCIENTIFIC PASSION

Number of postgraduate students

In 2021, the Institute maintained an active training program with 50 higher degree by research (HDR) students enrolled at ARMI. HDR students can study for Doctor of Philosophy (PhD), research Masters and other professional higher degrees by research. The Institute also provides training to Honours, selective undergraduate and visiting international students.

ARMI also had an intake of 13 students in the new Master of Biotechnology. This dedicated program integrates biotechnology and entrepreneurship and equips students with the skills and knowledge to work in a rapidly growing sector.

Number of undergraduate students

In 2021, nine students enrolled in the Honours program at ARMI.

Publications with student authors

Sixteen students contributed to 19 manuscripts published in peer-reviewed journals, including in the prestigious *Nature* suite of journals. Six of those students were first authors.

Student awards

PhD student Rebecca Dale from the Currie lab was awarded the inaugural Crilley Prize (see description on page 15) for her advocacy raising awareness of mental illness and driving change in the Institute for better support for all staff and students.

Student programs in 2021

Master of Biotechnology

ARMI and Monash University launched this program to integrate biotechnology and entrepreneurship and equip students with the skills and knowledge to work in a rapidly growing sector.

The course features practical training in medical biotechnology and opportunities for research projects with ARMI's world-leading researchers or industry placements.

Honours program

ARMI offered nine undergraduate students the chance to further their studies in the Honours program, work beside world-class scientists and gain access to a network of international scientists and organisations.

Undergraduate studies

Unfortunately, in 2021 students had limited access to the laboratories and were not able to take part in laboratory-based initiatives, including the Undergraduate Research Opportunities Program (UROP) – a paid 12-month employment scheme designed to give undergraduate students an early opportunity to experience real life in a research laboratory and gain insight into careers in biomedical research.

TEACHING – HARNESSING SCIENTIFIC PASSION

AZELLE HAWDON – TAKING THE WHEEL AS THE ARMI SOCIAL MEDIA AMBASSADOR FOR 2021

Following a successful inaugural year in 2020, PhD student Azelle Hawdon steered the social media ambassador program in 2021.

Azelle said she was especially excited to join the program so she could apply her scientific attention to detail to science communications.

“Since embarking on my scientific research career to follow my passion for science, I have become increasingly aware of the pivotal role social media has for science communications,” she said.

“The ARMI social media ambassador role provides a unique opportunity to contribute to the Institute and the broader scientific community.”

“As a social media ambassador, I would like to actively contribute to expanding scientific outreach by sharing information between the public, research community and ARMI. I hope this role will enable me to highlight the incredible regenerative medicine and stem cell science occurring in Melbourne and Australia.”

Azelle said she already has a significant personal social media profile and understands how media platforms can accelerate sharing and discussions of new research, enable scientific collaborations and even assist with the sourcing of reagents and experimental protocols.

“As scientists at the frontline of both discovery and clinical research, it is important that we share novel discoveries among other scientists and with the public. When messages are misinterpreted, the reputation of and trust in science is eroded,” she said.

With the COVID-19 pandemic, the spotlight on biomedical research, science communication and public-health messaging has never been stronger.

2021 Social Media Ambassador and PhD student Ms Azelle Hawdon.

Azelle sees the value of using social media as a tool to establish a more trustworthy perception of science and to bridge the gap between the lab bench and the public audience.

Her PhD project in the Zenker Group involves using cutting-edge live imaging technologies to understand the underlying mechanisms of embryo development. Azelle spends much of her time looking down the microscope to observe tiny movements in the microtubule cytoskeleton – structures that shape and help to organise the cell’s parts.

TEACHING – HARNESSING SCIENTIFIC PASSION

FORMER ARMI PHD STUDENT TAKES ON THE WORLD OF TRANSLATIONAL RESEARCH IN INDUSTRY

A former ARMI PhD student continued his academic research in postdoctoral roles in Perth, France and Belgium before pivoting to a career in the life sciences industry.

Dr Ivan Gladwyn-Ng is developing innovative mouse and rat models for preclinical testing of novel therapeutics as a Regional Leader of Field Application Scientist at Taconic Biosciences in Germany.

In this role, he collaborates with scientists in both industry and academia from all over Europe and the Asia-Pacific region. He also maintains professional contact with his former ARMI peers and researchers by exchanging technical guidance, reading theses and writing referral letters.

Dr Gladwyn-Ng said he has also extended the social side of the great collaborative atmosphere established at ARMI – he attends ARMI-related weddings and Christmas gatherings in Europe.

"Due to COVID-19, we haven't been able to meet for the past 12 months. But we have a WhatsApp group and just had a video chat a few weeks ago."

While studying under Dr Julian Heng at ARMI, Dr Gladwyn-Ng had a clear vision for his future and knew he wanted his work to translate into opportunities to develop therapeutics that help people.

"My PhD had to be a translational project. I knew I wanted to study something related to a human condition or disease. So, to me, developmental, regenerative medicine or child-related or adult-related pathologies were the kinds of projects I was looking at, especially if there were opportunities to develop therapeutics."

Dr Gladwyn-Ng began building his expertise with in vivo animal models and rodent surgical techniques at

Dr Ivan Gladwyn-Ng

ARMI. His other experience studying the Zika, West Nile and Yellow Fever flaviviruses and developing vaccines for the Zika virus made him an attractive prospect for industry.

Dr Gladwyn-Ng said his personal experience drives his path in the world of biomedical research – both of his brothers are also biologists.

"As an undergraduate student, I was intimately aware of the high incidence of cancer, neurodegenerative and metabolic diseases in my family. Losing my dad and both my grandmothers during my undergraduate studies at Monash was particularly difficult. It was my family that drove and inspired me."

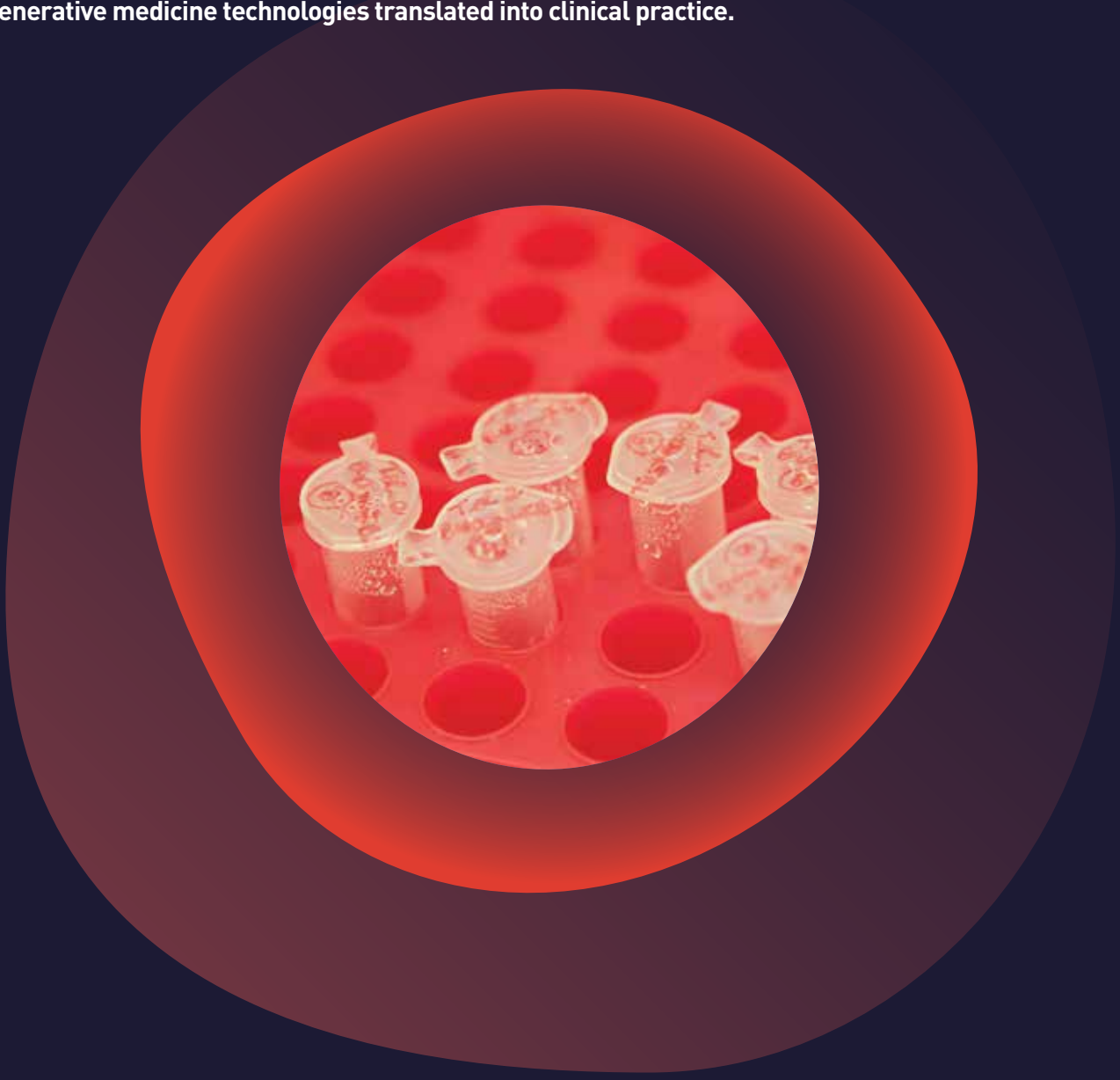
CLINICAL IMPACTS – DRIVING RESEARCH ADVANCES TOWARDS TREATMENTS

ARMI's world-class regenerative medicine research is well placed to create future treatments for many diseases, including neurological, immune and muscle conditions and organ and stem cell applications.

The Victorian Heart Institute has launched and will be in the new Victorian Heart Hospital when it opens in 2022. The Victorian Heart Hospital will be Australia's first dedicated heart hospital. It will provide a unique opportunity to expand ARMI's cardiac research capacity through collaboration and recruitment and boost our future impacts on medical treatments for heart disease.

ARMI is uniquely placed in a precinct with world-leading research and clinical expertise and infrastructure of Monash University, the CSIRO, Monash Health (Victoria's largest health service), the future Victorian Heart Hospital and numerous other key players in Victoria's medical research network.

Our location in this vibrant precinct creates opportunities for our researchers to collaborate with clinicians and leads to fruitful synergies that will support our push for the more rapid growth of tangible regenerative medicine technologies translated into clinical practice.



Samples awaiting testing.

CLINICAL IMPACTS – DRIVING RESEARCH ADVANCES TOWARDS TREATMENTS

HIGHLIGHTING ARMI'S STRATEGIC FOCUS AREA:
BUILDING FOR STRENGTH AT SCALE

Strong leadership across our Institute and alignment with our campus and precinct partners from academia, industry and the medical community will prepare us for the growth to come in our decade of delivery of regenerative medicine therapies.

ARMI Strategic Plan 2020–2025

AUSTRALIAN-LEBANESE COLLABORATION TO IMPROVE CLINICAL GENETIC DIAGNOSTICS FOR CONGENITAL HEART DISEASE

A first-of-its-kind ARMI collaboration has established an international data-handling pipeline for human clinical and research-based genetic screening for congenital heart disease (CHD).

The world-class clinical genetic diagnostics project aims to deliver direct, real-world benefits for families in Lebanon with CHD across more than one generation.

This project was enabled through a novel partnership among Australian and Lebanese medical researchers and clinicians and was instigated by scientist Ms Jeannette Hallab from the Ramialison Group.

"CHDs are the most common serious birth defects and affect one in every 100 newborn babies, but unfortunately, existing clinical genetics pipelines are unable to explain the basis of CHD in 80% of cases. One significant limitation of current clinical diagnostic methods is their focus on genes," Ms Hallab said.

The Ramialison Group has collaborated with Principle Cardiothoracic Surgeon Dr Elie Sawan, who visited ARMI in 2019, and expert Clinical Geneticist and Clinical Genetics Unit Head, Professor Chantal Farra, both based at Hotel Dieu de France Hospital and Saint Joseph's University of Beirut.

Dr Sawan said he was looking forward to working with his Australian colleagues and Professor Farra.

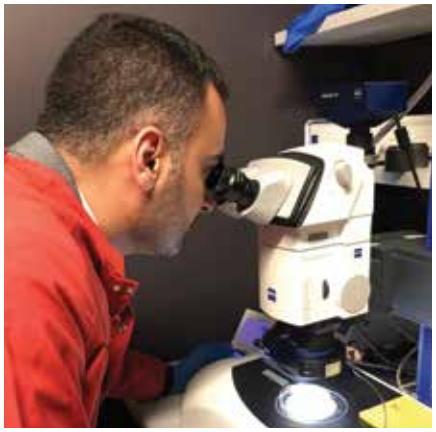
"Circumstances in Lebanon currently present numerous challenges to the healthcare system and life in general, but we will commence recruitment as soon as possible."

Ms Hallab designed the data-handling and project pipeline to first provide clinical genetics services and feedback to the study participants and research analyses of the same data will follow this.

Associate Professor Mirana Ramialison said: "The research-based analyses could fill existing gaps in current clinical genetic diagnostics approaches and provide new insights into the genetic basis of CHD, which cannot be provided through existing clinical genetics frameworks."

Ms Hallab said she hopes to provide families with the answers they deserve and help them understand whether their genomes contain changes that explain why CHD is recurring within their family."

"We hope the knowledge generated by the research study will ultimately improve genetic diagnostic rates and quality of life for other families affected by CHD in the future."



Dr Elie Sawan visited the ARMI labs in 2019.

Ms Jeanette Hallab (Ramialison Group)

CLINICAL IMPACTS – DRIVING RESEARCH ADVANCES TOWARDS TREATMENTS

CLINICIAN–RESEARCHER JOINS INTERNATIONAL REGENERATIVE MEDICINE NETWORK

In 2021, Colombian-born Professor Gustavo Duque, a clinician–researcher based at Western Health, joined the network of regenerative medicine and developmental biology researchers from Australia, Brazil and Chile (the ABC Network).

Professor Duque is the Chair of Medicine and Director of the Australian Institute for Musculoskeletal Science (AIMSS) at Western Health and leads a team performing musculoskeletal and ageing research at the University of Melbourne. He sees collaboration as a major catalyst of discovery and is excited to contribute and share his expertise through the ABC Network.

"My research group has a novel and different perspective on stem cells. We work a lot on a particular set of cells, known as circulating osteoprogenitor cells, that circulate in the bloodstream but are still progenitor cells. Few groups in the world are working on this particular set of cells," he said.

Professor Duque also has a particular interest in the molecular mechanisms of ageing.

"Understanding ageing and the molecular mechanisms will help us develop ways to target them, for both young and old, but particularly the older population who benefit the most from these interventions."

He said the interest in these fields is growing rapidly in Latin America, and many people who have trained outside Latin America are returning to start their research teams in Colombia, Chile and Brazil.

Professor Duque thinks there is also potential to run clinical trials in Latin America as governments are interested in investing and supporting medical research.

"Running clinical trials in Australia is extremely expensive. In contrast, running the same similar trials in Latin America is much cheaper while still maintaining the same stringent ethical and other criteria."

"You have a population of almost 500 million people who speak the same language and collaborate. So, there is already a relatively solid network in Latin America. The scientific community there has been very well integrated for a while."

Professor Gustavo Duque

Sample containers.

INDUSTRY PARTNERSHIPS – CUTTING BARRIERS TO COMMERCIALISATION

As a global life science centre in the Monash-Clayton Innovation Precinct, ARMI has access to an interconnected ecosystem with diverse research expertise and infrastructure, specialised manufacturing capabilities, industry partners and networks to accelerate commercialisation.

In addition to improving clinical research opportunities, the Victorian Heart Institute and the opening of the Victorian Heart Hospital in 2022 creates an essential link in Victoria's value innovation chain in the health care and medical sector. The initiatives will bring together world-class clinical care, leading research expertise and infrastructure in the heart of Victoria's light manufacturing belt.

In combination with the expertise of the Centre for Commercialisation of Regenerative Medicine Australia, ARMI is ideally placed to capitalise on this once-in-a-generation opportunity with the potential to attract global players in the pharmaceutical and biotechnology sectors to Victoria.

INDUSTRY PARTNERSHIPS – CUTTING BARRIERS TO COMMERCIALISATION

NEW AGREEMENT PROMOTES INNOVATION AND COMMERCIALISATION TIES BETWEEN ACADEMIA AND INDUSTRY

Professor Alan Trounson, Cartherics CEO

Cartherics, ARMI, and commercialisation initiative CCRM Australia have announced agreements for closer cooperation and collaboration.

Professor Alan Trounson, Cartherics CEO, said the affiliation coincides neatly with the new state-of-the-art facility established for Cartherics near Monash University.

"Cartherics affiliation with ARMI is an important step in our development and will embed industry and academic excellence in regenerative medicine and translation to clinical medicine in cancer," he said.

"It will herald a new horizon of industry-academic partnerships involving innovation and commercialisation in human medicine."

Cartherics develops novel, "off-the-shelf" (allogeneic) immune therapy products. Academic appointments and access to related ARMI and Monash resources will be a key benefit to the company.

ARMI staff and students will also benefit from closer association with the rapidly developing Victorian regenerative medicine company.

Professor Peter Currie said immediate benefits for the Institute will include access to Cartherics' development and commercialisation mindset and mentoring and related support for staff and students.

"The Australian Regenerative Medicine Institute can only be strengthened by more closely connecting with carefully selected companies from the growing number of Australian regenerative medicine-focused start-ups and SMEs [small and medium-sized enterprises]," he said.

"ARMI is delighted to provide this opportunity for our researchers and students to align with Cartherics, a leading Victorian immunotherapy company."

The Institute focuses on translational companies and individuals best placed to support and drive the commercial translation of ARMI research.

As a result of this agreement, ARMI researchers will develop a greater understanding and appreciation of industry needs, the commercialisation process and how research can be protected and translated for commercial and healthcare gain.

Silvio Tiziani, Director, External Strategy and Planning at ARMI and CEO of CCRM Australia, said Cartherics will also benefit as an industry member of CCRM Australia.

CCRM is the commercialisation initiative hosted by the Institute and modelled on the successful Centre for Commercialization for Regenerative medicine in Toronto, Canada.

"As a partner organisation to CCRM Australia, Cartherics will gain increased visibility to a global network of world-leading companies and access the business skills, leadership, potential funds for product development and receptor capacity for technologies and products available through the global CCRM network," Mr Tiziani said.

HIGHLIGHTING ARMI'S STRATEGIC FOCUS AREA: *CLINICAL CONNECTIONS, TRANSLATION AND COMMERCIALISATION*

Research translation and commercialisation through industry and clinical connections remain essential as we work towards our mission of discovering new regenerative medicine therapies.

ARMI Strategic Plan 2020–2025

INDUSTRY PARTNERSHIPS – CUTTING BARRIERS TO COMMERCIALISATION

NEW INNOVATION BOOST FOR ARMI'S INDUSTRY ADVISORY COMMITTEE

The Industry Advisory Committee (see page 72 for all members) was excited to add two talented specialists to support ARMI with strategic industry leadership in identifying needs and opportunities on current and emerging regenerative medicine industry practice and technological developments.

Mr Brian Hanrahan, Business Development Manager at Planet Innovation, has for more than 20 years overseen gene- and cell-therapy projects and developed new diagnostic devices and tissue-engineered products in Australia, the United States and Canada.

ARMI is excited to have someone with Brian's skills and broad experience in the global regenerative medicine industry on the Industry Advisory Committee, who can provide high-value advice on advancing ARMI scientists' research through the commercialisation process.

From working in clinical pathology in the public and private sectors, Mr Hanrahan's career has taken him to Invetech in the USA, including as Program Manager for Life Science and Pharmaceutical projects to StarFish Medical in Canada as the Biotech Program Director.

Mr Hanrahan said his background in science enabled him to become a key interface between science and engineering, especially during the early stages of product development.

"I was fortunate enough to be able to play in that gap in that middle as I developed a deeper understanding of the product development process and program management skills. My career then went from being involved in the technical side of commercialisation and moved into project and client management and then into business development," he said.

"I see many parallels between the world I lived through in diagnostics and where the regenerative medicine and cell therapy industry is at the moment. When I started in diagnostics, there were still many manual processes and tests, with automation just entering the industry. This is the crossroads where regenerative medicine is currently at, and I'm excited to apply my learnings to accelerate the sector's transformation."

Dr Bianca Lê, founder and Executive Director of Cellular Agriculture Australia, uses her expertise in cell biology to promote and accelerate research and development in the cellular agriculture industry to help develop food more sustainably.

While making the leap from academia to a start-up is not a risk taken by many, Dr Lê said founding a national organisation dedicated to accelerating cellular agriculture as an emerging field of research has been a challenging and rewarding achievement.

Dr Lê was a cell biologist at Monash University, where she completed her PhD focused on understanding the link between premature birth and cardiovascular disease.

"I've been fortunate to have gained experience in a broad range of sectors within STEM, including academic research, tertiary education, policy writing, and science communication," she said.

"I've been able to utilise all the skills I developed during my career thus far to help promote cellular agriculture research and accelerate the growing industry in Australia."

Dr Lê can now combine her passion for science, innovation and modern technology and her desire to do good in the world. Her expertise and ethos have made Dr Lê a fantastic addition to the Industry Advisory Committee. Dr Lê said her recent venture into the agtech and food innovation space has given her a fresh perspective on applying stem cell science to fields outside regenerative medicine.

"This will help ARMI broaden their talent pool, diversify funding sources and increase research opportunities for our scientists."

Mr Brian Hanrahan

Dr Bianca Lê

INDUSTRY PARTNERSHIPS – CUTTING BARRIERS TO COMMERCIALISATION

WORKSHOP SERIES WILL DISCUSS INTRODUCING ADVANCED THERAPIES INTO THE MARKET

The Centre for Commercialisation of Regenerative Medicine (CCRM) Australia held the first of a new series of workshops on 23 July 2021.

The workshops will be designed to encourage dialogue between stakeholders in the research, commercial, clinical and regulatory ecosystems.

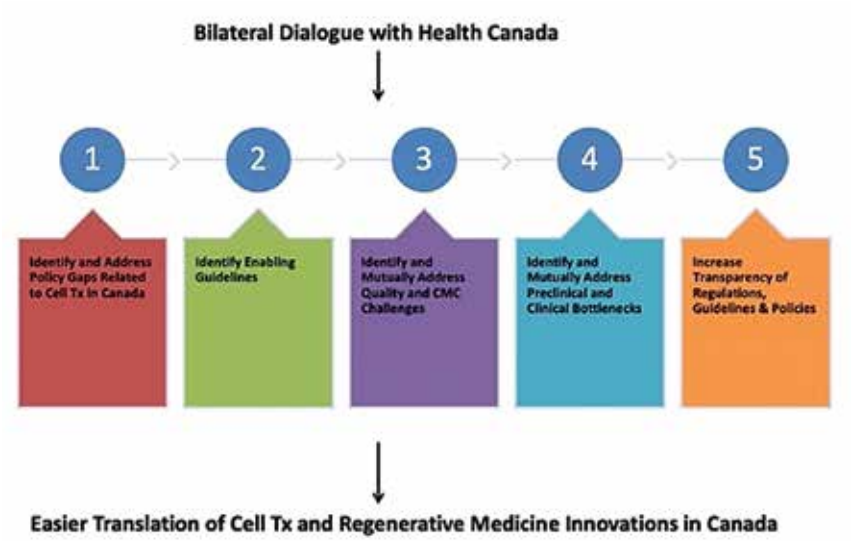
The discussions will cover regulatory issues impacting the translation and introduction of advanced therapies into the market. The themes will be based on questions, and concerns biotech companies, academia, clinicians and others have raised with CCRM Australia.

The first workshop covered the technology around extracellular vesicles and brought together crucial exosome stakeholders to discuss the regulatory requirements for exosome therapies.

Mr Silvio Tiziani, CEO of CCRM Australia, said investigations of exosomes for potential therapeutics and as a viable alternative for cellular therapies have increased.

"Unfortunately, the lack of well-established manufacturing protocols and other concerns such as high manufacturing costs and regulation concerns remain challenges to commercialisation."

Dr Sowmya Viswanathan, former co-Chair of Cellular Manufacturing and Clinical Trials at the Canadian Cell Therapy Stakeholder Group (CTSG), presented how the group approached engagement with Health Canada that resulted in policy changes in the cell- and gene-therapy regulatory landscape (see image).



Bilateral dialogue supported regenerative medicine innovations in Canada [Tx=transplantation, CMC=chemistry, manufacturing and control].

Other keynote presentations covered:

- **an overview of the types of extracellular vesicles** – Professor Andrew Hill, La Trobe University and Former President of the International Society for Extracellular Vesicles
- **how extracellular vesicles from mesenchymal stem cells could potentially be used to treat pulmonary fibrosis** – Professor Luis Ortiz, Clinical and Translational Science Institute, University of Pittsburgh and current Exosome Committee Member of the International Society for Cell and Gene Therapy
- **an overview of chemistry, manufacturing and control (CMC) issues surrounding extracellular vesicles** – Dr Sai Kiang Lim, A*STAR Research, Singapore.

Mr Tiziani said: "The fantastic contributions of the world-leading exosome experts greatly improved the understanding of Australian stakeholders in the challenging area of regulation. CCRM Australia looks forward to future workshops to benefit Australia's excellent capabilities and world standing in regenerative medicine."

INDUSTRY PARTNERSHIPS – CUTTING BARRIERS TO COMMERCIALISATION

NEW CLARITY UNIT PROVIDES THOUGHT LEADERSHIP AND ANALYSIS FOR THE COMMERCIALISATION OF REGENERATIVE MEDICINE IN AUSTRALIA

In 2021, the Centre for Commercialisation of Regenerative Medicine (CCRM) Australia announced the formation of its Clarity Unit to fill a need for an academic focus on market research and reporting.

Mr Silvio Tiziani, CEO of CCRM Australia, said Clarity would facilitate the commercialisation and diffusion of regenerative medicine in Australia.

"The sector needs [an] interdisciplinary, multi-institutional, demand-driven, team-based approach that will be fundamental to the way problems transcending disciplinary boundaries can be addressed."

"The success of our meeting on exosomes (see page 31) already shows how a multidisciplinary and collaborative approach can help Australia overcome some of the commercialisation issues."

The Clarity Unit aims to be:

- thought leading – an opinion leader on the development of critical ideas and policy for the Australian and global regenerative medicine sector
- demand driven – engaging with all key stakeholders at the start to increase the likelihood of ideas and solutions being embraced and adopted at the end
- interdisciplinary – drawing together an interdisciplinary team of experts using a collaborative research model and the extensive CCRM national and international partner network.

Mr Tiziani said the Clarity Unit's activities would often also use modes of engagement that are not traditionally academic to enhance the delivery of outputs with greater impact on the sector.

"In addition to international scientific papers, activities will include scoping studies, technical guidelines, case studies, explainers and infographics for reports and articles."

CCRM Clarity activities will include:

- researching and developing regenerative medicine business models and the diffusion of regenerative medicine technologies into the healthcare sector
- curating industry and research sector data to support the development of new policies and strategies concerning Australia and international markets
- analysing clinical and social information that helps support funding, grant applications and business strategies

CCRM AUSTRALIA CLARITY
Commercializing Living Therapies

The Centre for Commercialisation of Regenerative Medicine (CCRM) Australia formed the Clarity Unit in 2021.

- developing and writing opinion and blog articles for publication in appropriate print and online publications.

"The overall Clarity approach is designed to foster open, collaborative, multi-sectoral and impactful research. CCRM Australia is excited to take this forward, beginning with our series of annual regulatory workshops to increase interactions between industry stakeholders," Mr Tiziani said.

HIGHLIGHTING ARMI'S STRATEGIC FOCUS AREA:
FUTURE PERSPECTIVES

We continue to develop our clear perspective on which research is needed to address tomorrow's large-scale problems through multidisciplinary and collaborative research.

ARMI Strategic Plan 2020–2025

INTERNATIONAL COLLABORATIONS – FOSTERING GLOBAL LINKAGES

Our future is truly global. ARMI has built major international collaborative initiatives, including with researchers in Hong Kong and South America and through the Centre for Commercialisation of Regenerative Medicine (CCRM) Australia and the European Molecular Biology Laboratory (EMBL) Australia networks.

CCRM Australia was established by ARMI and forms part of an international network with the original organisation in Canada and future hubs in Europe, Japan, Singapore and Israel. ARMI, CCRM and its partners have worked towards building opportunities and programs such as the international mentoring program.

As another important international research link, ARMI group leaders, Associate Professors Edwina McGlinn and Mikaël Martino, are part of the Victorian Node of EMBL Australia. These links provide unique access to the best science in Europe and a new way to approach scientific endeavour.

INTERNATIONAL COLLABORATIONS – FOSTERING GLOBAL LINKAGES

INTERNATIONAL VISITORS TO ARMI

In addition to our international outreach, ARMI is always pleased to host prominent researchers from all over the world in our External Seminar Series. In 2021, Zoom enabled our staff and students to hear presentations and still have the opportunity to listen to the latest research findings, network online and link with the national and global research community (see page 86).

LAUNCH OF FAMOUS PROGRAM UNITES SCIENTISTS FROM AUSTRALIA AND BRAZIL

A new initiative launched to support new collaborations in the health sciences among researchers in Brazil and Monash University.

The FAMOUS program will help fund up to 10 collaborative projects to foster or strengthen the scientific relationship among research groups and generate preliminary results to support the development of longer-term projects.

Learning from the impact of the COVID-19 pandemic on international travel, the program will emphasise online activities to enhance collaboration.

Mr Silvio Tiziani, ARMI's Director of External Strategy and Planning, said the bonds between Australian and Brazilian researchers had strengthened over recent years through a network of regenerative medicine and developmental biology researchers from Australia, Brazil and Chile (the ABC Network).

"At ARMI, we established the ABC Network a few years ago," he said. "It is exciting to see this relationship deepen in the form of the FAMOUS program."

Approximately 100 medical researchers dialled in from Australia and Brazil for the virtual launch of FAMOUS, a collaborative seed program of FAPESP (São Paulo Research Foundation) and Monash University.

The virtual launch opened with welcome remarks from Marco Antonia Zago (President of FAPESP), Michael Ryan (Pro-Vice-Chancellor of Research, Monash University) and Eugênio Mello (Scientific Director, FAPESP), showing the strong support for this program from both organisations.

Several scientists, including ARMI group leader Associate Professor Mirana Ramialison, spoke about the challenges, the triumphs and the lessons learned from São Paulo – Monash University collaborations.

A Q&A session allowed scientists interested in the FAMOUS program to ask for more information.

ARMI Director of Research Professor Peter Currie said the ABC Network had realised its potential for securing additional funding for researchers involved in the network. He hoped the program would become a proof-of-concept project that can be adapted for other countries.

Mr Tiziani said international collaboration is critical in biomedical research and the health sciences to create global impacts.

"Cross-country and cross-cultural partnerships bring together different perspectives that can catalyse creativity, innovation, and new ways of thinking, which can drive progress towards improving patients' lives."

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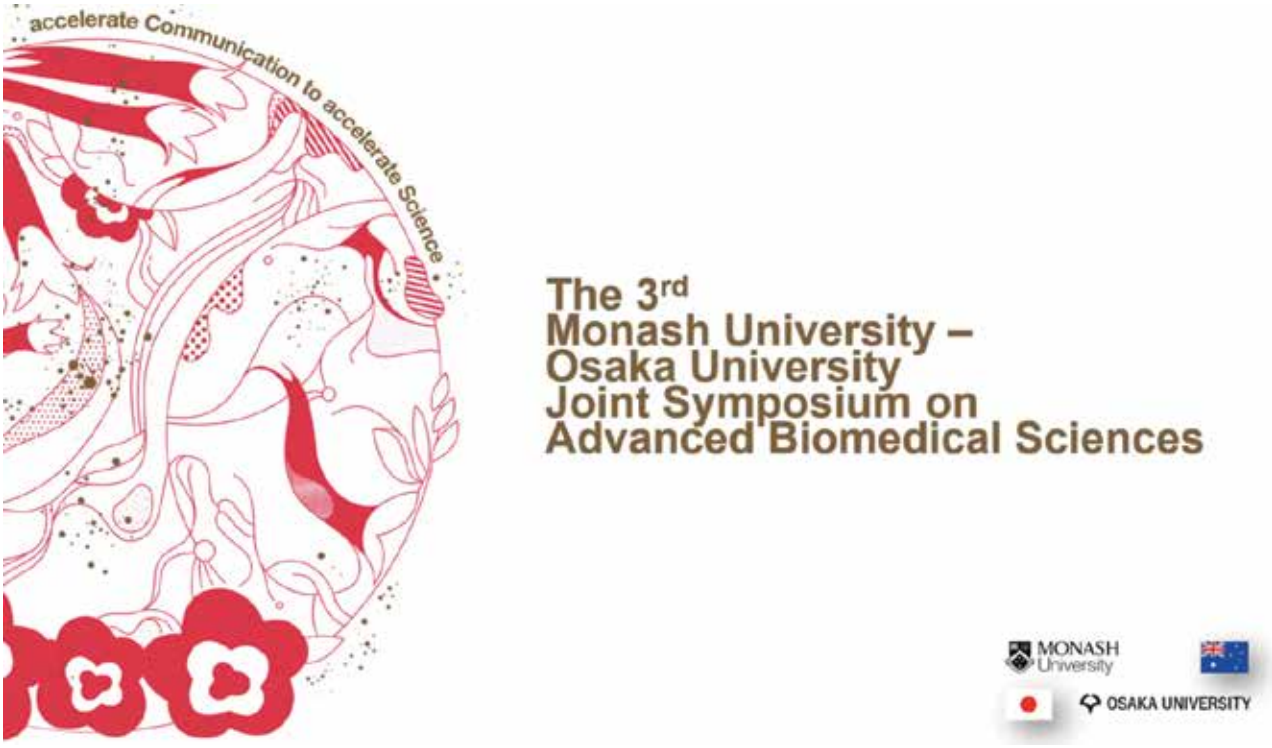
Collaborative partners of the FAMOUS program.

INTERNATIONAL COLLABORATIONS – FOSTERING GLOBAL LINKAGES

MONASH UNIVERSITY – OSAKA UNIVERSITY COLLABORATIONS POWER REGENERATIVE MEDICINE INNOVATION



In what has become a regular event in October each year, scientists from the sister cities of Melbourne and Osaka met in 2021 to discuss their work, exchange ideas and strengthen partnerships.

The meeting was the third iteration of the Monash University – Osaka University Joint Symposium on Advanced Biomedical Sciences.

Collaborative projects among the Australian and Japanese researchers investigate topics ranging from heart regeneration and ocular regeneration to single-cell RNA sequencing of skin cells.

Mr Silvio Tiziani, ARMI's Director of External Strategy and Planning, said that while ARMI was hoping to host the 2022 meeting in Melbourne, it was a pleasure to catch up online in 2021 with Japanese peers.

"We saw old friends updating us on shared projects established three years ago while also welcoming scientists from Monash University and Osaka University to talk about new projects they've been working on."

In a sign of the symposium's high-level support, the day opened with Mr Junji Shimada (Consul General of Japan in Melbourne) and Mr Trevor Holloway (Consul General of Australia in Osaka) discussing the deep ties between the sister cities of Melbourne and Osaka.

Mr Shimada and Mr Holloway both emphasised how international collaboration can catalyse discovery and innovation and produce new knowledge that impacts peoples' lives.

The symposium participants heard about the progress of existing projects and new projects covering a broad spectrum of the biomedical sciences, from RNA editing to brain-AI interfaces.

The meeting closed with a panel discussion of mechanisms for developing deeper collaborative ties between the two universities.

Mr Tiziani said it was a special treat to hear the keynote presentation from Professor Scott O'Neill from Monash University's World Mosquito Program.

"While Scott outlined the latest thinking in the prevention of the transmission of mosquito-borne viral diseases, his presentation reinforced the notion of working together as an international community to solve global health issues. It was inspiring and energising."

INTERNATIONAL COLLABORATIONS – FOSTERING GLOBAL LINKAGES

NETWORK EXPANDS TO INCLUDE RESEARCHERS FROM MORE SOUTH AMERICAN COUNTRIES

Expanded researcher network now includes five South American countries.

Leading regenerative medicine and developmental biology researchers from Australia, Brazil and Chile (the ABC Network) have welcomed new members from Argentina, Uruguay and Colombia.

The new researchers are Dr Guillermo Lanuza from Fundación Instituto Leloir (Argentina), Associate Professor Flavio Zolessi from Universidad de la República (Uruguay) and Drs Fernando Lizcano, Lina A Gómez, John Londoño and Ana María Santos from Universidad de la Sabana (Colombia).

ABC Network activities include staff and student exchange, shared projects and joint publications in leading journals, all supported by an annual meeting.

Mr Silvio Tiziani, ARMI Director of External Strategy and Planning, said it was fantastic to see the network grow. The expanded group will be workshopping a new and more inclusive name.

"Regenerative medicine and stem cell research are particularly strong in South America. Adding researchers to the network will help facilitate additional collaborations, accelerate our scientific discoveries and ultimately improve patient outcomes. This international and collaborative approach is a hallmark of our approach to the research program."

"We're excited to have more brilliant minds to share and challenge and catalyse some of the work we are all doing in the field."

The newest members of the Network cover a wide range of research topics:

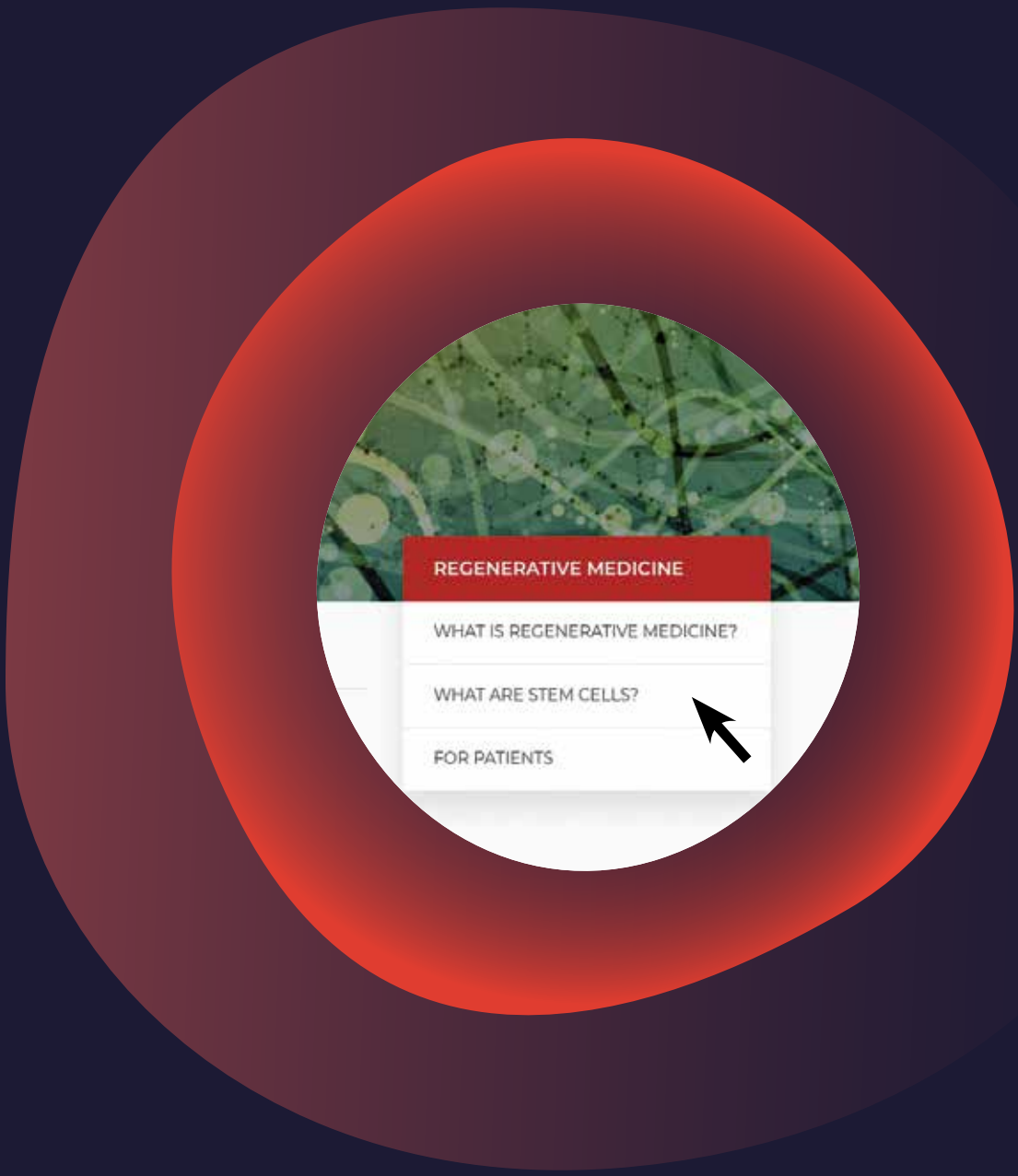
- Dr Guillermo Lanuza's expertise lies in neural development, particularly in understanding the basic mechanisms underlying hindbrain and spinal cord development.
- Associate Professor Flavio Zolessi investigates embryonic development, particularly neurogenesis and cell polarity, using zebrafish as a model.
- Dr Fernando Lizcano focuses on aspects of gene expression in metabolic diseases, including obesity, diabetes mellitus and thyroid diseases.
- Dr Lina A Gómez explores the clinical applications of blood products and upgraded methods for collection, storage and use of blood products to improve patients' outcomes.
- Dr John Londoño is a leading clinician–researcher in the field of inflammation and the musculoskeletal system, with a significant focus on rheumatology.
- Dr Ana María Santos investigates inflammation and the musculoskeletal system, specialising in rheumatology and autoimmunity.

OUTREACH – ENGAGING WITH THE PUBLIC

ARMI's early adoption and longstanding commitment to digital forms of communication fulfilled its promise in a year when face-to-face outreach was impossible.

In 2021, the Institute used our digital channels to continue giving back to the Australian public and to assist all stakeholders in improving their understanding of regenerative medicine's potential to contribute to Australia's public health and innovation.

The Institute's website, with its clean design and improved accessibility, continues to showcase ARMI's research and the beautiful images created by the scientists. Our world of regenerative medicine lives at – www.armi.org.au.



OUTREACH – ENGAGING WITH THE PUBLIC

Social media builds community

Throughout 2021, our social media activity continued even though our events were virtual rather than face-to-face. In addition, ARMI continued to develop engaging science content for the broader public through live-tweeting at events and sharing more success stories.

An important aspect of improving scientific understanding is teaching our future researchers how to communicate through social media and other channels. This is simultaneously teaching and an outreach activity. ARMI's Social Media Ambassador Program is helping to train our future science communicators and disseminate our stories and successes with the public and within our organisation (see page 22 to learn more about our social media ambassadors).

FACEBOOK FOLLOWERS

9.4K

TOTAL REACTIONS TO POSTS 801
TOTAL COMMENTS ON POSTS 270

TWITTER FOLLOWERS

3.5K

TOTAL LIKES 1298
TOTAL RETWEETS 252

LINKEDIN FOLLOWERS

2.0K

TOTAL CLICKS 3.3K
TOTAL LIKES, COMMENTS AND SHARES 2.3K

INSTAGRAM FOLLOWERS

701

TOTAL LIKES 1.0K

WEBSITE
TOTAL USERS 32.6K
TOTAL PAGEVIEWS 93.4K

HIGHLIGHTING ARMI'S STRATEGIC FOCUS AREA:
EXTERNAL ENGAGEMENT

External engagement and communications stand us in good stead as the regenerative medicine sector grows and competition for talented researchers and funding increases.

ARMI Strategic Plan 2020–2025

OUTREACH – ENGAGING WITH THE PUBLIC

"REGENERATIVE MEDICINE LOOKS LIKE A GAME-CHANGER" – DR PATRICK HUGHES, NEW LEADERSHIP ADVISORY BOARD MEMBER

Trained anaesthetist and experienced medical advisor, Dr Patrick Hughes, joined the Leadership Advisory Board in 2021, bringing a love of innovation and research to the role.

Dr Hughes said he is always most impressed by medical research that pushes the boundaries of discovery. During his career, he has watched the trajectory of change and the potential of regenerative medicine.

"Regenerative medicine looks like a 'game-changer'. After we cut it out or poison it or replace worn out or diseased tissue with a prosthesis, imagine being able to renew it?"

After graduating in medicine, Dr Hughes has had a long career as a specialist anaesthetist, from paediatrics to major reconstructive and complex airway surgery.

"Medicine is both art and science. I liked the science first. The more precise and predictable, the better, and this led me to anaesthesia as a career," he said.

"With age, maturity, and a greater appreciation of the complexities of life, the art of medicine has more appeal. Working with anxious, scared small children and their parents to help them negotiate an episode of acute care is far more about the art of communication and people than science."

This appreciation of the science and art of medicine, enthusiasm for communication and appreciation of innovative thinking are all attributes Dr Hughes is bringing to ARMI.

Dr Hughes sits on several boards, committees and panels as he believes in giving back to the medical community and helping it grow.

In addition to practising medicine, he has been involved in undergraduate and postgraduate teaching and clinical research, including publishing 15 journal articles in the medical literature.

He has served on the Board of Directors of the Victorian Anaesthetic Group, the Medical Advisory Panel of MIGA (Medical Insurance Group Australia) and the Advisory Panel and Board of Directors of indemnity insurer Invivo Medical Pty Ltd.

Dr Hughes has also served on the Victorian Executive Committee of the Australian Society of Anaesthetists and as a member of the Victorian Consultative Council on Anaesthetic Mortality and Morbidity.

Dr Patrick Hughes joins the ARMI Leadership Advisory Board.

OUTREACH – ENGAGING WITH THE PUBLIC

EXPERTISE IN TALENT ACQUISITION AND FORGING NEW RELATIONSHIPS – AN EXCELLENT ADDITION TO ARMI'S DEVELOPMENT ENGAGEMENT COMMITTEE

Robert Papworth has worked globally as a leadership and talent acquisition and management specialist. He has brought that expertise to his role on ARMI's Development Engagement Committee (see page 71).

Mr Papworth said he had built a relationship with Monash University and was keen to support the University because he believes in contributing to something that "gives to the world," as opposed to taking from the world.

While he is still learning about regenerative medicine and ARMI's research, he knows what is needed for a viable and sustainable partnership among tertiary institutions and industry.

"As ARMI continues its momentum in forging new relationships, I intend to bring that perspective to the Development Committee. That way, our relationships and partnerships will be mutually beneficial, viable and sustainable," he said.

"By the nature of my career and experiences, I tend to be more of a pragmatist than an idealist. This will help with the 'diversity of thought' within the ARMI Development Engagement Committee about our challenges and the tactics to move forward."

Mr Papworth said he likes to build relationships and trust and to generate positive outcomes by combining his skills for internal talent pathways, graduate programs, local community employment pathways, international mobility, diversity and inclusion.

"I've continually strived to make companies successful by engaging good people and making people successful through that. When you get that right, you get symbiotic momentum," he said.

He said his career foray into human resources was surprising and his breakthrough role working to facilitate recruitment with Computer Sciences Corporation in Canberra helped build the foundations of his career.

"It was a perfect start to the 'talent' side of human resources, a career I never knew existed, but one that became my passion. Even 24 years later, I still smile at what I do."

Mr Robert Papworth joins ARMI's Development Engagement Committee.

OUTREACH – ENGAGING WITH THE PUBLIC

ARMI'S CONNECTIONS AND SUPPORT FOR PEOPLE CROSSES GLOBAL AND SECTOR BOUNDARIES

A Brazilian former ARMI postdoctoral fellow has leveraged her time at the Institute to return to Melbourne to support drug discovery and development.

Dr Hozana Castillo arrived in Australia in 2016 for postdoctoral studies in the Kaslin Group's research program. In 2018, she returned to her native Brazil to investigate the role of specific signalling pathways in zebrafish spinal cord regeneration at the Brazilian Bioscience National Laboratory.

Dr Castillo said her time in Australia with ARMI had ignited her desire to return, and in 2020, she quit her job in Brazil and began the process of moving to Australia.

With the Global Talent Visa Program, a new program to introduce innovative skills to high-priority industries such as biotech, Dr Castillo was granted Permanent Residency to work as a Solutions Consultant at Clarivate Analytics.

Dr Castillo said her time and connections at ARMI were critical to the success of her application.

"Being at ARMI, gaining the skills I did during this time, having the opportunity to form connections with Australia's biomedical research ecosystem and having the support of the ARMI leadership was instrumental in this application."

She is now part of our burgeoning industry through her work at Clarivate Analytics, which offers data, insights and analytics tools to support life science innovation and drug development, from early-stage research all the way through to commercialisation.

Dr Castillo said she supports research teams across Australia, New Zealand, the US, China and India, including teams at Monash University, by talking to scientists about their project needs.

"I talk to scientists from research institutes and pharma companies to understand their projects and how they can use Clarivate tools to accelerate their project," she said.

"So, it's nice that I still have contact with science. Also, I have been focused on basic science research all my career, but now, I'm learning so much about regulation, clinical trials [and] market assessment."

Dr Castillo said her time at ARMI also helped her develop a critical way of thinking about science and how to talk to fellow scientists about the intricacies and complexities of research projects.

"With its specific focus, ARMI was a rich environment for discussing regenerative medicine."

Dr Hozana Castillo

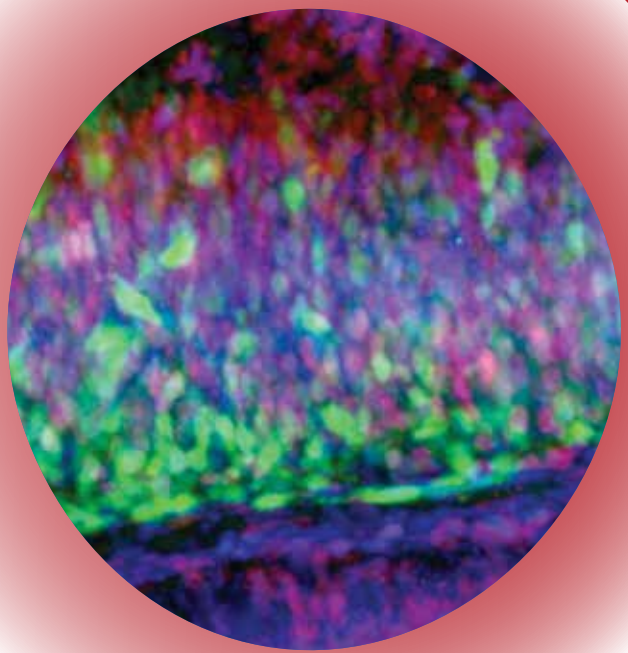
FIVE DISCOVERY PIPELINES BACKED BY INNOVATIVE RESEARCH TEAMS

RESEARCH AT ARMI IS STRUCTURED ALONG FIVE INTEGRATED DISCOVERY PIPELINES THAT ALLOW OUR RESEARCH TEAMS TO EXPLORE SPECIFIC ASPECTS OF THE REGENERATIVE PROCESS.

HEART AND MUSCLE DEVELOPMENT AND REGENERATION 	Cardiovascular diseases (CVDs) are the number one cause of death globally: more people die annually from CVDs than from any other cause. An estimated 17.9 million people died from CVDs in 2016, representing 31 per cent of all global deaths. Of these deaths, 85 per cent are due to heart attack and stroke. ARMI researchers study animals with highly sophisticated and specific tissue regenerative qualities, developing cures for heart disease and other muscular disorders, including dystrophies that can be translated to the patient bedside.
IMMUNITY AND REGENERATION 	Soon after birth, our immune systems mature and we lose our capacity to respond to damage with scar-free healing. ARMI scientists explore the animal kingdom's relationships between immunity and regeneration to enhance tissue repair in patients with wounds or degenerative diseases.
STEM CELLS AND REGENERATION 	Stem cells are integral to the development of tissues in the embryo and persist in adults as essential building blocks for our bodies. ARMI studies embryonic stem cells as a window on the mechanisms of human development and as an essential part of the tool kit of regenerative medicine. ARMI has devised methods for growing stem cells that can be used to repair damaged tissue, investigate diseases, test drug candidates for therapeutic safety and effectiveness, and develop ways to enhance the intrinsic mechanisms of stem-mediated repair. In addition, ARMI can offer IP on specific stem cells for culturing and scale-up and models that allow testing of stem cell potency.
NEURAL REGENERATION 	Unlocking the regenerative potential in the central nervous system is crucial so it can be harnessed to treat neurodegenerative disorders. ARMI scientists tackle the fundamental obstacles in neural repair for diseases such as multiple sclerosis and Alzheimer's disease by uncovering neural regenerative potential across the animal kingdom.
ORGAN ENGINEERING AND SYNTHETIC BIOLOGY 	ARMI is exploring several innovative techniques to enhance function and form that is lost because of ageing and degenerative diseases. These techniques explore various aspects of tissue engineering, including organoid and organ on a chip technology, bioactive biomaterials and biointerfaces that simulate the cellular microenvironment at the micro and nanoscale, functional biomaterials and synthetic and biological matrices for tissue engineering and transplant development.

HEART AND MUSCLE DEVELOPMENT AND REGENERATION

A human heart beats more than four billion times in an average lifetime, yet, unlike other tissues in the body, the heart cannot regenerate or replace damaged tissue. However, some organisms, such as the zebrafish, can repair injuries to the heart without any scar tissue or collateral damage. This gives researchers a unique opportunity to study these organisms to unlock the secrets of heart tissue regeneration. ARMI researchers are studying zebrafish to develop cures for heart muscle degenerative disease and to discover new ways to mend a broken heart.



Neural tube electroporation with U2-GFP to target neural crest cells of chick embryos.

HEART AND MUSCLE DEVELOPMENT AND REGENERATION

Professor Peter Currie

PETER CURRIE

The Currie Group is curious about the biological mechanisms of the zebrafish, a freshwater fish that is native to South-East Asia.

Zebrafish are used in scientific research to understand human genetics and the biological processes of human diseases.

They are beneficial because they grow quickly and are optically transparent. The zebrafish embryo is clear – every cell in the forming embryo can be seen. It also shares 70 per cent of the genetic code of *Homo sapiens*.

RESEARCH

The Currie Group uses zebrafish embryos to learn about muscle cell types. In particular, the group is interested in how specific muscle cell types are determined within the developing embryo, how they grow and how they regenerate after injury.

Associate Professor Edwina McGlinn

EDWINA MCGLINN

The McGlinn Group focuses on elucidating novel gene networks that drive growth and identity in the early embryo.

RESEARCH

The McGlinn Group is particularly interested in critical developmental regulators, the *Hox* genes and how micro-RNAs shape Hox functional output during vertebral column and spinal cord formation.

They use elegant mouse genetics coupled with cutting-edge functional genomics technologies to unravel novel gene networks and mechanisms of regulation.

EMBL Australia

HEART AND MUSCLE DEVELOPMENT AND REGENERATION

Associate Professor Mirana Ramialson

MIRANA RAMIALISON

The Ramialison Group is studying development and disease. They are a multidisciplinary team of computational and molecular biologists specialising in genomics. The researchers answer complex questions using new genomic technology and the zebrafish as a model organism.

RESEARCH

The research team applies systems biology (the study of biological components – molecules, cells, organisms or entire species) to reconstruct the cardiac gene regulatory networks and to work out what leads to proper heart formation and what causes congenital heart disease.

2021 HIGHLIGHTS

- The Ramialison Group published four manuscripts (see references 14, 18, 32 and 35 Appendix 1), including two in the high-ranking journals *Nature Communications* and *Genome Biology*.

Dr Gonzalo del Monte Nieto

GONZALO DEL MONTE-NIETO

Cardiovascular disease is the major killer worldwide, with congenital heart disease affecting 1 in 100 live-born babies in Australia. The del Monte-Nieto Group is interested in understanding the molecular mechanisms and developmental processes orchestrating normal heart development in embryos and translating this knowledge to better understand congenital and adult heart disease and cardiac regeneration.

Understanding the cellular and molecular processes normally happening during embryonic development that, when dysregulated, lead to disease will allow us to design efficient genetic screening methods and therapies to ameliorate disease sequelae, including cardiac regeneration after myocardial infarction.

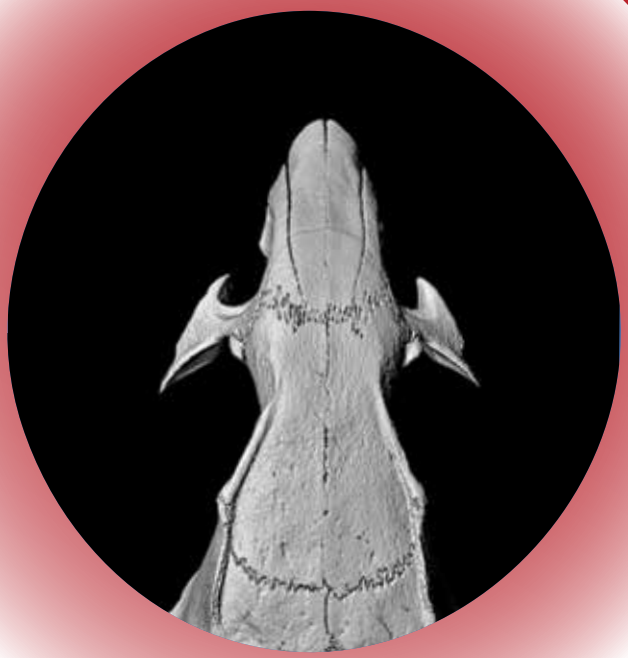
PhD student Jess Manneken (Currie Group).

IMMUNITY AND REGENERATION

Before birth, the human immune system allows the body to heal injuries and tissues without forming a scar. But soon after birth, the immune system matures and the capacity to regenerate tissue and repair damage with scar-free healing is lost.

Just how the immune system regulates this prenatal tissue regeneration is still unknown. Researchers have studied animals with a wide range of regenerative capabilities and discovered that the immune system can either aid or hinder tissue repair. The greatest regenerative capacity is achieved by carefully orchestrating particular immune system responses.

ARMI scientists are examining the relationships between immunity and regeneration across the animal kingdom to learn how to enhance tissue repair in patients with wounds or degenerative diseases.



This image shows reconstitution of a rat skull by micro computed tomography (microCT). Two circular bone defects on the calvaria were regenerated after two months by the local delivery of engineered human growth factors.

IMMUNITY AND REGENERATION

Professor Graham Lieschke

GRAHAM LIESCHKE

The Lieschke Group studies the haemopoietic system and leukocytes. The haemopoietic system is a collection of organs and tissues (bone marrow, spleen, lymph nodes, etc.) responsible for producing blood cells.

Leukocytes (white blood cells) are the key cells that defend the body against foreign substances. They also play a significant role in determining whether tissue repairs and regenerates rather than scars after injury.

RESEARCH

The Lieschke Group study blood cell development and function using the zebrafish as a model organism. They look at mutant zebrafish with faulty blood cell development to find insights into the genes that regulate the haemopoietic system.

Mutant zebrafish also assist with understanding the role of leukocytes in inflammation and healing. Infection models that stimulate leukocytes in action are used to investigate the host-pathogen response.

2021 HIGHLIGHTS

- The Lieschke Group published five papers including one in the prestigious journal, *Nature* (Ratnayake and colleagues, see reference 41 in Appendix 1).
- Professor Graham Lieschke and colleagues Professor Peter Currie and Dr Jenny Zenker received an $800,000 Australian Research Council Linkage Infrastructure, Equipment and Facilities grant to purchase a state-of-the-art lattice light sheet microscope.
- International PhD student, Abdulsalam Isiaku was featured in an interview in the journal *Disease Models & Mechanisms* where he talked about his research using zebrafish gene-editing tools to investigate the role of phagocytes in inflammatory and infectious diseases.

Associate Professor Mikaël Martino

EMBL Australia

MIKAËL MARTINO

The Martino Group combines immunology, stem cells and bioengineering research to understand the molecular and cellular mechanisms governing tissue repair and regeneration. Using the findings from the lab, the group aims to engineer novel regenerative strategies.

RESEARCH

To design successful regenerative therapies and make regenerative medicine a more widespread reality, we need to understand how our bodies can create an environment suitable for regeneration. For instance, tissue injury and the healing process are usually accompanied by activating our immune system. The type of immune response, its duration, and the cells involved can considerably change the outcome of the healing process from incomplete restoration (causing scarring/fibrosis and loss of function) to complete recovery (regeneration).

One of the group's main goals is to reveal the key mechanisms by which the immune system leads to tissue repair or regeneration. Our research tools include genetically modified and chimeric mice and injury models in tissues such as bone, skin and muscle. Ultimately, the group seeks to engineer efficient regenerative strategies that integrate control of the immune system using various bioengineering approaches (such as biomaterials, protein engineering or immune engineering).

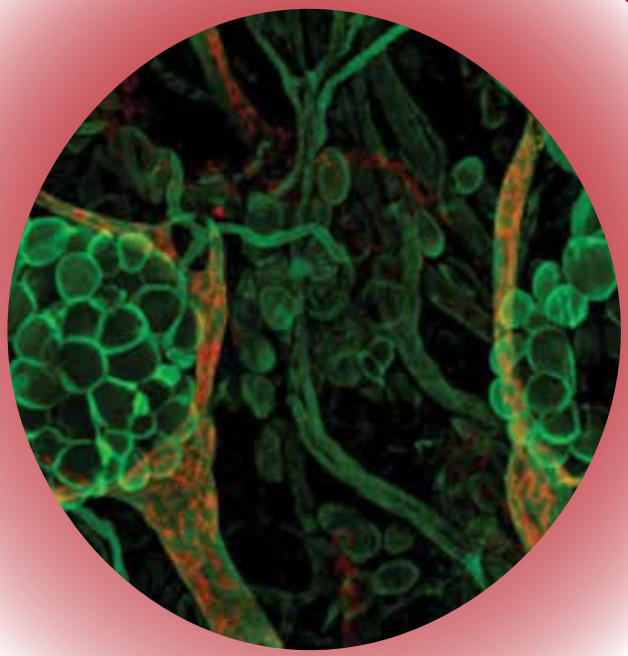
STEM CELLS AND REGENERATION

Stem cells are less specialised cells that divide and differentiate into diverse, specialised cells to form a vast array of tissues. Stem cells can be grown in the laboratory and can be used to:

- **repair damaged tissue**
- **investigate particular diseases**
- **test the therapeutic safety and effectiveness of potential new drugs.**

Cancer stem cells can proliferate to form persistent, self-renewing tumours and understanding how this happens could help researchers create future new treatments.

Researchers at ARMI study stem cells as a window on the mechanisms of development and as an essential part of the toolkit of regenerative medicine.



Mouse adipose tissue (green) and blood vessels (red).

STEM CELLS AND REGENERATION

Dr Jennifer Zenker

JENNIFER ZENKER

Microtubules are highly dynamic cytoskeletal filaments regulating fundamental processes, including cell division, migration and differentiation. The Zenker Group seeks to understand how a cell's structure and function are regulated by the continuous re-organisation of the microtubule network. Live imaging is used to discover the spatio-temporal accuracy of microtubule dynamics in animal developmental and stem cell biology models.

2021 HIGHLIGHTS

- A review published in the journal *Development* by PhD student Azelle Hawdon summarises how the organisation of the microtubule cytoskeleton contributes to the pluripotency of cells in the living preimplantation embryo and induced pluripotent stem cells (Hawdon and colleagues, see reference 19 in Appendix 1).
- Dr Jessica Greaney published a manuscript in the *Journal of Visualized Experiments* describing a step-by-step protocol for using light-switchable microtubule drugs to enhance the detail of experimental procedure and information for other researchers (Greaney and colleagues, see reference 15, in Appendix 1).
- In collaboration with her co-supervisory team at the University of Melbourne, PhD student Gemma Stathatos published a review in *Trends in Cell Biology* describing the role of delta and epsilon tubulin in spermatogenesis and early embryogenesis (Stathatos and colleagues, see reference 44 in Appendix 1).
- Dr Jennifer Zenker was awarded a highly competitive and prestigious NHMRC Investigator Grant (Emerging Leadership Level 2). She also received a Monash Platform Access Grant and a Catalyst Fund from the Canadian Institute for Advanced Research (CIFAR).
- PhD student Azelle Hawdon was awarded the best PhD student oral presentation award at the Victorian state conference of the Australian and New Zealand Society for Cell and Developmental Biology (ANZSCDB).
- PhD student Gemma Stathatos won two awards at the Society for Reproductive Biology (SRB) conference – the SRB Male Contraceptive Initiative Abstract Award and the Male Contraception Initiative Travel Award.

STEM CELLS AND REGENERATION

Professor Andrew Laslett

ANDREW LASLETT

Human pluripotent stem cells (hPSCs) have the ability of indefinite self-renewal and to differentiate into all types of human adult cells.

The Laslett Group investigates the biology of human pluripotent stem cell lines, including embryonic stem cells (hESC) and human-induced pluripotent stem cells (iPS) – developed cells that have been manipulated to enter a more primitive, less specialised stem cell state.

RESEARCH

More understanding of human pluripotent stem cell lines will lead to developing tools and novel cell lines that will be required to safely use these cell types in future cell-based industries.

This is important because although the potential for treating diseases and injuries is huge, the technology also creates several risks when producing cell populations to be used for cell therapy.

Professor Andras Nagy

ANDRAS NAGY

Cell-based therapies can potentially treat many currently incurable degenerative diseases by replacing missing or damaged tissues or generating cells with unique biological activity at the disease site. The Nagy Group is creating “designer” cells that incorporate pre-engineered functional elements to confer novel therapeutic features. These features include inducing allograft tolerance, reducing tumour risk, live-cell tracking and cell sensors and expressing local-acting secreted biologics. These functional elements act as building blocks, which can be combined and customised for cell therapy applications across various species and disease models.

RESEARCH

The Nagy Group’s research efforts are highly collaborative and coordinated with our sister lab in Toronto, Canada. At ARMI, the Nagy Group is predominantly focused on developing cell therapies for brain injury, stroke and multiple sclerosis (MS). We work with mouse, human and nonhuman primate pluripotent stem cell systems using technologies such as CRISPR/Cas9-mediated genome editing, somatic cell reprogramming, directed differentiation and piggyBac transposase-mediated gene transfer. To learn more about the Toronto-based Nagy Group and research interests, see http://research.lunenfeld.ca/nagy/.

STEM CELLS AND REGENERATION

Professor Susie Nilsson

SUSIE NILSSON

The Nilsson Group is involved in several research projects that focus on understanding haemopoietic stem cells – the stem cells responsible for producing blood and immune cells.

Haemopoietic stem cells are a very important part of the body as they are continually renewing blood, creating billions of new blood cells each day. They are in the bone marrow, the flexible tissue found inside most bones.

RESEARCH

The main objective of the group's research is to characterise the microenvironment in which blood stem cells reside. In addition, the group studies blood stem cells at a cellular and molecular level and analyses how the stem cells develop into new blood cells.

Learning more about normal and diseased stem cells will lead to better prevention, clinical diagnosis and treatment. This will ultimately improve human health. For example, cancer patients might have better outcomes if researchers can improve bone marrow transplantation by finding new ways to replace normal cells destroyed during anticancer therapy. Essentially, better bone marrow transplantation will allow higher doses of chemotherapy or radiation to be given, which will be a more effective form of treatment.

Professor José Polo

JOSÉ POLO

The Polo Group is interested in the transcriptional and epigenetic mechanisms that govern cell identity and cell fate. It focuses on pluripotency and reprogramming somatic cells into induced pluripotent stem (iPS) cells and other mature cell types.

Being able to reprogram any specific mature cell into a pluripotent state and then back into any other particular cell gives the group a unique tool to study the molecular and cellular events that permit the conversion of one cell type to another.

Moreover, iPS cells and the reprogramming technology are of great interest in pharmaceutical and clinical settings, as the technology can be used to generate animal and cellular models for the study of various diseases as well as provide (in the future) specific patient tailor-made cells for their use in cellular replacement therapies.

RESEARCH

The Polo Group is dissecting the nature and dynamics of the process using a broad array of approaches using mouse models and a combination of different molecular, biochemical and cellular techniques and genome-wide studies.

NEURAL REGENERATION

Researchers now know that the adult brain retains plasticity (the ability to change) throughout life and can respond to injury or disease. This ability can determine healthy ageing and mental functioning. In addition, understanding the regenerative potential of the brain and central nervous system will assist researchers in finding new treatments for neurodegenerative disorders.

Uncovering neural regenerative potential across the animal kingdom helps ARMI scientists to tackle the fundamental obstacles to more effective neural repair in diseases like multiple sclerosis (MS), stroke, spinal cord injury and Alzheimer's disease.

Samples ready to be processed for imaging.

NEURAL REGENERATION

Professor James Bourne

JAMES BOURNE

The Bourne Group is at the forefront of understanding visual brain development and plasticity and studying pathology states such as stroke.

The group uses the non-human primate (marmoset monkey) visual system as a research model to address how the complex visual cortex is established. The non-human primate visual brain's protracted development allows for a greater understanding of how different brain areas establish connections and ultimately mature, with implications for diseases such as schizophrenia and autism.

The marmoset serves as an invaluable model in stroke research as the nonhuman primate brain has a high degree of anatomical and physiological similarity with the human brain. This similarity is not evident in other species. Furthermore, lessons learned from brain injury in the monkey have given the group greater capacity to translate the results, providing significant hope for stroke victims.

RESEARCH

The group has three primary focuses that are studied in parallel. These are:

- to explore the development and maturation of the visual brain in non-human primates
- to determine which brain areas enable residual vision following significant brain injury
- to understand the cellular and systemic effects that occur following stroke.

DEVELOPMENT AND PLASTICITY

The cerebral cortex of an adult is an intricate system of interconnected areas. How these areas emerge and mature seamlessly and establish connections with other parts of the brain is unknown. The Bourne Group has made many significant findings and discoveries in neurobiology through molecular biology techniques, magnetic resonance imaging and neural tracing.

NEUROREPAIR

It is now accepted that the brain is in its most plastic state early in life and is more amenable to repair following injury. The Bourne Group is beginning to uncover which molecules are present in the neonatal brain and which ones are responsible for greater permissibility of functional recovery following brain injury than an adult brain that has suffered an identical injury.

The group has developed a novel model of stroke that will translate to the clinic and enables the researchers to explore how the brain responds to injury early and late in life. The researchers have used this model in conjunction with molecular biology techniques and live multiphoton imaging to shortlist some candidate molecules that may prove beneficial to patients who have had a stroke.

NEURAL REGENERATION

Associate Professor Jan Kaslin

JAN KASLIN

The Kaslin Group is interested in cellular plasticity in the brain and spinal cord. In particular, the group studies how the neural system can repair itself by mobilising stem cells and how researchers can improve this process.

RESEARCH

In the past, neural stem cells and brain regeneration have mainly been studied in vertebrates (such as rodents). But this raises a problem because these vertebrates have limited potential to regenerate.

Enter the zebrafish. This fish can regenerate parts of its central nervous system – even in adult zebrafish. Therefore, using the zebrafish model has many advantages for researchers, as it can solve questions that previously could not be answered.

The Kaslin Group uses the zebrafish model to reveal how neural stem cell populations are formed during development and how they can be controlled to improve repair after injury or disease.

2021 HIGHLIGHTS

- The Kaslin Group was awarded a Sanfilippo Children's Foundation Translational Grant.
- The group was also awarded an NHMRC Ideas Project Grant.
- The Kaslin Group published seven papers, including one in the high-impact journal *Developmental Cell* (Vandestadt and colleagues, see reference 51 in Appendix 1).

NEURAL REGENERATION

Dr Nadinath Nillegoda

NADINATH NILLEGODA

Protein conformational diseases with pathological consequences such as those leading to neurodegeneration and dementia coincide with the formation and accumulation of protein aggregates in affected cells/tissues over time, leading to cellular proteostasis breakdown. Often, symptoms linked to these disease conditions become apparent only in the long-lived, ageing communities and thus limits our ability to develop preventive therapeutics.

The Nillegoda Group probes attractive new proteostasis-based directions for future therapeutic interventions that could potentially slow or reverse neurodegeneration and apply to a broad range of disorders from Alzheimer's disease to multiple sclerosis.

RESEARCH

Misfolding/aggregation of cellular proteins is amplified upon exposure to various acute proteotoxic stresses (e.g. oxidative damage and heat shock), chronic disease conditions (e.g. neurodegeneration) and ageing. The Nillegoda Group uses cutting-edge in vitro and in vivo techniques to study chaperone-based protein quality control machineries mediating protein aggregate solubilisation and clearance, a process central to restoring and linked to organismal fitness. A major focus is to study the regulation of human protein disaggregases (aggregate solubilisation machines) under physiological and pathophysiological conditions. These studies provide insights into the molecular basis of the onset and progression of neurodegenerative diseases and allow us to devise strategies to boost aggregate clearance in affected tissues to reduce associated neurotoxicities.

2021 HIGHLIGHTS

- The Nillegoda Group published a manuscript in the journal *Haematologica* describing the role of the heat shock protein (Hsp70) chaperone system in the formation of red blood cells and their maintenance (Mathanagasinghe and colleagues, see reference 29 in Appendix 1).

Dr Toby Merson

TOBY MERSON

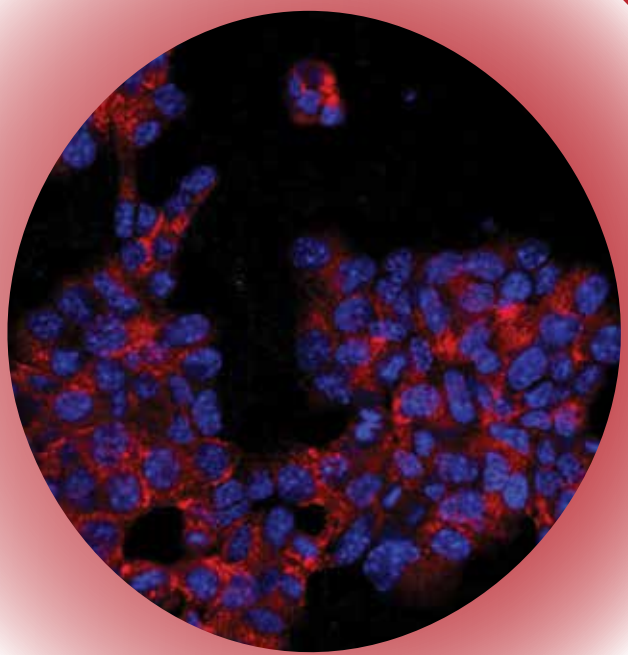
The Merson Group studies the cellular and molecular interactions between neurons and myelin-forming oligodendrocytes in the central nervous system.

A major goal of the group's research is to develop strategies to promote myelin repair in diseases such as multiple sclerosis. The group is also interested in the role of oligodendrocyte turnover and myelin remodelling in cognitive processes such as learning and memory and the contribution of myelin dynamics to neurological disorders.

2021 HIGHLIGHTS

- The Merson Group published one manuscript in the highly prestigious journal *Nature Communications* (Boghdadi and colleagues, see reference 7 in Appendix 1).
- Dr Lulu Xing's entries in the 2021 Monash Micro Imaging Competition were awarded third place in the Image category and first place in the Video/Moving Image category.

ORGAN ENGINEERING AND SYNTHETIC BIOLOGY



Insulin in pancreatic beta-cells.

ORGAN ENGINEERING AND SYNTHETIC BIOLOGY

Dr Harald Janovjak

EMBL Australia

HARALD JANOVJAK

The research of the Janovjak Group lies at the interface of synthetic biology and mammalian physiology. The group has established new methods to control:

- cellular signalling pathways such as those activated by receptor tyrosine kinases and G-protein-coupled receptors (GPCRs)
- behaviour such as proliferation and survival of nerve cells, cancer cells and key cell populations involved in metabolism.

Their methods offer spatial precision and can, for example, activate only selected cells or tissues ex vivo and in vivo. The methods also provide temporal precision and can intervene in specific stages during development and disease progression, including but not limited to optogenetics.

The group is currently applying these methods to understand and manipulate cells and tissues affected by degeneration, focusing on Type I diabetes and Parkinson's disease. The group's interdisciplinary research combines the development of new molecular tools and the study of disease using the mouse and the fruit fly.

Dr Alberto Roselló-Díez

ALBERTO ROSELLÓ-DÍEZ

The aim of regenerative medicine is not only to recover the integrity of individual organs but also to maintain the proportions with the rest of the body. The Roselló-Díez Group uses animal models to study the local and systemic mechanisms that orchestrate organ growth and repair in vertebrates. The ultimate goal is to lay the groundwork for regenerative therapies to boost these mechanisms.

RESEARCH

The Roselló-Díez Group studies the signals within the bones and between them and other tissues/organs during development and regeneration. At the local level, the group studies phenomena such as compensatory proliferation in response to biochemical and mechanical changes in the cell vicinity. At the systemic level, the group explores the role of the vascular and nervous systems in the bidirectional communication between the bones and the rest of the body.

2021 HIGHLIGHTS

- The Roselló-Díez Group published a manuscript in the journal *Frontiers in Cell and Developmental Biology* describing a process to help developmental biologists and evolutionary researchers achieve fast, reproducible and non-destructive length measurement of bone samples from multiple animal species (Diaz and colleagues, see reference 9 in Appendix 1).

OPERATIONS AND GOVERNANCE
CORE TECHNICAL FACILITIES AND SERVICES

AQUATICS RESEARCH PLATFORM

AquaCore

AquaCore is a unique Aquatics Research Facility in Australia. It houses and breeds essential model organisms for regenerative biology, including zebrafish, Medaka, Killifish, sharks, turtles and axolotls.

Zebrafish are key tools in biomedical research, including regenerative medicine. Researchers use them to model human diseases and injuries to improve their understanding of how the body regenerates. AquaCore houses 1,000 quarantine and 5,200 non-quarantine tanks and supplies and houses zebrafish, which the researchers use.

AquaCore can provide wild-type zebrafish as well as genetically modified and mutant strains. The facility is the largest of its kind in the southern hemisphere and can meet the needs of ARMI, Monash University and the external biomedical research community. The facility also can host additional freshwater fish such as Medaka fish.

AquaCore is certified to a Physical Containment level 2 (PC2) by the Office of the Gene Technology Regulator. The large zebrafish quarantine facility is approved by the Australian Quarantine and Inspection Service and provides infrastructure and know-how for imports of zebrafish for laboratories in Australia.

In addition to the aquarium facilities, AquaCore has a phenotyping laboratory with the infrastructure necessary for phenotypic analyses, embryonic and adult fish manipulation and the generation of transgenic animals. It also has microscopes with microinjection apparatus, dedicated confocal microscopy for time-lapse analysis of live animals, and laser ablation and single-cell labelling equipment.

Axolotls are a well-studied animal regeneration model as they can fully regenerate limbs and organs, much like zebrafish. As they are very primitive vertebrates, sharks are critical to understanding the evolution of development and regenerative biology.

The facility has several separate water recirculating systems, including tempered and tropical freshwater (zebrafish, Medaka, axolotl, Killifish) and seawater systems (sharks and turtles).

The axolotl facility is used to maintain a breeding colony of various pedigree axolotls. It houses large 1.5-metre tanks for breeding adults and hundreds of tanks for rearing and keeping larvae and juveniles.

The marine system houses a broodstock of tropical epaulette sharks *Hemiscyllium ocellatum* and a cold-water incubation system for elephant shark *Callorhinchus milii* embryos. The facility can also accommodate additional marine animals, for example, the facility transiently hosts juvenile marine turtles.

The Monash Transgenic Quail Facility (MTQF) was established by ARMI researchers to create a unique research platform using birds for genetic manipulation.

A collaboration among ARMI, Monash University and CSIRO Geelong, the MTQF is the first transgenic quail facility in the world and the first to apply the powerful gene-editing technology (CRISPR) to quails.

MTQF produced several proof-of-concept transgenic quail lines to provide disease and experimental models for researchers worldwide.

Genetic manipulation of birds is a relatively recent development compared with widely used mice and other mammals. Although the use of chickens is growing, transgenic quails reach sexual maturity in six weeks (six months for chickens), making the quail a faster and cheaper alternative to transgenic chickens, with which they share 96 per cent genetic similarity.

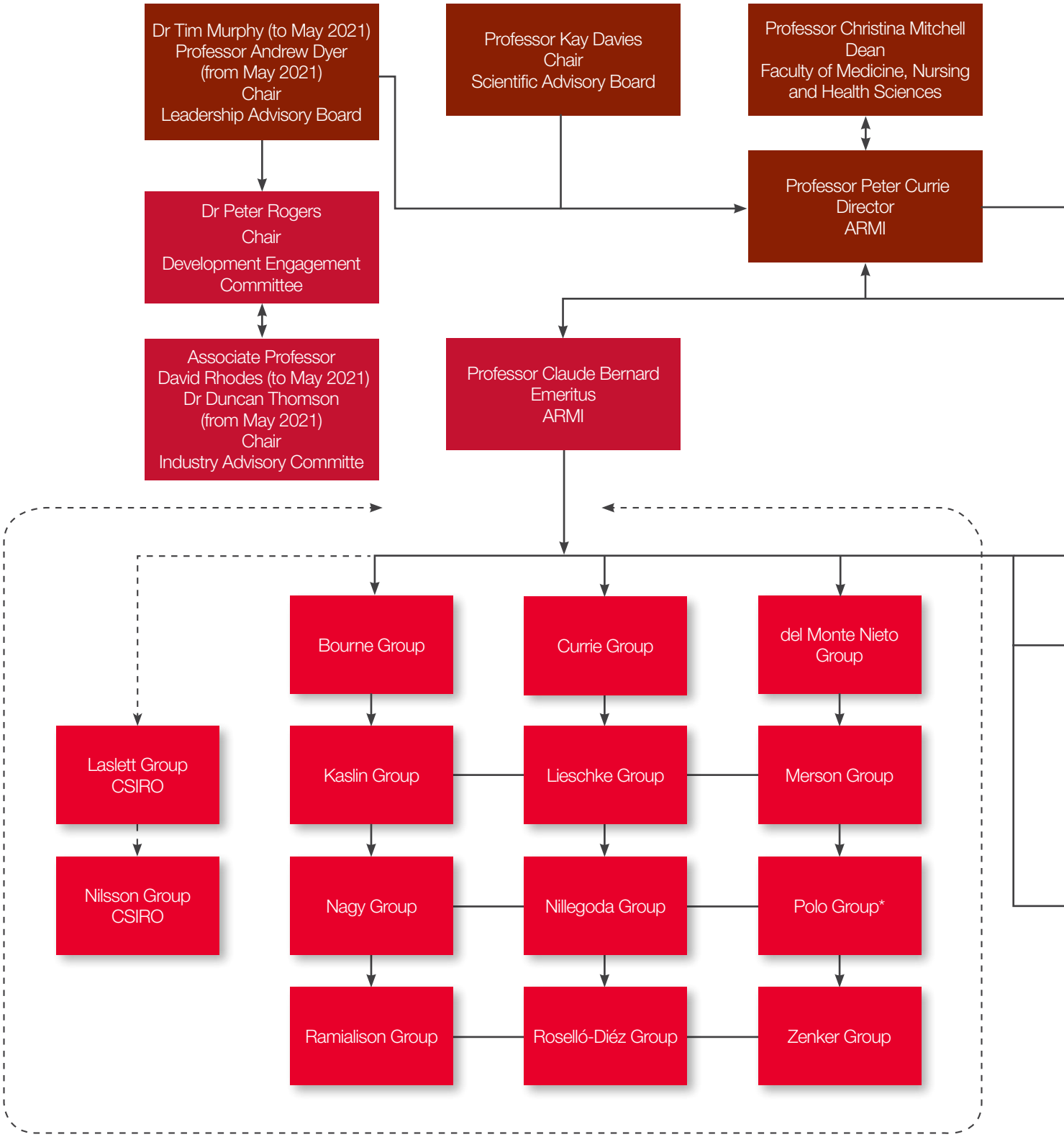
Avian models are better than mice in some situations because birds produce many eggs (one egg per day per female) that give easy access to the embryo. Birds have some useful genetic links with humans, and some tissues are better for comparison with humans. The skeletal system of birds is similar to humans and mice. This is especially useful for research into skeletal muscle regeneration.

Genetic manipulation is faster and cheaper in quails because quails reach sexual maturity in six weeks rather than the six months it takes for chickens. This makes quails a good pilot model for the poultry industry before moving into more expensive chicken models.

Bird models give researchers better access to the embryo than mammals. Researchers can store the eggs at 14°C for up to one week allowing the synchronisation of batches of incubating eggs. At their convenience, researchers can open the egg to manipulate the embryo, re-seal it and then continue incubation. In mice, manipulating embryos would be a difficult procedure requiring surgery that is riskier for the animals.

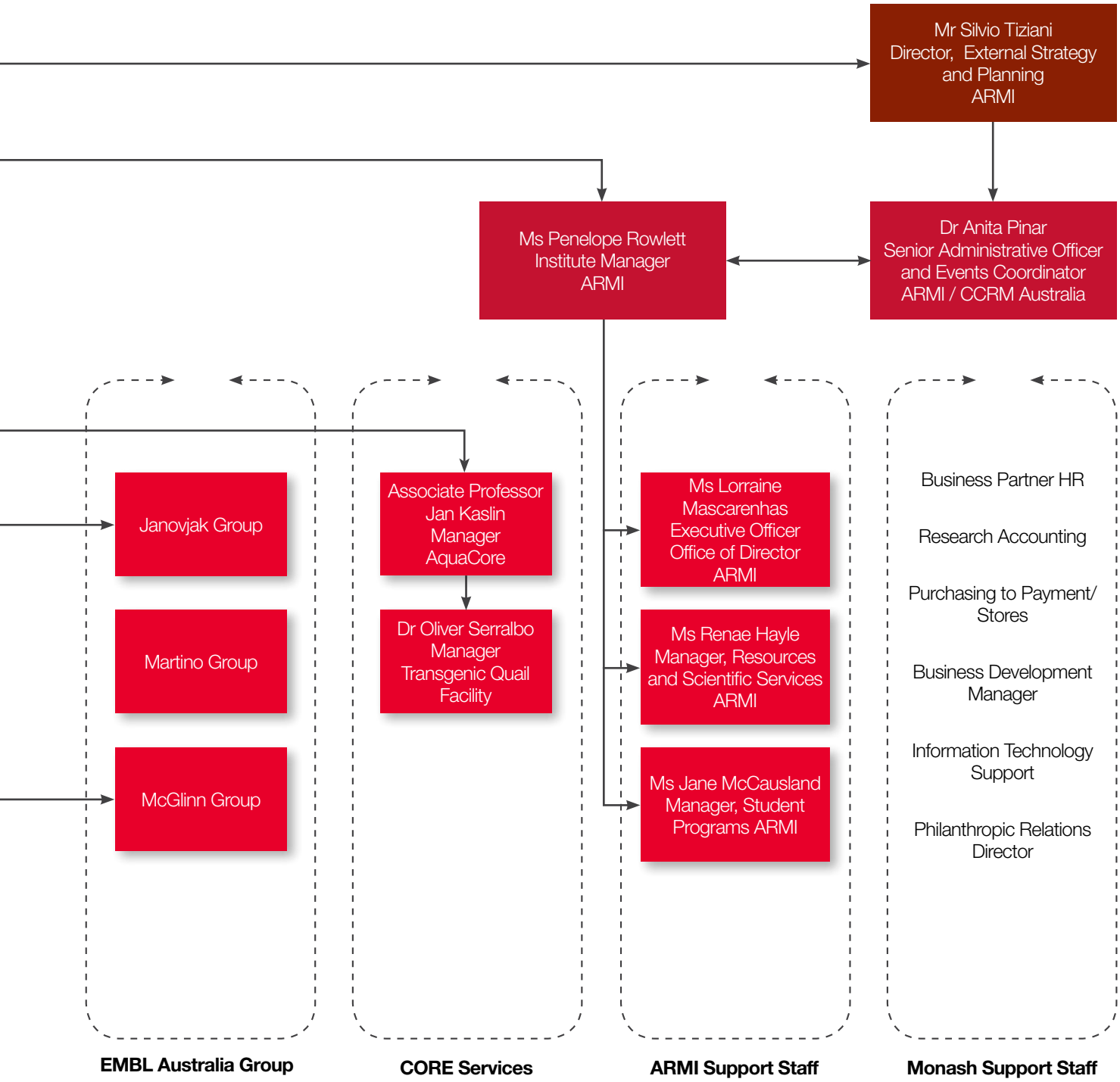
The MTQF is located in Building 13C (Chancellor Walk) adjacent to ARMI and is part of the Monash University Facility of Nursing and Health Science.

STRUCTURE AND GOVERNANCE



Research Groups

*with Department of Anatomy and Development Biology


Mr Silvio Tiziani
Director, External Strategy and Planning
ARMI
Ms Penelope Rowlett
Institute Manager
ARMI
Dr Anita Pinar
Senior Administrative Officer and Events Coordinator
ARMI / CCRM Australia
Janovjak Group
Martino Group
McGlinn Group
Associate Professor Jan Kaslin
Manager
AquaCore
Dr Oliver Serralbo
Manager
Transgenic Quail Facility
Ms Lorraine Mascarenhas
Executive Officer
Office of Director
ARMI
Ms Renae Hayle
Manager, Resources and Scientific Services
ARMI
Ms Jane McCausland
Manager, Student Programs ARMI
Business Partner HR
Research Accounting
Purchasing to Payment/ Stores
Business Development Manager
Information Technology Support
Philanthropic Relations Director
EMBL Australia Group
CORE Services
ARMI Support Staff
Monash Support Staff

LEADERSHIP ADVISORY BOARD

The ARMI Leadership Advisory Board (ARMILAB) plays a vital role in helping ARMI achieve its objectives and strategic goals.

The Board helps to enhance the reputation and positioning of the Institute with key stakeholders, including business, government, media and the broader community.

Specifically, the Board works closely with senior management to:

- promote the vision, role and accomplishments of ARMI among business, government, media and the broader community
- assist in the development of new ideas and initiatives to support the objectives of ARMI
- provide the Director and any steering bodies with feedback from an external perspective of ARMI.

These objectives are accomplished through:

- advocacy
- contributing experience and insight
- supporting and, where appropriate, mentoring ARMI's Director and its leadership
- supporting ARMI's fundraising objectives by assisting ARMI and Monash External Relations, Development and Alumni to build key philanthropic, donor and funding relationships.

Meeting dates

17 February

26 May

18 August

17 November

LEADERSHIP ADVISORY BOARD

Professor Andrew Dyer (Chair, from May 2021)

Professor Andrew Dyer is a company Director and serves on several boards. He is also the Australian Energy Infrastructure Commissioner for the Federal Government.

His other positions include executive and operational roles in the utilities, telecommunications, information technology and professional services industries. Professor Dyer specialises in governance and operational performance and advises several private and public sector organisations.

As well as his board and government roles, Professor Dyer is a Professorial Fellow at Monash University, where he assists with the University's industry engagement programs. He is a member of the Monash University Industry Council of Advisors (MICA), the Monash Energy Institute Advisory Council (Chair) and serves on Advisory Boards for the Monash Sustainability & Development Institute and the Engineering Faculty.

Prior to his board career, Professor Dyer was the Victorian Government Commissioner to the Americas, based in San Francisco. During his tenure he facilitated several significant trade and investment outcomes for Victoria and Australia.

A former McKinsey & Company consultant, Professor Dyer holds a Bachelor of Mechanical Engineering with first class honours from Monash University and an MBA from Georgetown University in Washington DC.

Mr Tim Murphy (Chair, to May 2021)

Mr Tim Murphy lived and worked in Brussels, London, Canberra and Melbourne. His extensive national and international experience during the past 20 years includes advising C-suite staff on corporate issues in regulated environments. He's a business builder, strategist, adviser and survivor of high growth, merger, consolidation and downsizing global and national business environments. Mr Murphy specialises in providing strategic corporate licence-to-operate advice, advising a range of businesses from corporations and Small-Medium Enterprises (SMEs) to start-ups and research institutions. He has also had successful roles in the arts and entertainment industries, as well as in pharmaceutical and medical research sectors, universities and on company boards. In 2007, Mr Murphy was a senior advisor to Australia's Innovation Minister, Senator Kim Carr. Mr Murphy is a Fellow of the Australian Institute of Company Directors, has a Master of Marketing from the University of Melbourne's Melbourne Business School and a Bachelor of Science (Hons).

Emeritus Professor Claude Bernard

Over the course of nearly 50 years in research, Professor Claude Bernard established the first multiple sclerosis (MS) mouse model, elucidated the role of immune cells (T cells) in MS, and led world-first research establishing human cell lines from people with MS. These human cell lines have become invaluable research tools to investigate MS and develop new therapies.

Professor Bernard undertook a Master of Sciences in Microbiology and Immunology in the Faculty of Medicine, Montreal and then completed a PhD in the same area of research (1973). He furthered his studies by completing a Doctorat es Sciences (DSc) d'Etat at the University Louis Pasteur, Strasbourg, France in 1978.

His extensive research and teaching career includes working at the University of Alberta, Canada, the Walter and Eliza Hall Institute of Medical Research, Australia, LaTrobe University, Australia, the Monash Immunology and Stem Cell Laboratories at Monash University, Australia and ARMI.

Professor Bernard's sabbaticals encompass stints at the Weizmann Institute of Science, Israel (1985), the Department of Neurology & Neurological Sciences, Stanford University, USA (1991); the San Raffaele Scientific Institute Milano, Italy and the Laboratoire d'Immunologie Faculté de Médecine de Nancy, France.

He was a Fulbright Scholar with the Department of Neurology at the University of California, San Francisco (1998–1999) and held the title of Guest Professor at Kuming Medical University, China and the Bayi Brain Hospital, General Hospital of Beijing Military Command, China (2011–2014).

Professor Bernard was the Interim Deputy Director of ARMI between May 2016 and April 2018.

LEADERSHIP ADVISORY BOARD

Mr Andrew Brough (to February 2021)

Mr Andrew Brough's career has included working in Australia, the United Kingdom, United States and France in executive and non-executive roles. Most recently, he has spent six years as an Executive Director with the Foundation for Young Australians. In the UK, he worked with the Young Foundation developing partnerships with public and private sector stakeholders and setting up social venture funds in education and health and new ventures, including the School of Everything, Studio Schools and the Social Innovation Camp.

Previously he worked in technology venture capital and management in Europe, developing several ventures from University R&D and consulting on innovation for organisations such as the BBC, NHS, UCL, Siemens and Philips.

He has been a Board member for commercial, government and social organisations, including the National Probation Service and Metropolitan Support Trust in the UK. He has a Masters in Space Science, Cum Laude and a Bachelors Degree in Mechanical Engineering with First Class Honours. He is a member of the Australian Institute of Company Directors.

Professor Kim Cornish (Deputy Chair)

Professor Kim Cornish is a developmental cognitive neuroscientist and a Fellow of the Academy of Social Sciences Australia. She is the current Head of the School of Psychological Sciences and the Founding Director of the Turner Institute for Brain and Mental Health at Monash University.

Before joining Monash University, Professor Cornish held the prestigious Canada Research Chair in developmental cognitive neuroscience at McGill University in Montreal. She is a pioneer in the field of developmental cognitive neuroscience having defined attention pathways and their trajectories across development in children with brain disorders such as autism and fragile X syndrome. This work resulted in a game-based, interactive cognitive training program (TALI™), which helps young children with severe attention deficiencies and is National Disability Insurance Scheme (NDIS) approved and used in clinics across Australia.

Professor Cornish is an Executive Board Member of the Australian Brain Alliance and a Board Member of the Hudson Institute of Medical Research.

Professor Peter Currie

Professor Peter Currie received his PhD from Syracuse University, New York, USA. He undertook postdoctoral training in zebrafish development at the Imperial Cancer Research Fund (now Cancer Research UK) in London, UK. He has worked as an independent laboratory head at the UK Medical Research Council Human Genetics Unit in Edinburgh, UK and the Victor Chang Cardiac Research Institute in Sydney, Australia where he headed a research program focused on skeletal muscle development and regeneration.

In 2016, he was appointed Director of ARMI at Monash University in Melbourne, Australia. He is a recipient of a European Molecular Biology Organization Young Investigators Award and a Wellcome Trust International Research Fellowship and currently is a Principal Research Fellow with the National Health and Medical Research Council in Australia. Professor Currie, along with Dr Georgina Hollway, from the Garvan Institute of Medical Research and Dr Phong Nguyen from ARMI, won the UNSW 2015 Eureka Prize for Scientific Research. They were awarded the prize in recognition of their groundbreaking research into stem cell generation.

LEADERSHIP ADVISORY BOARD

Dr Patrick Hughes (from August 2021)

Dr Patrick Hughes graduated in 1977 from Monash Medical School. He initially worked in rural general practice, but eventually specialised in anaesthesia. His practice provides care to paediatric patients and those who need major reconstructive and complex airway surgery. While juggling a busy practice, Dr Hughes found time to lecture and teach undergraduate and postgraduate students and contribute to clinical research.

As well as serving on the Board of Directors of the Victorian Anaesthetic Group, his other positions include a role on the Medical Insurance Group Australia (MIGA) Medical Advisory Panel and on the Advisory Panel and Board of Directors of indemnity insurer Invivo Medical Pty Ltd.

Dr Hughes also served on the Victorian Executive Committee of the Australian Society of Anaesthetists and for more than 10 years, as a member of the Victorian Consultative Council on Anaesthetic Mortality and Morbidity.

Mr Jeremy Nestel (to November 2021)

Mr Jeremy Nestel joined the ARMILAB in September 2018. His professional career includes senior executive roles at Citibank in Australia, London and Hong Kong. Before joining Citibank, Jeremy was CFO/COO of Aetna International's Asset Management business in Hong Kong. From 1982 to 1986 he was an Insolvency Principal at Arthur Andersen, Hong Kong. Currently, Mr Nestel is the owner and principal of Avisford Private Capital Consultancy, providing a broad range of investment related services and strategic business advice to Australian and international clients.

As a qualified Chartered Accountant, Mr Nestel has considerable specialised expertise in assisting family-based businesses. He served as Chair of the Board on Monash University's Medical Foundation (2012–2017) and is currently a member of the Monash University Investment Advisory Committee. Mr Nestel is a member of the Institute of Chartered Accountants Australia and has a Bachelor of Science in Economics from the University of Hull (UK).

Associate Professor David Rhodes (to May 2021)

Associate Professor David Rhodes joined the ARMI Leadership Advisory Board in 2016. He is an Adjunct Associate Professor at the Monash Institute of Materials Engineering, Monash University and has had a long career in commercialisation of science with senior roles at publicly listed companies including Avexa, Admedus and AdAlta.

Dr Meroula Richardson (from November 2021)

Dr Meroula Richardson graduated from the University of Western Australia as a physician but continued her training to specialise in cardiology. Her interest in organ transplantation led to an overseas stint at the Harefield Hospital (London, UK) where she undertook training in heart transplantation under the guidance of Professor Sir Magdi Yacoub, a pioneer in this field.

She returned to Australia in 1994 and worked as a consultant cardiologist at The Alfred Hospital (Melbourne) in the Heart and Lung Replacement Service and a few years later, became a founding member of The Alfred's Heart Failure Unit.

Dr Richardson returned to Harefield on sabbatical for further training in implantation of cardiac electrical devices and cardiac resynchronisation therapy for heart failure.

In 2005, as well as holding a part-time position at the Alfred, Dr Richardson established a private practice at the Cabrini Hospital with an emphasis on delivering specialised care for heart failure patients in the private setting. Until early 2020, she was also involved in rural outreach clinics in Bairnsdale.

Dr Richardson was a committed teacher of undergraduate and postgraduate students and a mentor of medical students and junior doctors.

She also served on medical panels and on the Advisory Board of Medtronic.

LEADERSHIP ADVISORY BOARD

Dr Peter Rogers

Dr Peter Rogers is a Councillor of the Graduate Union at University of Melbourne, Emeritus Chair of the Monash University Engineering and Information Technology Foundation, Chair of the Australian Rotary Health District D9800 Committee and a past President of the Rotary Club of Melbourne.

Dr Rogers graduated in chemical engineering from Monash, M App Sc from University of Melbourne, and received his PhD degree from Monash University in 1974. He is a Fellow of Engineers Australia.

Early in his career, Dr Rogers worked at ICI Australia (now Orica) in their agricultural chemicals and plastics businesses and at their production facilities in Victoria and NSW. In 1980, he was appointed Staff Manager at ICI Australia (Melbourne).

In 1984, he was appointed to ICI PLC headquarters in London. He was a Director of ICI's subsidiary and associated companies, including ICI Bangladesh and ICI Bangladesh Trading Company. Between 1985 and 2000, Dr Rogers was a Director of the London-based Board of Employment Conditions Abroad Ltd. He later established the International Consultants Centre, a consulting company he led for more than 25 years. In 2015, the company was transferred to staff.

In 2009, Dr Rogers was appointed Chair of Monash University Engineering and Information Technology Foundation Board. During his eight years in this role, the Leadership Program, the Monash Industry Team Initiative and three research institutes were established, including the Monash Institute of Medical Engineering.

Dr Rogers was elected to the Board of Hepburn Wind in 2011 – Australia's first community-owned wind farm located at Daylesford, Victoria. During his tenure, $10m capital fundraising, construction and commissioning was carried out. For his work, Dr Rogers was awarded the Victorian Premier's Award, World Wind Energy Award and Banksia Award.

He was also awarded a Monash Distinguished Service Medal in 2008, Rotary Paul Harris Fellow 2008 and the UCSD Jacobs School of Engineering medal in 2013. In 2014, Dr Rogers was awarded an Honorary Doctor of Laws by Monash University.

Dr Duncan Thomson (from August 2021)

Dr Duncan Thomson consults in the regenerative medicine and animal health sectors, bringing a pragmatic passion for translational commercialisation.

He is an executive with more than 25 years of experience in animal health, healthcare and pharmaceutical industries, having worked in senior marketing, sales and management roles in Europe, the US and Australia.

Dr Thomson has extensive knowledge of what it takes to translate and commercialise and minimise risk and avoid some of the pitfalls.

He began his career as a veterinarian in the largest vet practice in Sydney and has always been at the cutting-edge of development. He then worked in the United Kingdom, Switzerland and the United States and completed his Master of Business Administration (MBA) in the UK. In 2001, he joined Novartis Animal Health where he came to fully appreciate the process of drug development, registration, marketing and sales.

Dr Thomson returned to Australia and had his first encounter with regenerative medicine in Regeneus, which he joined in 2010. He saw the company expand and succeed – growing from treating small animals (dogs) to larger ones (horses), moving to allogeneic treatments and then into human products, culminating in a cell therapy treatment licence in Japan.

LEADERSHIP ADVISORY BOARD

Mr Silvio Tiziani

Mr Silvio Tiziani is Director of External Strategy and Planning at ARMI and Chief Operating Officer for the Centre for Commercialisation of Regenerative Medicine (CCRM) Australia.

At ARMI, his focus is on external engagement, strategic planning and communications for the Institute, as well as identifying and developing the Institute's national and international strategic alliances.

Mr Tiziani played a central role in establishing CCRM Australia to support the commercialisation of Australian regenerative medicine technologies, securing operational funding for the initiative and developing a national network of partner organisations.

His knowledge of the national and international regenerative medicine ecosystem including current academic and clinical research, government policy, private funding organisations and the biotechnology and pharmaceutical industries is central to his success in establishing initiatives that promote and build Australia's regenerative medicine capacity.

Dr Zita Unger (to February 2021)

Dr Zita Unger has a distinguished career spanning 15 years as an evaluator, educator and entrepreneur, drawing on extensive knowledge of organisational development, business acumen and governance to bring valuable contributions at the Board level. Dr Unger gained her doctorate in sociology of education at the University of Melbourne.

Ms Sonya Walker

Ms Sonya Walker is a Board member with a background in information technology (IT), banking and finance, commercial and public sectors. For more than 20 years, Ms Walker has served on numerous boards and committees and she holds a current role at ARMI.

She is a business leader with strengths in the building of strong teams and the delivery of results. She has an excellent track record in the delivery of major organisation change initiatives with integrated commercial and consulting services components.

As an Executive Business Leader, Ms Walker worked across the Asia Pacific region and the US where she held positions in major IT companies including IBM, Infor, RSA Security, SAS, SAP and Oracle. Her most recent role was as an Executive Partner at IBM. She is a highly respected global adviser where her strengths include go to market strategy, partners and alliances, corporate governance, mergers and acquisitions together with business development and building high growth business.

Ms Walker has a passion for business and digital transformation and currently provides consulting services to enable her clients to translate board directives to develop strategy, execute successful C-level business plans and programs of work that deliver real revenue outcomes.

She has a Masters of Applied Science, Postgraduate Certificates in strategy and strategic human resource management and a Bachelor of Science (Honours).

Ms Walker is also a recipient of many industry and service awards for her community work.

EXECUTIVE TEAM

Our Executive Team comprises members appointed from ARMI's research and professional staff. The Executive Team is now working with the Institute's staff, stakeholders and Board and subcommittee members to implement the strategic plan's (Strategic Plan 2020–2025) recommendations.

Professor Peter Currie, Director of ARMI

Emeritus Professor Claude Bernard, Interim Deputy Director of ARMI

Professor Graham Lieschke, Group Leader, ARMI

Associate Professor Edwina McGlinn, Group Leader, ARMI

Dr Jennifer Zenker, Group Leader, ARMI

Mr Silvio Tiziani, Director, External Strategy and Planning, ARMI

Ms Penny Rowlett, Institute Manager, ARMI

Ms Lorraine Mascarenhas, Executive Officer, Executive Assistant to ARMI Director

DEVELOPMENT ENGAGEMENT COMMITTEE

The Development Engagement Committee is a subcommittee of the ARMILAB. As requested by the ARMILAB, the committee supports major funding submissions to government, trusts and foundations, corporations, major philanthropists, venture philanthropists and investors.

Mr Luke Belfield
Emeritus Professor Claude Bernard
Mr Richard Dent
Ms Michelle Gallaher
Mr David Livingstone (from November 2021)
Ms Madeleine McManus
Mr Robert Papworth
Dr Peter Rogers (Chair)
Dr Chris Sotiropoulos
Mr Silvio Tiziani, Secretary, External Strategy and Planning

Meeting dates
13 April
12 October

STRATEGY ADVISORY COMMITTEE

The Strategy Advisory Committee's primary role is to provide independent and objective advice to the ARMI Leadership Advisory Board for the implementation and progress of the ARMI Strategic Plan 2020–2025.

Professor Claude Bernard (Chair)
Professor Peter Currie
Professor Graham Lieschke (from May 2021)
Associate Professor Edwina McGlinn (from May 2021)
Ms Penny Rowlett (from May 2021)
Mr Silvio Tiziani
Ms Sonya Walker
Dr Jennifer Zenker (from May 2021)

Meeting dates
9 February
18 May
10 August
9 November

INDUSTRY ADVISORY COMMITTEE

The Industry Advisory Committee is a subcommittee of the ARMILAB. The committee ensures that ARMI is attuned to industry-related regenerative medicine trends by acting as a strategic scanning mechanism and assisting ARMI in identifying needs and opportunities. It advises ARMILAB and Institute leadership on current and emerging regenerative medicine industry practice and technological development to inform the Institute's research program and related activities.

Associate Professor David Rhodes, Chair (to May 2021) – Adjunct Associate Professor, Monash University, Australia; Senior Executive Head of Drug Discovery and Senior Vice-President Biology, Avexa Ltd, Australia

Dr Damien Bates – Chief Scientific Officer and Head of Translational Medicine, BioCurate, Australia; Senior Advisor, Sanbio, USA

Dr Paul Bello – Innovation Lead, Industrial Biotechnology, Innovate, UK

Dr Julie M Cherrington – Member of the Scientific Advisory Board, Clearity Foundation, USA; Advisor in entrepreneurship initiatives, UC San Francisco, UC Davis and CLSI, USA

Dr Julian Chick – Director SkinLife Products, Australia

Dr Jonathan Fitzgerald – Vice-President of Program Management, Torque Therapeutics, USA

Dr Lusia Guthrie – Chair, Clever Culture Systems AG, Switzerland; Non-executive Director, 4Dx Limited, Australia; Director, ANDHealth, Australia; Chair, Industry Advisory Committee, Medicines Manufacturing Innovation Centre, Monash University, Australia; Member, ARMI Industry Advisory Committee, Monash University, Australia

Ms Sara Mary Hall – Senior Advisor, Oxford BioMedica (UK) Ltd; Member, Board of Directors University of Kansas Innovation and Collaboration (KUIC), USA; Member of the commercialisation arm of Kansas University Main Campus/ Kansas University Medical Center, USA; Director and Executive Committee member, BioKansas, USA

Professor Abid Khan – Deputy Vice-Chancellor and Vice-President (Global Engagement) Monash University, Australia

Mr Brian Hanrahan (from April 2021) – Business Development Manager, Planet Innovation

Dr Bianca Lê (from April 2021) – Executive Director, Cellular Agriculture Australia

Professor Kenneth Lee – Chief, Developmental and Regenerative Biology Thematic Research Program, School of Biomedical Sciences at the Chinese University of Hong Kong (CUHK), China; Director, Key Laboratory for Regenerative Medicine, Ministry of Education, China; Director, CUHK-Southampton Joint Laboratory for Stem Cell and Regenerative Medicine, China; CEO, StapWorks Stem Cell Limited, Hong Kong, China; Prestigious Professor, Chinese Academy of Science, China; Visiting Professor, Robert Gordon University, Scotland, UK

Dr Linda Somerville – Director, Linfaws Consulting Limited

Dr Duncan Thompson, Chair (from May 2021) – Consultant, Duncan Thomson Consulting; CEO, Captixbio

Mr Silvio Tiziani – Director of External Strategy and Planning at ARMI and Chief Operating Officer for the Centre for Commercialisation of Regenerative Medicine (CCRM) Australia

Professor Alan Trounson (from October 2021) – Emeritus Professor, Monash University; Distinguished Scientist, Hudson Institute of Medical Research; CEO, Cartherics Pty Ltd, Australia

Mr Gordon Waldron – CEO, Sequoia Business Solutions, France

Meeting dates

20 April

19 October

COMPLIANCE AND ETHICS COMMITTEES

To ensure that ARMI complies with external standards, regulations and genetic guidelines for genetic manipulation and biosafety, the Institute follows the rules and regulations outlined by the following committees:

Monash University Institutional Biosafety Committee (MUIBC)

Monash University Human Research Ethics Committee (MUHREC)

Monash University Animal Ethics Committee (MARP, BSCI and MIPS)

Monash University Radiation Advisory Committee

STAFF

EXECUTIVE

Professor Peter Currie, Director of ARMI

Emeritus Professor Claude Bernard, Interim Deputy Director of ARMI

Professor Graham Lieschke, Group Leader, ARMI

Associate Professor Edwina McGlinn, Group Leader, ARMI

Dr Jennifer Zenker, Group Leader, ARMI

Mr Silvio Tiziani, Director, External Strategy and Planning, ARMI

Ms Penny Rowlett, Institute Manager, ARMI

Ms Lorraine Mascarenhas, Executive Officer, Executive Assistant to ARMI Director

OFFICE OF THE DIRECTOR

Ms Renae Hayle, Manager, Resources and Scientific Services

Ms Lorraine Mascarenhas, Executive Officer, ARMI (from September 2021)

Ms Jane McCausland, Manager, Student Programs, ARMI

Dr Anita Pinar, Senior Administrative Officer, ARMI

Ms Penny Rowlett, Institute Manager, ARMI

Mr Silvio Tiziani, Director, External Strategy and Planning, ARMI

RESOURCES AND SCIENTIFIC SERVICES

Ms Renae Hayle, Manager

Ms Radana Ninkovic

Ms Rebecca Dale

Mr Sebastian-Alexander Stamatis

ARMI COMMITTEES

GROUP LEADERS COMMITTEE

Professor James Bourne
Professor Peter Currie
Dr Gonzalo del Monte-Nieto
Dr Harald Janovjak
Dr Jan Kaslin (Chair)
Professor Andrew Laslett (CSIRO)
Professor Graham Lieschke
Associate Professor Mikaël Martino
Dr Toby Merson (Chair)
Associate Professor Edwina McGlinn
Professor Andras Nagy
Dr Nadinath Nillegoda
Professor Susie Nilsson (CSIRO)
Professor José Polo
Associate Professor Mirana Ramialison
Dr Alberto Roselló-Díez
Ms Penny Rowlett (Institute Manager)
Dr Jennifer Zenker

Meeting dates

28 January
25 February
25 March
29 April
27 May
24 June
29 July
2 September
30 September
28 October
25 November

SCIENTIFIC SERVICES COMMITTEE

Ms Renae Hayle
Manager, Resources and Scientific Services

Ms Radana Ninkovic
ARMI Store

Mr Sebastian Stamatis
ARMI Store, alternate member

Mr William Kwan
Bourne Group

Ms Carmen Sonntag
Currie Group

Ms Silke Berger
Currie Group, alternative member

Dr Max Tailler
del Monto-Nieto Group

Ms Mia De Seram
Janovjak Group

Mr Alon Douek
Kaslin Group

Dr Vahid Pazhakh
Lieschke Group

Dr Jean Tan
Martino Group

Dr Angel Lu
Martino Group, alternative member

Dr Lulu Xing
Merson Group

Dr Jan Manent
McGlinn Group, alternative member

Ms Lisa Wong
McGlinn Group

Ms Laurie Ma
Nagy Group, alternative member

Dr Natalie Payne
Nagy Group

Ms Maddie Fulton
Nilsson and Laslett Groups

Dr Yasith Mathangasinghe
Nillegoda Group

Ms Jeannette Hallab
Ramialison Group

Ms Xinli (Cindy) Qu
Roselló-Díez Group

Dr Asma Aberkane
Zenker Group

ARMI COMMITTEES

SAFETY COMMITTEE

Ms Renae Hayle
Manager – Resources & Scientific Services and Safety Officer

Ms Renae Hayle
Biosafety Officer

Ms Renae Hayle
Radiation Safety Officer

Mr William Kwan
First Aid Coordinator

Ms Penny Rowlett
Institute Manager

Mr Alex Zuperman
Faculty Occupational Health and Safety (OHS) Adviser

Ms Rebecca Dale
Student Representative

Mr Rodney Glanvill
Aquarium Manager

Ms Ruth Oliver
Environmental Advisor

Dr Jihane Homman-Ludiye
Environmental Officer

Dr Anita Pinar
Senior Administrative Officer

Vacant
Health and Safety Representative

Meeting dates

17 March

23 June

25 August

17 November

STUDENT PROGRAMS COMMITTEE

Professor Graham Lieschke
Chair, HDR Coordinator

Associate Professor Mikaël Martino
Deputy Chair, ARMI and EMBL Australia Group Leader

Associate Professor Edwina McGlinn
ARMI Group Leader

Dr Tobias Merson
ARMI Group Leader

Dr Alberto Roselló-Díez
ARMI Group Leader

Ms Jane McCausland
Student Programs Leader

Professor Andrew Laslett
ARMI/CSIRO Group Leader

Dr Chau Khuong
Associate Course Coordinator, Master of Biotechnology

Dr Jan Manent
ARMI Honours Coordinator

Mr Jacob Paynter
Student Representative

Ms Jasmine Poh
Student Representative

Ms Penny Rowlett
ARMI Institute Manager

Meeting dates

16 February

4 May

17 August

7 December

APPENDIX 1 – PUBLICATIONS

1. Abuwarwar MH, Baker AT, Harding J, Payne NL, Nagy A, Knoblich K, Fletcher AL. In vitro suppression of T cell proliferation is a conserved function of primary and immortalized human cancer-associated fibroblasts. *International Journal of Molecular Sciences*. 2021;22(4):1827. DOI: 10.3390/ijms22041827.
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APPENDIX 1 – PUBLICATIONS

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APPENDIX 1 – PUBLICATIONS

49. Tulenko FJ, Currie PD. Bones of contention: skeletal patterning across the fin-to-limb transition. *Cell*. 2021;184(4):854–856. DOI: 10.1016/j.cell.2021.01.039.
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APPENDIX 2 – STUDENT SUPERVISION

Student name	Position	Team	Supervisor	Co-supervisor	Project title
Seyed Hosseini Fin Nafiseh	HDR Student	Bourne Group	Professor James Bourne	Dr Jihane Homman-Ludiye	Elucidating the role of microglia in the maturation of the primate neocortex
Jack Scott	HDR Student	Bourne Group	Professor James Bourne	Dr Jihane Homman-Ludiye	Examining changes to behaviour in the marmoset following early-life lesions of the medial pulvinar
Dylan Fox	HDR Student	Bourne Group	Professor James Bourne	Dr Inaki Carril	The role of the inferior pulvinar on the development of visually guided behaviours
Kwan William	HDR Student	Bourne Group	Professor James Bourne	Not applicable	An optogenetic strategy for dissecting the neural circuits implicated in neurological disorders
Angela (Yuxin) Fan	HDR Student	Bourne Group	Professor James Bourne	Dr Jihane Homman-Ludiye	Using DREADDs to manipulate the visual attention circuit in the marmoset as a model for SCZ
Tuan Anh Hoang	HDR Student	Bourne Group	Professor James Bourne	Dr Leon Teo	Predictive model of astrocyte transcriptomic changes through time
Mervyn Dauer	HDR Student	Currie Group	Professor Peter Currie	Dr Joachim Berger	The role of Myo18b in sarcomere assembly
Jessica Manneken	HDR Student	Currie Group	Professor Peter Currie	Professor Graham Lieschke / Dr Margo Montandon	Investigating the dynamics of Fibroadipogenic Progenitors (FAPs) in muscle injury and muscle wound repair
Rebecca Dale	HDR Student	Currie Group	Professor Peter Currie	Associate Professor Edwina McGlinn	Evolution of vertebrate muscle patterning systems
Abbas (Adrian) Salavaty Hosein Abadi	HDR Student	Currie Group	Professor Peter Currie	Associate Professor Mirana Ramialison	Identification and functional analysis of novel long non-coding RNAs involved in drifting, clonal expansion and differentiating muscle stem cells
Duy Tran	HDR Student	Currie Group	Professor Peter Currie	Dr Avnika Ruparelia	Characterisation of muscle aging and macrophage in zebrafish
Kevin (Yansong) Lu	HDR Student	Currie Group	Professor Peter Currie	Dr Avnika Ruparelia	Investigating the clonal drift dynamic in zebrafish skeletal muscle growth
Eashwar Anbupalam	HDR Student	Currie Group	Professor Peter Currie	Dr Margo Montandon	Analyze marcophage populations to profile specific signals involved in macrophage polarization
Taylor Graham	HDR Student	Currie Group	Professor Peter Currie	Dr Avnika Ruparelia / Professor Andrew Laslett	The development of FBS-free fish iPSC lines for cellular agriculture
Shabnam Sabetkish	HDR Student	Currie Group	Professor Peter Currie	Not applicable	Using novel imaging technologies and tissue engineering techniques for treatment of muscle diseases
Eman Mohamed	HDR Student	del Monte-Nieto Group	Dr Gonzalo del Monte-Nieto	Dr Ekaterina Salimova	Characterization of KLFs as new causative factors for non-compaction cardiomyopathy

APPENDIX 2 – STUDENT SUPERVISION

Student name	Position	Team	Supervisor	Co-supervisor	Project title
Masoud Pourhaghgouy	HDR Student	del Monte-Nieto Group	Dr Gonzalo del Monte-Nieto	Dr Ekaterina Salimova	Characterization of the cardiomyocyte extracellular environment for heart regeneration
Hue Mai La	HDR Student	Hobbs Group	Dr Robin Hobbs	Associate Professor Jan Kaslin	Role of Tsc-22 domain family members in germline stem cell function
Alexandra-Madelaine Tichy	HDR Student	Janovjak Group	Associate Professor Harald Janovjak	Professor Peter Currie	All-optical interrogation of bone cell behaviour in extreme environments
Christina Gangemi	HDR Student	Janovjak Group	Associate Professor Harald Janovjak	Dr Robin Hobbs	Optical stimulation of pancreatic beta-cells: regenerating blood glucose levels in diabetes
Sebastian Stamatis	HDR Student	Kaslin Group	Associate Professor Jan Kaslin	Dr Toby Merson	Making and shaping a vertebrate brain: defining the cellular and genetic drivers of CNS growth
Alon Douek	HDR Student	Kaslin Group	Associate Professor Jan Kaslin	Dr Alberto Roselló-Díez	Investigating neural stem and progenitor cell fate determinants in the regenerating zebrafish brain
Florian Kreuder	HDR Student	Kaslin Group	Associate Professor Jan Kaslin	Associate Professor Michael Fahey (external)	Investigating genetic components of cerebral palsy
Oliver Trusler	HDR Student	Laslett Group	Professor Andrew Laslett	Professor Jane Visvader (external) / Dr Jacob Goodwin	Differentiation of human pluripotent stem cells to mammary cell types: influence of BRCA mutations
Abdulsalam Isiaku	HDR Student	Lieschke Group	Professor Graham Lieschke	Professor Peter Currie / Dr Vahid Pazhakh	Neutrophil antimicrobial activities during infection in vivo – studies using zebrafish models
Azadeh Anbarlou	HDR Student	Lieschke Group	Professor Graham Lieschke	Dr Vahid Pazhakh	The influence of nuclear plasticity on leukocyte migration: studies in macrophages
Yasmin Alshoubaki	HDR Student	Martino Group	Associate Professor Mikaël Martino	Dr Ekaterina Salimova / Dr Gonzalo del Monte-Nieto	The role of T cells in cardiac repair – mechanisms and therapeutic targets
Celeste Piotto	HDR Student	Martino Group	Associate Professor Mikaël Martino	Dr Julien Legrand	Promoting tissue regeneration via specific delivery of miRNAs to macrophages
Bhavana Nayer	HDR Student	Martino Group	Associate Professor Mikaël Martino	Dr Jean Tan	In vivo reprogramming of somatic cells into multipotent stem cells capable of tissue regeneration
Rezvan Karami	HDR Student	Martino Group	Associate Professor Mikaël Martino	Dr Ziad Julier	Designing new growth factor delivery system for the treatment of chronic wounds
Surojeet Das	HDR Student	Martino Group	Associate Professor Mikaël Martino	Dr Angel Lu	Immunomodulator hydrogels for application in bone regeneration
Wenhao You	HDR Student	Martino Group	Associate Professor Mikaël Martino	Dr Jean Tan	Engineering cell-specific drug delivery system for treating ischemic injuries

APPENDIX 2 – STUDENT SUPERVISION

Student name	Position	Team	Supervisor	Co-supervisor	Project title
Nan Hu	HDR Student	Martino Group	Associate Professor Mikaël Martino	Dr Julien Legrand	Promoting tissue regeneration by delivering engineered factors derived from regulatory T cells
Jasmine Poh	HDR Student	Merson Group	Dr Toby Merson	Dr Lulu Xing	The role of intrinsic and extrinsic cues in regulating remyelination of the central nervous system
Yi-Cheng Chang	HDR Student	McGlinn Group	Associate Professor Edwina McGlinn	Dr Victoria Garside	The role of miR-196 in cardiac development and disease
Gabriel Hauswirth	HDR Student	McGlinn Group	Associate Professor Edwina McGlinn	Dr Fernando Rossello	Regulatory architecture of the trunk-to-tail transition
Xiaoxue Ma	HDR Student	Nagy Group	Dr Natalie Payne	Professor Andras Nagy	Developing safe 'designer' stem cell therapies for the treatment of multiple sclerosis
Yasith Mathangasinghe	HDR Student	Nillegoda Group	Dr Nadinath Nillegoda	Professor David Jans (external)	Characterisation of the protein disaggregation activation program (DAP) in neurodegenerative disease
Fahmida Islam	HDR Student	Nillegoda Group	Dr Nadinath Nillegoda	Not applicable	A new class of HSP70-JDP chaperone-based antiviral agent against coronaviruses
Claire Pritchard	HDR Student	Nilsson Group	Professor Susie Nilsson	Dr Ben Cao	The role of alpha9beta1 integrin in the drug resistance of acute lymphoblastic leukaemia
Joseph Chen	HDR Student	Polo Group	Professor José Polo	Assistant Professor Owen Rackham (external)	Using the Mogrify algorithm to study induced pluripotency and direct reprogramming
Esther Miriklis	HDR Student	Polo Group	Professor José Polo	Dr Toby Bell (external)	Real-time visualisation of stembody inheritance required for embryonic cell fate specification
Gulrez Chahal	HDR Student	Ramialison Group	Associate Professor Mirana Ramialison	Dr Sonika Tyagi	Contribution of non-coding regulatory elements to congenital heart disease
Lisa Waylen	HDR Student	Ramialison Group	Associate Professor Mirana Ramialison	Dr Lan Nguyen (external) / Associate Professor Kelly Smith (external)	Formation of boundaries in the lateral plate mesoderm
Ehsan Razmara	HDR Student	Roselló-Díez Group	Dr Alberto Roselló-Díez	Not applicable	Studying the clonal dynamics of cartilage stem cells during normal and perturbed bone growth
Azelle Hawdon	HDR Student	Zenker Group	Dr Jenny Zenker	Professor Andrew Laslett	Real-time visualization of stembody inheritance required for embryonic cell fate specification
Neda Rahmani Mehdiabadi	External HDR Student	Elliot Group	Associate Professor David Elliot	Associate Professor Enzo Porrello (external)	Harnessing stem cells to develop regenerative therapies for childhood heart disease
Gemma Stathatos	External HDR Student	Zenker Group	Professor Moira O'Bryan	Dr Jenny Zenker	Investigating the roles of delta and epsilon tubulin in spermatogenesis and early embryogenesis

APPENDIX 2 – STUDENT SUPERVISION

Student name	Position	Team	Supervisor	Co-supervisor	Project title
Wang Lok So	MSc Student	Janovjak Group	Associate Professor Harald Janovjak	Dr Zane Andrews	Engineered plant receptors as orthogonal neuronal switches
Alice Sunnucks	2021 Honours Student	Currie Group	Professor Peter Currie	Not applicable	The evolution of vertebrate muscle patterning systems
Yolana Kapsa	2021 Honours Student	Janovjak Group	Associate Professor Harald Janovjak	Dr Samuel Crossman	Light control of CRISPR: Any gene – any place – any time
Keith Naylor	2021 Honours Student	Janovjak Group	Associate Professor Harald Janovjak	Not applicable	Developing a novel method of modulating chemical neurotransmission
Aaron Thijis	2021 Honours Student	Kaslin Group	Associate Professor Jan Kaslin	Mr Alon Douek	Defining drivers and putative diagnostic biomarkers of MPSIIIA pathobiology
Anna Box	2021 Honours Student	Kaslin Group	Associate Professor Jan Kaslin	Mr Sebastian-Alexander Stamatis	Evolution of macro glia in the spinal cord of vertebrates
Thana Adeniyi	2021 Honours Student	Laslett Group	Professor Andrew Laslett	Dr Joey Man	Modifying the effects of microgravity on human cells using light
Quinn Stacpoole	2021 Honours Student	Martino Group	Associate Professor Mikaël Martino	Dr Julien Legrand	Engineering of a novel macrophage-derived cytokine to promote muscle
Olivia Sims	2021 Honours Student	Merson Group	Dr Toby Merson	Dr Lulu Xing	Modulating myelin regeneration mediated by neural precursor cells
Jinny Hojin Chang	2021 Honours Student	Roselló-Díez Group	Dr Alberto Roselló-Díez	Not applicable	Mechanisms of injury response in limb catch-up growth
Malvika Bakshi	Master of Biotechnology Student – Research project BRM5021	Merson Group	Dr Toby Merson	Not applicable	Identifying the anatomical origin of oligodendrogenic neural precursor cells in the adult mouse ventricular-subventricular zone
Brenda Briones	Master of Biotechnology Student – Research project BRM5021	Lieschke Group	Professor Graham Lieschke	Dr Vahid Pazhakh	Validating a mouse model for the conditional ablation of adult-born oligodendrocytes in order to elucidate the role of de novo myelin formation in learning and memory
Pralesh Devkota	Master of Biotechnology Student – Research project BRM5021	del Monte-Nieto Group	Dr Gonzalo del Monte-Nieto	Not applicable	Role of KLF8 in cardiac trabeculation and congenital heart disease
Jackson Feng	Master of Biotechnology Student – Research project BRM5021	Janovjak Group	Associate Professor Harald Janovjak	Not applicable	Novel antibiotic resistances for synthetic biology
Quoc Viet Ho	Master of Biotechnology Student – Research project BRM5021	Nillegoda Group	Dr Nadinath Nillegoda	Not applicable	Identification of post-translational modifications on DNAJB1 vital for protein disaggregation in human cells

APPENDIX 2 – STUDENT SUPERVISION

Student name	Position	Team	Supervisor	Co-supervisor	Project title
Anna Kalashnikova	Master of Biotechnology Student – Research project BRM5021	del Monte-Nieto Group	Dr Gonzalo del Monte-Nieto	Not applicable	Tip/stalk cell decisions control endocardial sprouting during cardiac trabeculation
Yu Shen	Master of Biotechnology Student – Research project BRM5021	del Monte-Nieto Group	Dr Gonzalo del Monte-Nieto	Not applicable	Study of cardiac trabecular myocardium induction during ventricular chamber development in the mouse
Jiarui Lai	Master of Biotechnology Student – Research project BRM5021	Currie Group	Professor Peter Currie	Dr Andrew Boyd	Investigating the role of critical components of nuclear lamina in the zebrafish muscular skeletal system
Sikun Liu	Master of Biotechnology Student – Research project BRM5021	McGlinn Group	Associate Professor Edwina McGlinn	Dr Jan Manent	Characterizing the antagonistic relationship between Gdf11 and retinoic acid
Yutong Cheng	Master of Biotechnology Student – Research project BRM5021	Roselló-Díez Group	Dr Alberto Roselló-Díez	Not applicable	Establishing new models of rodent chimeras to study limb growth regulation
Sheng Hsu	Master of Biotechnology Student – Research project BRM5021	Polo Group	Dr Anja Knaupp	Not applicable	Comparison of different single genomic locus analysis approaches to characterise mammalian regulatory complexes
Yi Li	Master of Biotechnology Student – Research project BRM5021	Zenker Group	Dr Jennifer Zenker	Not applicable	Real-time visualisation of paternally inherited mitochondrial outer membranes during early mammalian embryogenesis
Mohammad Razmjoo	Master of Biotechnology Student – Research project BRM5021	Zenker Group	Dr Jennifer Zenker	Dr Jessica Greaney	The role of microtubule and associated protein in regulation of different cellular function

HDR – Higher Degree by Research includes Doctor of Philosophy (PhD), research Masters degrees and other professional higher degrees by research.

APPENDIX 3 – GRADUATING STUDENTS

Student name	Position	Team	Supervisor	Co-supervisor	Project title
Dylan Fox	HDR Student	Bourne Group	Professor James Bourne	Dr Inaki Carril	The role of the inferior pulvinar on the development of visually guided behaviours
Hue Mai La	HDR Student	Hobbs Group	Dr Robin Hobbs	Associate Professor Jan Kaslin	Role of Tsc-22 domain family members in germline stem cell function
Alexandra-Madelaine Tichy	HDR Student	Janovjak Group	Associate Professor Harald Janovjak	Professor Peter Currie	All-optical interrogation of bone cell behaviour in extreme environments
Rezvan Karami	HDR Student	Martino Group	Associate Professor Mikaël Martino	Dr Ziad Julier	Designing new growth factor delivery system for the treatment of chronic wounds
Gabriel Hauswirth	HDR Student	McGlinn Group	Associate Professor Edwina McGlinn	Dr Fernando Rossello	Regulatory architecture of the trunk-to-tail transition
Gulrez Chahal	HDR Student	Ramialison Group	Associate Professor Mirana Ramialison	Dr Sonika Tyagi	Contribution of non-coding regulatory elements to congenital heart disease
Alice Sunnucks	2021 Honours Student	Currie Group	Professor Peter Currie	Not applicable	The evolution of vertebrate muscle patterning systems
Yolana Kapsa	2021 Honours Student	Janovjak Group	Associate Professor Harald Janovjak	Dr Samuel Crossman	Light control of CRISPR: Any gene – any place – any time
Keith Naylor	2021 Honours Student	Janovjak Group	Associate Professor Harald Janovjak	Not applicable	Developing a novel method of modulating chemical neurotransmission
Aaron Thijis	2021 Honours Student	Kaslin Group	Associate Professor Jan Kaslin	Mr Alon Douek	Defining drivers and putative diagnostic biomarkers of MPSIIIA pathobiology
Anna Box	2021 Honours Student	Kaslin Group	Associate Professor Jan Kaslin	Mr Sebastian-Alexander Stamatis	Evolution of macro glia in the spinal cord of vertebrates
Thana Adeniyi	2021 Honours Student	Laslett Group	Professor Andrew Laslett	Dr Joey Man	Modifying the effects of microgravity on human cells using light
Quinn Stacpoole	2021 Honours Student	Martino Group	Associate Professor Mikaël Martino	Dr Julien Legrand	Engineering of a novel macrophage-derived cytokine to promote muscle
Olivia Sims	2021 Honours Student	Merson Group	Dr Toby Merson	Dr Lulu Xing	Modulating myelin regeneration mediated by neural precursor cells
Jinny Hojin Chang	2021 Honours Student	Roselló-Díez Group	Dr Alberto Roselló-Díez	Not applicable	Mechanisms of injury response in limb catch-up growth
Malvika Bakshi	Master of Biotechnology Student – Research project BRM5021	Merson Group	Dr Toby Merson	Not applicable	Identifying the anatomical origin of oligodendrogenic neural precursor cells in the adult mouse ventricular-subventricular zone

APPENDIX 3 – GRADUATING STUDENTS

Student name	Position	Team	Supervisor	Co-supervisor	Project title
Brenda Briones	Master of Biotechnology Student – Research project BRM5021	Lieschke Group	Professor Graham Lieschke	Dr Vahid Pazhakh	Functional testing of a new candidate allele for bone marrow failure disease in zebrafish models
Pralesh Devkota	Master of Biotechnology Student – Research project BRM5021	del Monte-Nieto Group	Dr Gonzalo del Monte-Nieto	Not applicable	Role of KLF8 in cardiac trabeculation and congenital heart disease
Jackson Feng	Master of Biotechnology Student – Research project BRM5021	Janovjak Group	Associate Professor Harald Janovjak	Not applicable	Novel antibiotic resistances for synthetic biology
Quoc Viet Ho	Master of Biotechnology Student – Research project BRM5021	Nillegoda Group	Dr Nadinath Nillegoda	Not applicable	Identification of post-translational modifications on DNAJB1 vital for protein disaggregation in human cells
Anna Kalashnikova	Master of Biotechnology Student – Research project BRM5021	del Monte-Nieto Group	Dr Gonzalo del Monte-Nieto	Not applicable	Tip/stalk cell decisions control endocardial sprouting during cardiac trabeculation
Yu Shen	Master of Biotechnology Student – Research project BRM5021	del Monte-Nieto Group	Dr Gonzalo del Monte-Nieto	Not applicable	Study of cardiac trabecular myocardium induction during ventricular chamber development in the mouse
Jiarui Lai	Master of Biotechnology Student – Research project BRM5021	Currie Group	Professor Peter Currie	Dr Andrew Boyd	Investigating the role of critical components of nuclear lamina in the zebrafish muscular skeletal system
Sikun Liu	Master of Biotechnology Student – Research project BRM5021	McGlinn Group	Associate Professor Edwina McGlinn	Dr Jan Manent	Characterizing the antagonistic relationship between Gdf11 and retinoic acid
Yi Li	Master of Biotechnology Student – Research project BRM5021	Zenker Group	Dr Jennifer Zenker	Not applicable	Real-time visualisation of paternally inherited mitochondrial outer membranes during early mammalian embryogenesis

HDR – Higher Degree by Research includes Doctor of Philosophy (PhD), research Masters degrees and other professional higher degrees by research.

APPENDIX 4 – 2021 EXTERNAL SPEAKERS SERIES

Date	Speaker	University/company	Title
9 February	Professor Sabine Werner	Institute of Molecular Health Sciences, Switzerland	Parallels between tissue repair and cancer: the fibroblast perspective
16 March	Professor Janet Rossant	SickKids Research Institute, The Hospital for Sick Children, Canada	Making the mouse blastocyst – from totipotency to stem cell commitment
13 April	Professor Alpha Yap	Institute for Molecular Bioscience, University of Queensland, Australia	Mechanosensing for epithelial homeostasis
4 May	Professor Clare Parish	The Florey Institute of Neuroscience and Mental Health, University of Melbourne, Australia	Advancing stem cell therapies for neural repair
15 June	Dr Sarah Teichmann	Wellcome Sanger Institute, UK	Human cell atlas: mapping the human body one cell at a time
13 July	Dr Lachlan Harris	Sid Faithfull Brain Cancer Laboratory, QIMR Berghofer, Australia	Controlling stem cell quiescence for therapeutic gain in cognitive disorders and brain malignancies
7 September	Professor David Lynn	South Australian Health and Medical Research Institute (SAHMRI), Australia	Can the microbiota be targeted to enhance immune responses to vaccination?
5 October	Professor Eldad Tzahor	Weizmann Institute of Science, Israel	Signalling mechanisms in heart regeneration
16 November	Associate Professor Noriaki Ono	University of Texas Health Science Center at Houston School of Dentistry, USA	Stem cells in bone development, disease and regeneration
7 December	Professor Nicola Harris	Department of Immunology & Pathology, Central Clinical School, Monash University, Australia	Eosinophils promote homeostatic adaptation of the intestinal tissue following microbial colonisation

Please note: In 2021, the seminars were held online because of the COVID-19 pandemic.

APPENDIX 5 – GRANTS

NEW GRANTS

Primary chief investigator	Granting body	Description/Title	Total funding ($)
Professor James Bourne	MRFF	The SPRINTS Project: Stroke – Prevention of Reperfusion Injury and Neuroinflammation – a Therapeutic Strategy	323,283
Professor Peter Currie	NHMRC Ideas Grant	Harnessing macrophage-derived cytokine signalling in skeletal muscle regeneration	999,603
	NHMRC Equipment Grant	Synergy H1M microplate reader	50,000
Dr Gonzalo del Monte-Nieto	ARC Discovery Project	Genetic, cellular and molecular analysis of cardiac septation	384,100
Associate Professor Jan Kaslin	ARC Discovery Project	Neurovascular pericytes in development and brain regeneration	332,400
	ARC Discovery Project	Shaping the vertebrate brain: defining the cellular and genetic drivers	351,544
	NHMRC Equipment Grant	Automatic quantitative locomotion and behaviour phenotyping setup for small animals	45,000
Professor Graham Lieschke	ARC Discovery Project	The macrophage nucleus – its form and function during migration in vivo	389,962
	HRC New Zealand	Uncovering the earliest events leading to tophaceous gout	25,962
Dr Tobias Merson	NHMRC Ideas Grant	Reversing age-related impairment of myelin repair – a novel therapy for MS	931,042
Dr Nadinath Nillegoda	NHMRC Investigator Grant	Counteracting age-associated neurodegenerative diseases using chaperone-based amyloid disaggregases	649,743
Professor José Polo	ARC Discovery Project	How do transcription factors control cell fate transitions?	746,430
	ARC LIEF	Tracking the single molecule dynamics of transcription factors in a living cell	289,341
	NHMRC Ideas Grant	Developing an in vitro model of a human blastocyst	890,062
	NHMRC Ideas Grant	Reprogramming human fibroblasts into induced trophoblast stem cells	889,064
	NHMRC Equipment Grant	Olympus SlideView VS200 slide scanner	350,000
Associate Professor Mirana Ramialison	Rotary Global	PhD Scholarship – Graduate study in cardiac disease at the Australian Regenerative Medicine Institute	6,817
Dr Alberto Roselló-Díez	NHMRC Ideas Grant	Identification of novel mediators of bone catch-up growth	1,055,849
Dr Avnika Ruparelia	The French Muscular Dystrophy Association (AFM Telethon)	Identification of therapies for Collagen V1-related congenital muscular dystrophy	38,303
Mr Silvio Tiziani	Department of Foreign Affairs and Trade	Showcasing Australian-Chinese biomedical innovation and commercialisation	100,000
	St Vincent's Hospital	CCRM Australia Tranche III	50,000
	CSIRO	CCRM Australia Tranche III	50,000
	Australia Chase Sun Pty Ltd	CCRM Australia	9,500
	Eureka International Group	CCRM Australia	6,000
	Griffith Hack PTM Pty Ltd	CCRM Australia	10,500
Dr Jennifer Zenker	NHMRC Ideas Grant	Shedding light onto the structural secrets inside pluripotent stem cells in real-time	562,165
	Canadian Institute for Advanced Research (CIFAR) Catalyst	Real-time effects of embryo-microbe interactions on mammalian embryo implantation	31,707

APPENDIX 5 – GRANTS

CONTINUING GRANTS

Primary chief investigator	Granting body	Description/Title	Total funding ($)
Dr Joachim Berger	The Angior Family Foundation	The role of tubulin folding in the retina affected by Leber Congenital Amaurosis	20,000
Professor James Bourne	ARC Discovery Project	From gene to duty: the emergence of the complex brain	560,876
	NHMRC Project Grant	The pulvinar is instrumental in the development of the visual cortical networks	1,207,780
	NHMRC Postgraduate Award	Peter Doherty Scholarship – William Kwan	91,050
	CSIRO	Development of a brain implant material	240,000
Professor Peter Currie	ARC Discovery Project	How does a fin become a limb? The role of somite cells	392,962
	ARC Discovery Project	Fins to limbs: Investigating the evolution of complex limb musculature	376,900
	NHMRC Fellowship	Genetic basis for skeletal muscle formation and regeneration in development and disease	883,575
	NHMRC Project Grant	The role of Myo18b in myopathies and sarcomere assembly	870,519
	NHMRC Project Grant	Defining the molecular regulation of muscle stem cell action during organ growth	746,647
	NHMRC Project Grant	Defining the molecular basis of macrophage-mediated muscle stem cell activation	496,444
	Muscular Dystrophy Australia	Correcting muscle stem cell dynamics in Duchenne Muscular Dystrophy	390,621
	MRFF	Developing novel cellular therapies and tissue engineering approaches for the treatment of muscle injury and wasting disorders using tissue resident muscle stem cells	387,506
Dr Gonzalo del Monte-Nieto	ARC Discovery Project	Endocardial sprouting and mechano-signalling in heart trabeculation	219,000
	National Heart Foundation	Heart Foundation Fellowship	361,620
	National Heart Foundation	Heart Foundation Project	160,000
Dr Alexandra Grubman	Dementia Australia Research Foundation Ltd	Characterising and inducing a protective microglia phenotype in human AD	71,928
	Yulgibar Foundation	Using reprogramming to generate late onset Alzheimer's disease microglia	180,000
Associate Professor Harald Janovjak	ARC Future Fellow	Spatio-temporal activation of genes in cells and mice	792,349
	ARC Future Research	Spatio-temporal activation of genes in cells and mice	17,882
	ARC Discovery Project	Engineered plant receptors as orthogonal neuronal switches	404,300
	NHMRC Ideas Grant	Beta-cell replication through light activation of the OPN3 receptor	472,081
	CSIRO Future Science Fellowship in Synthetic Biology	Optogenetic platforms and optical regulation of Oct4: light-controlled reprogramming	223,675
	JDRF	Postgraduate top-up scholarship – Christina Gangemi	18,000

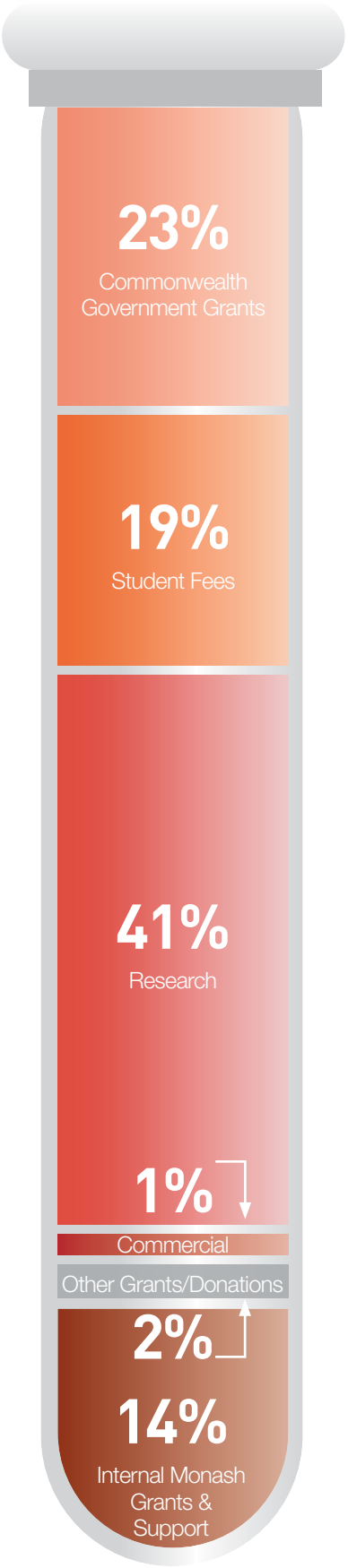
APPENDIX 5 – GRANTS

Primary chief investigator	Granting body	Description/Title	Total funding ($)
Associate Professor Jan Kaslin	Cerebral Palsy Alliance	Using zebrafish to model genetic causes of cerebral palsy	125,000
Professor Graham Lieschke	NHMRC Project Grant	Defining the molecular basis of macrophage-mediated muscle stem cell activation	496,444
	Maddie Reiwoldt's Vision	Grant-In-Aid for research in bone marrow failure – Discovering new genes that cause failure of bone marrow neutrophil production	200,000
Associate Professor Mikaël Martino	NHMRC Investigator Grant	NHMRC salary – Development of immune-centric regenerative strategies	393,564
	NHMRC Investigator Grant	NHMRC Project – Development of immune-centric regenerative strategies	238,910
	MRFF	Developing novel cellular therapies and tissue engineering approaches for the treatment of muscle injury and wasting disorders using tissue resident muscle stem cells	230,854
Dr Tobias Merson	NHMRC Project Grant	The role of neuronal activity in promoting remyelination of the brain	1,013,410
	Metals Manufactures Ltd	MS Research Fellow	600,000
Professor Andras Nagy	PanCELLA	PanCELLA	530,994
Professor José Polo	ARC Future Fellowship	Unveiling the epigenome dynamics through the pluripotency continuum	918,126
	ARC Industrial Transformation Training Centres, CI	ARC training centre for cell and tissue engineering technologies	4,929,177
	NHMRC Project Grant	Exploring and targeting the anti-inflammatory signalling mechanisms of interleukin 37	1,018,306
	NHMRC Ideas Grant	Developing an in vitro model of a human blastocyst	890,062
	NHMRC Ideas Grant	Reprogramming human fibroblasts into induced trophoblast stem cells	889,064
	Department of Health and Human Services (Victoria) Ltd	Evaluating direct and indirect effects of SARS-CoV-2 on multiple organ systems using stem cell-derived human tissues	1,000,000
	Department of Health MRFF: Coronavirus Research Response – Rapid Screening of Approved Drugs in Stem Cell Models for COVID-19 Treatment	Stem cell-derived human tissue models for the identification of drugs to treat COVID-19	610,000
	Cancer Council Victoria	Targeted reprogramming of prostate cancer	433,805

APPENDIX 5 – GRANTS

Primary chief investigator	Granting body	Description/Title	Total funding ($)
Associate Professor Mirana Ramialison	ARC Discovery Project	Formation of boundaries in the developing embryo	247,320
	NHMRC Project Grant	Regulatory networks defining stem cell populations in the adult male germline	77,600
	NHMRC Ideas Grant	Role of human non-coding DNA regulatory elements (REs) in heart development and disease	703,227
	Rotary Global	PhD Scholarship, Graduate study in cardiac disease at the Australian Regenerative Medicine Institute	81,242
Dr Alberto Roselló-Díez	Human Frontier Science Program Grant	The long and short of inter-organ communication during the regulation of organ growth and repair	423,082
Dr Ekaterina Salimova	International Society of Differentiation Inc.	ISD Editorial	13,600
Mr Silvio Tiziani	Victorian Government	DJPR Future Industries Fund	200,000
Dr Lulu Xing	NHMRC Ideas Grant	A novel discovery pipeline for regenerative therapies targeting multiple sclerosis	861,460

APPENDIX 6 – FINANCIAL SNAPSHOT



REVENUE

Revenue	2021 ($)	2020 ($)	2019 ($)	2018 ($)
Commonwealth Government Grants	$3,151,177	$2,181,736	$1,910,813	$2,602,314
Student Fees[1]	$2,730,716	$3,315,318	$1,863,120	$723,034
Research[2]	$5,765,431	$5,930,297	$6,282,141	$7,335,398
Commercial	$108,066	$314,099	$427,964	$419,690
Other Grants & Donations	$265,573	$245,734	$4,352	$14,247
Other Revenues	$24,398	$10,000	$1,262	$157
Internal Monash Grants & Support	$1,946,410	$1,981,101	$3,715,685	$2,693,991
TOTAL	$13,991,770	$13,978,285	$14,205,338	$13,788,833

1 Student programs includes Higher Degree Research (HDR), Honours, Undergraduate Research Opportunities, Masters and Masters of Biotechnology

2 Includes ARMI research groups and laboratories, communal research services, research equipment and research platforms – AquaCore and Transgenic Quail Facility

INDEX

CONTACT AND LOCATION INFORMATION

CONTACT

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LOCATION