

RESEARCH CHANGING LIVES

BRAVE MINDS



**Modelling the future to
prevent extinction**

Understanding the effects on global ecosystems



Flinders
UNIVERSITY

FEARLESS

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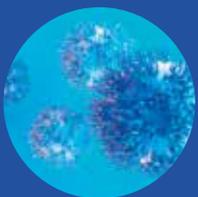
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In 1966 when Flinders University was established, founding Vice-Chancellor Professor Peter Karmel stated his ambitions for the University “*we want to experiment, and experiment bravely.*”

In the spirit of this tradition, we recognise the “Brave Minds” of our researchers.

Welcome to this, the third edition of Brave Minds, showcasing just some of the transformative research Flinders University is fearlessly undertaking to change lives and change the world.

In these pages you'll find inspiration, enlightenment, discovery, and hope, where research expanding our understanding of our world and addressing problems we all face is brought to life, with important and even amazing consequences.

We'll take you on a journey into the stomach of sharks and how fatty acids could be a key to the survival of these apex predators so crucial to ocean health.

Still with the sea, we'll give you a glimpse into an extraordinary suite of research into marine bioproducts that have the ability to transform our thinking and actions on sustainability.

Or perhaps you'd prefer to journey to space, where our researchers are looking at the “rules of engagement”, the management of space debris, and what happens if there's a space dispute – all critical to the escalating race into this last frontier.

Back on earth to some very human concerns, our researchers are examining how veterans who are making the difficult transition back to civilian life can be offered a pathway that not only values their past contributions but also their future potential.

We examine a crisis of confidence among parents amidst the epidemic of childhood obesity and the cultural divide that needs to be bridged if we're to give children a healthier start to life and a healthier outlook for the future, whatever their circumstances.

Fighting glaucoma to give the gift of sight, tracking ancient superhighways to inform how species including humans may be able to adapt to our fast-changing climate, deep diving into the durability – or otherwise – of democracy, or how wriggly critters barely a millimetre long are helping us unravel secrets of the human nervous system to address chronic pain; all expand our understanding and contribute to better lives.

And the all-pervading challenge of COVID-19 – which featured so prominently in our last Brave Minds – is central to a success story of international relevance, with Flinders front and centre in developing a test which diagnoses COVID-19 in rural and remote areas within an hour, rather than days, with remarkable flow-on benefits.

I invite you to immerse yourself in these and the other amazing stories that make Brave Minds a fascinating read.

**President and Vice-Chancellor
Professor Colin J Stirling**



“I worked for five to six years to establish Australia’s first industrial scale Factory of The Future at Tonsley.

I faced disappointments, but persistence and perseverance enabled me to get to where I am today.

If I persist, this will happen, this will come about.

It’s unstoppable... Fearless.”

**Pro-Vice Chancellor - Research Impact
Professor John Spoehr**

Finding solutions to the world’s challenges takes dedication, expertise and innovation. For most problems, they also require teams with a range of expertise and close engagement with research partners and end-users.

At Flinders, we know that our people are our strength, but our partnerships provide the stimulus, guidance and opportunity to translate our research so that it makes a difference.

Two exciting recent initiatives illustrate this well. A Flinders team, led by Professor Sue Gordon, is amongst a strongly competitive national field in contention to lead a \$34 million commonwealth-funded initiative to transform Australia’s aged care by tackling the sector’s workforce challenges – so important to us all as we get older and need and expect high quality care. The strength of our bid is underpinned by our engagement with our industry partners. They will provide the staff who will work with our researchers to develop innovative ideas, the industry setting to show whether or not the ideas actually work to improve aged care and of course the setting to show that the innovations can be implemented in real-life aged care situations. Our aim is that this will comprehensively transform aged care in Australia.

We have taken a related approach to an entirely different type of challenge. A Flinders team led by Professor Wei Zhang has partnered with 68 Australian and international research and industry partners to win \$59 million in federal funding towards a \$270 million Marine Bioproducts Cooperative Research centre. The centre is designed to transform an industry from a relatively small economic player to a major export industry for Australia through the sustainable production of new, high-value marine products - from foods and fuels to bioplastics, antivirals and agrochemicals. In doing so, it aims to create employment opportunities around Australia, including in Indigenous and regional communities.

These and many other new research initiatives have seen Flinders grow its research activity dramatically – over 40% in the last three years, with further growth this year. While this includes our highest ever total for nationally competitive grants, reflecting our strong research base, our strength in building research partnerships also means that it is our highest ever funding from industry. Partnerships were also a key factor in the award to chemistry researcher Associate Professor Justin Chalker, of the Prime Minister’s Prize for New Innovators in 2020. Our underlying research performance underpins our continued climb in international rankings – this year climbing 17 places in the influential Times Higher Education ranking to 266 in the world, taking us to the very cusp of the top one percent of the world’s universities.

As you’ll see in this edition of Brave Minds, our research is having a significant and globally important impact. You can be assured we will fearlessly continue to pursue research that makes a difference.

**Deputy Vice-Chancellor (Research)
Professor Robert Saint**

An eye on the past: a view to the future

Clues to understanding human interactions with global ecosystems already exist. The challenge is to read them more accurately so we can design the best path forward for a world beset by species extinctions and the repercussions of global warming.



This is the puzzle being solved by Professor Corey Bradshaw, head of the Global Ecology Lab at Flinders University. By developing complex computer modelling and steering a vast international cohort of collaborators, he is developing research that can influence environmental policy — from reconstructing the past to revealing insights of the future.

As an ecologist, he aims both to reconstruct and project how ecosystems adapt, how they are maintained, and how they change. Human intervention is pivotal to this understanding, so Professor Bradshaw casts his gaze back to when humans first entered a landscape – and this has helped construct an entirely fresh view of how Aboriginal people first came to Australia, up to 75,000 years ago.

Two recent papers he co-authored — ‘Stochastic models support rapid peopling of Late Pleistocene Sahul,’ published in *Nature Communications*, and ‘Landscape rules predict optimal super-highways for the first peopling of Sahul’ published in *Nature Human Behaviour* — showed where, how and when Indigenous Australians first settled in Sahul, which is the combined mega-continent that joined Australia with New Guinea in the Pleistocene era, when sea levels were lower than today.

Professor Bradshaw and colleagues identified and tested more than 125 billion possible pathways using rigorous computational analysis in the largest movement-simulation project ever attempted, with the pathways compared to the oldest known archaeological sites as a means of distinguishing the most likely routes.

The study revealed that the first Indigenous people not only survived but thrived in harsh environments, providing further evidence of the capacity and resilience of the ancestors of Indigenous people, and suggests large, well-organised groups were able to navigate tough terrain.

“Humans are highly adaptable and show a huge capability to change. Tracking the movement of the first Aboriginal people in Australia proves they were adept, able to enter a completely foreign landscape and to make their new communities thrive,” says Professor Bradshaw. “Understanding this not only challenges a colonial and racist view of Aboriginal culture, it also underlines the great cognitive powers humans have always shown to solve problems and to progress.”

Beyond using data to reconstruct pictures of the past, Professor Bradshaw’s analysis can also assess possible future scenarios, investigating how environmental modification will comprise human health, wealth and wellbeing.

The most effective summary has been a chilling perspective paper — ‘Underestimating the challenges of avoiding a ghastly future,’ published in *Frontiers in Conservation Science* —

in which the team of scientists led by Professor Bradshaw say continuing loss of biodiversity and accelerating climate change in the coming decades coupled with ignorance and inaction is threatening the survival of all species.

The paper cites more than 150 studies, outlining likely future trends in biodiversity decline, mass extinction, climate disruption, and planetary toxification that are all tied to human consumption and population growth. The modelling demonstrates that these problems will worsen over coming decades, generating negative impacts for centuries to come.

“We are underestimating the number of extinctions on our planet by at least half the real number, and we are becoming less, not more, able to tackle these problems,” says Professor Bradshaw.

The paper explains the impact of political impotence and the ineffectiveness of current and planned actions to address the ominous scale of environmental erosion.

“We are underestimating the number of extinctions on our planet by at least half the real number, and we are becoming less, not more, able to tackle these problems...”

It rang loud alarm bells, was picked up by international media and triggered a global call for political leaders to take more decisive environmental action.

“I’m not looking to the past to predict the future. I think that’s a very weak premise for future predictions. But through accurately analysing the past, we can make a strong argument for constructive change,” says Professor Bradshaw.

“In the case of bushfires, for example, there are lots of existing factors that can provide probabilities of occurrence, extent and intensity — and that’s a valuable guide that we need to pay attention to.”

Professor Bradshaw’s work relies on sophisticated computer modelling that he has developed, and enables such research by being versatile enough to look both backward and forward with powerful predictive capacity.

Using this tool, his research follows paths not usually trodden by ecologists, as he examines the functional links and implications of environmental integrity affecting human health, climate-change mitigation, low-carbon energy provision, economics, and human demography to identify long-term sustainability.

It represents different ways of thinking about measuring data and information, addressing



**Professor
Corey Bradshaw**

bigger questions of how climate change affects all components of an ecosystem, including our ability to grow food in a changing environment, along with the capacity to cope with natural disasters.

Progressive modelling also enables more complex interdisciplinary collaborations that produce expansive, interconnected research. In the follow-up to the influential “ghastly future” paper, Professor Bradshaw has engaged the expertise of 62 authors from across the sciences and humanities, plugging him into the centre of a crucial global conversation.

It provides a taste of what other diverse collaborations are possible and shows that the outcomes of such studies can have powerful influence on policy decisions. “Presenting evidence is critical for sound decision making,” says Professor Bradshaw. “Humans tend to decide emotionally before acting rationally. Sound research points to the reason why things occur. Policies can influence how outcomes occur, so this is a policy-influencing method of research.”

Professor Bradshaw is confident that more detailed examination of the interconnectivity of species and natural events affecting them, such as fires and floods, will reveal ever more complex cascading relationships. The more scientists can draw into these research conversations, the better the outcomes – and even in an era of stalled travel, global research collaborations are flourishing thanks to the rise of online meeting and discussion platforms that facilitate easy international communication.

“By being so expansive and international with our research, we are all speaking in a common language. I consider this a great privilege to be steering this work from Flinders University,” says Professor Bradshaw. “We need all these experts involved, because only by working together can we turn commonly held environmental truisms into numbers and data that can lead us towards solutions.”

Planting the seed to improve global crops

Many people in developing countries don't have diverse diets, nor the availability and access to a variety of nutritious foods, so their dietary staples need to do more to provide adequate nutrition.



It's a challenge that Flinders University plant physiologist and biochemist Professor James Stangoulis has been successfully tackling for two decades: improving the nutrition of staple food crops with remarkable biofortification breakthroughs.

"While the focus is on nutrition for human consumption, it also has the important benefit of helping to deliver higher yields on nutrient-poor soils," says Professor Stangoulis. "The target is to improve the mega-crops."

When international biofortification programs were initially discussed in 2003, it was seen as an ambitious idea – that agriculture would be the driving force that could deliver better nutrition to people though improved seed traits.

"Plant scientists had the ideas, but it wouldn't have come to fruition without economists working in tandem with us," says Professor Stangoulis. "They plugged into the necessary funding and commercial distribution channels that ensured our research would be translated into crops that would be grown in the communities that most need them."

In collaboration with international plant breeding partners, this has enabled the team at Flinders to apply their specific expertise to address crop problems prevalent in many countries, and with staple grains that are vital to enable broad community subsistence. This has included lentils in Nepal, rice in Bangladesh and Madagascar, maize in South and Latin America, wheat in Zimbabwe and pearl millet and sorghum in India.

Crucial to this has been Flinders' ongoing funding support from HarvestPlus, a global agricultural development organisation, with key financial supporters including the United Kingdom Government, the Bill and Melinda Gates Foundation, the United States Government's Feed the Future initiative, Global Affairs Canada, the European Commission, and donors to the CGIAR Research Program on Agriculture for Nutrition and Health (A4NH). HarvestPlus is also supported by the John D and Catherine T MacArthur Foundation.

Flinders' role has been critical in the global success of this expansive program, with the University's analytical capability able to validate samples from all global breeding programs — to swiftly measure, assess and identify the best germplasm for further development in breeding programs. It has also played a major role in setting up analytical labs within breeding institutions worldwide, and this helps to accelerate the breeding of nutrient-dense crops.

"We're not creating things out of thin air. There is a natural variation for our traits of interest, and we are identifying and corralling a particular genotype that provides the best result, and this is used in widespread breeding to improve seed nutrition," explains Professor Stangoulis.

"It's not just an environmental effect you're measuring. You make better choices based on genetics."

Developing molecular marker work - to identify the best candidate genes that are involved in improved nutrition within seeds - is not easy, which is why the importance of cross-disciplinary collaborations in this field of research is so important and delivering strong results.

"The complexity involved in this seed research and the need for great outcomes demands much broader conversations, which is why we talk with nutritionists and economists. This research busts out of the existing silos and limited thinking. It's exciting to take on the experience and knowledge of thinkers from outside your area of expertise."

Ensuring adequate zinc levels in grains has been a fundamental problem. Mild-to-moderate zinc deficiency affects up to one-third of the global population, leading to impaired immune system function, skin disorders, cognitive dysfunction, and increased susceptibility to lower respiratory tract infections, malaria and diarrhoeal disease. It is responsible for more than 800,000 deaths every year.

Breeding for higher zinc concentration in grains helps farmers provide better growth on zinc deficient soils — a major problem worldwide, including in Southern Australia. Identifying genes that effectively boost nutrients into the grain involves an entirely different mechanism in the plant to how it would transport nutrients from the soil. The efficiency of improved seed helps produce better crops and more reliable yields.

This proven process is now being applied globally, with the results having been marked against control crops to prove that improved targets are being effectively met. Results have been universally positive.

"The developing world is really embracing these new varieties and what HarvestPlus research groups are achieving is giving everyone the know-how at low cost," says Professor Stangoulis.

"It's great science, because there have been no negative outcomes. We develop better seed that provides good nutrition and helps maintain good germination and sustainable yields."

While much of this work was initially intended to benefit developing countries, ultimately the improved seed with higher nutritional value is also being introduced to Australia through CGIAR collaborations with their breeding partners in Australia. "We will all benefit greatly from being plugged into this vast and cohesive global network."

Having spent the best part of 20 years working to improve the presence of iron and zinc in food



Professor James Stangoulis

"It's great science, because there have been no negative outcomes. We develop better seed that provides good nutrition and helps maintain good germination and sustainable yields."

crops, Professor Stangoulis is now focusing his research attention on calcium – with a specific aim to help improve children's nutrition.

He believes that breeding new strains of millet may provide the best solution, as millet is already packed with nutrition and some of the many millet varieties are very drought-tolerant. "I expect that we'll be able to get more speedy results on this," he says. "There are high throughput analysis programs already in place, and there are laboratories around the world that now have the necessary equipment and expertise to swiftly do analysis of trial crops that once took ages.

"The frustrations that we went through in the early years, going through so much trial and error, were all worthwhile. Now, we have proven answers and tested methods. The seed breeders know what to look for, so results from the next areas of crop research will be so much faster."

Professor Stangoulis also studies the stress physiology of plants, which has growing importance as this knowledge can provide a clearer understanding of how climate change will affect crops – especially how abiotic stress affects plants, and how increased heat in our atmosphere could affect the nutritional value of crops.

"It's an important future investment," says Professor Stangoulis. "We need to provide sufficient information to tomorrow's seed breeders, so they know precisely what they are targeting to provide the strongest possible crops that can withstand a changing environment."

PUTTING THE BITE ON MICROPLASTICS

Healthy sharks are emblematic of a healthy ocean ecology – and detailed shark diet investigations by [Dr. Lauren Meyer](#) are providing insight about the great risk that microplastics pose to marine life.





The Flinders University marine ecologist does this by fearlessly examining the foods ingested by the ocean's top predators.

Her studies into shark diet and behaviour, which have involved her developing biochemical tools to assess a shark's dietary intake, are bringing scientific clarity to these oft-maligned and widely misunderstood sea creatures.

"Gaps in research knowledge plug into our fears of sharks because we really don't know these creatures," says Dr Meyer. "I want my research to help change that."

To monitor the impact of microplastics being ingested by tiger sharks, she is reviewing materials from research colleagues in the Reunion Island, Madagascar, Hawaii, the Gulf of Mexico, the USA, the Galapagos Islands, Brazil, Japan, South Africa and around Australia – with all the samples coming to Flinders University for analysis. "The sharks eat a lot of turtles and seabirds, which are notorious for ingesting a lot of microplastics. We need to know what this means for some of the ocean's top predators."

This research – part-funded by the Georgia Aquarium in the US (which made contact with Dr Meyer after being impressed by her biochemistry presentation at the 2018 Sharks International conference in Brazil) – illustrates the flow-on effect of damaging litter and waste products in oceans that are spreading throughout the oceanic food chain.

In studying a shark's diet through biochemical methods rather than the traditional process of examining its stomach contents, Dr Meyer is able to identify such intricate details as the amount of microplastics ingested by alpha predators and the related threat posed to wider habitats. It's a process she says can be applied across many marine species.

"If we only consider what white sharks eat on the ocean surface, then we assume their diets are dominated by seals and sea lions, without understanding what else they feed on – and therefore it's no surprise we can be misguided about how many things can be on their menu, and what they choose to hunt for."

"We now have a vast number of shark movement and diet databases, providing us with decades of information to draw from, but the big picture of unified ocean health is only being revealed to us one piece at a time."



Dr Lauren Meyer

Assessing a shark's access to its preferred diet not only reveals crucial information about threatened species but also migrating populations – and possibly identifies reasons why sharks move into specific areas to hunt for food. "Linking diet to the movement of sharks has not been done before," says Dr Meyer. "Looking at this in careful detail means that it's not a one-size-fits-all approach to explaining sharks."

The benefits of being plugged into such extensive global research collaborations have also inspired the creation of Dr Meyer's tissue-sharing web platform Otlet, a free-access database housing an index of biological research samples that is now open for all research scientists working with any plant or animal anywhere in the world.

Dr Meyer has a unique cross-disciplinary skill set, having initially trained to be a doctor in the US, with a specific interest in biochemistry – but her study focus changed to oceanic ecology to satisfy her love of aquatic environments. She moved to Australia to complete her studies and gravitated towards analysing sharks and stingrays. "The top predators of the ocean are so unique. Studying them is fascinating – and far-reaching, especially coming from a biochemistry angle, which is unique in this field."

She has also acquired precise skills in reading statistics, helping to plug her research capabilities into cross-disciplinary teams that link such diverse skills as veterinary welfare and advanced computer modelling, which steers ecology and food web research into previously unexplored directions. "It's invigorating to work with such a diverse group of analysts, because any of their scientific findings keeps stimulating more questions that are worth exploring," says Dr Meyer.

"We now have a vast number of shark movement and diet databases, providing us with decades of information to draw from, but the big picture of unified ocean health is only being revealed to us one piece at a time."



Developing essential care for aged care workers

Support for the aged care workforce has been sadly neglected. Poor wages and poor working conditions have been compounded by insufficient uptake of technological advances and innovative practices across the sector, resulting in a crisis of care within Australia's ever-growing aged care sector.



Professor
Sue Gordon

But that's set to change. The federal government has commissioned Flinders University and collaborating partner Wells Advisory to develop the structure for the Aged Care Centre for Growth and Translational Research - a \$34 million, federally funded three-year initiative which will provide a significant boost for the troubled sector by focusing on its workforce and dealing directly with its varied needs to implement better care.

Statistics reveal glaring problems within the aged care workforce. In 2020, 29% of staff left the sector, compared with national averages of 7.5% departure rates in other workforce sectors.

"It's a very distressed sector," explains [Professor Sue Gordon](#), Professor of Healthy Ageing at Flinders University. "Many staff transferred from aged care to the disability sector, which pays more for the same skills. Career pathways are not readily available, so advancement is difficult."

Having established the structure, Flinders aspires to lead the new Centre with the aim of delivering a breakthrough for the quality of aged care by providing direct workforce interaction and training. With the Flinders bid supported by 73 aged care sector participants, including providers of 25% of all residential aged care beds in Australia, it would have a strong platform to influence significant change.

"We have many wonderful areas of innovation within aged care in Australia, but it's piecemeal. Best practices need to be adopted that are scalable and transferable across the nation," explains Professor Gordon. "This will improve the consistency of care, which the sector has had difficulty achieving."

Problems were highlighted by the important 2018 Australian Department of Health report A Matter of Care, that mapped an aged care workforce strategy (including the creation of a Centre for Growth and Translational Research among its 14 recommendations), but the needs were greatly magnified by the 2020 Royal Commission into Aged Care Quality and Safety. Professor Gordon is delighted that there will soon be a Centre able to support the workforce to implement swift change within the aged care sector.

Statistics reveal glaring problems within the aged care workforce. In 2020, 29% of staff left the sector, compared with national averages of 7.5% departure rates in other workforce sectors.

"The proposed industry-facing model is designed to support aged care organisations that recognise they have problems. It will provide the aged care sector with capability-building resources and solutions that support aged care workers to deliver better quality care."

Much of Professor Gordon's research has been implemented locally by ACH Group, a not-for-profit community and residential aged care service provider, which co-funds her position. This has included easy-to-use technology packages that make people feel safer at home, developing age-friendly dining options, prefrailty assessments and evaluating simulation programs to help aged care workers understand the experience of dementia.

Another valuable study is assessing student attitudes towards working with older people, to better inform how effective student placements in aged care should proceed.

Professor Gordon laments that so much research evidence that could support provision of better quality aged care has been left to gather dust on shelves, with research taking an average of 17 years to be translated into practice - and only about 14% ever getting fully implemented. The proposed Centre will significantly improve the capability of the aged care workforce to translate research findings into practice.

As well the Centre will concentrate on assisting the aged care workforce to adopt technology. "Many aged care facilities aren't digitally mature; quite a lot are still paper-based," Professor Gordon says. "If the workforce is supported to adopt new time saving technologies such as digital systems, it will provide the staff with more time to provide actual care. And that, of course, is the ultimate goal."

GROWING PAINS



“In some cases, the cancer cells themselves, or the cells surrounding the cancers, produce more IGF,” she says. “It’s a way in which the cancer is being sneaky to try and promote its survival and have growth benefit.”

Balancing chemical messengers holds clues to cancer and diabetes treatment.



**Professor
Briony Forbes**

Our bodies are in a constant state of change. Our cells divide and replenish. Tissues regenerate.

“Even in your brain, cells are regenerating,” says [Professor Briony Forbes](#). “We’re constantly growing new cells. Skin needs to be replenished and regrow. If you cut it, you need growth to heal the wound.”

And in all these processes, the key ingredients are peptides – small proteins – known as “growth factors”.

As Head of Medical Biochemistry in the College of Medicine and Public Health, Professor Forbes is particularly focused on one in particular – the insulin-like growth factor (IGF).

While growth factors are vital to the growth of a foetus before birth and then the normal functions of the body after, too much can lead to disease. Too little can also cause growth-related diseases. A mutation in the growth factor gene can result in short stature or intellectual disability. IGF can also play a role in atherosclerosis and the laying down of arterial plaques.

“It’s a balance. In the context of IGF, too much can cause abnormal overgrowth of bones known as acromegaly, or a greater risk of cancer,” she says.

“High circulating levels of IGF in pre-menopausal women lead to a higher risk of breast cancer, for instance.”

However, growth factors such as IGF are not the catalyst for cancerous cells; once they are present, high growth factor levels will make those cells grow faster, dividing and surviving even in the face of chemotherapy.

Whereas insulin is produced solely in the pancreas, most cells can produce IGF. The question is, why do some people suddenly make too much? Genetics is one reason, and taller people tend to have higher levels of IGF than smaller, shorter people.

Cancer, however, can actually switch on and even increase growth factor production for its own benefit.

“In some cases, the cancer cells themselves, or the cells surrounding the cancers, produce more IGF,” she says. “It’s a way in which the cancer is being sneaky to try and promote its survival and have growth benefit.”

And there lies the pointy end of Professor Forbes’ research.

“We’re trying to work out the way in which that signal is relayed into the cell to say, ‘Come on, start growing’.

“If we know that, we can then produce an inhibitor that will very nicely block the signals.”

An understanding of the mechanics of IGF and insulin itself not only holds hope for cancer, but for treatments to manage diabetes.

“One area of research informs the other,” says Professor Forbes. “We’re doing some interesting work on trying to develop novel insulin for the treatment of diabetes.”

One avenue is to look at different species and how their growth factors and insulins work to find clues about how different molecules are a benefit to us, or can inhibit the growth factor.

“We have a very exciting collaboration with Stanford, Melbourne and Denmark, with the discovery of insulins secreted in the venom of cone snails.”

While superficially, the cone snail insulin might look similar to the human version, its molecular make-up is subtly different.

“By understanding the molecular mechanisms of how the cone snail insulins work, we may be able to make a human variety that has new properties with desirable actions.

“We’d like to develop insulins which are very rapid-acting, so that you might administer them right at the time of eating, rather than having to manage administration a certain time before eating.”

Professor Forbes has witnessed an explosion of knowledge over 30 years of research.

“When I did my PhD, we only just knew that these growth factors must exist. We’ve come an awfully long way in actually identifying how they work and what they do.

“When I first started, we didn’t know there was a link to cancer and we discovered that. What drives you then is maybe we can actually make something that will benefit patients.”

Nurturing a new marine bio-economy

More than 20 years ago, [Professor Wei Zhang](#) recognised the need to build environmentally sustainable industries, and changed his scientific focus from chemical engineering to marine bioproducts development.

He identified this as an area for future global industry with enormous growth potential and with environmental and economic benefits, especially within the context of a circular economy.

“It’s all about 21st Century change,” he says. “I felt that the old ways of chemical engineering would no longer be sustainable. However, I saw huge opportunities ahead to study Australia’s abundant marine resources. I could see that examining the ocean in much greater detail would become our next great scientific frontier.”

He led the creation of the [Centre for Marine Bioproducts Development](#) at Flinders University in 2009, which served as a crucial springboard for the recently announced \$270 million [Marine Bioproducts Cooperative Research Centre \(MB-CRC\)](#). Flinders University led the MB-CRC bid, which involved a consortium of 68 Australian and international research, industry and government partners.

It’s an exciting moment for Flinders University, marking its first successful CRC bid and cutting an important path for future economic development. The MB-CRC has secured \$59 million of federal funding for 10 years. This will unlock the awesome potential for advanced production and manufacturing of marine bioproducts to help feed a hungry planet, provide new nutritional products, address diseases ranging from cancer to Parkinson’s, create innovative eco-friendly bioplastics and skin-protective cosmeceuticals, and develop functional animal feed additives to curb climate-changing greenhouse gas emissions.

This wide-ranging, decade-long research and development program will transform Australia’s emerging marine bioproducts sector into a sustainable and globally competitive industry with an anticipated \$1.5 billion annual turnover by 2030. Globally, the marine biotechnology industry is expected to reach over \$700 billion by 2035.

With a goal to expand Australia’s existing marine biotechnology enterprises through developing a suite of manufacturing technologies and high-value marine bioproducts, the MB-CRC’s first projects are expected to start in early 2022.

Oceans account for 71% of the Earth’s surface, and vast areas of these aquatic territories remain unexplored. With Australia having the third largest marine zone on earth – 22.3 million square kilometres, ranked only behind France and the US — there is enormous potential to harness untapped resources and build Australia’s marine bioproduct industries.

Beyond introducing innovations to improve the productive output of existing fisheries and aquaculture, the MB-CRC aims to develop advanced manufacturing and high-value marine bioproducts. Current Australian enterprises represent a very modest economic value – about \$4 billion compared to China’s marine bio-industries worth about \$250 billion – but Professor Zhang sees an opportunity to rapidly accelerate growth in this sector.

Southern Australia has more than 1,400 species of seaweed — up to 60% being unique to our waters and representing 15% of the world’s red and brown seaweeds. For the MB-CRC, these seaweeds, plus marine microalgae and filter-feeding animals, represent new sources of marine biomass which, through the development of advanced manufacturing technologies and processing, lay the foundation to generate high-value marine bioproducts.

Sustainable nutrition is a pressing issue, with questions of how adequate protein supplies can meet increasing demand from a rising global population. As a viable alternative to animal production, fast-growing, protein-rich microalgae can be produced in controlled environments, making them ideal candidates for meat-protein substitution that could build into a thriving export industry.

However, functional foods and nutritional products represent only a portion of this high-value bioproducts market; other great growth opportunities lay in pharmaceuticals, nutraceuticals, agrochemicals, bioactive feeds, cosmetics, marine bio-plastics and emerging bio-synthetic building materials.

“It’s simple – by concentrating our efforts on high-value products, we can make more profitability from constrained supplies and with less effort,” says Professor Zhang. “The size and scale of these opportunities, in combination with their environmental sustainability, will encourage people to develop more marine bioproducts businesses.”

High-value marine biomaterials are also directly applicable to the medical sector – especially the use of marine biodegradable plastics to create single-use items such as masks, gloves and sterile dressings, as well as 3D printing of materials for tissue and organ replacement. “These are safe, bio-compatible and non-toxic materials, and they will be recognised as a perfect solution for meeting the enormous demands of hospitals and medical centres.”



Professor Wei Zhang

Professor Zhang says the wider application of marine bioproducts can also contribute significantly to the push for a carbon-neutral society. “Red algae added to animal feed improves their digestion and can dramatically decrease an animal’s methane emissions, reducing greenhouse gas problems,” he says. “We keep finding more and more ways that marine bioproducts provide unexpected functions and benefits.”

Professor Zhang’s new role will be Research Director of the MB-CRC, as the Flinders team grows to about a dozen key researchers, supported by up to 30 research students. Their aim will be to propel a \$1.5 billion per annum delivery to industry and to stimulate job growth toward 10,000 a year by 2030.

Through pioneering and driving this research in Australia, Professor Zhang believes Flinders University will further its international reputation in this important and emerging field of scientific and technological development.

He reflects that persistence has paid off. “I had a vision that our work could make a difference, and through the patience and persistence of our team and the support of key leaders, we now have the opportunity to make incredible new things come to fruition.”

“I had a vision that our work could make a difference, and through the patience and persistence of our team and the support of key leaders, we now have the opportunity to make incredible new things come to fruition”

Can our behaviour affect our genes?

How connected is our behaviour and our environment to our genetics? Can genes be turned on and off in response to our environment, and consequently can we steer them towards positive outcomes? It's likely, according to Associate Professor Sarah Cohen-Woods, who is examining epigenetics and behaviour through a range of groundbreaking studies.

Epigenetics examines how expression of our genes are influenced by factors over and above the genetic code. Associate Professor Cohen-Woods' work at the Flinders Behavioural Genomic and Environmental Mechanisms Lab explores the connection between the forces of genetics, epigenetics and environment on mental health outcomes and fertility, and how early life experiences or even parental experiences can get imprinted and influence behaviour later in life.

"The brain and the body are not separate from each other, so addressing mental and physical health together is imperative," says Associate Professor Cohen-Woods. "This is a crux of my work, that behaviour is a union of nature and nurture, not one or the other."

Reaching across many themes, she is examining genomic risk factors in a range of disorders, conditions and behaviours, from genetic factors affecting basic decision making through to disorders in eating, how autistic behaviours play a part and how much environmental factors may adapt these genetic risks.

This novel line of research is leading to ideas being explored in new ways, demanding very different types of cross-disciplinary collaborations that can bring together hundreds of diverse experts. "New ways of thinking about problems demand the interaction of different skill sets. It's necessary for this type of science to make a discovery."

Associate Professor Cohen-Woods learned quickly about the vast scale of studies necessary in this field. In 2009, she thought she was working with a huge cohort, comprising 2,000 people, for one of the first genome-wide studies in depression. "We were convinced we had a solution within reach because we had such a strong cohort but it very quickly became clear to us that, because genetic effects are tiny, our numbers were nowhere near enough. The latest depression study has 800,000 people in the discovery phase and more than one million in the replication. Therefore, large-scale collaborations are vital in this work."

One significant project she is working on studies intergenerational inheritance and transmission of trauma and stress. "I wasn't initially convinced it involved molecular transmission, but then a new study using Scandinavian data on men who had lost a parent during their early development period showed an impact on their own children. These children had lower birth weights, more were premature and had differential physical outcomes at birth, so that definitely is not a result of parenting. There's more that needs to be examined."

Associate Professor Cohen-Woods acknowledges that epigenetic inheritance is only a theory — any existing evidence in humans is correlational and usually after a period of development — so she is keen to deliver solid research that can tap into mechanisms and early development in humans.

Studies in mice show a severely anxious male's offspring and subsequent generations display heightened anxiety-related behaviours. Studies have identified changes in the DNA of those male mice's sperm, even though subsequent generations had never been subjected to the original stress. "This suggests something very interesting, but there isn't currently similar research in humans — and it's very difficult to engage men in such research, even more difficult to have them provide sperm for testing," says Associate Professor Cohen-Woods.

To explore this idea, she has commenced the Flinders Environmental Epigenetics in Life study, being done in collaboration with Flinders Fertility Clinic in Glenelg, South Australia. "They only use a tiny portion of a sperm sample to fertilise embryos and throw the rest away — so we can use those samples, and we are also collecting psychological data from the men as well, focusing on childhood trauma through their developmental periods. The results are very saddening — as high as 30% — but it gives us a very effective cohort to examine."



**Associate Professor
Sarah Cohen-Woods**

"The brain and the body are not separate from each other, so addressing mental and physical health together is imperative," says Associate Professor Cohen-Woods. "This is a crux of my work, that behaviour is a union of nature and nurture, not one or the other."

After identifying dysregulated genes in the sperm, Associate Professor Cohen-Woods wants to test the blood spots of the babies born to these men. All babies have blood spots taken at birth to do gene testing for specific single-gene disorders, and South Australia stores these samples. "When we get full consent, we will use these to trace — for the first time in humans — a correlation in the germline from parents to children at birth about stress-related trauma.

"This whole line of study started sceptically, but with a keen interest from me — and that's the best way to run a study. I'm not assuming I'm going to find an effect. I'm going to see if there is an effect and then take that forward."

Statistics, however, can be confounding — and knowing that correlation is not causation, she is acquiring much more data, on diet, exercise, adult stress, anxiety and depression symptoms. "Going through IVF is stressful; getting through COVID-19 is stressful, so there are many, many factors we have to consider here to identify the confounding elements."

In identifying future outcomes, Associate Professor Cohen-Woods is cautious. She points to the emergence of companies offering direct-to-consumer genetic testing, and that people can ask to identify specific risk data about the likelihoods of developing genetically translated diseases. "A genetic risk factor is very difficult for most people to understand — and just identifying a risk does not mean it is definitive," she explains. "We've seen that this type of testing did the opposite for people that we thought it would. The people who receive this information are feeling a loss of control over their lives, and they believe there is nothing to stop them from getting the identified problem, whether it be cardiovascular disease or schizophrenia."

She believes that if this same type of direct-to-consumer testing happens with epigenetics, it could have a negative impact. "We simply aren't ready. Firstly, we need to build on epigenetic education — explaining what it is and how it can be used as an environmental motivator to take control of your life. To perhaps switch genes on and off by engaging in various different behaviours," she says.

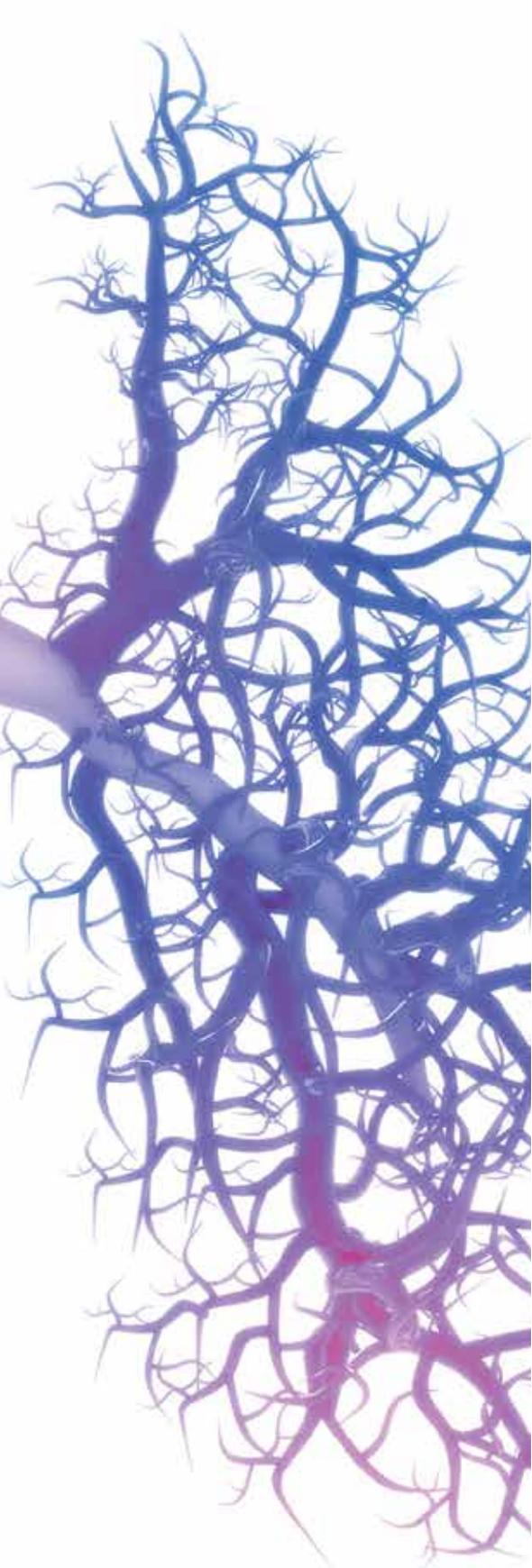
"What we do hope is that it becomes a motivational factor for people to engage in therapies or interventions — that could help them to embrace better lifestyles. Encouraging better exercise and diet is an immediate objective, but we can see that encouraging mental therapies will be equally important."

GOING VIRAL

How research into dengue fever gave new insights into COVID-19.



“So many things from past experience have driven new technologies that have meant that we could get on top of this really, really quickly.”



As with so many of us, SARS-CoV-2 has had a profound impact on the work of Associate Professor Jill Carr.

For years she had been researching ways to reduce the devastating impacts of the mosquito-borne dengue and Zika viruses – work she has been forced to put on the back-burner.

“A whole lot of other research directions have really fallen by the wayside due to the pandemic,” she says.

But in Carr’s case, her previous research has come into its own to tackle the deadliest aspects of COVID-19 – in virology our work with one virus builds on what we know about others.

“My main focus on dengue has been sort of looking at the way the body’s own inflammatory response underlies the disease that develops,” she says. “And it is that inflammatory response, when it gets out of control, that is the cause of some of the most fatal aspects of COVID-19.”

Crucial to the inflammatory response are small proteins called cytokines – effectively messengers that tell cells how to respond to infection. They are essential in making our bodies respond to virus, bacteria or injury, but if they do not turn off when the danger has passed they can wreak havoc themselves — your own body essentially attacking itself from the inside.

In dengue when inflammation runs rampant, it attacks the cells lining the walls of our veins and arteries. Carr’s research is looking at the mechanics of that, with a view to finding ways to disrupt it.

In COVID-19 the lungs are the frontline.

“In dengue, we were looking at inflammatory cytokines, particularly two specific ones which have proved to be really important in the lungs in COVID-19 patients as well,” she says.

“We often don’t have to reinvent the wheel. We can take something that we’ve learned from another situation and then apply it and maybe amend some of those models.”

While Carr is working at the cutting edge of our understanding of viruses, her inspiration has much more ancient roots.

Her mother and grandfather are Nukunu people from near Port Augusta and inculcated a sense of traditional thinking in Carr, in which land, water, animals and plants are in balance.

“It is the same approach I have to biology – to understand the balance in the host cell and dysfunction induced by viruses,” she says.

It has driven a career-long fascination with the many “clever” ways viruses have of replicating and subverting our bodies defences.

She began in plant virology but turned to studying HIV during the 1990s, then on to the dengue and, in 2016, Zika.



**Associate Professor
Jill Carr**

Not strictly living organisms, viruses cannot reproduce without a living host – sometimes us – where they hijack cells to replicate. And different viruses often use the same strategies to both invade their hosts and to constantly change slightly to improve the way they do that, as we have seen with the shifting patterns of SARS-CoV-2 variants.

Drawing on the particular strengths of Flinders’ ophthalmology team, before the pandemic Carr was focusing on how dengue might be carried in the eye.

“It is a unique thing that we are learning more and more about. It began with Ebola virus research, finding that Ebola could lay latent in the eye, and there was a number of reports that dengue can similarly infect the eye as well.”

As with dengue and COVID-19, this can then set off a hyper-inflammatory response that can damage the eye and affect the site for six months after the infection has been cleared.

“It would be interesting to see if that’s something associated potentially with long COVID,” says Carr.

While the pandemic has set off fears that viruses are mutating and developing more frequently, Carr believes the truth is more complex.

“I think our mechanisms for monitoring viruses are a lot better. But for SARS-CoV-2, I think it just looks worse because we’ve got so much replication going on and, of course, we’re monitoring so much of that, that we see all these different aspects.

“Then of course, the interaction between humans and animals is becoming more prevalent and so much part of, I guess, everyday lives that we see a lot more of these zoonotic events than we’ve seen in the past.”

If that’s the bad news, then Carr also has a more optimistic message. The more we chase down ways to cope with viruses, the better we become at it.

“There’s no way we could have done all the rapid diagnosis that we’ve had through thousands and thousands of tests, without the PCR-based testing that, again, really came to the fore, for the sensitivity and high throughput with HIV.

“So many things from past experience have driven new technologies that have meant that we could get on top of this really, really quickly.”

The tide is turning on coastal health

“When I look at mudflats, I see an upside-down forest.”

It’s an important view that defines ecological insight for [Professor Sabine Dittmann](#), Professor of Marine Biology at Flinders University, whose focus on tidal wetlands is central to the conservation and restoration of coastal ecosystems.



Her knowledge of mudflats helps define the vast ecosystem beneath the mud surface, facilitating habitat for huge numbers of species that interact and thrive in a healthy environment.

Of importance is Professor Dittmann's work applying this knowledge to improve the health of the Coorong, where salt levels are concentrating to concerning levels in the southern part, with salinity up to four times higher than sea water.

"In some areas of the Coorong, salinity levels are so high that an accumulating toxic black mud is making it uninhabitable for many invertebrates that support the health of the whole ecosystem," she says.

Fortunately, her research team is finding that such conditions can be reversed. "We have been able to do controlled experiments on site and in real time that have had incredible results for sediment and water quality improvements. Within a few weeks, we saw significant change in the sulphur concentration of the mud. Worms came back and made the whole system come alive. The turnaround was remarkable."

This project is part of the South Australian Government's Healthy Coorong, Healthy Basin Program (HCHB), which is jointly funded by the Australian and South Australian governments. The Goyder Institute for Water Research, of which Flinders University is a partner, is delivering five research components of the HCHB program, providing independent research to inform future management decisions for the region. These Goyder-led projects will be completed by mid 2022.

The ramifications of ensuring the Coorong's health as an ecosystem are huge, and not just for fish and marine life. It serves as a crucial feeding ground for many migratory shorebird species – such as red-necked stint and sharp-tailed sandpiper that migrate annually from Siberia. The main prey items of these shorebirds are macroinvertebrates, which Professor Dittmann's team measures each year to determine changes in the condition of the Coorong. With food volumes reduced in a compromised Coorong, the long-term survival of these bird populations will be severely threatened. Through this research, her team is now able, for the first time, to also analyse the nutritional value of prey items, to find out whether the birds can get enough energy for their return journey.

Professor Dittmann brings a global perspective to the understanding of mudflats, having done her initial studies in Germany's Wadden Sea (a UNESCO World Heritage Site), and then further studies in tropical northern Queensland, before coming to Flinders University and doing critical examination along South Australia's temperate coastline. Her work on tidal wetlands also includes mangrove and saltmarsh, which are important carbon sinks in the emerging Blue Carbon conversation.

The Blue Carbon term, introduced globally in 2009, refers to the natural carbon sequestration in coastal and marine ecosystems. By restoring and increasing the area of Blue Carbon ecosystems, carbon is captured and stored, a nature-based solution to mitigate climate change. Yet, when these ecosystems are degraded, lost or converted to other land uses, the large stores of Blue Carbon are exposed and released as CO₂ into the atmosphere.

South Australia holds an estimated 1.12 million hectares of Blue Carbon ecosystems (more than seven per cent of Australia's Blue Carbon habitat) with seagrass beds accounting for 96%, and tidal saltmarsh and mangrove comprising about two per cent each, but with much higher carbon storage per hectare.

Professor Dittmann's work on assessing and monitoring carbon capture and storage provided a pivotal basis for Blue Carbon projects and policy in South Australia – from the St Kilda mangroves to ongoing transformation of a Dry Creek salt pond, which has become a national pilot project for the reintroduction of tidal flow to former salt harvesting sites.

Introducing positive change through rehabilitation was the focus of the Salt to C Project, delivered through the Goyder Institute for Water Research. Professor Dittmann's team found that reintroducing tidal flows to one pond in the Dry Creek salt field worked well and could gain carbon credits as restoration through tidal flows, providing substantial carbon offset opportunities.

Bringing her expansive knowledge to the St Kilda mangroves is crucial in trying to solve an ongoing problem of plants dying due to high salt concentration. Funded by the Blue Carbon Futures Fund of the Green Adelaide Landscape Board, Professor Dittmann's team is assessing the health of the mangrove and its carbon storage, to quantify effects of the dieback on the Blue Carbon storage of the mangrove.

"Building on our foundational projects, further research on Blue Carbon can make South Australia a leader in integrating coastal management and climate change mitigation."

"We are leading the way with this measurement of carbon and biodiversity, and our work will be of great value in many parts of the world where environmental degradation must be urgently addressed."



Professor Sabine Dittmann

While she says many coastal systems in South Australia are in quite good shape, and guarded by legislation, Professor Dittmann still worries about possible future developments compromising the outcomes of the state's Blue Carbon future.

"We have pristine systems in place that we can monitor – many of which are unique in the world – but there are still great risks that these fragile environments can be damaged, especially with developments and restrictions to inland migration with sea-level rise," she says. "Our data presents strong arguments for more stringent protection, to safeguard our Blue Carbon future."

The sum of this research and engagement provides an important qualifier to enable continued coastal restoration, and Professor Dittmann is confident of attracting growing amounts of corporate and industrial support. "We are seeing many companies wanting to take responsible action. For example, fisheries want protection and increase of fish nursery habitats and they want to benefit from carbon offsets. It's a double win."

She therefore hopes her research will provide evidence for even tighter environmental legislation, while also providing a framework for future Blue Carbon projects once the Clean Energy Regulator has determined a methodology to earn Australian carbon credit units through tidal restoration.

"The conservation, restoration and creation of stronger coastal ecosystems not only has the potential to mitigate climate change, but also provide many other important ecosystem services, such as improved water quality, tourism, fisheries and shoreline protection."

The way forward demands different thinking and action, and Professor Dittmann is keen to see more Indigenous knowledge incorporated in future ecological management plans and practices. She sees that this expansive view of improved environmental management will have global benefits.

"We are leading the way with this measurement of carbon and biodiversity, and our work will be of great value in many parts of the world where environmental degradation must be urgently addressed."

EARLY warning SYSTEM



How genetics and AI can keep an eye on glaucoma.

Glaucoma can be a devastating disease that damages the optic nerve to leave some of its victims blind — but it doesn't have to be. If caught in time, it is highly treatable. If left too long, the loss of eyesight is irreversible.

Professor Jamie Craig, Chair and Academic Head of the Department of Ophthalmology at Flinders University as well as a Consultant Ophthalmologist, is on a mission to make this catastrophic outcome a rarity.

"The treatments that we have are very, very good at slowing down disease progression or preventing worsening," he says. "But they can't bring back vision that's already lost."

Unfortunately, the nature of the disease means often patients seek treatment when it is too late.

Usually associated with ageing, the condition sees progressive loss of peripheral vision but the process is slow.

"Often the early stages are asymptomatic as you're losing this side vision. There's no pain and the clarity of the central vision can remain normal," says Professor Craig.

"It is frequently associated with high eye pressure, which is one of the common contributors to glaucoma, but that's not always the case." That means, even with regular checks when a patient visits the optometrist, the condition can be missed.

In the developing world, the situation is even worse. There it is common for people to present with one eye that is totally blind, and the other in a very bad state.

"It's a very difficult disease to treat in the developing world because there's no screening," Professor Craig says.

He believes a solution may lie in one of the other characteristics of the disease — its heritability.

If those most genetically predisposed to contracting the disease can be identified, it may be possible to improve targeted screenings or be more alert for signs and symptoms in the at-risk populations.

"It's one of the most heritable diseases in all of medicine. There's a strong genetic component," says Professor Craig.

Sometimes this genetic component can be due to a high-impact change in a single gene.

"We've worked extensively with families to identify whether the next generation has the single risk gene or not. We've become quite good at it, but that tops out at about five per cent of all cases. So 95%, we don't know."

But single-gene inheritance is only part of the picture being uncovered by Professor Craig and his team, including inaugural Snow Fellow, Associate Professor Owen Siggs.

Their program has recruited thousands of patients with severe glaucoma to identify more common and subtle genetic changes that may contribute to the disease.

"By doing that, we've come up with around 2,500 small genetic contributions to glaucoma that additively can make a very solid prediction for an individual," he says.

Associate Professor Siggs adds "In some circumstances, these predictions are as good as genetic tests we already use in the clinic today."

That research was published last year in *Nature Genetics* and allows doctors to ascribe a "polygenic risk score" (or PRS) to patients.

"In doing so, we can make a really strong prediction. People in the highest 10% of risk are 15 times more likely to get glaucoma than people in the lowest 10% of risk," he explains.

That means a blood or saliva test could give a good indication of whether an individual is in a very high or low risk group.

While that doesn't address the middle groups, the research has thrown up some unexpected findings that may make it more universally adaptable, such as whether a high-risk patient will need surgery, and at what age they get the disease. It also predicts how many family members are likely to get glaucoma.

"So now we're designing a test that can be performed as a routine screening, similar to the over-50s bowel cancer screening.

"If we could access a sample from everyone at the age of 50, we would identify those in the very high-risk groups, and advise they turn up for a regular eye check-up for glaucoma."

The team is also running a longitudinal research project monitoring around 2,000 people every six months. That has been going on for more than five years and has revealed a lot about who loses vision and how rapidly.

"It turns out that our PRS test is also quite good at predicting the rate of progression in early disease and who ends up losing vision, requiring treatment.

"We think that it might have value amongst people who have a borderline eye pressure test, for example, as then an optometrist could get those people back for further observation."



**Professor
Jamie Craig**

But Professor Craig warns that eye pressure tests are not always a completely reliable indicator – around 30% of people with glaucoma have normal pressure.

While regular imaging of the optic nerve as well as laser scanning can get around that and is highly effective at picking up early-stage glaucoma, it also picks up people who don't have glaucoma and are unlikely to contract it.

If all those with some borderline features were referred to a specialist, it would threaten to swamp the system.

"It's what we call the false positive conundrum," says Professor Craig. "By doing really sophisticated testing, you can end up with a massive number of patients to deal with."

The answer may lie in precision medicine made possible by artificial intelligence.

"We are working on the use of AI to refine our predictions and to work out who actually has a problem. In what we call the PROGRESSA study, the data includes laser photographs, pressure ratings and a whole lot of other measures about the rigidity of the eyeball, performance on field tests and the genetics.

"We're currently feeding all of that information into AI algorithms. That's quite exciting because it takes it towards precision medicine where we can apply treatments, screening and monitoring at the individual level rather than just one size fits all."

"We're currently feeding all of that information into AI algorithms. That's quite exciting because it takes it towards precision medicine where we can apply treatments, screening and monitoring at the individual level rather than just one size fits all."

AUSTRALIA'S SPACE PROGRAM

TAKES FLIGHT

Australia's decision to engage in a dynamic space program shows bold ambition, but securing a share of space power among superpower nations means that Australia needs to precisely define its purpose and understand the extent of its capabilities.



Associate Professor
Rodrigo Praino

Time is of the essence. While not replicating the frantic 1960s Space Race to launch humans in orbit and land on the Moon, the new frontier of space engagement by many countries – and corporations – is moving quickly and changing rapidly.

To accurately identify Australia's position within this crowded and highly competitive international arena, [Associate Professor Rodrigo Praino](#) has been building a Space Power Index for the Australian Department of Defence – a world-first framework to measure and determine how effectively different countries engage in space programs.

It's an important tool to qualify space politics and policy, especially for South Australia, which is home to around 80 space-related organisations and the South Australian Space Industry Centre. It also complements other work of the Space Power and Policy Applied Research Consortium (SPPARC) that Associate Professor Praino founded at Flinders, in collaboration with the European Space Policy Institute and the University of Naples "L'Orientale".

The index measures 11 countries currently active in space projects – from the superpowers of China, the US and Russia, through significant middle powers of India and Japan, to emerging national entities that include India, Canada, Israel, Brazil and South Korea, along with Australia.

It covers two measurements – a country's technical capability to engage with space projects, and a country's autonomy – to assess whether a country has the capacity to do its own space projects or whether it needs partners.

It also examines whether countries have the political capability to make their own space decisions without outside interference. In Australia's case – and with many competing countries – this becomes a complex answer, as much of the local space technology is owned and operated by private entities, not by the state.

Delving deeper, the index assesses how a country is effectively using its space technology – identifying whether it simply records weather patterns or relays telecommunications information, or does it help inform industries such as fishing, farming and forestry, or play a key role in Defence?

Analysing these answers shapes a firmer framework for what a country such as Australia should be doing in space.

"The index shows that Australia is a middle power in space – and quite obviously does not have the resources to become a superpower," explains Associate Professor Praino. "Australia has an emerging role to play, but at this stage it is not clearly defined."

Therefore, Associate Professor Praino suggests that rather than try to "discover" opportunities in space, Australia must instead decide what it has the ability to do and how to engage such assets as the way to best shape its engagement in space programs.

While Associate Professor Praino's year-long data collection phase – comprising more than 150 pieces of separate information on each country to shape the Space Power Index – and initial report writing is complete, his deeper examination of the data will show where Australia should place its energies to effectively compete in space, especially by focusing in areas where other countries are underperforming.

There are added complexities to consider, with some multinational corporations edging ahead of many countries. It suggests the current space race isn't solely about technological power but the prospect of attaining great commercial power.

If the players and rules of engagement in the new space race have changed, who stands as the umpire – and who determines the rules that should be adhered to? Heavy questions about this unexplored realm linger, but Associate Professor Praino continues to mine a vast trove of information at Flinders University to find answers.

"The most exciting outcomes will happen now, as we enter the deep analytical stage of this project and tease out specific opportunities that can be achieved in Australia's space program," says Associate Professor Praino.

"Engaging in space is especially complex. For every choice of action, there are multiple reactions. For instance, what debris gets left behind in space, what is appropriate international engagement, what technology should be sold to other countries, what happens in the case of a space dispute? All this needs a policy framework and a proper strategy – and that is what we are considering right now."

"Engaging in space is especially complex. For every choice of action, there are multiple reactions. For instance, what debris gets left behind in space, what is appropriate international engagement, what technology should be sold to other countries, what happens in the case of a space dispute?"



CULTURAL CARE PACKAGE

Help is at hand to navigate the thickets of dementia services.

Dementia by its nature is alienating. Imagine how much worse the experience is, for both patient and carer, when language and cultural barriers shut them off from help.

Those are exactly the people Professor Lily Xiao of the Flinders University Caring Futures Institute is working to reach.

“We need to support the informal carers of people with dementia,” she says, “so they do not need to navigate the huge aged care system and healthcare system to discover which services are available for them.”

Professor Xiao has long experience in cross-cultural care for older people, particularly those living with dementia. She’s worked closely with cultural minorities and understands the importance of communication to the quality of care in aged care and dementia care.

Now, for the first time, Professor Xiao is rolling out a four-year, nationwide project to better equip dementia carers, called “Partnership in iSupport”. Originally developed by the World Health Organisation, it has been culturally adapted for Australia by Professor Xiao. She has received a total of \$2 million in funding from the Australian Government to connect informal carers such as family, friends and neighbours with the help they need.

She will work with colleagues in Flinders Caring Futures Institute and four industry partners – the Southern Adelaide Local Health Network (SALHN), Canberra Health Services, and aged care providers Resthaven in South Australia and Bolton Clarke in Victoria.

“In the first year we are going to work with stakeholders –informal carers, service providers, or the care workers and health professionals who provide the direct care for the people with dementia.”

“We are in phase one to find out a linkworker’s roles and responsibilities. It responds to needs many informal carers have called for by linking them to services currently not available for people with dementia and their carers.

Linkworkers will provide one-stop shops for informal carers to find and access available care.

“We know people with dementia rely on family members to organise care services, but carers are not aware about the resources and the services, including education programs for them, that are available,” Professor Xiao says.

“If they have the linkworkers to support them, it will significantly reduce the stress and save the time, with access to people who understand aged care funding and how to apply to relevant services.”

This system will also provide support in co-ordinating other short-term services that are needed from time to time such as hospital-to-home transitional care, and services provided by physiotherapists and dieticians.

The second and third phases of the project will roll out an online iSupport program providing dementia care education for carers, combined with virtual peer support.

“We have found that carers end up shut in at home with the dementia patients most of the time. They lose the opportunity to socialise, and this isolation is a widely recognised problem,” she says.

“We know people with dementia rely on family members to organise care services, but carers are not aware about the resources and the services, including education programs for them, that are available,” Professor Xiao says.



While Dementia Australia and other community organisations do provide face-to-face care support groups, these often require travel, which even in the best of times is not always possible. This problem was highlighted as a result of COVID-19.

“The COVID-19 situation stopped them going out altogether,” says Professor Xiao. “You must remember most of the carers are old people as well – the spouse of the people with dementia typically – and are 80 or 90 years old already.

“This is why we are building a virtual peer support for them.”

This peer support group will work closely with the linkworkers to make sure people stay in the program and get the help they need.

“In this we are taking lessons from India, where the iSupport program was tested. But without linkworkers to facilitate the program, and without peer support, the majority of carers dropped out.”

What is a first for Australia is also set to become a first for the People’s Republic of China.

“Last October – even at a very low point of the relationship with China – the Australian Government released a large grant to support the collaboration between Australia and China, to support Chinese-Australian carers and the carers from Greater China, and to improve the dementia care services as well.”

This will involve building on a previous collaboration with Peking University, Xi’an Jiaotong University, Taipei Medical University, the Chinese University of Hong Kong and Kiang Wu Nursing College of Macau to roll out a similar program to the Australian project, aimed specifically at Chinese-Australian carers and carers in mainland China, Taiwan, Hong Kong and Macau.

But that is just a start.

“The Chinese iSupport for Dementia program is a trial to showcase how it could work with other diverse culture groups and the potential for multilingual versions of the support program in Australia.

“After the Chinese version, we are going to develop other language versions for our multicultural communities here in Australia, for example, Italian, Greek, Vietnamese and Indonesian communities.

“It will be free for family carers to access the online iSupport for Dementia program. We hope this will significantly ease the disease burden on the healthcare and the social care systems in a country with an increased ageing population.”

PORTABLE COVID-19 PATHOLOGY PASSES THE TEST

COVID-19 has afflicted global populations with devastating speed – and has exposed the vulnerability of Australia’s remote Indigenous communities. Fortunately, Flinders University’s [Professor Mark Shephard](#) devised portable and rapid diagnostic test systems that had been more than 20 years in the making.





**Dr Susan
Matthews**



**Professor
Mark Shephard**

Professor Shephard is director of the Flinders University International Centre for Point-of-Care Testing, a groundbreaking unit that is a global leader and advocate for point-of-care testing research, teaching and innovation. Since 1996, this team has taken pathology testing that was previously only available in laboratories and managed its use in primary care settings across Australia and internationally.

Molecular point-of-care testing has proved invaluable in diagnosis of COVID-19 throughout remote Australia. Embedding successful elements for remote point-of-care testing of diabetes and sexually transmitted diseases, Professor Shephard and his team used gold standard SARS-CoV-2 testing on the GeneXpert medical device. This provided access to accurate COVID-19 test results in 88 remote Aboriginal and Torres Strait Islander communities across Australia – generally beyond the reach of urban pathology laboratories.

“We first used GeneXpert technology nine years ago with the successful Test, Treat, ANd GO program, which was a world-first point-of-care testing network for sexually transmitted diseases in remote communities,” says Professor Shephard. “This laboratory device had never been taken into the field before, and it has provided the infrastructure necessary for effective COVID-19 testing.”

The speed that the Australian Government wanted this COVID-19 network set up was daunting, yet the response from the Flinders team and collaborating partners at the Kirby Institute (UNSW) was swift. After receiving federal funding in late April 2020 and commencing testing operation in early May, the program was running at full capacity by November 2020.

The Centre’s co-director Dr Susan Matthews says the program delivered more than 850 hours of training for remote health professionals to perform on-site tests using the GeneXpert. It has enabled more than 40,000 people in remote communities to be tested and obtain accurate COVID-19 results within 45 minutes, rather than a three-day turnaround for the same results from laboratory services — and this translates to more than 58,000 unnecessary patient isolation days that have been saved.

“Professor Shephard’s foresight of 20 years ago made this all possible,” says Dr Matthews. “His leadership and mentoring in this field meant there was already a proven model and a capable scientific team in place to deliver a successful program, with an emphasis on quality and safety that would be expected of an accredited pathology laboratory.”

Laboratory testing represents the gold standard in pathology analysis. Proving that point-of-care testing performed outside a pathology laboratory can have comparable high standards of analytical quality has been a major focus of the Centre’s work.

It now manages networks for chronic, acute and infectious disease that deliver clinical, cultural, operational and cost benefits for patients and the Australian health system.

The breakthrough program that proved the merit of point-of-care testing was QAAMS – the Quality Assurance for Aboriginal and Torres Strait Islander Medical Services program that uses point-of-care testing to manage and diagnose diabetes in Indigenous medical services across Australia. QAAMS has been running for 22 years, and recently received another four-year extension of federal funding to ensure its ongoing work. Significantly, the pathology tests performed in QAAMS receive a Medicare rebate, underlining the program’s emphasis on analytical quality and capacity to improve diabetes control in remote communities.

The Centre’s next goal is to use the GeneXpert device to establish a point-of-care testing network in Australia for hepatitis C diagnosis, to help meet World Health Organization virus elimination targets by 2030. The Australian Government recently announced \$6.5 million in funding for the Flinders University International Centre for Point-of-Care Testing and The Kirby Institute to establish a national testing program at 65 sites with a high prevalence of hepatitis C infection.

“We’ve proved that if point-of-care testing models are set up and managed well, the pathology results are comparable to laboratory tests and the clinical benefits for patients are undeniable,” says Professor Shephard.

“What we achieved in the face of COVID-19 shows that the speed, efficiency and quality of our work can directly inform health policy — and it shows unequivocally how point-of-care testing can be game-changing in emergency response situations.”

“What we achieved in the face of COVID-19 shows that the speed, efficiency and quality of our work can directly inform health policy — and it shows unequivocally how point-of-care testing can be game-changing in emergency response situations.”

POPULISM and politics



Donald Trump failed to win a second term as President of the United States, but his rise as a populist figure has signalled seismic change reverberating through traditional political parties around the world.



Dr Rob
Manwaring

Flinders University politics and policy expert Dr Rob Manwaring is mapping the shift in his ongoing research, analysing the current health of democracies and the fluctuating fortunes of traditional political parties.

Specifically, he is examining the fading popularity and influence of centre-left political parties that held a strong grip on democratic governments around the world through the early 2000s, but have mostly been adrift for the past decade. His recent book — *The Politics of Social Democracy* — provides analysis of this ailing political force that is akin to checking the pulse of social democracies, and ascertaining their future. He sees the new dawn of personality-driven populist leaders as a genuine threat.

“It’s a hollowing out of democracy to see populists gain the upper hand over established and traditional parties,” says Dr Manwaring. “It’s clear that the populists can’t deal with a genuine crisis, because they don’t have a solid platform of policies – and once a democracy loses good governance, it’s not easy to replace.”

Dr Manwaring is interested that murmurs of public concern about the influence of big business on politics is not resulting in widespread public willingness to engage in politics. “History tells us that a population needs a clear threat to push policy change, but even in the era of COVID-19, we’re not clearly seeing that sort of public reaction.”

Casting a wary eye across Europe, Dr Manwaring’s research has identified several prominent campaigns as a Trojan horse for pushing populist agendas. In France, the 2017 French presidential elections were especially revealing, as the victorious Emmanuel Macron had quit a traditional party to form his own *En Marche!* party only nine months before the election. He won office from nationalistic/populist Marine Le Pen, who had radically reshaped and re-named the right-wing National Rally party.

The rise of such individuals underlines growing detachment from traditional political parties, which are floundering in their efforts to regain traction. Dr Manwaring’s systematic mapping of policy change across social democratic political parties shows a significant shift away from their historical foundations, although even these gestures have failed to connect with voters.

“There are pressures on these parties to more clearly define their policies. Voters have much higher expectations of centre-left parties than conservative parties, because the left is viewed as a tax-then-spend choice, so voters want to know precisely what they will get in return for their tax dollars. They don’t like what they are being offered.”

In this scenario, questions hang about whether centre-left parties are still relevant. If so, what do they stand for? “I don’t believe centre-left parties have resolved those questions satisfactorily,” says Dr Manwaring. “Voters have certainly recognised this, and have responded by removing their support for those parties.”

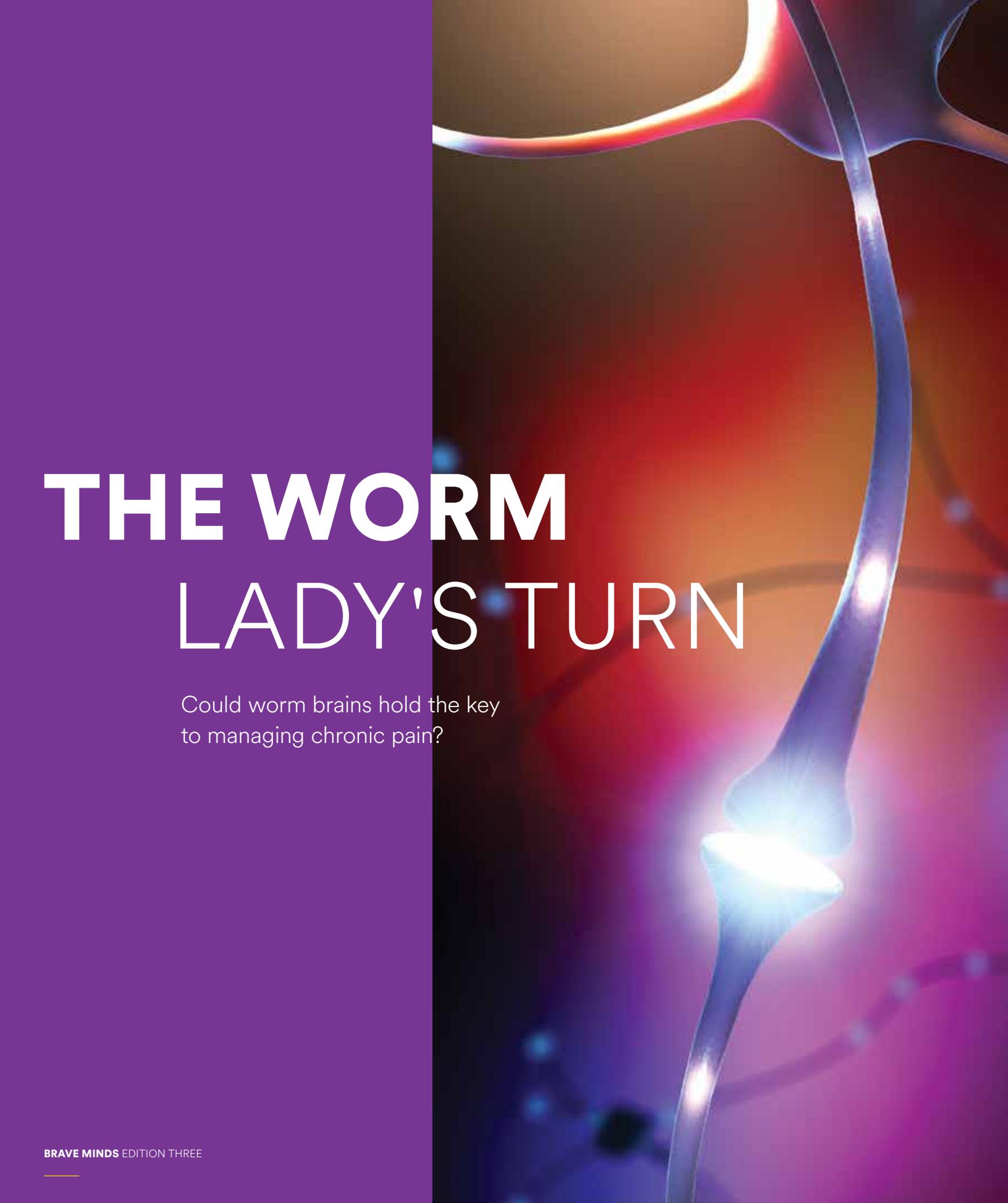
Some of these voters have gravitated towards populist political figures, but an alarming amount now feel disenfranchised and jaded with politics. Since the 1990s, there has been a 10% drop in global turnout at elections. Dr Manwaring’s research seeks to identify where these voters choose to shift their allegiance, or whether they remain disconnected from politics.

To obtain clarity about who wields most power in this era of waning centrist political parties, Dr Manwaring says it is crucial to unlock the identities of para-political sub-groups – the various institutes, “think tanks” and fundraising bodies that wield great influence over the direction and agendas of political populists. Dr Manwaring believes this shadowy area of contemporary politics must be brought into the light for voters to be fully informed, which is the purpose of his latest research.

“As the power of traditional party factions decreases and the numbers of active members in political parties continue to shrink, more needs to be known about this ecosphere of proxy organisations, and the amount of influence they wield,” says Dr Manwaring. “They have power and influence far beyond their relative size, and regulation of these organisations is lax.”

With voters veering further away from a traditional two-party option, democracy is in an era of flux, and change is continuing. “To understand this, people need more factual knowledge, and research provides that,” says Dr Manwaring. “Knowledge is true power.”

“It’s a hollowing out of democracy to see populists gain the upper hand over established and traditional parties,” says Dr Manwaring. “It’s clear that the populists can’t deal with a genuine crisis, because they don’t have a solid platform of policies – and once a democracy loses good governance, it’s not easy to replace.”



THE WORM LADY'S TURN

Could worm brains hold the key
to managing chronic pain?

Dr Yee Lian Chew doesn't mind standing out in a crowd, nor does she object to being known as the "worm lady".

"When I say I work on worm brains, it's a good conversation starter."

Dr Chew is a Senior Research Fellow in Neuroscience at Flinders University's College of Medicine and Public Health, and the worm in question is the roundworm *C. elegans*.

It is a far cry from your common or garden earthworm, however, being just a millimetre in length and transparent, each animal carrying exactly 300 neurons, or brain cells.

But these diminutive creatures are 80% genetically identical to humans and could hold the key to how our own brains work, including how to better manage chronic pain without the use of potentially problematic drugs.

"I'm interested in the changes in the brain when you learn and remember something," says Dr Chew. "We think that for long-term memory there's a particular change, and for short-term memory there's another type of change.

"This is encoded in a particular part of the brain, and then upon remembering those brain cells become active again and chemical changes happen."

But what does all this have to do with worms?

"These worms can do a lot with a small number of brain cells. They crawl around. They eat. They mate. They say, 'Hi,' to each other. They have interesting social behaviours. They move towards certain chemicals, avoid others," says Dr Chew.

"We know a lot about *what* they do, but we still don't really know *how* they learn and change their behaviours depending on experience, or how that memory is encoded in their 300 neurons."

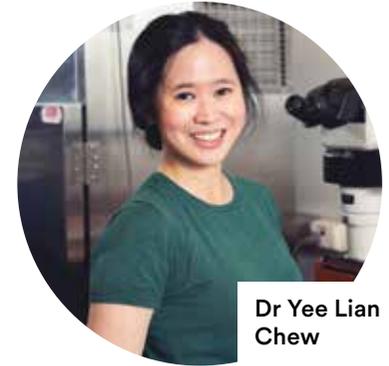
These are all questions that scientists ask about bigger brains, but in the case of the worm, the process takes place in a dramatically more compact system which is easier to follow.

The worms' transparency is also an advantage when it comes to microscopy because you can see the neurons in action in an intact animal, labelled with fluorescent proteins to distinguish the 10% or so that are chemical sensing neurons.

"So using some fairly straightforward image processing, you can monitor the ups and downs of the fluorescence and say when a neuron is active or whether it's active only when given stimulus," says Dr Chew.

"But the other amazing thing that we can do with a transparent animal is functionally turn on or off certain neurons by shining a light on them."

Since 2015, a large part of Dr Chew's work has been to investigate pain-sensing circuits and how they become more excitable.



Dr Yee Lian Chew

While at the MRC Laboratory of Molecular Biology in Cambridge, she picked up work that had been started by a former colleague from Japan. "He had left but had kept incredible records. So I looked through all of his work and basically continued on from that.

"We found one neurochemical signal was released by the neurons that sense touch, and those chemicals were essential for the sensitisation or the increased excitation of the pain circuit.

"If you take the signal away, the pain circuit still senses pain but it doesn't become sensitised and doesn't become more excitable with repeated stimulation."

While the neurochemical was invertebrate-specific, the research led Dr Chew to approach the treatment of chronic pain from a different angle.

Instead of management strategies to block pain, Dr Chew began to look at ways to stop pain becoming chronic by targeting the sensitisation of pain cells. She is using the worm system to identify how that might work, and investigating other neurochemicals which might play a role. She acknowledges that this work will have to move on to more complex animals at some time.

"Absolutely. I will probably go to either flies or mice first. There are several established pain models of those and to see if those particular neurochemicals, first, affect pain sensing, and second, affect pain sensitisation in those animals.

"Perhaps we can try to develop ways with pharmacologists to block those signals in people and see what happens."

But for now she is happy to be the odd worm woman out.

"When you come into a team and work on something a little unusual, you have to think slightly differently to how everyone else thinks.

"And I think being the one Worm Lab in a neuroscience department full of non-Worm Labs forces people to think differently because I always ask the strange questions. Although I am sure a lot of people think, 'Oh no, the worm lady has her hand up again!'"

"We found one neurochemical signal was released by the neurons that sense touch, and those chemicals were essential for the sensitisation or the increased excitation of the pain circuit."

FUELLING the fight



against

CHILDHOOD

obesity

Tackling rapid weight gain in childhood is a critical issue affecting more than 746,000 young Australians – but it can't just focus on traditional approaches.

Professor Rebecca Golley has broadened the perspective with her research program, looking expansively at interrelated factors such as diet quality, sleep patterns, screen-time, physical activity – and particularly the role of caregivers to help prevent obesity.

"If we look at where children live, learn and play, it becomes clear that the role of parents and caregivers is critical to children's wellbeing," says Professor Golley, who is Deputy Director of the [Flinders University Caring Futures Institute](#). "We need to be providing caregivers with the knowledge, skills and confidence to make informed decisions that foster a child's wellbeing."

Professor Golley's research teams are creating nutrition and lifestyle programs that aim to reach parents and caregivers across multiple access points – including childcare, playgroups and schools. "Parents are a child's first teacher, but it gets harder for them as we lose the traditional village model of living and fragmented families live further apart."

This has been amplified in the COVID-19 era, with isolation and interrupted routines exacerbating the difficulties. "As we lose the connections of village-style networks, we've noticed that traditional support systems have gone missing. We need to improve the foods provided to children – so the concept of creating a virtual village, accessed through multiple means, including online delivery, becomes an important way to reach caregivers and help children be curious and adventurous in their eating."

To link all the disparate components necessary to raise healthy children, it has been crucial for Professor Golley and her colleagues to reach far beyond a dietary focus to also encompass exercise physiology, nursing and midwifery, health psychology, sociology and knowledge translation science.

Such cross-disciplinary collaboration underlines the importance of the Caring Futures Institute, which was established at Flinders University in August 2019. By bringing together diverse research teams, the Institute has attracted \$17.4 million in funding during 2020 and is supporting several important research programs, including those led by Professor Golley.

With an estimated 95% of Australian children aged between two and six years not eating adequate amounts of vegetables, the creation of VegKIT provides a suite of tools and resources to help

increase children's vegetable consumption.

The five-year \$4 million project involving the CSIRO, Flinders University and Nutrition Australia (Victoria Division) has been trialled at childcare centres in the past year, with impressive results.

Flinders researchers have also enjoyed success with the Early Prevention of Obesity in Childhood (EPOCH) Centre for Research Excellence, which has developed a suite of tools that take less than five minutes to measure or screen a range of healthy lifestyle behaviours including diet quality from as early as six months of age.

Traditional routine childhood checks record weight and height according to growth percentiles, but that system does not provide any actions on how to change situations. A new behaviour-focused screening tool may help healthcare workers formalise what can be said to caregivers during child check-ups to discuss weight concerns.

"Monitoring children's growth is important, but it has limited impact to spark actions. This new tool is providing the means to initiate conversations about children's wellbeing between health practitioners and caregivers."

Promoting widespread application of these outcomes is now a priority — and a formal partnership has been established between Caring Futures Institute and Wellbeing SA to help fast-track the implementation of research into policy and practice.

"Monitoring children's growth is important, but it has limited impact to spark actions. This new tool is providing the means to initiate conversations about children's wellbeing between health practitioners and caregivers."

"The research we are doing directly addresses the challenges of the health, education and care systems we are trying to influence."

The Institute's focus on providing a healthy start to life is embracing a broader perspective of growth, health and development. Having these ideas embraced by a raft of caregivers – from teachers and childcare workers to parents and grandparents – will ultimately make it easier for them to guide strong childhood health and wellbeing practices.



**Professor
Rebecca Golley**

"Through our playgroup research, we know that parents are feeling overwhelmed by the weight of decisions they face, which undermines their confidence in parenting," says Professor Golley. "The parents feel a lot of blame and shame, and we head into the world of weight stigmatisation. This has to stop."

"All the focus is on the problem, but we need to change the narrative so that parents can feel they have solutions within easy reach that will best suit the needs of their families. If parents can work from a position of strength, they can be confident that they have the answers to move forward."

"There are lots of different threads to this, but the resources we are making available all tie together to create a connected village that provides answers for better child health outcomes."

The strength of the research being provided helps plug existing knowledge gaps, but Professor Golley says much more needs to be delivered, to ensure maximum reach and inclusivity of these services.

"I want this research to benefit all children and families, regardless of their life circumstances, so they can have a seamless health, care and education experience through their early years, to help set them up for the rest of their lives."

Professor Golley understands that a significant cultural divide needs to be bridged if the holistic research being done by the Caring Futures Institute is to serve its full purpose, and to reach those who need help most. Providing practical means of preventing childhood obesity provides a crucial foundation, and will bring the ideal of an inclusive health and care offering several steps closer.



Telling it how it is

Verbatim Theatre can be a powerful expression of real life.

Oscar Wilde once suggested that life imitates art far more often than art imitates life. In its drive to find expression, art offers life a way to do so with beauty and impact.



Dr Sarah Peters

Dr Sarah Peters' research in Verbatim Theatre, which uses the words of real people, rests precisely at this intersection.

A playwright, theatre practitioner and Senior Lecturer in Drama at Flinders University, Dr Peters came to Verbatim while doing her PhD in Toowoomba, Queensland, and was commissioned (with support of funding from the Regional Arts Development Fund and Medicare Local) to write a play for a medical conference.

“They liked the idea of how Verbatim Theatre starts by interviewing people about a topic or an event and recording those conversations and then uses those stories in the development of the play,” Dr Peters says.

“They were really interested in young people’s experience of accessing mental health support.”

The result was a creative performance at a conference.

It was a hit, so much so that the Empire Theatre in Toowoomba commissioned a rewrite. The play called *twelve2twentyfive* performed a local school tour with the Empire and support from Headspace national youth mental health foundation.

The Verbatim experience became more personal with Dr Peters’ next play, *bald heads and blue stars*, about the female experience of alopecia, a hair loss condition she has.

“I had interviewed 15 women from across Queensland. I flew up to Cairns and Mackay, and I drove out to Longreach to interview them.”

Interviewing 15 people results in many thousands of words, a formidable challenge when crafting a play of an hour or so. Dr Peters gently rebukes the suggestion that it is an “editing” job.

“I think of my role very much as an artist and as a playwright even when working with people’s verbatim. When I sit down and have a chat with somebody, the questions that I ask and my demeanour and the way that I respond to their stories are all a part of my creative practice.

“It informs the way that they would tell me a story compared to the way that they would tell another person that story.

“And so, I feel like my hand, or my voice as an artist is present even from that initial community immersion.”

Dr Peters says that some dialogue does come straight from interview to stage via the page.

“All the way through to the other end of the spectrum where maybe a long series of interviews has taken place, a lot of community immersion, and that has informed the amalgamated characters – all the richness and the simplicity

– and the language that exists in the world of the play,” says Dr Peters.

Slowly the medium is losing the stereotype of being minimalistic, a circle of actors sitting on chairs speaking directly to the audience.

“Now there are quite a lot of verbatim works that are highly theatrical – there’s even verbatim-based musicals – but Verbatim Theatre methodologies do bring the sense of actuality. There’s something about it that feels actual and real.”

She says the unifying aspect of her projects can be expressed in three questions: What matters to people? How can that be written into performance? And how does it help?

Currently she is working on community-engaged projects in Adelaide.

“I am working with young people and youth ensembles to figure out how they want to tell stories about themselves, and the things that they care about and the things that matter to them and what it means for people to be able to tell their stories.

“I also want to know what it means in the foyer afterwards, to be able to have conversations about those things that matter to them and their lived experiences and what that does to our sense of belonging and connection and understanding of our places in the world.”

Her works sometimes deliver powerful impacts to those involved. In the case of *bald heads and blue stars*, it helped people feel less alone.

“All of them expressed this sense of being aware that they were part of a larger community and that had a positive impact for them.

“Another impact is that there’s something beautiful about art and how it can convey an experience and an emotion. And so that the burden of that doesn’t have to fall on those individual women. The play could take the burden.”

Oscar Wilde would have understood.

“All the way through to the other end of the spectrum where maybe a long series of interviews has taken place, a lot of community immersion, and that has informed the amalgamated characters – all the richness and the simplicity – and the language that exists in the world of the play,” says Dr Peters.

HUMAN development



is more than

FINANCIAL

As Associate Professor Udoy Saikia was completing his masters in economics from the prestigious Gokhale Institute in Pune, his friends were lining up traditional careers in finance and banking.

Associate Professor Saikia was not so sure. "I wanted a job with scope to work in society, rather than in a corporate environment," he says.

He set his sights on demographics, taking a job in his home state of Assam, working in farming communities and tribal areas.

It was to set in train a career that has led to a fundamental shift in the way we think about demographics and development, focusing on holistic "wellbeing" rather than narrow momentary markers.

A master in demographics from the London School of Economics and a PhD at Flinders University followed, where he spent most of his time thinking about women's empowerment – especially in India.

Then, in 2007, Associate Professor Saikia read a news article about Timor-Leste, which was ultimately to change the way that country thought about its development.

"Since Timor-Leste's independence, the birth rate had gone up. The Total Fertility Rate – the average number of children a woman has in her reproductive life – was nearly eight," he says. "And because it was a new nation, the infrastructure was not there."

With financial backing from Flinders he headed to Dili to investigate. He was there for a month, publishing the first study on fertility in Timor-Leste. But his fascination with the Asia Pacific was now cemented.

His next project was in Bougainville where, with Associate Professor James Chalmers from the UN, and Flinders colleague Associate Professor Gour Dasvarma, he worked on a United Nations commissioned, island-wide survey to measure the Human Development Index (HDI). The experience was to have profound, far-reaching consequences.

UN guidelines list three components of the HDI – life expectancy, per capita income, and education.

"When we analysed the data, the index was very, very low," says Associate Professor Saikia. "But on the ground people were very healthy, and quite happy – extremely happy in the more remote areas. We realised that it was the per capita income component that was pulling down the whole index."

Most villagers, who lived in a barter economy, reported no income.

"They were very happy but they didn't have cash – and they didn't care for cash, in fact.

"We began to think that in traditional societies we should apply another methodology."

Saikia read more about the concept of measuring human development through a capability approach by Nobel Prize winning economist Amartya Sen, as well as the Happiness Index, used in Bhutan.

The Wellbeing Index was well on the way to being born.

He then saw an interview with the Chief Minister of Assam referencing Bhutan's Happiness Index and saying he was keen to do a happiness survey in his state. He was quick to offer his services.

Associate Professor Saikia assembled his old Bougainville team and, again backed by Flinders, headed to Assam. There he met the Bhutanese experts in the Happiness Index, trained by the Oxford Poverty and Human Initiative (OPHI) group.

But as Saikia's team worked, they found that the concept of "happiness" limiting.

"We began to think more holistically – and that was the start of the wellbeing index. We constructed the whole concept there."

The Wellbeing Index is a mixture of the objective and subjective. It takes into account psychological and emotional health as well as physical, and people's relationship with their environment, and with the government.

Data is gathered through a long questionnaire and then processed through a mathematical model developed by OPHI.

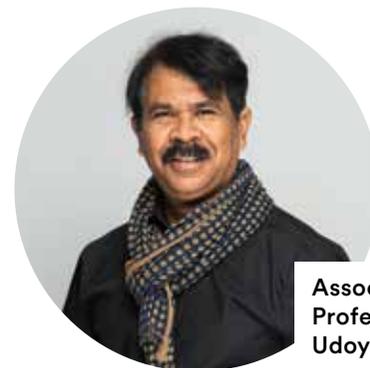
Armed with his new Wellbeing Index, Saikia was intent on showing its value as a developmental tool.

Thanks to the high fertility rates, 72% of the Timorese population is under 35.

"This doesn't have to be a negative. Youth can be a strength that can be turned into demographic dividend in the future. That is what South Korea did particularly well – the situation there 30 to 40 years ago was very similar to Timor.

"Every country goes through a demographic transition where fertility starts dropping, and when it drops there's a window of opportunity to invest meaningfully in education and training. You have more people of working age being economically more productive.

"But if they use the time well, it can be turned into a dividend – although that is not automatic," says Associate Professor Saikia.



Associate Professor Udoy Saikia

Timor Leste was intrigued enough to launch a collaboration with Associate Professor Saikia's Flinders team and the UN to produce a report that would highlight potential policies.

The resulting Timor-Leste Human Development Report took two and a half years to produce and came out in 2018. It paints a detailed picture of the possibilities for Timor Leste up to 2050 or so, and establishes the Wellbeing Index as part of the developmental architecture.

Saikia received Australian Research Council funding and is partnering with the Australian Government through DFAT, the UN, the government of Timor-Leste, and the International Organisation for Migration in a project to assess the wellbeing of the families who have worked seasonally in Australia and returned home.

With remittance the second highest contributor to the national income in Timor Leste after oil, the project is a vital one.

"The income they earn from foreign countries is very important, but they haven't done any work to see how it is having an impact on the society."

Associate Professor Saikia says he will continue to focus on Australia and the Indo-Pacific as he develops the Wellbeing Index further as a holistic tool for demographers and policymakers.

"I am a researcher into evidence-based policies but I use my whole heart."

"Every country goes through a demographic transition where fertility starts dropping, and when it drops there's a window of opportunity to invest meaningfully in education and training. You have more people of working age being economically more productive."



ON SOCIETY'S FRONTLINES

We all need to shoulder the
burden of social justice.

Social work is a family business for Dr Michelle Jones, a Senior Lecturer at Flinders University’s College of Education, Psychology and Social Work – her Popa worked at Yatala prison and her aunt in the health field.



Dr Michelle Jones

“There has been a focus on social justice throughout my life as a result of their influence,” Dr Jones says.

While her focus on social justice may be a singular one, the fronts from which she fights for it are many and varied, ranging from childhood obesity, Aboriginal health, domestic and family violence, child protection, the health and social impacts of climate change and social isolation of diverse communities.

The unifying factor is an understanding of the social determinants of health, and how the social circumstances in which people live, work and play affect their health, wellbeing and safety.

“Taking a social justice lens helps us to understand the ways race, rurality, religion, income, gender and ability contribute to health and social inequities.”

Dr Jones returned to academic life just four years ago after 15 years on the frontlines with SA Health.

“I worked on the childhood Obesity Prevention and Lifestyle (OPAL) program as an evaluation manager. Following that I was involved in setting up a public health indicator system and then worked for Health Performance Council Secretariat as a principal health analyst,” says Dr Jones.

The experience has left her with a passionate belief that social workers need to think holistically if they are not to just treat the symptoms of the problem.

“This is part of the reason I’ve come back to research and teaching – to encourage students to make those links between an individual’s personal troubles and those structural societal issues, rather than seeing each client as an individual case,” she says.

“The origins of people’s individual troubles are more than likely much larger, social problems.”

Looked at through this prism, Dr Jones believes the two biggest top-level problems we face as a society are poverty and racism, which both can create social isolation.

“I have been partnering with social workers in our health system and Aboriginal colleagues to look at how we can build the cultural responsiveness and safe practice among our social workers.”

This, she says, starts with social workers beginning to look at themselves and their effect on other people.

“Recognising, for example, the privilege that they have and the impacts that might have in a practice context.”

While this might look like dumping a lot of society’s problems on the shoulders of social workers to fix, Dr Jones says that other professions are beginning to share the mantle.

“Our social workers in the field are quite remarkable given the level of complexity they are managing. And they manage that within a very complex service system with reduced money to provide services, and limits around who they can provide services to and the amount of those services that they can provide.”

“I see it more and more – one of my PhD students based in Tennant Creek for example has an education background, and she is doing amazing work in this area as well.”

“Earlier this year, I was sitting in the dappled sunlight under the red gums on the banks of the River Murray, chatting with the First Nations peoples from the region, listening to the importance and strength of Aboriginal culture for ‘growing up strong’ children and young people. As a result, the Aboriginal community’s feedback was used to re-shape the study design and methods.”

Dr Jones co-designs research with her partners using rigorous research methods to develop evidence-based practice and practice-based evidence.

“I have partnered with social workers within local and state governments including multiple health networks, as well as the non-government sector such as Kornar Winmil Yunti Aboriginal Family Services and Life Without Barriers.”

“Our social workers in the field are quite remarkable given the level of complexity they are managing. And they manage that within a very complex service system with reduced money to provide services, and limits around who they can provide services to and the amount of those services that they can provide.”

“So, I really take my hat off to practitioners working in the field.”

But in talking to social workers, she says, they seldom complain about the work no matter how traumatic individual problems may be.

“They find it incredibly rewarding. It’s not that bit that is draining. The bits that are draining are working within and across different systems – the health system, the housing system, the mental health system.

“And that’s our social workers, let alone the demands on our service users.”

Dr Jones says the health bureaucracy should be playing a bigger role in creating solutions.

“I’ve been a part of this as a health bureaucrat, but I suppose that is the thing – all of these systems are made up of people just like myself. And you need lots of these individuals to make changes within those systems.

“So, I don’t think it’s down to any one system, or any one person, or any one profession. We need to work together.”

Riverland story

Uncovering the rich Aboriginal history of the Murray River.



Bringing the Aboriginal history of South Australia's Riverland region to the fore has been a long-term collaborative project for Professor Amy Roberts, of Flinders University, and the River Murray and Mallee Aboriginal Corporation.

Together they have explored the period of European invasion and frontier conflict, examined the ongoing effects of European settlement and pastoralism, discovered rare artefacts and extended the known Aboriginal occupation of the region.

Their work has had significant support from the Australian Research Council and others.

One archaeological site that the research team recorded was a secluded rockshelter, a place which preserved traditional Aboriginal engravings overlaid with the historical inscriptions of European members of frontier conflict expeditions and later settlers.

The expedition inscriptions were part of a larger historical trajectory that culminated in the devastating Rufus River Massacre in 1841. However, much of the South Australian story of frontier conflict and violence on the Murray River had received less attention. A swastika, engraved in 1932, also attests to later settlement and racism.

"We need to tell these stories to protect our history and heritage so that our culture is respected and not lost," says Fiona Giles, of the River Murray and Mallee Aboriginal Corporation.

"For us, as traditional owners, this rockshelter is a highly significant and special place. It tells the stories of our ancestors and shows our deep connection to the river and reminds us of how our people lived before Europeans invaded our world."

The team also surveyed vast swathes of the floodplain.

In conjunction with Traditional Owners, they recorded hundreds of archaeological sites including shell middens, stone tool scatters, hearths and oven mounds, canoe trees, rock art and more.

Along the way, they uncovered a number of extremely rare finds such as a 600-year-old serrated shell artefact and a sharp tool made from a tektite (a natural glass created during meteorite strikes).

The breadth of this research has revealed important findings about Aboriginal technological innovations.

"This recent shell find confirms that our ancestors not only made utensils and tools for everyday use, but they were also gifted with making artistic pieces using any materials that were readily available." Ms Giles says.

The research team also recorded a significant collection of oral histories, particularly from community Elders. These histories have provided a guide to their work and have brought to light many "hidden histories".

In particular, accounts have highlighted the importance of Aboriginal labour in the riverboat and pastoral industries – such contributions are often overlooked in history books which have largely celebrated the pioneering achievements of European settlers.

A radiocarbon dating program, led by Professor Roberts' PhD student Craig Westell, culminated in the discovery of the Riverland's oldest archaeological site: a 29,000-year-old shell midden deposit that radically extended the known Aboriginal occupation of the region by 22,000 years.

The dated shells were the remnants of meals eaten long ago. Other dates and sites revealed how Aboriginal people adjusted to an ever-changing river landscape.

The period represented by the radiocarbon results brackets the Last Glacial Maximum when climatic conditions were colder and drier, and when the arid zone extended over much of the Murray-Darling Basin. The river and lake systems of the basin were under stress during this time. In the Riverland, dunes were advancing into the Murray floodplains, river flows were unpredictable and salt was accumulating in the valley.



Professor Amy Roberts

The ecological impacts witnessed during the Millennium Drought provide some impression of the challenges Aboriginal people may have faced along the river during the Last Glacial Maximum, and other periods of climate stress.

"These studies show how our ancestors have lived over many thousands of years in the Riverland region and how they managed to survive during times of hardship and plenty," says Ms Giles.

Professor Roberts hopes that her work contributes to better cross-cultural understandings, promotes the amazing diversity of the archaeological record and significantly improves protections for Aboriginal heritage.

"It's an immense privilege to be able to work with Aboriginal communities, to have their trust and to work together to foreground the extraordinary achievements of their ancestors, from deep time to the recent past," she says.

Together they have explored the period of European invasion and frontier conflict, examined the ongoing effects of European settlement and pastoralism, discovered rare artefacts and extended the known Aboriginal occupation of the region.

GAOL FOR GENERATIONS

Criminology Professor Mark Halsey has unearthed a worrying truth – that intergenerational incarcerations represent a significant number among the nation’s 40,000 prisoners. The problem disproportionately impacts Indigenous prisoners, who report both parents as having been incarcerated at three times the rate of non-Indigenous prisoners.





Following the completion of a 10-year longitudinal study of repeat offending and desistance from crime, Professor Halsey decided there was one issue that called for more specific investigation – how people from the same family get caught up in successive cycles of incarceration, release and reincarceration across generations.

Funded by a four-year Australian Research Council Future Fellowship, the book *Generations Through Prison: Lived Experiences of Intergenerational Incarceration*, by Professor Halsey and Flinders University colleague Dr Melissa de-Vel Palumbo, offers important signposts for change.

It shows that about one in ten prisoners in South Australia has at least one previously incarcerated parent. More specifically, 240 survey respondents (about 11% of the South Australian prison population at that time) reported two or more successive generations of incarceration, and told of 1,138 additional family members ever having been incarcerated, with 533 family members incarcerated at the time of survey.

Given the voluntary nature of the survey, Professor Halsey believes these figures considerably underestimate the true extent of the problem.

“It’s clearly far more than a peripheral correctional issue,” he says. “Our data shows a significant number of families are tied to this situation and that new approaches are needed to stem the tide of intergenerational incarceration.”

One third of those surveyed reported three or more successive generations of imprisonment, while 40% indicated their family’s history of incarceration had a major effect on, or totally determined, their life.

The extent of intergenerational incarceration for Indigenous prisoners is stark. One third told of 10 or more family member having been incarcerated. Indigenous prisoners were also twice as likely to report three or more generations of incarceration. Such trends have very real consequences for family support following release from custody – especially when so many Indigenous people are dealing with the ongoing effects of colonial-induced trauma and loss, or where orders are in place prohibiting family members from associating with and supporting one another to desist from crime. Tragically, many Indigenous prisoners described prison as a safe place, where their families “catch up” and connect.

Professor Halsey says it is heartening that prisoners agreed to contribute to an area of research that has received little previous attention. “They want their stories to be known – and for the continuing patterns of incarceration to be broken.”



Professor Mark Halsey

A key theme to emerge from interviews was the gendered scripts encouraging young men to fill the void of protector and breadwinner left by older incarcerated males. That gap was too often filled in criminal fashion and continued the cycle of intergenerational imprisonment.

Another prevalent theme was the unresolved intergenerational trauma in participants’ lives. This issue was commonly left unaddressed by the correctional system, resulting in high rates of return to prison for such people.

Professor Halsey believes authorities should collect specific data on intergenerational incarceration. “It could be done as part of a screening and assessment instrument at point of admission into custody and could be used to flag the complex social, familial and rehabilitative needs of such prisoners,” he says.

Professor Halsey’s current ARC-funded research is examining how to reduce the number of Aboriginal people in SA and NT prisons for a combination of “administrative” offences (such as breach of bail) and the more serious offences of acts intended to cause injury. Around 60% of Aboriginal people incarcerated on any day in those jurisdictions are for offences under one or both of these categories.

What happens for these people beyond the prison gate? What does their reintroduction to broader society look like? “Even the best therapeutic work in custodial environments is liable to falter if it’s not matched with concerted efforts to transform the social, economic and cultural situations that people return to on release,” says Professor Halsey. “We have to understand the key turning points in people’s lives if we hope to set them on a better path, and research plays a crucial role in that process.”

“Our data shows a significant number of families are tied to this situation and that new approaches are needed to stem the tide of intergenerational incarceration.”



SLAVE STATE

Modern slavery hides in plain sight in South Australia.

Slavery conjures many unsavoury mental images, but to most people few of those would involve South Australia in the 21st Century.

That is about to change if [Associate Professor Marinella Marmo](#) of Flinders University's College of Business, Government and Law has her way.

All around us, people are working and living under appalling conditions that few of us even see, let alone comprehend, she says.

Slavery and slavery-like practices in South Australia include cases of forced marriage, forced labour and domestic, labour and sexual servitude in intimate partner violence cases.

"People, especially temporary visa holders, tend to just accept any condition of exploitation," says Associate Professor Marmo.

"We go to restaurants and never give a thought of the people working there. But last year, international students put together a grassroots movement out of anger that they are being exploited. They published a list on Facebook of over 60 restaurants in the metropolitan area paying \$10 or less per hour to temporary visa holders: chances are we go to these restaurants, but we can't see the exploitation," she says.

"What goes on in regional Australia is also shocking in terms of exploitation. Yet when we go to the supermarket and buy the fruit and veg, we don't know how they come from the Riverland to us.

"The same is true for nail parlours popping up like little mushrooms everywhere, and you see rows and rows of Asian women working. And you do wonder, what is going on in these places that even for trades unions are impossible to access."

In 2019, Associate Professor Marmo published the first report on slavery and slavery-like practices in South Australia, putting this state "on the map of severe exploitation" and bringing at the forefront multiple cases of people trafficked in South Australia between 2004 and 2019 – most of them young women forced to marry.

Her report, in collaboration with ACRATH (Australian Catholic Religious Against Trafficking in Humans), urged the South Australian Government to launch an inquiry and even got the Labor Party to back the establishment of a committee.

That failed to go ahead and now Associate Professor Marmo is running a survey until mid-December on temporary visa holders' extreme exploitation. The survey is designed to provide more evidence of the problem so that the public and politicians can no longer hide behind the excuse of ignorance.

The survey is online (contact marinella.marmo@flinders.edu.au for details) and Associate Professor Marmo, together with Katrine Hildyard MP, maintains a Twitter and Facebook account to highlight the issue at @stopslaverysa.

But being a social justice warrior was not Associate Professor Marmo's first choice of job upon qualifying as a lawyer in her native Italy.

"I practised a little but I remember one time when I was in court with the solicitor and I realised that it was a very important, but dry process," she says.

So, she travelled to the UK to do her PhD in judicial dialogue and the way judges across the European Union dealt with criminal proceedings and basic human rights.

"It's about questioning the law, who makes law? That was more fascinating to me."

She arrived in Australia 16 years ago to find a vibrant scene where she could pursue her research in criminology.



**Associate Professor
Marinella Marmo**

"There are the cases of young women, temporary visa holders, asked to give sexual favours to obtain more hours and so to earn more money. So, the condition of exploitation, it's all layered. And we really struggle to understand what it means."

"It was a wonderful time, and Flinders University was very social justice and social impacts-oriented. And I feel that this is exactly where Flinders wants to go back to now," she says.

In the decade and a half she has been in this country, she has seen public attitudes harden to migrants, refugees and low-paid workers.

"There is a level of cynicism as the result of years of normalising certain narratives from the federal government.

"And so we say about the temporary visa workers, 'Oh, if it they don't like it, they can always find another job or leave'. No, they can't; it's not that easy.

"Then you have the situation of international students being exploited and paid only handful of dollars a day.

"There are the cases of young women, temporary visa holders, asked to give sexual favours to obtain more hours and so to earn more money. So, the condition of exploitation, it's all layered. And we really struggle to understand what it means."

Since her 2019 report, she has kept up her research in this area. She believes we should be bracing for a surge in modern slavery cases.

"The United Nations has said that with COVID-19, we will see more people subjected to modern forms of slavery, forced labour, forced marriage and other forms of servitude. But in Australia, you really don't see that yet, because the international border has been shut for so long."

Associate Professor Marmo says the South Australian Government needs to wake up now to the scale of the problem to come when borders open.

"I'll submit further evidence of severe exploitation and slavery-like practices occurring in this state to the SA Government, to send the message that we need to get ready for it. As a researcher, I can provide evidence-based material, the stories and the data, to the members of parliament. However, we need their understanding that this is a human rights issue, a bipartisan issue, which requires their collaboration and action."

PROVIDING a PATHWAY



for every
VETERAN

The welfare of veterans in Australia has been written in a false narrative. Although 6,000 people leave the Australian Defence Forces each year, focus has been placed on the 20% who are broken. The reality is that every veteran needs a hand to make the transition into regular society.



**Associate Professor
Ben Wadham**

Associate Professor Ben Wadham can attest to this, having been an infantryman in the Australian Regular Army from 1987 to 1992. He found the transition into public life very difficult, but persistence has seen him achieve great things in academia – especially through focusing on veteran mental health and wellbeing in his current role as Deputy Director of Wellbeing and Resilience for the Orama Institute for Mental Health and Wellbeing at Flinders University.

Through his research into the difficult and largely unspoken areas of veteran education-to-employment pathways, male veteran suicide, institutional abuse within the military and veterans in correctional services, Associate Professor Wadham aims to provide better outcomes for all veterans and their families, to ensure their wellbeing rather than leaving them vulnerable and detached.

“We adopt a social health perspective that includes education, employment, health and justice pathways open to all veterans,” says Associate Professor Wadham. “Research and data are critical to influence better policy that will support more expansive and holistic welfare of all veterans.”

To change the existing paradigm beyond purely social aspects of veteran wellbeing, an economic argument must be introduced that reorientates policy discussions to ensure a better return of investment on veterans. “A lot of money is invested in the training of these Australians, but after they have been put through a lot of challenges and struggles, they are not being looked after as well as they should be,” says Associate Professor Wadham. “If we only see these people as being broken, it builds a culture of welfare dependency. Instead, if we view every veteran as an asset, with great skills and experience, their economic case gains traction within a whole new area of policy and legislation. The economic argument is fundamentally about wellbeing.”

Associate Professor Wadham is taking a strong lead to beat a new path. He led the design, development and coordination of the Military Academic Pathway Program in 2019 to facilitate veteran entry to higher education at Flinders University. This innovative program has been a significant success through its initial four intakes, with 80% of participants intending to pursue higher education, and it was nominated as an Australian Defence Industry Award Finalist for best veteran support program in 2020 and 2021.

“I’ve heard about transition struggles so many times from veterans who are looking to take their next step after leaving the armed services.

“They tell me ‘I don’t know how to do uni – not just the study but the social aspect as well. How do I integrate? How do I make connections, make friends?’ For the first time, every decision is up to them, and it’s overwhelming.”

They’ve operated under instructions for years, and now they are on their own. They tell me ‘I don’t know how to do uni – not just the study but the social aspect as well. How do I integrate? How do I make connections, make friends?’ For the first time, every decision is up to them, and it’s overwhelming. This program helps address some of their doubts.”

Providing such practical assistance is only one step towards realising veteran value. Associate Professor Wadham is the Director of Open Door: Veteran Transition, Integration, Wellbeing, a research initiative at Flinders University that collaborates with the Defence Force Welfare Association South Australian Branch. This Australasian research hub brings together a diverse group of 70 veterans, scholars and practitioners to research service provision and policy initiatives, and through building this multidisciplinary approach, the knowledge in veteran wellbeing is expanding.

Such work will come under the spotlight during the Royal Commission into Defence and Veteran Suicide, for which Associate Professor Wadham provided a submission to help frame the terms of reference. He has been engaged in more than 60 interviews relating to institutional abuse, and being drawn into the intimacies of tragic outcomes has not been an easy personal journey. “The conversations have been strong and fearless, because they are built on trust,” he explains, “and they have never before been recorded as evidence. This work is very important.”

Having pioneered sociological research into the Australian Defence Force since 2004, he came up against initial resistance from some areas of Defence, but is now seen as an ally and an asset. His strong body of work now places Flinders University as a place of excellence in Defence-related work – with social inclusion and wellbeing initiatives interlocked with other work associated with Defence technology, construction and training. It all points towards a more complete and integrated understanding on the true value of veterans.

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Our ongoing engagement with industry, government and consumers has helped us take a leading role in a range of research advances that will help shape a better future for our health, economy and community.

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