

FORREST
RESEARCH
FOUNDATION

Annual Report 2019







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**DRS ANDREW FORREAST AND NICOLA FORREAST,
CHAIRMAN AND CO-CHAIR OF THE MINDEROO
FOUNDATION AND GOVERNORS OF THE
FORREAST RESEARCH FOUNDATION**





Charles F. Kettering, an American inventor of the electric automobile starter said, “keep on going, and chances are that you will stumble on something, perhaps when you are least expecting it. I never heard of anyone ever stumbling on something sitting down.”

A Kettering-esque approach to “generating ideas” is one of Minderoo Foundation’s core values. There are so many urgent social, economic and environmental problems to solve, and we must approach each one with fresh ideas.

Innovation is also fundamental to the Forrest Research Foundation. This unique platform brings the finest minds in their fields together, allowing collaboration and idea-sharing to occur organically.

This is how the ideas that will enable humanity to solve its greatest challenges will emerge.

2020 has been a devastating year for Australians, with two unprecedented catastrophes – the worst bushfire season on record and the COVID-19 pandemic. Both have destroyed lives and livelihoods; both will require innovations to stop them becoming the “new normal.”

Now more than ever, it is clear that humanity needs to prioritise investing in applied research – research that will prevent dangerous climate change, research that will protect our fragile ocean ecosystems, research that will improve our resilience to future diseases. We also need to support research that helps us understand the vital role of arts and culture in building stronger communities.

Research shines a light on the path forward.

The Forrest Research Foundation challenges its members to push the limits of what is possible, even if it means failing. Forrest Hall provides a unique habitat in which researchers from diverse fields live side by side, encouraging collaborations, novel approaches and re-inventions of old ideas.

This year, we are again amazed at the calibre of work by our scholars and fellows. It has spanned from constructing climate-resistant buildings, to designing sturdier hip and knee replacements, to improving salt tolerance in wheat crops and making marine ecosystems more resilient to environmental stressors. As a direct response to the COVID-19 crisis, one of our post-doctoral fellows has taken her research out of the lab and into the community. She is endeavouring to help solve the mental health challenges of social distancing and isolation.

The work our scholars and fellows undertake requires enormous self-motivation and determination. They live the value of never ever giving up.

Charles F. Kettering pushed boundaries and pioneered many breakthroughs in the engineering, science and medical worlds. Of course, he faced setbacks, but his creativity and tenacity allowed his ideas to evolve and his work to endure for generations. At Forrest Research Foundation, scholars and fellows are encouraged to take risks and recognise setbacks as a learning opportunity.

In the past, Australia has not taken full advantage of the world-class research taking place in this country. It is estimated that only 2.4 per cent of Australian businesses are sourcing ideas or information from universities. In comparison, the United States, France and Sweden rate considerably higher, and utilise the research sector to address business challenges. Stronger engagement is needed between our research sector, industry, government and wider Australia.

As you read this report, we urge you to recognise the great work of our scholars and fellows and challenge yourself to engage with their projects. They are generating the ideas and solutions we need for tomorrow.

Andrew and Nicola Forrest



**MESSAGE FROM THE CHAIR
THE HON ROBERT FRENCH AC**

The Foundation, with the enthusiastic support of Andrew and Nicola Forrest and their Minderoo Foundation is ‘leaning into the future’.

To coin an oceanic metaphor, the Forrest Research Foundation finds itself, in the first quarter of 2020, in a sea of uncertainty with the advent of the Coronavirus pandemic. It is not alone.

Universities and colleges across Australia have had to deal with a perfect storm of threats to health and safety posed by the virus, the demands that it places on established methods of course delivery and research and the social and economic impacts the pandemic has placed on staff and students and generally on national, state and global economies. Despite that the Forrest Research Foundation continues its important mission.

When we look back at 2019, which is the period covered by this Report, we see a year of growth with 24 PhD scholars and six post-doctoral fellows supported by the Foundation. The Warden, in his report, gives details of the activities of the Foundation and at Forrest Hall as well as the ongoing development of Forrest Hall 2.

I want to emphasise in this message that the reputation of Forrest Hall in the international academic community is central to its future as a crucible for the development of outstanding young scholars and researchers as judged by global standards. The different disciplines from which our scholars and fellows are drawn and their colocation at Forrest Hall, provides a mechanism for inter-disciplinary discovery which enhances excellence and advances human knowledge. Inter-disciplinary interaction is fostered in Forrest Hall where scholars occupy a common home-from-home. That home-from-home provides the physical and social framework in which they can simply meet and talk to each other about all the things that young researchers talk about, including their work. It is that special ethos which we hope will mark Forrest Hall as a place to which the best young researchers will want to come.

I recently read a history of the development of our understanding of quantum theory. In part it was a social history of the science and it illustrated the importance of the informal interactions of fine minds, young and old, in the great debate on that topic that occupied most of the 20th century.¹ That kind of interaction is made possible among early career researchers by a collegial and mutually supportive atmosphere in which established researchers and scholars appointed as Fellows play an important part. Needless to say the selection of scholars and fellows is of great importance and I express my appreciation of the considerable work of Grant Donaldson and his committee in undertaking that responsibility.

The Foundation, with the enthusiastic support of Andrew and Nicola Forrest and their Minderoo Foundation is, ‘leaning into the future’. The Foundation will continue to seek students and fellows of the highest quality despite the challenging environment in which it and Western Australian universities generally have to operate.

I thank the Warden for his work in the past year and the Members of the Board of the Foundation and its Secretary, Rochelle Gunn. I especially thank Andrew and Nicola Forrest for their strong support in ensuring that the Foundation is, and is seen to be, an island of optimism in a sea of uncertainty.

The Hon Robert French AC

1. Adam Becker, *What is Real: The Unfinished Quest for the Meaning of Quantum Physics* (John Murray Publisher, 2018).





We want to:



Eradicate hunger



Conquer disease



Live wisely



Extend human knowledge

*Through our research,
we work out how to:*



Design climate-resilient buildings

Manage the ocean's fisheries

Develop cancer therapies

Protect endangered species

Produce renewable energy

Preserve WA's biodiversity

Track the evolution of the universe

Create new chemical compounds

Improve the management of disease

Understand past societies and cultures

Tackle the mental health crisis

Use natural resources more efficiently

Expand Australia's space science capability

Analyse the workings of the brain and body

Grow more food with fewer chemicals





PROF PAUL JOHNSON
WARDEN'S REPORT

An exceptional community of early-career researchers.

In 2019, the Forrest Research Foundation passed an important milestone with the first two Forrest PhD scholars completing their theses.

The Foundation was established, in the words of its constitution, 'to create a world-leading, collaborative centre of research and scholarship by attracting outstanding doctoral students and post-doctoral fellows to Western Australian universities and developing their potential to address the world's most pressing challenges.' By the end of 2019, it was supporting 24 PhD scholars and six post-doctoral fellows, with a further nine scholars and four fellows to join early in 2020. They hail from 23 countries and every continent, and their academic prowess and intellectual curiosity has brought them to Perth, where they form an exceptional community of early career researchers. In this report we highlight the bold ambition of four of our scholars and fellows, and their desire to analyse, understand and improve our world.

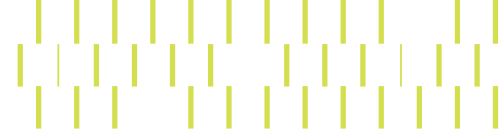
Access to this community of scholars and fellows is not easy. Competition among extremely well-qualified applicants is intense, and this year the selection committee was again faced with difficult decisions in awarding the scholarships and post-doctoral fellowships. I want to express my appreciation to all members of the selection committee for the time and care they devote to ensuring we recruit the very best Forrest Scholars and Fellows, and particularly to the Chair, Grant

Donaldson, for his exemplary stewardship of the process, and to Professor Robyn Owens, retiring Deputy Vice-Chancellor (Research) at UWA, for the outstanding academic guidance she has provided to the selection panel since its inception.

All shortlisted applicants are individually interviewed by the selection committee in Perth, unless logistics prevent them travelling. The interviews are a crucial part of the selection process, and provide applicants with an opportunity to elaborate on both their research aspirations and their broader intellectual and personal interests. They also give international candidates the chance to visit their chosen Western Australian university, see something of the City of Perth, and gain an insight into the life of Forrest Scholars and Fellows in Forrest Hall.

The academic and social activities of the Foundation have expanded greatly over the past year as the number of scholars and fellows residing in Forrest Hall apartments has grown. Fortnightly evening meetings organised by the post-doctoral fellows provide a supportive environment for scholars to try out upcoming seminar and conference presentations, and create an opportunity for visiting fellows to offer guidance on building a research career. Dr Thomas Mehner visited from Berlin to lead a very successful week-long intensive scientific writing workshop for Forrest Scholars. The Chancellor of UWA, Robert French, convened a discussion with scholars

Competition among extremely well-qualified applicants is intense, and this year the selection committee was again faced with difficult decisions in awarding the scholarships and post-doctoral fellowships.



and fellows on freedom of speech in universities, drawing on his major report on the issue presented to the Australian Government in April. Regular drop-in breakfasts were also held in the Forrest Hall lounge, where scholars and fellows have been able to meet and chat with many of the more than 40 Visiting Fellows that the Foundation hosted in 2019.

The visiting fellow program, run in collaboration with the Western Australian universities, has brought senior researchers from around the world to work with colleagues in Perth. The Foundation supports visiting fellows by providing them with accommodation in a Forrest Hall apartment for up to four weeks. The visiting fellow program is open to all disciplines, and in 2019 we welcomed fellows in creative arts, humanities and social sciences, ecology and environment, biological and life sciences, engineering, physical sciences, and health and medicine. In the latter category, we were pleased to partner with the Raine Medical Research Foundation in supporting four joint Raine/Forrest Visiting Fellows in medical research. Visiting Fellows all give public lectures and masterclasses that are open to members of all five WA universities and the broader Perth research community. This year we also welcomed our first two distinguished visiting fellows, Professor David Bloom from Harvard University, and Professor Sir Roy Anderson from Imperial College London. In addition to a large number of public lectures, keynote addresses, workshops and seminars, they each held high-level meetings with government ministers and senior public servants to advance policy development in the areas of, respectively, health economics and infectious disease epidemiology.

To further extend the reach of the Foundation's research, we held our first Forrest Hall open day, in conjunction with UWA Convocation (the graduate alumni society) on a rather damp Saturday afternoon in June. Over 200 UWA alumni and members of the local community came to meet with 10 Forrest Scholars and Fellows who presented posters about their research. We also hosted an evening meeting with new undergraduates from one of the UWA residential colleges, St George's, at which three of the postdoctoral fellows spoke about their research, and why they had chosen to pursue a research career.

Forrest Hall, as well as being a locus for intellectual enquiry and exchange (we hosted more than 80 academic seminars, workshops and conferences in 2019), is also home to the scholars and fellows, their partners and families, 80 per cent of whom come from outside Australia. There have been multiple barbeques, children's birthday parties and sundowners on the riverside terrace, and the strong sense of community creates a welcoming environment for each new cohort of scholars and fellows.

Another new cohort was created in 2019: Forrest Foundation alumni. The first two Forrest Scholars, both from the USA, completed their PhDs - in plant taxonomy and in marine ecology - and they have both chosen to carry on with post-doctoral work in Western Australia, thereby demonstrating that Forrest Foundation scholarships create a 'brain gain' for the state and the nation. They are the initial members of what will grow to become a strong and powerful network of Forrest Foundation alumni.

Finally, at the very end of 2019, contracts were signed for the construction of a second Forrest Hall building adjacent to our current home, with completion scheduled for September 2021. It will house a further nine apartments for scholars and fellows; office accommodation; 65 short-stay rooms for academic visitors, conference attendees and other university guests; and food and beverage facilities. This second building was also designed by the late Kerry Hill. In recognition of his contribution to architecture, and through his design of Forrest Hall to the growth of the Forrest Research Foundation community, Andrew and Nicola Forrest have agreed to fund an additional PhD scholarship in the area of architecture and building design. This new scholarship will be known as the Forrest - Kerry Hill Scholarship. We are again indebted to our donors, Andrew and Nicola Forrest, whose generosity has created the Forrest Research Foundation, and whose vision will drive its further development and ambition.

Professor Paul Johnson
Warden



A GLOBAL SCHOLARSHIP AND
FELLOWSHIP PROGRAM...

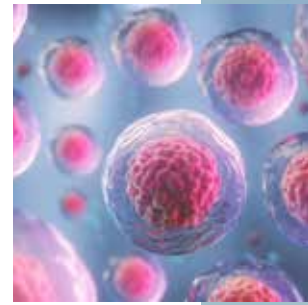
*Scholars and fellows come
from around the world*





RESEARCHER PROFILE

FORREST SCHOLAR: AKILA BALACHANDRAN



Born and bred in Trichy, an ancient city in the state of Tamil Nadu, India, Akila Balachandran wanted to be a scientist since she was a child. “Mom wanted me to be a doctor but I always knew that I wanted to do research,” she said.

Her parents, neither of whom were well-educated, worked hard to ensure their children had the best education possible. Apart from health, it was their top priority.

The bubbly 27-year-old has been in Perth for just over a year, researching brain and liver cancer treatments at Murdoch University for her PhD. She is also seeking a way to enable early diagnosis of neurological disorders.

Akila explains her research as simply as possible.

“Can protein deficiency kill people? Yes. Can this kill cancer cells as well? It’s yes again.

“Proteins are the second most abundant substance in our body. We are made up of 62 per cent water and 16 percent protein amongst many others. The same applies to individual cells,” she said.

So, what differentiates a healthy cell from a cancer cell? Akila explains the difference is the proteins that they have. Some proteins are produced in large quantities in cancer cells. These proteins help them grow faster. However, we can use such proteins in cancer cells to help detect and treat cancer.

“The proteins come from DNA. The four letters of DNA are converted to RNA, which is further converted to proteins. One of the

ways we can stop the production of proteins in cancer cells is via artificial RNA. The man-made RNA sticks to the natural RNA and affects protein production. This may result in a faulty product or, sometimes, no product at all. As a result, cancer cells become unhappy and become sick.

“I am trying to create this trick for liver and brain cancer,” Akila said. “Why these two cancers specifically? These two cancers are less common, but they are deadly. Less than 20 per cent of people who are affected by these cancers live for more than five years. I am trying to improve drugs for the treatment of these cancers.”

Simple.

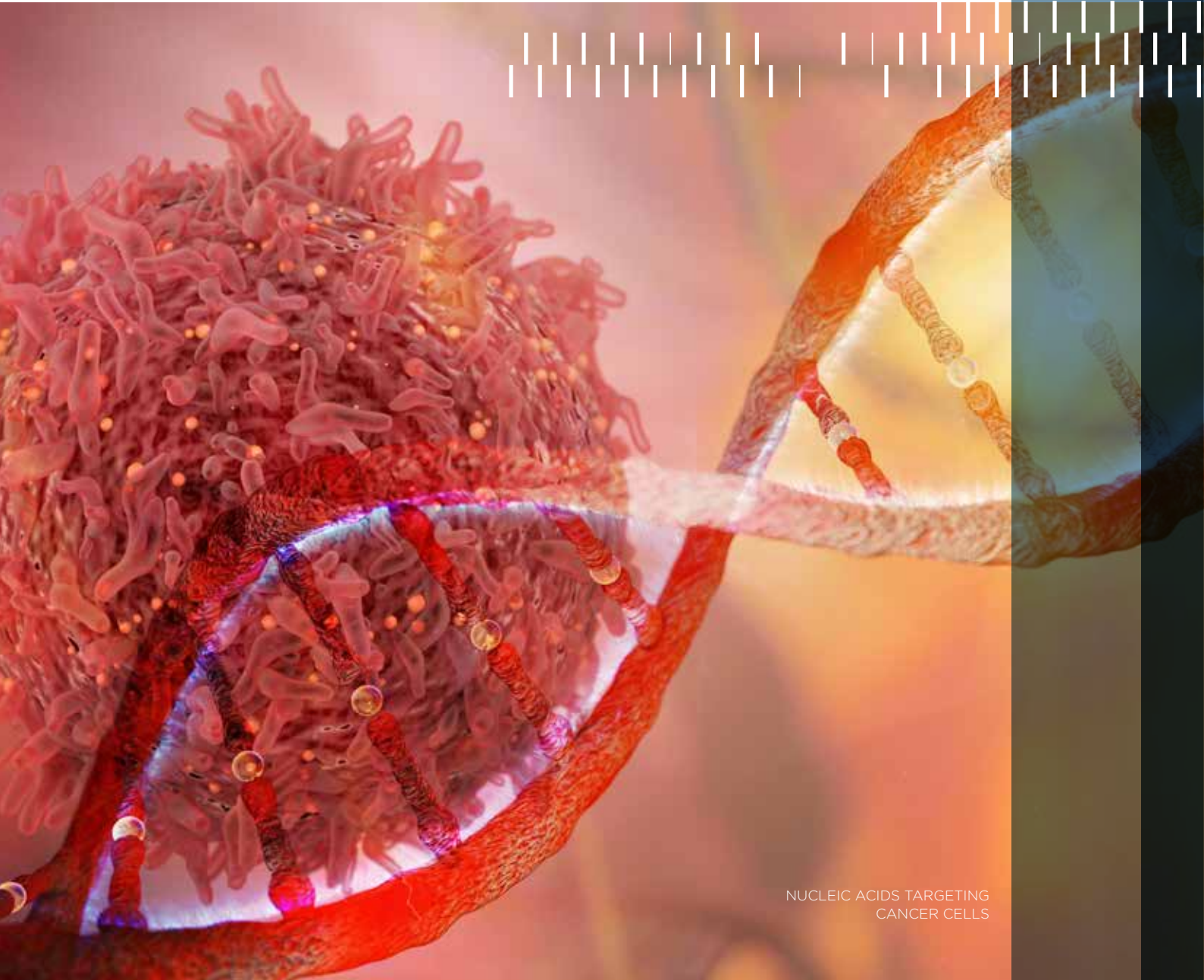
Following school, Akila completed a six-year Master of Technology, specialising in Biotechnology, at Bharathidasan University, Trichy, ranking first every semester.

“During the initial years of my undergraduate studies, I was fascinated by stem cells. I was given an opportunity to work on ovarian cancer cells for my Bachelor’s dissertation which was when I gained an interest in research into cancer,” she said.

Akila spent the next four years as a senior research fellow in Chennai, working with synthetic DNA/RNA molecules. She learnt







NUCLEIC ACIDS TARGETING
CANCER CELLS

several new techniques during this period, which laid the foundation for her PhD. Despite these positive outcomes, she felt that the lack of synthesising equipment and other resources were a barrier to her research progress. She explained, “I decided to do my PhD. My supervisor, Dr Rakesh, has a lab at Murdoch which is equipped with an oligo synthesiser. Also, my previous areas of research and Dr Rakesh’s research expertise aligned perfectly. Taking all these factors into consideration, I chose Murdoch University for my PhD.”

When asked what support she receives as a Forrest Scholar, she responds, “I receive excellent guidance and support from my supervisor for my PhD work. We have regular meetings and discussions regarding the progress of my work. He is motivating me to improve my research and analytical skills. The laboratory environment and infrastructure at Murdoch University are helping me achieve a lot in my research.”

Akila said the regular Forrest Hall meetings enable her to learn about the research focus of other scholars and fellows and get updated with the current research in all disciplines.

Forrest Research Foundation Warden Prof Paul Johnson and Program Coordinator Rochelle Gunn are always a great source of intellectual and moral support.” Akila said. “They make sure that they are there whenever I need them. Fellows and scholars at Forrest Hall are more like a family to me. They are a great source of emotional support. Every time I see kids around Forrest Hall, I forget all of my worries.”

There are currently eight children living at Forrest Hall, ranging in age from a newborn to five years. Akila talks of the large network of people who surround her and of never having felt isolated since arriving in Perth.

“This is the first time I am out of my country,” she said. “I have absolutely no clue how well I might have adjusted to the accommodation and people, if I were to stay somewhere else. The idea of accommodating scholars and fellows together in a place like Forrest Hall is mind-blowing and it helped me a lot during my first few days in Perth.”

She describes herself as a simple, happy person who loves nature. When she’s not working on her research, she gets outside as much as she can. “I love to take long walks and bike rides. I enjoy gardening and growing roses. Perth is green everywhere and it is so beautiful and far less populated than India.”

She returned to India briefly last November to celebrate the Diwali festival with her family and friends and to get a much-needed dose of her Mum’s cooking. She said, “My parents and my brother are my world of happiness. I am blessed to have them in my life. I inherited my self-confidence and perseverance from my Mom and Dad.”

What does the future hold for Akila? “I hope that my journey in research continues to contribute to understanding and treating cancer.”

It’s a hope we at the foundation share.

One of the ways we can stop the production of proteins in cancer cells is via artificial RNA.

RESEARCHER PROFILE

FORREST FELLOW: DR JULIE JI



MENTAL IMAGERY AND DEPRESSION

“Imagination is more important than knowledge. For knowledge is limited to all we now know and understand, while imagination embraces the entire world, and all there ever will be to know and understand.” ALBERT EINSTEIN

What is focus of your research?

I investigate the role mental imagery plays in accentuating or mitigating depression, anxiety and self-harm. Experienced as mental pictures and ‘movie clips’, imagery is the internal experience of perception in the absence of external sensory input, commonly referred to as ‘seeing with the mind’s eye’.

I am fascinated by imagery simulations of future events because it is a uniquely human capacity that allows us to pre-experience hypothetical futures. By *depicting* (rather than *describing*) what future experiences might *look, sound* and *feel* like, we can experience emotional and motivational responses to our mental simulation in an *as-if-real manner*, which serves to guide our behaviour in the present.

As an inaugural Forrest Postdoctoral Fellow at the Centre for the Advancement of Research on Emotion (CARE), led by ARC Laureate Professor Colin MacLeod, within the UWA School of Psychological Science, my current work extends previous experimental research on mental imagery from understanding its impact on *emotion* to further downstream effects on *motivation, judgment* and *behaviour*.

My experimental work during the fellowship thus far has focussed on why individuals in depressive states are less motivated to pursue potentially rewarding experiences, and how to change this. To drive this research, I lead a team of research students (one PhD and six honours students since 2018).

We have found that when it comes to motivating yourself to do more of the rewarding things in daily life, simply convincing yourself of all the logical reasons and benefits of doing so is not as effective as simulating the experience of doing so using mental imagery. This is particularly true for activities that have been put off, and this motivational benefit of mental imagery works irrespective of your level of depression. On the other hand, people with depression tend first to imagine the high effort or cost, rather than the benefits, of undertaking rewarding activities, and the negative evaluation of these costs means that they do not move on to imagining the benefits. This results in them not engaging in the very activities that would deliver positive mental health outcomes.







DR JULIE JI AND DR LIES NOTEBAERT FROM THE UWA SCHOOL OF PSYCHOLOGICAL SCIENCE GAVE TALKS AT THE RAISING THE BAR PERTH EVENT IN OCTOBER 2019, WITH DEPUTY VICE-CHANCELLOR (RESEARCH) PROF. ROBYN OWENS AS MC.

DR JULIE JI LED THE INAUGURAL PERTH IMAGERY & MENTAL HEALTH SYMPOSIUM (PIMHS), HELD AT FORREST HALL, IN FEBRUARY 2020. THE SYMPOSIUM BROUGHT TOGETHER LEADING MENTAL IMAGERY CLINICAL RESEARCHERS FROM UWA, CURTIN UNIVERSITY, AND UPPSALA UNIVERSITY, SWEDEN, AND LED TO THE SUBMISSION OF A JOINT GRANT APPLICATION TO THE RAINE MEDICAL FOUNDATION, LED BY DR JI.



My postdoctoral research builds on discoveries I made during my doctoral research as a Cambridge Australian Poynton Scholar at the University of Cambridge, UK (PhD awarded May 2018). Working with my supervisor Prof Emily Holmes, my work produced the first evidence of depression-linked deficits in imagining positive future events during mind-wandering. Prior to taking up my Forrest Fellowship, I worked with Prof Bethany Teachman as a postdoctoral research associate at the School of Psychology, University of Virginia, USA, where we tested ways in which mental imagery can enhance scalable web-based interventions that modify the way people suffering from anxiety think about the future.

Why is it important?

My work on mental imagery is important because anomalies in the occurrence of emotion-laden mental imagery has significance for emotion, motivation, and behavioural dysfunction across mental disorders. While my work has a central focus on depression, the leading contributor to the global burden of disease, findings from my experimental work carry implications for all aspects of human behaviour that involves self-regulatory dysfunction, from food and substance abuse to self-injurious behaviour in young people.

Ultimately, understanding how mental imagery-based anticipation of the future influences how we feel and act can lead to novel insights on when and how it can be leveraged to promote adaptive behaviours and reduce harmful behaviours.

Why do this in WA?

Perth is fast becoming a research hub leading the world in basic and applied psychological science research on mental imagery and mental health. Together with colleagues at UWA Psychology and Psychiatry, Curtin School of Psychology, and the Centre for Clinical Interventions (CCI), I hosted the inaugural Perth Imagery and Mental Health Symposium (PIMHS) in February this year.

This event helped to consolidate and strengthen my collaborations with leading mental health researchers in Perth, resulting in a grant application I led that helped to establish a powerful new partnership between UWA, Curtin, Telethon Kids Institute, and Uppsala University, connected to vital community partners and end-users through 'Embrace @ Telethon Kids'. Together, we are powerfully positioned to drive and harness psychological science research to improve mental health on a global scale in the coming years.

What is the potential impact of your research?

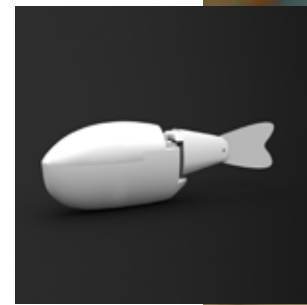
Ultimately, my research aims to inform the development of innovative cognitive 'tools' that can enhance treatment of mental health conditions. My research is designed to solve specific problems in treatment, and has direct implications for behavioural treatments for depression, as well as risk monitoring and prevention of self-injurious behaviours. I am working with collaborators at the UWA Robin Winkler Clinic and the Centre for Clinical Interventions to ensure insights gained in my lab can be translated and tested in the clinic.

While my work has a central focus on depression, the leading contributor to the global burden of disease, findings from my experimental work carry implications for all aspects of human behaviour...

RESEARCHER PROFILE

FORREST FELLOW: DR GIOVANNI POLVERINO

MODEL OF
ROBOTIC FISH



ROBOTS VERSUS PESTS

A new frontier in man's attempt to control the natural environment through a novel and transdisciplinary approach.

Dr Giovanni Polverino is a behavioural ecologist interested in how animals cope with environmental changes. He works with engineers to develop bioinspired robots (robots that look and behave like the animals they are mimicking) which can be used to mitigate the impact of invasive species on our native fauna.

Giovanni has undertaken pioneering research with colleagues in the Engineering Faculty at New York University (USA) in which they used state-of-the-art technology to study animal behaviour. Giovanni designed the biological components of bioinspired robots to mimic specific characteristics of fish, enter their social groups, and interact with live fish in real time, offering a precise, customisable, and consistent approach to study animal behaviour from a novel perspective.

What is the focus of your research?

My current research takes advantage of the unparalleled control offered by bioinspired robotics to manipulate the behaviour of the invasive mosquitofish (*Gambusia holbrooki*) and mitigate the ecological impact of this invasive threat to Australian freshwaters. My results show that bioinspired robotic predators can be designed to repel and compromise the health of invasive mosquitofish, and simultaneously attract non-invasive fish. I found that the threat of predation by a robot fish affects much more

than just the behaviour of mosquitofish. A 15-minute-per-week exposure to the robotic predator provokes meaningful stress responses in mosquitofish, triggering physiological changes associated with substantial energy loss, and potentially compromising their ability to survive in the long term. My research indicates that the robotic predator discriminates mosquitofish from Australian tadpoles in real time, with targeted attacks toward mosquitofish that lower the fertility of both sexes. Whether lower fertility results in lower reproductive rates remains unknown. But a large body of literature – including my own studies – suggests that altering fish behaviour has repercussions for their physiology, growth, fertility, and reproduction.

Why it is important?

Invasive species threaten the biodiversity of our planet, especially in freshwater habitats where native species are confined to smaller water bodies and their ability to disperse is limited compared to other ecosystems. It is therefore imperative to achieve a better understanding of factors that can help combat freshwater invaders and develop new strategies to eradicate them. The invasive mosquitofish is a major threat to Australian freshwater fish and amphibians; its impact on biodiversity worldwide has been recognised







by the International Union for Conservation of Nature, which lists mosquitofish as among the world's top one hundred worst invasive species. To date, efforts to eradicate mosquitofish from freshwaters and mitigate their impact on native fauna have been labour-intensive, typically dangerous for native fish, and ineffective. Ironically, mosquitofish acquired their name because humans introduced them into wetland areas around the world early in the 20th century to counter the spread of mosquitos and malaria. They were consciously introduced as a predator in Australia in 1925, but they have predated on native fish rather than insects, and so have become a greater problem than the one they were intended to address. Mosquitofish in Australia are an example of a 20th century attempt at biocontrol of pests that has spectacularly failed. My research pioneers novel pathways for the technological evolution of pest control agents, creating a 21st century version of biocontrol using bioinspired robots that selectively target invasive mosquitofish. Robots are inherently safer to use than live agents, since robots can be finely controlled and can't breed. This represents a new frontier in man's attempt to control the natural environment through a novel and transdisciplinary approach.

Why do this in WA?

Australia's unique richness in endemic species compared to other continents makes it the best possible location for me to study animal invasions and inform management plans on how to safeguard endangered ecosystems. Freshwater bodies in Western Australia are widely colonised by the invasive mosquitofish, and its negative impacts on native fish and amphibians are well known. In this unfortunate, yet perfect, scenario for my research, the Forrest Fellowship offered me a unique opportunity to join the Centre for Evolutionary Biology at UWA, one of the globally recognised leaders of scientific research in the fields of behavioural ecology and evolutionary biology. Here I joined the EVOLab led by Prof. Jon Evans, a leading expert in the study of behaviour and reproduction of freshwater fish.

What is the potential impact of your research?

The overarching innovation of my research is to demonstrate that bioinspired robotic predators can selectively alter mosquitofish behaviour, survival, and reproduction in the lab, and to translate this knowledge into the natural environment. A key aim of Australia's Biodiversity Conservation Strategy (2010–30) is to reduce the impact of invasive species on threatened native species and ecosystems by at least 10 per cent. Understanding the ecological and evolutionary vulnerabilities of invasive species will be a crucial first step in developing effective biosecurity and management strategies to achieve this aim. My research is also pioneering novel pathways for the technological evolution of pest control agents, developing a world-first robotic toolkit to control invasive fish and protect the native biodiversity of Australia.

Understanding the ecological and evolutionary vulnerabilities of invasive species will be a crucial first step in developing effective biosecurity and management strategies to achieve this aim.

RESEARCHER PROFILE

FORREST SCHOLAR: SARAH LEESON

SARAH LEESON
COLLECTING SPECIMENS



During her honours year at UWA, Sarah Leeson cycled along Mounts Bay Road almost every day, watching Forrest Hall being constructed. Fast-forward four years, she now calls it home – a home which she shares with her partner, Sam, and rescue cat, Elise.

Sarah's PhD focusses on the genetics of dung beetles brought to Australia around 50 years ago to combat the problematic build-up of cattle dung. While 43 species were introduced, only 23 have established, and many have failed to fulfil their predicted distribution.

Specifically, her interest is in the role that genetic variation has played in determining the outcome of these introductions, and how genetic variation is utilised in local adaptation across climatic gradients.

"I am also interested in the potential benefits of using multiple source populations for species introductions, so I will look for evidence of 'adaptive introgression', which is the mixing of genes from different source populations in novel, beneficial combinations", she said.

Understanding the genetic factors that influence the outcome of species introductions is important for improving the success of future dung beetle introductions and species translocations undertaken for conservation purposes.

Growing up in Allanson, a small town just outside Collie in the South West of Western Australia, Sarah spent most of her free time

outside and it is there she quickly developed a love of animals and the environment.

"Funnily enough, I spent a lot of time wandering around in our paddocks, trying to avoid stepping in cow dung. Little did I know what my future would hold," she laughed.

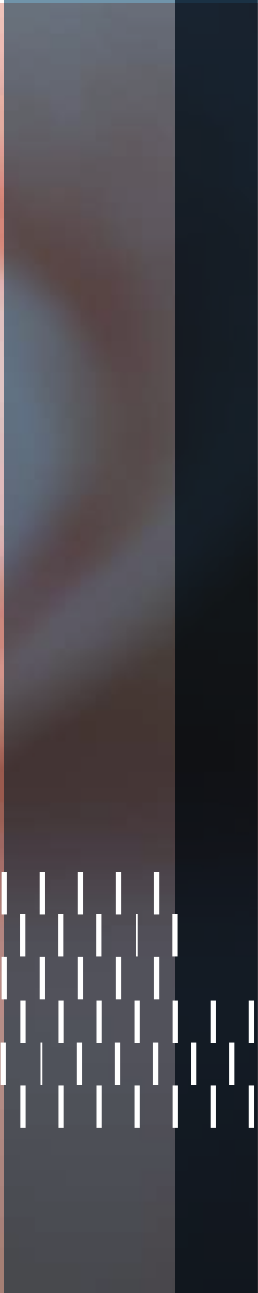
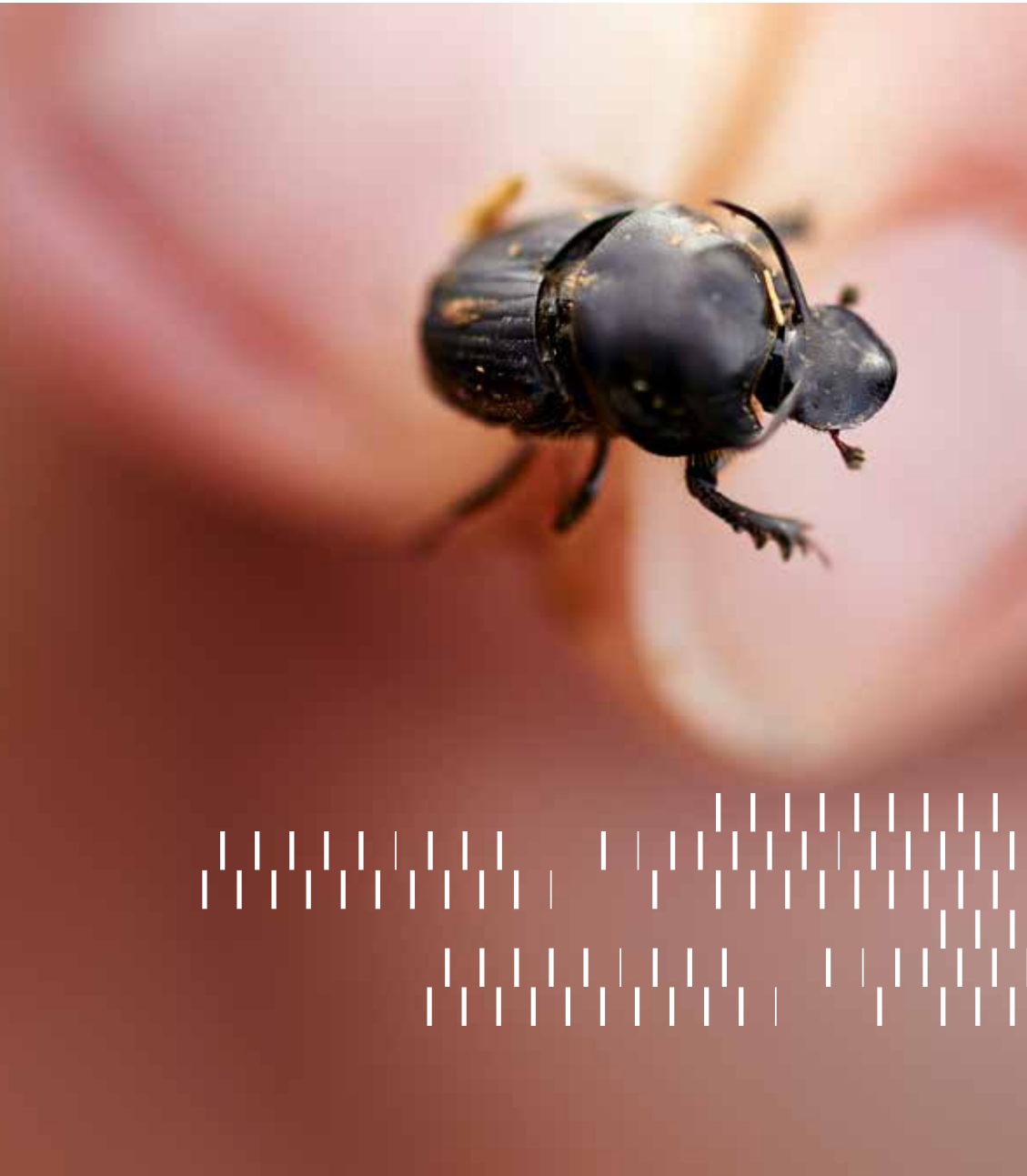
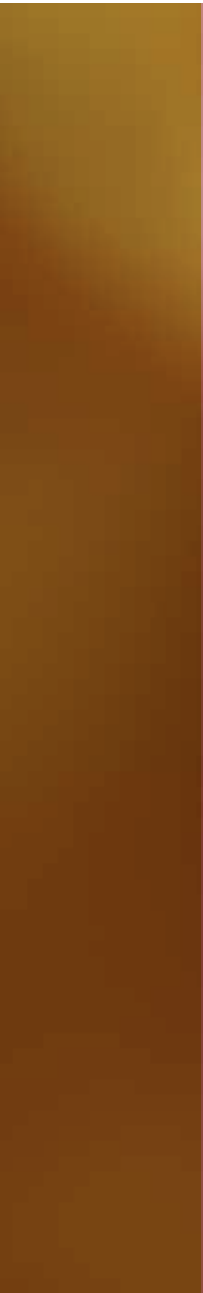
Her Dad still lives in Collie, and when she goes back, they wander around the paddocks together looking for fresh cow dung for collecting beetles.

Reflecting on her past, Sarah says she had many dreams and career aspirations throughout her childhood.

"At around three years of age, in a moment of intense environmentalism, I told my Mum that when I grew up, I wanted to be a 'rubbish picker-upper'. She was very supportive but pointed out some problems with that idea! Later, I wanted to be an inventor, then a mechanic, then an actor, then a guide dog trainer and, finally, in my late teens, I read a book called *The Selfish Gene* by Richard Dawkins. I was completely fascinated by the ideas presented in the book and started seeing the actions of genes everywhere. From then on, I decided I wanted to be a scientist. However, I still pick up rubbish whenever I can."







A common theme amongst Forrest Scholars is the potential for collaborations which can occur by bringing together some of the brightest young minds in the world. She says she is driven by practising good science, finding answers, contributing knowledge and practical results, as well as being around bright, motivated people.

Acknowledging the assistance afforded to her as a Forrest Scholar, Sarah says she receives a huge amount of research support from her supervisors and the other academics in her research group (The Centre for Evolutionary Biology).

Financially, she receives support from the Forrest Research Foundation and the Research Training Program Scholarship through UWA. Her project is funded by a government grant, with additional funding from UWA and the Forrest Research Foundation.

“On a day-to-day basis, I receive a lot of support from the postgraduate community at UWA. A PhD can be a rollercoaster of highs and lows, and no-one understands that quite like your peers. I have benefitted immensely from both idle chit-chat and deeper conversations with my office mates. They are some of the best friends I’ve ever had.

“Last but not least, I have made some lifelong friends within the Forrest Hall community. It is truly unique to live in an apartment building where everyone is friends and everyone is working in research. In both work and personal life, I have the support of my neighbours, and this is something that I value immensely.”

Sarah completed her undergraduate degree in Zoology at UWA. This is very much aligned with her love of animals and her strong environmental conscience.

“I have a gorgeous adopted cat from Cat Haven and a flourishing worm farm on my balcony, with a resident spider who diligently contains the vinegar fly populations. I’m environmentally motivated, and I spend a lot of time working out ways to reduce food waste and upcycle items that would otherwise be thrown away. This leads to a range of projects, which have varying degrees of success and smelliness, but my intentions are good!”

I receive a lot of support from the postgraduate community at UWA. A PhD can be a rollercoaster of highs and lows, and no-one understands that quite like your peers.

She says while she’s a country person at heart, she recognises Perth as a ‘lovely city’ and a good place to be if you’re a university student. “UWA, in particular, has a beautiful campus, dedicated teaching and research staff and a great postgraduate community.”

She’s also acutely aware of the advantages that come with growing up in Western Australia.

“As a biologist, I could talk for hours about the natural beauty of Western Australia and the biological research opportunities on offer. The marine and terrestrial environments are both equally stunning and hugely variable from north to south. Western Australia is my favourite place in the world.”

Sarah hopes the future will see her working with animals and working in research.

“I would like to continue focussing on combining population genetics with practical research, which is applicable across disciplines. While I would welcome the opportunity to work abroad, I will always be most at home in Western Australia, and I feel sure I will find my way back here eventually”, she said.

When asked where she’d be without this scholarship, Sarah quips, “In a less fancy apartment, with fewer friends, less support and no cat. I would be fine, and I would continue my research, but I would have missed out on a wonderful opportunity.”

Selecting our scholars and fellows

The Foundation supports early-stage researchers who think differently, who forge new pathways, who are prepared to take risks.

We offer up to 12 PhD scholarships and up to four post-doctoral fellowships each year to outstanding candidates who wish to undertake ground-breaking research in Western Australia. Research can be in any subject area and the awards are open to candidates of all nationalities. The principal criteria for selection are academic excellence, intellectual curiosity, and personal determination and resilience.

Candidates for PhD scholarships will typically have been in the top five per cent of their graduating cohort and will have a first-class degree or equivalent, for example, a grade point average (GPA) of at least 3.8/4.0. The average GPA of current PhD scholars is 3.96/4.00. Candidates will have an innovative research proposal that they have developed and discussed with their prospective PhD supervisor, and a demonstrable passion for their chosen field of study. The PhD scholarships are for a maximum of four years.

Candidates for post-doctoral fellowships will have completed an outstanding PhD which has demonstrated an intellectual contribution to their discipline through high-quality publications. Their research track record will typically include examples of national and international recognition, such as presentations at major conferences, invited research visits to other institutions or laboratories, and significant national and international research linkages and collaborations. The post-doctoral research project will be designed to challenge convention and develop novel and rigorous research ideas which may establish new paradigms within or across disciplines. The post-doctoral fellowships are for three years and are non-renewable.

In addition to academic excellence, successful scholarship and fellowship candidates will be intellectually curious, with a deep commitment to their chosen field of endeavour and an ability to see how this fits into a larger vision for the future of humanity. They will be able to communicate their ideas and knowledge in ways that are appropriate to their audience – in technical language with their peers, and in



accessible ways with the general public. They will be collegial in their approach to research, willing to share ideas with others from within their discipline and from outside, and they will demonstrate a level of personal resilience necessary for success in a challenging and competitive research environment. They are the research leaders of the future.

Applications are reviewed by a selection committee comprised of senior academic members of Western Australian universities, together with some leading representatives of the business and broader Western Australian community. The selection committee invites each university to produce a 'long-list' of its preferred candidates, but makes its own determination of which candidates to short-list for interview. To inform its decision making, the selection committee seeks academic evaluations from both nominated referees and independent experts.

All short-listed candidates are interviewed by the selection committee, usually in person in Perth, and otherwise by video-conference.

“We are thrilled with the calibre of the scholars and fellows that will be joining the Forrest Research Foundation in 2020. These exceptional minds will join our state’s thriving scientific research community, to tackle some of the world’s most pressing problems.

We look forward to following their progress over the next few years.”

**DRS ANDREW FORREST AND NICOLA FORREST,
CHAIRMAN AND CO-CHAIR OF THE
MINDEROO FOUNDATION AND GOVERNORS
OF THE FORREST RESEARCH FOUNDATION**



L-R: SAMALKA WIJEWEERA,
KRISTINA HEIDRICH, MARIE WINDSTEIN,
CELINA BURKHOLZ, HARRISON CADDY,
DAWID MAKOSA, JESSICA MURRAY,
AMIE SHUTTLEWORTH, MINGXIN YE

Our PhD scholarships

Number of scholars

31



30% MALE
70% FEMALE

Distribution across universities:

74% UWA
16% CURTIN
7% MURDOCH
3% ECU



Number of scholarship applications in 2019

129

48% MALE
52% FEMALE



SUCCESS RATE

6.9%



FIELDS OF RESEARCH



Archaeology
Biodiversity
Bio-engineering
Biological science
Chemistry
Design
Ecology
Economics
Engineering
Epigenetics
Mathematics
Medical science
Neuroscience
Physics
Physiology
Plant science
Public health


SUBJECT AREA OF APPLICATIONS




32% Biological science and ecology
20% Social sciences and humanities
20% Engineering and technology
15% Medical and life sciences
12% Natural sciences

Our postdoctoral fellowships

Number of fellows **10**
70% MALE
30% FEMALE



Distribution across universities:
70% UWA
20% CURTIN
10% MURDOCH




FIELDS OF RESEARCH

Radio-astronomy
Bioinformatics
Chemistry
Evolutionary biology
Marine physics
Materials science
Medical science
Physical chemistry
Psychology
Space science



Number of fellowship applications in 2019
177
66% MALE
33% FEMALE



SUCCESS RATE
2.3%



SUBJECT AREA OF APPLICATIONS

32% Social sciences and humanities
23% Biological science and ecology
23% Engineering and technology
14% Medical and life sciences
9% Natural sciences



2020 Scholars



**AMIE
SHUTTLEWORTH**



**CELINA
BURKHOLZ**

In late 2019, nine students from around the world were awarded Forrest Scholarships to study at Curtin University, Murdoch University and The University of Western Australia. The students come from a broad range of academic backgrounds and will research everything from kelp forest restoration and resilience to understanding how the retinal cardiovascular system responds to extra-terrestrial environments.

(FORREST - KERRY HILL SCHOLAR)

Amie's PhD addresses the need for climate-resilient buildings due to the high exposure of much of the built environment to the physical risks of climate change. Until recently, there has been little research in this area, as the focus has been to understand how the built environment can mitigate its contribution to anthropogenic climate change. This research aims to address these gaps, to understand the challenges surrounding climate change risk and resilience for those who invest in, own, design, develop and operate buildings. In addition, due to the lack of methods and metrics available for measuring climate resilience at a building level, Amie would like to develop an adaptation and resilience framework which could be included within the National Construction Code of Australia, which is due to be updated in 2022.

"I am passionate about sustainable engineering, and grateful to have the opportunity to spend the time to help understand such an important issue that will impact all of us who live, work and study in an urban environment that will be put under stress due to a changing climate."

Celina's PhD project will assess the adaptive capacity of kelp forests in a changing climate. Kelp forests are among the most productive ecosystems in the world while providing numerous ecosystem services. Yet, these valuable habitats are declining due to climate change and other anthropogenic influences. As a result, we can see a decrease in kelp performance and eventually an ecosystem collapse leading to a shift from kelp forests to communities dominated by turf algae. However, different kelp populations show varying responses to climatic stress. Identifying these differences will be crucial in predicting possible future scenarios and improving restoration efforts. The aim of this project is therefore to identify thresholds and feedback mechanisms resulting in the loss of kelp forests, and to provide novel solutions to promote kelp forest restoration and resilience.

"My research will contribute to our understanding of kelp forests and the effects of climate change, in order to improve conservation and restoration efforts in a changing environment."



**DAWID
MAKOSA**

Dawid is a molecular biologist from Poland mainly interested in the biology of aging and single cell brain epigenomics. In his PhD research project, he will investigate how a crucial layer of the epigenome, termed DNA methylation, changes in the brain as we age.

Recent research has discovered that DNA methylation, which acts as tiny molecular signposts added to our DNA that can control how the underlying genetic information is used, is impaired in the brain during aging, and this is tightly linked to cognitive decline. During his PhD, Dawid aims to utilise diverse cutting-edge genomic techniques and technologies to investigate these epigenetic changes and their role in the process of aging. His research will be particularly useful in developing new therapies to improve the quality of life of the elderly, reducing health and aged-care costs and alleviating pressures on the health industry.

"In my PhD project, I aim to identify the epigenomic patterns and processes crucial for maintaining cognitive functions. I hope that these insights will contribute to the development of novel (epi)genomic therapies improving the quality of life of the elderly and consequently reduce health-care and aged-care costs."



**HARRISON
CADDY**

Harrison is a biomedical engineer with an interest in understanding how the cardiovascular system responds to extreme environments, including conditions of reduced gravity and elevated heat stress. His PhD will involve developing three-dimensional fluid mechanics simulations of human and animal micro-blood-vessel networks to aid planning for future planetary missions to the moon and Mars, as well as improve health screening methods for terrestrial workers such as those in military training and operations, and remote environments.

"I believe research in one of the most isolated cities in the world can have global implications and can differentiate Western Australia by extending our capability in understanding physiological effects that extend to the extremes of Earth and beyond."



**JESSICA
MURRAY**

Jessica is excited to explore tumour cell spreading in melanoma at Curtin Health Innovation Research Institute. The aggressive malignant nature of melanoma is what contributes to this being a major cause of skin-cancer-associated deaths. As a PhD student in the Melanoma and Molecular Immunology Laboratory, Jessica will be investigating a less well-understood form of cancer spread, termed extravascular migratory metastasis (EVMM). EVMM has been identified to occur in melanoma, however also in other cancers associated with poor prognosis. These include glioma, pancreatic cancer and ovarian cancer. More specifically, these studies will focus on the biomolecular interactions that occur during EVMM. Findings from this research may provide an avenue for future development of effective anti-cancer therapeutics for a range of cancers with poor prognosis.

"It is a privilege to be researching melanoma as part of Western Australia's vibrant research community, to collaboratively strive toward delivering recovery for cancer patients."

2020 Scholars



**KRISTINA
HEIDRICH**



**MARIE
WINDSTEIN**



**MINGXIN
YE**

A vital component of improving fisheries management is to fill the data and transparency gap for a better understanding of the full scope of global fisheries for large pelagic species beyond national jurisdiction. This is necessary to find patterns of unreported fishing and to determine the extent of modern slavery and other unethical and illegal cost-cutting actions in fisheries. Kristina's PhD project focusses on the reconstruction and analyses of catches and fishing efforts of the global large pelagic fisheries from 1950 to today, to make the best and most comprehensive data and analyses available, thus empowering effective management and policy decisions.

"My dream is to make a meaningful difference in the lives of all those who rely on our oceans as well as help conserve the most valuable ecosystems on our planet."

Marie has an academic background in marine ecology and geospatial analysis. Her research interests lie primarily in bridging animal behaviour and landscape ecology through the study of movement and space use. Within this scope, she is particularly interested in studying marine predators. During her PhD, she will be investigating how variations in the environmental and biological conditions of coastal habitats influence the distribution, growth and health of juvenile sharks and rays in the coastal nurseries of the Kimberley Marine Parks.

Elasmobranchs play a critical role in maintaining balanced and healthy marine ecosystems. Despite their intrinsic value, they face higher risk of extinction than most other groups. In coastal areas, sharks and rays are threatened by habitat loss and overexploitation. Understanding the ecological factors sustaining healthy populations of juvenile sharks and rays is therefore critical to the long-term management and successful conservation of elasmobranchs.

"The Kimberley region is one of the last pristine coastal areas in the world. This research project is an exciting and rare opportunity to study undisturbed marine ecosystems and contribute to our understanding of the natural world."

Obesity remains a problem in Australia, now ranked third among the English-speaking countries. Mingxin learnt that the Indigenous Australians suffer most from obesity, along with the wider Australian population, particularly women and the middle-aged. They are also the most at risk for arthroplasty replacement.

Although alumina ceramic hip joints have been used for more than 30 years with low wear rates, there is still risk of ceramic fracture due to stripe wear resulting in osteolysis and aseptic loosening caused by high contact stresses as a result of direct edge loading. Thus, improving the reliability of ceramics to bio-applications is Mingxin's current research proposal.

Mingxin's wanted to challenge the current bioceramic designs and find out if nanostructured zirconia bioceramics can ease the patients' unnecessary discomfort and minimise risks. Mingxin's fervent hope is that this germ of a study may develop into something bigger and more important.

"Here, I found my home away from home, my research niche. As William Wordsworth puts it: 'The essential passions of the human heart find a better soul in this humble and rustic life.'"



**SAMALKA
WIJEWEERA**

Samalka is interested in plant breeding for improved quality characteristics to overcome novel agricultural threats and to meet the current food requirement worldwide. Soil salinity is a major agricultural issue that affects crop production around the globe.

Growth of plants in saline soils results in physiological stress, which disrupts the essential biochemical processes of respiration, photosynthesis and transpiration, and causes severe loss of crop yield. Understanding the molecular responses of plants exposed to salinity stress can inform future strategies to reduce agricultural losses due to salinity. Samalka is working on discovering common genetic and metabolic salt-tolerance mechanisms in mitochondrial and chloroplast function in wheat.

"I hope this project would light up the direction for much other research on producing stress-tolerant plants that could compete against global climate change and successfully provide enough food for all humans worldwide. Thus, it would support my aim to wipe out hunger from this beautiful planet."



2020 Fellows



**DAVID
GOZZARD**



**HOUDA
ENNACERI**

Four international postdoctoral researchers were awarded 2020 Forrest Research Foundation Fellowships to commence their research in the fields of childhood health, astrophysics, biofuels and sustainable energy solutions in Western Australia.

David's research will develop technologies to stabilise the transmission of laser signals to spacecraft through the shimmering atmosphere. Laser links between the ground and spacecraft will enable much higher-precision scientific measurements and faster data transmission rates, while using smaller and lighter transmitters and receivers. Stable and precise transmission of laser signals from ground to space will revolutionise many areas now critical to human society, from fundamental and applied sciences, such as physics and Earth science, to those with immediate social and economic benefits, such as meteorology, satellite navigation, and communications.

"I am honoured to be awarded a Forrest Fellowship and am grateful to have the opportunity and support to work on space technology in Australia. The development of Australia's space capability will be fundamental to our social and economic prosperity in the 21st century. I am excited to join the Forrest Foundation community and look forward to building collaborations that will cultivate discovery and applications of knowledge to improve prosperity in Australia and around the world."

Houda's research focusses on microalgal downstream processing, capitalising on innovative and low-cost technologies for microalgal biofuel production. Houda will focus her research on the advancement of dewatering processes at the Murdoch University Algae Research and Development Centre, and on the integration of heterogeneous acid catalysts in the biodiesel production process. This work aims to exploit the untapped potential of microalgal biofuel production and will contribute to the development of a sustainable microalgal industry.

"I am honoured to be awarded a Forrest Fellowship, which offers me a unique opportunity to join the world-renowned scientific group at Murdoch University. As a Forrest Fellow, I will work on multi-disciplinary research, focussing on new technologies and processes for biodiesel production combining biological and chemical catalytic processes. The Forrest Fellowship allows me to pursue my career objective to make a positive difference in the world, and to obtain pioneering results that will positively influence future energy scenarios."



**JESSICA
BUCK**



**PETER
KRAUS**

Jessica is a scientist who works with the brain tumour research team, led by Dr Raelene Endersby and Dr Nick Gottardo, to help find more effective and less damaging treatments for children's brain tumours. Her work involves testing new drugs in combination with chemotherapy and radiotherapy to both increase survival and reduce side effects from radiotherapy by reducing the dose delivered. In particular, she works with a type of children's brain tumour called medulloblastoma. She also has expertise in using MRI imaging to study brain tumours.

"Brain tumours kill more Australian children than any other disease. Consequently, there is a huge need to develop new therapies to help treat these devastating diseases."

Peter's research focusses on calculating electrical conductivity of novel materials in real-world scenarios. While such properties can be measured experimentally, the ability to screen candidate materials accurately and quickly without costly synthesis is crucial for the development of novel compounds for batteries, solar cells, or semiconductors.

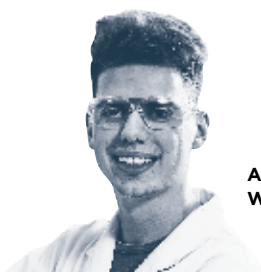
Peter will join the team of Prof Julian Gale at Curtin University, who is an expert in the simulation of complex interfaces and development of accurate and affordable computational methods for biomineralisation and crystallisation.

The goal of the project is to produce a 'cookbook' of computational methods for predicting electrical conductivity of materials under operating, real-world conditions, incorporating the effects of the environment.

Peter completed his PhD at Imperial College London with Prof Peter Lindstedt, studying catalytic combustion, after which he moved to the University of Hannover working in computational chemistry, and later to the Fritz Haber Institute in Berlin focussing on catalysis.

"I am genuinely thankful for the opportunity to join Curtin University as a Forrest Fellow. It is a great way to establish personal connections with the world-class researchers at WA's universities, including the wonderful team at Forrest Hall. I especially value the rare freedom of being able to explore and focus on my own research ideas without external pressures."

Current scholars



**ADAM
WDOWIAK**

Poland
The University of Western Australia
Research field: Chemistry
Commenced in 2019



**AKILA
BALACHANDRAN**

India
Murdoch University
Research field: Cancer therapies
Commenced in 2019



ANA MOTTA

Argentina
The University of Western Australia
Research field: History and
archaeology
Commenced in 2017



**ASJA
KROEGER**

Germany
The University of Western Australia
Research field: Computational
chemistry
Commenced in 2018



**BHEDITA
SEEWOO**

Mauritius
The University of Western Australia
Research field: Neuroscience
Commenced in 2017



**CLAIRE
DOLL**

Canada
The University of Western Australia
Research field: Agricultural economics
Commenced in 2019



**EMILY
HOFFMANN**

Australia
The University of Western Australia
Research field: Biological science
Commenced in 2017



**DULCE VARGAS
LANDIN**

Mexico
The University of Western Australia
Research field: Epigenetics
Commenced in 2015



**FREDERIK
SEERSHOLM**

Denmark
Curtin University
Research field: Biodiversity
Commenced in 2016



**GLADYMAR
PEREZ**

Venezuela
Curtin University
Research field: Infectious disease
Commenced in 2018



GRACE GOH

Singapore
The University of Western Australia
Research field: Physiology and biology
Commenced in 2018



**JINCHENG
WANG**

China
Edith Cowan University
Research field: Mechanical engineering
Commenced in 2018

Current scholars



**KARISSA
LEAR**

USA

Murdoch University

Research field: Behavioural ecology

Commenced in 2016

PHD SUBMITTED 2019



**KIT
PRENDERGAST**

Australia

Curtin University

Research field: Biodiversity
and ecology

Commenced 2016



**LIAM
SCARLETT**

Australia

Curtin University

Research field: Theoretical physics

Commenced in 2018



**MANOU
ROSENBERG**

Germany

The University of Western Australia

Research field: Engineering
and mathematics

Commenced in 2017



**MASNUN
NAHER**

Bangladesh

The University of Western Australia

Research field: Chemistry

Commenced in 2018



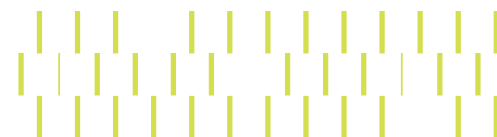
**MARISA
DUONG**

Vietnam

The University of Western Australia

Research field: Biochemical and
molecular health and medical science

Commenced in 2016





**MONICA
DANILEVICZ**

Brazil
The University of Western Australia
Research field: Plant genomics
Commenced in 2019



**NICHOLAS
LAWLER**

Australia
The University of Western Australia
Research field: Electromagnetic radiation
Commenced in 2019



**SARAH
LEESON**

Australia
The University of Western Australia
Research field: Biology
Commenced in 2018



**TIM
HAMMER**

USA
The University of Western Australia
Research field: Biodiversity
Commenced in 2015

PHD COMPLETED



**TRUNG VIET
NGYUEN**

Vietnam
The University of Western Australia
Research field: Epigenetics
Commenced in 2015



XUYEN LE

Vietnam
The University of Western Australia
Research field: Biology
Commenced in 2018

Current fellows



DR ALFRED TILEY

United Kingdom
The University of Western Australia
Research field: Astrophysics
Commenced in 2019



DR CHONG WEI

China
Curtin University
Research field: Marine bioacoustics
Commenced in 2019



**DR GIOVANNI
POLVERINO**

Italy
The University of Western Australia
Research field: Evolutionary biology
Commenced in 2018



DR JULIE JI

Australia
The University of Western Australia
Research field: Psychology
Commenced in 2018



DR MARCUS KORB

Germany
The University of Western Australia
Research field: Chemistry
Commenced in 2019



**DR PHILIPP
BAYER**

Germany
The University of Western Australia
Research field: Plant genomics
Commenced in 2018



Forrest Hall events

Throughout 2019, Forrest Hall hosted more than 80 academic conferences, workshops and other events.

Here are some of our highlights from the year:

January: Breakfast presentation by North Korean defector and human rights campaigner Yoenmi Park, in an event organised jointly by the Walk Free Foundation and the Perth USAAsia Centre.

February: Workshop led by Professor David Bloom, Harvard University (Forrest Distinguished Visiting Fellow) with Director General of Health and senior Department of Health colleagues, and senior researchers from all five WA universities and Telethon Kids Institute on the development of capacity in health economics.

March: Seminar led by Professor Bob Wong, Monash University (Forrest Visiting Fellow) on the challenges of building an academic career.

April: Masterclass led by Professor Brian Nosek, University of Virginia and Centre for Open Science (Forrest Visiting Fellow) on how to change peer review and embed openness, integrity and transparency in research publication.

May: International Data4Life Symposium, convened by Professor Parwinder Kaur, UWA, on the application of AI to research in life sciences.

June: Forrest Hall Open Day welcomed over 200 members of the local community to poster presentations on research by 10 current Forrest Scholars and post-doctoral fellows.

July: Discussion meeting on freedom of speech and academic freedom led by Robert French, Chancellor of UWA.

August: Industry and PhD engagement program (iPREP) workshop for final stage PhD students from WA's five universities.

September: 17th Annual Symposium of the international Fishbase Consortium, researching, monitoring and safeguarding the health of our ocean fisheries.

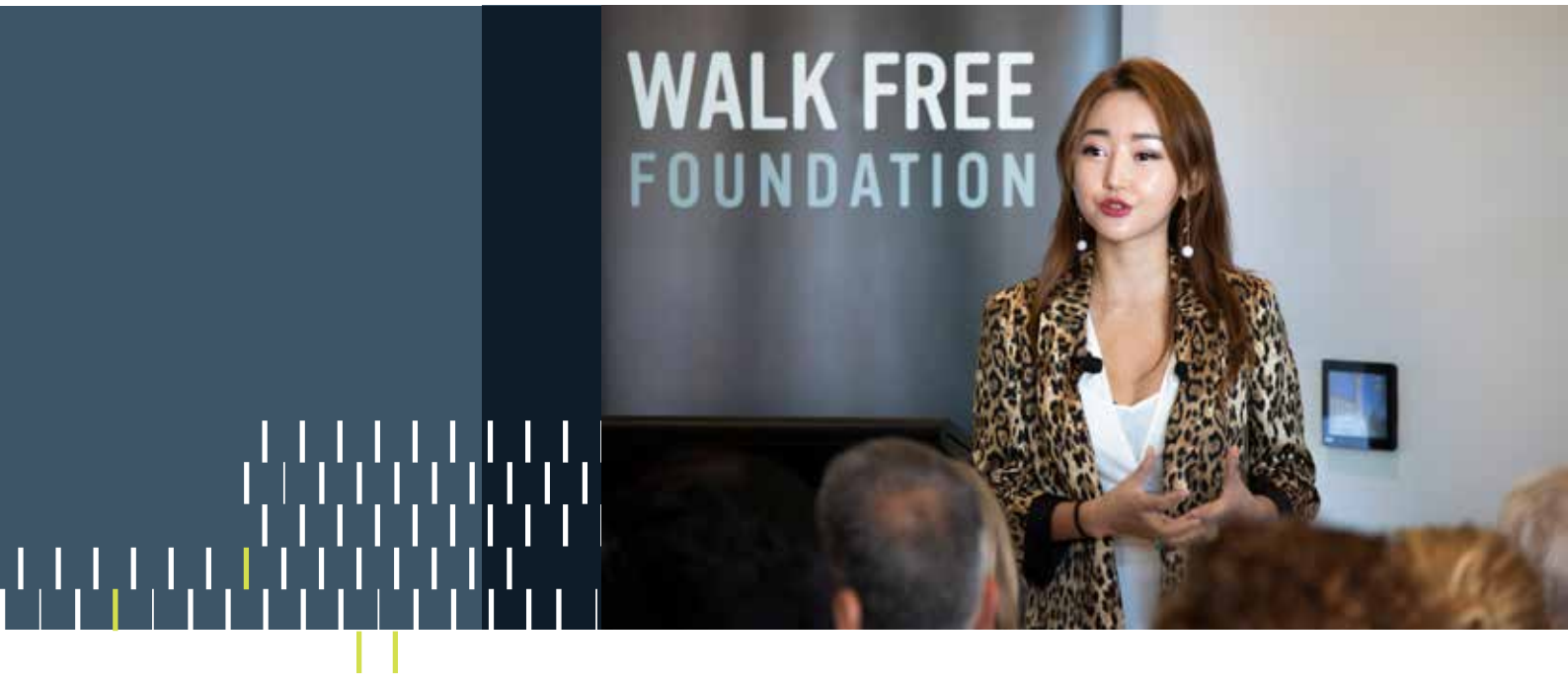
October: Expert group led by Sir Roy Anderson, Imperial College London (Forrest Distinguished Visiting Fellow) on Epidemiology of Infectious Diseases.

November: Annual Conference of Western Australian Computational Chemistry Group, convened by Professor Amir Karton, UWA.

December: Video-conference for WA researchers on phylogenetic trees as part of Australian node of the European Molecular Biology Laboratory.



ABOVE: SIR ROY ANDERSON WORKSHOP
BELOW: YEONMI PARK



Visiting fellows

We were pleased to welcome 42 visiting fellows and two distinguished visiting fellows to Perth in 2019.

Visiting fellows gave public lectures, led masterclasses and PhD seminars, collaborated with research groups across the five WA universities and related research institutes, and interacted with Forrest Scholars and Fellows during their stay in Forrest Hall.

The distinguished visiting fellows, in addition to leading academic symposia and delivering keynote lectures, held numerous high-level meetings with government ministers and senior public servants to contribute to the development of public policy in Western Australia.

DISTINGUISHED VISITING FELLOWS

Sir Roy Anderson

Professor of Infectious Disease Epidemiology
Imperial College London, UK

David Bloom

Professor of Economics and Demography
Harvard University, USA

VISITING FELLOWS

Erez Lieberman Aiden

Professor of Mathematics and Genetics
Baylor College of Medicine, Rice University, USA

Timothy Atkins

(Raine / Forrest Visiting Fellow)
Professor of Microbiology
Defence Science Technology Laboratory, UK

Mark Bateman

Professor of Palaeoenvironmental Reconstruction
University of Sheffield, UK

Andrea Cereatti

Professor of Bioengineering
University of Sassari, Italy

William Cheung

Professor of Marine Science
University of British Columbia, Canada

Kimberley Czajkowski

Lecturer in Ancient History
University of Edinburgh, UK

Mohamed Darouach

Professor of Engineering
University of Lorraine, France

Hilal Elver

UN Special Rapporteur on the Right to Food, USA

Thomas Erren

(Raine/Forrest Visiting Fellow)
Professor of Chronobiology
University of Cologne, Germany

Richard Falk

Professor Emeritus of International Law
Princeton University, USA

Robert Fletcher

Professor of History
University of Warwick, UK

Rainer Frose

Helmholz Centre for Ocean Research
Kiel, Germany

Thomas Funke

Professor of Cryogenics
Technical University of Dresden, Germany

Adam Gibson

Professor of Medical Physics
University College London, UK

Zulfikar Hirji

Professor of Anthropology
York University, Canada

Theodora Hyuha

Professor of Agricultural Economics
Makerere University, Uganda

Hamid Karimi

Professor of Applied Mechanics
Polytechnic of Milan, Italy

Roger Keil

Professor of Urban Studies
York University, Canada

Ron Kikinis

Professor of Medical Imaging
Harvard Medical School, USA

Jacob Leachman

Professor of Materials Engineering
Washington State University, USA

Daniela Liggett

Professor of Antarctic Studies
University of Canterbury, New Zealand

Joyce Maina

Professor of Aquaculture
University of Nairobi, Kenya

Thomas Mehner

Director, Leibniz Institute of
Freshwater Ecology
Berlin, Germany

Svante Norrheim

Professor of History
Lund University, Sweden

Brian Nosek

Director, Centre for Open Science
University of Virginia, USA

Bill Notardonato

Principal Investigator, NASA
Kennedy Space Centre, USA

Darren Newbury

Professor of Photographic History
University of Brighton, UK

Daniel O'Donnell

Professor of Digital Humanities
Lethbridge University, Canada

Daniel Pauly

Professor of Marine Science
University of British Columbia

Maurizio Porfiri

Professor of Electrical Engineering
New York University, USA

Craig Purchase

Professor of Evolutionary Biology
Memorial University Newfoundland,
Canada

Des Richardson (Raine/Forrest Visiting Fellow)

Professor of Cancer Cell Biology
University of Sydney

Daan Roosegaarde

Sustainable art and design
Studio Roosegaarde, Rotterdam,
Netherlands

Gilad Rosner

Founder, Internet of Things Privacy
Forum, UK

Johannes Strobel

Professor of STEM Education
University of Missouri, USA

Rashid Sumaila

Professor of Ocean and Fisheries
Economics
University of British Columbia, Canada

Dahbia Talbi

Professor of Astrochemistry
University of Montpellier, France

Bethany Teachman

Professor of Psychology
University of Virginia, USA

Hester van Herk

Professor of Cross-cultural Marketing
Free University Amsterdam,
Netherlands

Vicky Wing Lam

Research Associate, Fisheries
Economics
University of British Columbia, Canada

Mary Wlodek**(Raine/Forrest Visiting Fellow)**

Professor of Foetal and Post-natal
Physiology
University of Melbourne, Australia

Bob Wong

Professor of Biology
Monash University, Australia



Being able to discuss with people of different backgrounds (psychologists, biologists, computational scientists etc.) in an informal way and in a very pleasant location was extremely enriching.

I am a theoretical chemist specialising in astrochemistry (the chemistry of space). I belong to the French National Centre for Scientific Research (CNRS) conducting my researches at the interface of chemistry physics and astrophysics at the University of Montpellier.

My involvement with UWA started a while ago. In 1998, I was invited by the head of the chemistry department, a theoretical chemist, for a three-month visit. Thanks to regular visits to his group, I built up a solid network of collaborators and friends there, making Perth a second home. My visit in 2013 happened to be a turning point. I met a new generation of theoretical chemists at UWA (Dr Amir Karton and Dr Dino Spagnoli) which gave me a second inspiration for my UWA collaboration. This collaboration has now even enlarged to include one researcher from Curtin University and one from ANU, a former PhD student at UWA. Within this collaboration, we are using

the methods of theoretical chemistry to investigate mechanisms for the formation of carbon dust particles in the atmosphere of carbon stars.

The invitation by the school of molecular sciences and Dr Amir Karton for my visit in 2019 gave me a memorable experience. Firstly, we finalised an ongoing work and were able to suggest an efficient mechanism for the formation of polycyclic aromatic hydrocarbon aggregates in carbon star atmospheres as seeds for dust formation in the universe. Secondly, thanks to the public talk I gave, I met astrophysicists from ICRAR (where I also gave a seminar) and from the CSIRO. Exciting exchanges resulted from these new connections. Moreover, my seminar at the School of Molecular Sciences was one more opportunity to introduce astrochemistry to students and young academics in the school, with the hope it would contribute to the birth of new research interests. Thirdly, and this was the 'cherry on the cake',

I stayed in Forrest Hall and it was magic! The beauty of the location, the inspiring environment and the human experience made it so. The breakfast I attended allowed me to be introduced to the residents of the place, discovering the rich melting pot that Forrest Hall has succeeded in gathering. Being able to discuss with people of different backgrounds (psychologists, biologists, computational scientists, etc.) in an informal way and in a very pleasant location was extremely enriching. What a nice way to feed both the body and the brain! But the most rewarding experience was the exchange I had with scholars and fellows during the evening seminar I gave at Forrest Hall. I received very positive feedback from sharing my experience of scientific and human management and also my enthusiasm for science and research. I really hope to have a chance to meet them in the near future to find out if our exchanges have been useful to their research activity.



The Forrest Visiting Fellowship gave me a chance to really engage much more closely with the research that is going on in Curtin, Perth and Australia more generally.

I was a Forrest Visiting Fellow in November 2019. This was a sabbatical visit, and the goal was to get some face-to-face time with Lucy Montgomery and Cameron Neylon at the Curtin University Open Knowledge Institute (COKI), a research group that focusses on the study of open science and scholarship — how models of publication and knowledge dissemination such as Open Access, and Open and FAIR (Findable, Accessible, Interoperable, and Reusable) Data can be implemented within the current research environment.

I've worked with the COKI group for several years on various projects, but the Forrest Visiting Fellowship gave me a chance to really engage much more closely with the research that is going on in Curtin, Perth, and Australia more generally. I discovered a new potential collaborator at the University of Western Australia, renewed contact with an old acquaintance at Edith

Cowan, and got to know the entire team at COKI much better. It was also much easier to collaborate across Australia from Perth than it is from the North American Mountain Time Zone!

As this suggests, it was a very productive time. We finished one major grant application while I was in Perth, and got a good start on another. We also finished the draft of a book on novel forms of peer review. And as you might imagine with so much contact, we brainstormed on more new ideas than we could possibly write up!

As productive as my time at Forrest Hall was, the fellowship was for me about much more than my research program. The start of my sabbatical had been delayed by extended contract negotiations at my home university (I am the chief labour negotiator for my faculty union) and the opportunity to get away from the daily distractions of university affairs was very welcome. My apartment in Forrest

Hall overlooked the sailing and rowing clubs, and the sun hit my bed even morning at just before 5am, meaning I got a nice early start each day. I think I closed my balcony door only twice during the five weeks I was in Perth — a very welcome respite from the -20°C weather my family and colleagues were enjoying in Lethbridge. With access to a rental car, I also took frequent trips on my own or with colleagues from COKI around Western Australia. I drove up through the dunes and nature reserves to the Pinnacles and Jurien Bay, then eastwards for a day at New Norcia, comparing Australian and Canadian approaches to reconciliation. And I also enjoyed several day trips to the wineries around Perth.

All told, it's been a wonderful, productive, academic, social, and educational experience. I am very grateful for the opportunity and would recommend it to any academic. I wish we had something similar here!

Governors



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Chair of Governors



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University of Melbourne



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DR MICHAEL CHANEY AO

Financial update

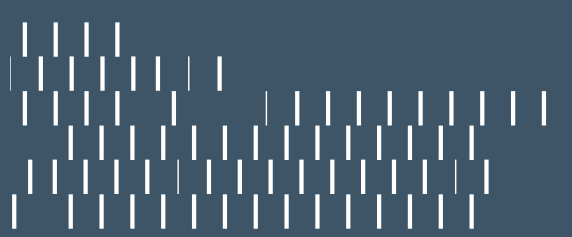
The following financial statements reflect the financial performance and position of the Forrest Research Foundation for the period ended 31 December 2019.

2019 marked the first full year of operation of Forrest Hall, and further development of the scholarship, fellowship and visiting fellowship schemes.

Donation income from Minderoo Foundation was double the budgeted sum as the 2018 donation instalment was received in February 2019, and the 2019 instalment was received in December 2019.

Investment income at 31 December reflects the mark-to-market revaluation of the investment corpus. The strong performance from investment markets throughout 2019 produced a return to the university's long-term investment pool of 16.95 per cent.

The cumulative donation received as at 31 December 2019 was \$74 million. The total carrying value of the foundation financial assets as at 31 December 2018 was \$54 million, of which 94 per cent is invested in the long-term pool. The total carrying value of property, plant and equipment as at 31 December 2018 was \$29 million.



Income Statement for the period ended 31 December 2019

	2019 Actual	2019 Budget	2019 Actual
	\$	\$	
INCOME			
Funds from Forrest Foundation (a)	-	6,500,000	13,000,000
Forrest Hall - student accommodation rental (b)	273,599	497,879	451,113
Forrest Hall - short-stay rental (b)	331,674	444,165	555,864
Forrest Hall - parking (b)	5,754	6,000	6,490
Investments income (c)	562,930	3,077,978	6,858,618
Other	145,253	-	187,789
TOTAL INCOME	1,319,210	10,526,022	21,059,866
EXPENDITURE			
Forrest Research Scholarships (d)	516,126	619,167	497,165
Forrest Foundation Fellowships (d)	251,176	573,569	609,174
Salaries	303,608	337,705	311,883
Marketing	19,558	90,000	3,154
Operating costs	213,833	302,530	252,163
Forrest Hall - expenses (b)	336,065	521,424	456,057
Construction expenditure expensed	401,568	-	-
TOTAL EXPENDITURE	2,041,934	2,444,394	2,129,595
OPERATING RESULT BEFORE DEPRECIATION	(722,724)	8,081,628	18,930,271
Depreciation expense	142,999	856,565	852,987
OPERATING RESULT AFTER DEPRECIATION	(865,723)	7,225,062	18,077,284

Notes:

- The 2018 \$6.5 million donation instalment from the Minderoo Foundation was received in February 2019 and the 2019 instalment was received in December 2019.
- The Forrest Hall operating model has adopted a 'whole-of-life' approach to managing the building. Forty-five per cent of the income (\$456,057) flows to manage the facility and pay all associated operating costs. The residual income (\$557,402) available to the foundation is allocated to a building sinking fund.
- Represents actual investment return earned. For the year ended 31 December 2019, the long-term pool returned 16.95% and the short-term pool returned 3.03%.
- The variance to budget is driven by the timing of cash flows. The budget is phased on a straight-line basis whilst the actual expenditure is impacted by the staggered commencement of the fellows and scholars.

Statement of Financial Position as at 31 December 2019

	2018	2019
	\$	\$
ASSETS		
Current assets		
Cash and cash equivalents	2,168,336	2,112,312
TOTAL CURRENT ASSETS	2,168,336	2,112,312
NON-CURRENT ASSETS		
Other financial assets	34,482,021	52,762,574
Property, plant and equipment (a)	30,771,660	29,080,516
TOTAL NON-CURRENT ASSETS	65,253,621	81,843,090
TOTAL ASSETS	67,421,957	83,955,460
EQUITY		
Reserves (b)	274,962	885,460
Retained earnings	67,146,995	83,069,942
TOTAL EQUITY	67,421,957	83,955,402

Notes:

a) Depreciation is based on a 2% reducing balance for buildings and 5% straight line for fixtures and fittings.

b) The reserves represent 55% of Forrest Hall total revenue set aside to cover future capital maintenance.



FORREST
RESEARCH
FOUNDATION

Forrest Hall, 21 Hackett Dr, Crawley WA 6009
POSTAL M441, 35 Stirling Hwy, Crawley WA 6009
T +61 8 6488 5598
E admin@forrestresearch.org.au
forrestresearch.org.au

