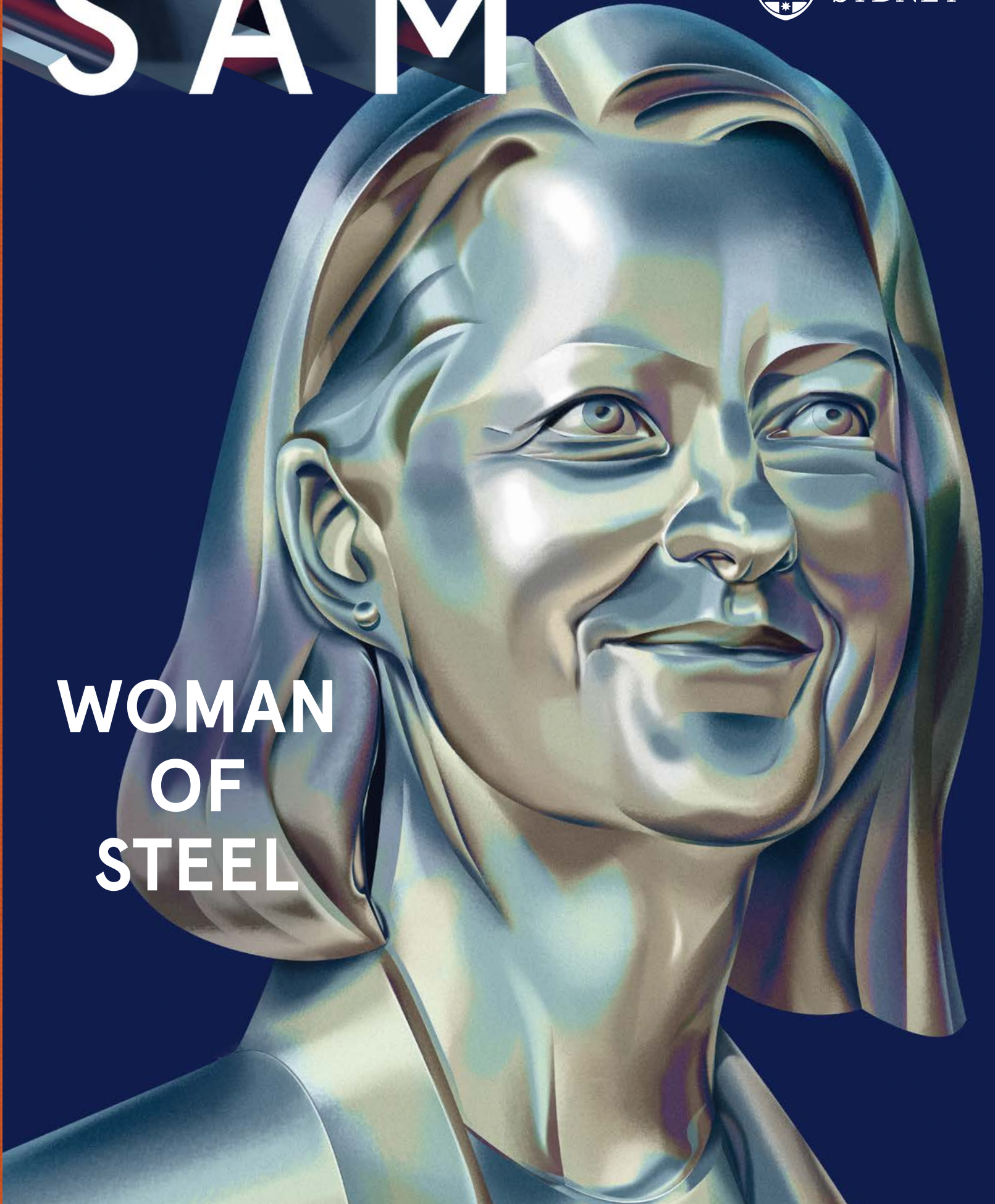


SAM



THE UNIVERSITY OF
SYDNEY

WOMAN
OF
STEEL





Students of the Sydney Teachers
College in a maths class, 1911.
Archive photo G3_224_2285

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BUILDING THE FUTURE TOGETHER

As we emerge from almost two years of COVID-19 uncertainty, one thing that the pandemic has clearly demonstrated is that our alumni and donors are informed, aware global citizens with a keen sense of social responsibility.

We've had numerous conversations with people concerned for the welfare of students whose studies and finances have been so disrupted by the COVID-19 crisis. Certainly, even as students continue their studies, many have experienced challenges with work, accommodation and support networks.

The University has provided financial aid where we can through our scholarship and bursary programs, with the timely support of many of you. To all of our donors, we thank you for your open-hearted generosity.

While most of our students have been learning remotely in recent months, we have supported students unable to study from home by providing them with COVID-safe areas on campus, with additional provisions for those who require in-person teaching in order to complete or progress their studies. Our aim from the outset has been to keep students learning and connected to one another from wherever they are.

While COVID has necessitated a different student experience from the one we imagined this year, it has been wonderful to see the way staff and the broader University community have demonstrated to students that they are valued, and that we want them to have the fullest experience and best education possible.

Our research has also greatly benefited from the consideration of our donors, including \$20 million from the CLEARbridge Foundation for a chair in cancer immunotherapy; a bequest for

another chair in medicine; and two gifts from the BHP foundation - \$12.8 million from their suicide prevention program and a gift of over \$1 million to the Matilda Centre in support of its innovative COVID-19 Mental Health Think Tank. This extraordinary generosity has a lasting impact not just on the people undertaking the research, but on the broader community as a force for good.

It is when we are challenged that we find out what we are capable of, and our vibrant community of students, staff, alumni and donors joining together to emerge from this time even stronger has been truly inspirational.

We look forward to 2022 with great anticipation, and to providing a warm welcome when the many members of our University community return to campus. ●



Belinda Hutchinson AC
(BEc '76), Chancellor

Mark Scott AO
(BA '84 DipEd '84 MA '93 HonDLitt '15)
Vice-Chancellor and Principal



Helping lead the global fight against wheat rust, University researchers are now tackling myrtle rust which threatens native trees with extinction.

ENVIRONMENT

Breaking the mould

Three local plant species have been driven to near extinction since myrtle rust (*Austropuccinia psidii*) arrived in Australia 10 years ago. It now threatens bottlebrush, paperbark, lily pilly and tea-trees. All these belong to the Myrtaceae family, so they're susceptible to this easily spread fungal disease. It can be controlled by sprays, but that's not practical for wild tree populations. To find an answer, University researchers were part of an effort that assembled the world's largest fungal genome, taking up a billion letters of DNA genetic code. Printing it would require 400,000 A4 pages.



SOCIETY

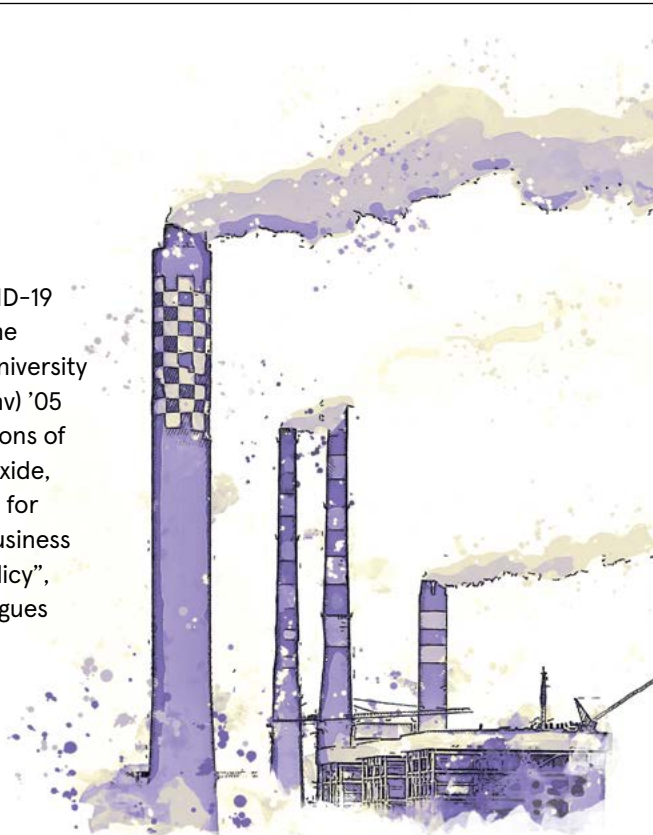
Uneasy money

It worked for organ donation, now it's working for gambling. Previously, government regulations required online gamblers to opt in to betting limits. The uptake was weak. When the regulation changed, requiring gamblers to opt out, a study by the University's Gambling Treatment and Research Clinic (GTRC) found the majority of gamblers stuck with their limits during the course of a year. Another GTRC study found some common characteristics in problem gamblers (younger, likely to be male, placed more and bigger bets, had fewer no-gambling days), which will help design future anti-gambling initiatives.

CLIMATE

Hitting the gas

Has reduced human activity due to COVID-19 led to less carbon in the atmosphere? The answer is no. In fact, in a recent study, University researcher Dr Thomas Newsome (BSc(Env) '05 MWiHePM '06 DSc '11) found concentrations of the main greenhouse gases – carbon dioxide, methane and nitrous oxide – set records for 2020 and 2021. Citing “an unrelenting ‘business as usual’ approach to climate change policy”, Dr Newsome and his international colleagues note three urgent necessities: a global carbon price; a full phase-out of fossil fuels; and environmental reserves to restore natural carbon sinks.



OUR NEW VC TACKLES A CHANGED WORLD

Written by George Dodd
Photography by Louise M Cooper

➤ Mark Scott planned to spend his first few weeks as Vice-Chancellor meeting students, sitting in on lectures, engaging with staff and visiting research labs. Instead, he has been absorbing the culture and operations of his new workplace via video calls at his long-time home in the northern suburbs of Sydney.

“It’s not the way I envisaged I’d start, but we’ve all had to adapt over the last couple of years, and I’ve been so impressed by how Sydney has responded,” says Scott, who has a long history of adapting to the situation. Although new to the management of a university, much of Scott’s career has had an education theme, most recently as secretary of the NSW Department of Education.

“I truly believe in the transformative power of education and research. We are bombarded with compelling reasons to support world-class research and teaching, robust public policy-making, clear communication, courageous leadership and evidence-based decision-making,” says Scott, who is himself an alumnus of the University and one of three generations in his family to have studied here.

As a student in the 1980s, Mark Scott couldn't have known he would become the University of Sydney's 27th Vice-Chancellor. Almost four decades after graduating, he begins his tenure at a time of historic societal upheaval, bringing skills uniquely suited to navigating the challenges faced by the higher education sector.

Being part of the alumni community is clearly something he is intensely proud of. "Our alumni are out there, all over the world, helping to tackle some of today's most pressing issues, whether that's through their chosen careers or contributing to our research and supporting our students. You can't help but feel proud of that connection."

Scott started his career as a teacher, which led to a role in the NSW government as a political adviser in education. Following this, he became an education reporter on *The Sydney Morning Herald*, a position which would shape and expand his career.

Rising through the *Herald* ranks to become Fairfax Media's editorial director, he demonstrated a talent for managing a large, disparate and at times unruly organisation. Even as he tackled a very public and high-pressure job, he was variously described by colleagues as decent, calm, articulate, intelligent and in possession of a rapier wit.

"This was the first time I worked across different geographies and different cultures," says Scott. "Not unlike the University, people there valued their independence. I learned a lot about creating an environment where people could put their own stamp on things while still being part of a team."

It has also been noted that Scott has the confidence to make tough decisions and respond to critics firmly and with candour. These qualities were particularly useful when he took the hotseat as managing director of the ABC at the relatively young age of 43. If running the ABC at a time of great controversy was a cyclone, Scott managed to project a sense of being the calm centre.

"My time at the ABC gave me an insight that an organisation's people and particularly its senior managers have to be comfortable with the unexpected and ready to catch the curve balls," says Scott, adding that if he'd locked in a five-year year plan when he took the helm of the ABC, it soon would have been made obsolete by the dramatic arrivals of the smartphone, fast internet connectivity and social media.

He now recognises the imminent arrival of another transformation for the tertiary sector, spurred on by the global pandemic. As universities around the world have been forced to move to online teaching, with Sydney being particularly successful in the shift, non-university competitors have sensed a tech-driven opportunity: slick, cheap, online-only courses. Already in the US an online education company has listed on the New York Stock Exchange with an initial public offering of US\$4.3b, heralding the potential for international expansion.

"There are a lot of people and organisations thinking about new opportunities in the post-COVID environment," says Scott. "Universities have to think the same way. If universities don't adapt, we could be left behind."

That said, Scott doesn't foresee the looming demise of in-person teaching. "It's not an either/or situation," he says. "Traditional teaching will have to be reimaged. There are also tremendous opportunities for universities in delivering online-only learning for specific industry and business skills. Above all, I want students to be able to say that their days at Sydney were among the best of their lives, as I do."

Another view that Scott holds strongly is that ever-changing technologies mean universities must equip students for lifelong learning. "We're used to people going from school to an undergraduate degree to a job, always following the same path. But that's changing. The pathways to a first degree are changing, as is what might happen after you graduate.

"We want to create opportunities for people to stay connected to learning at every stage throughout their lives."

What those ongoing opportunities might look like is the subject of conversations Scott will have with the whole University community. But if history is anything to go by, his natural optimism and his ability to drive transformation will stand him in good stead in realising this vision for the University. ●



Our planet is named for it, but most of us don't give the earth beneath our feet a second thought. Not so Professor Budiman Minasny. His deep understanding of soil helps keep food on the table and might even rein in climate change.

DOWN TO EARTH

Written by George Dodd
Photography by Louise M Cooper

👉 It's too late. There is now general agreement that the time has passed when we could have tackled climate change by only reducing the use of fossil fuels. Now we also have to look at mechanical ways to remove excess carbon from the air.

The current carbon capture technologies still have quite some way to go, but there are existing mechanisms that deal with massive quantities of carbon every day, both capture and storage. They are forests, the ocean and soil. A global effort is now underway to understand the best ways to bring these ecosystems to the climate change fight.

Soil is receiving particular attention because of its carbon-storing credentials. It's estimated that there are 2540 billion tonnes of carbon in the world's soil, compared with 813 billion tonnes in the atmosphere and 569 billion tonnes in plant and animal life. It is a powerful carbon machine, with one estimate saying it has the potential to store another 1 billion to 3 billion tonnes of carbon annually.

One of the leading international thinkers on soil is Professor Budiman Minasny (MAgr '96 PhD(Agr) '01). As a professor in soil-landscape modelling at the University and the theme leader of Carbon, Water and Soil at Sydney Institute of Agriculture, he has a deep understanding of soil and its potential to turn back the carbon clock.

"Compare the soil under Australia's natural vegetation to the soil of croplands and you'll see about half of the organic matter has been lost since European-style agriculture began here," says Minasny, who is softly spoken with an easy smile.

"A lot of that lost organic matter has been exposed to oxygen by tilling the earth, and it's decomposed into a lot of carbon.

"This has happened everywhere. But we don't have to accept it. We can build the soil back up, we can put the carbon back in."

The singularity of the word 'soil' downplays the fact that soil isn't singular at all. It's a vast, global collection of unique and complex environments that are ever changing. Understand this and you can identify parts of the landscape

that can store more nutrients or moisture or have the potential to store more carbon.

That carbon potential caught the eye of the Australian Department of Agriculture, Water and the Environment, which established the Carbon Farming Initiative (CFI) where farmers and land managers can earn carbon credits by storing carbon on their land. These credits can then be sold to people and businesses wishing to offset their emissions.

Many Australian farmers are already working to reduce carbon emissions on their properties. In fact, they lead the world in a carbon storage approach called minimum tillage.

"That's where you don't remove harvest residue, including leaving the stubble and roots in the ground," says Minasny. "Around 80 percent of Australian farmland is reduced tillage now, which means a substantial amount of carbon not released."

It also means more robust soil that is less likely to be washed away by rain, and more able to hold moisture during a drought.

A major obstacle to farmers embracing the CFI is that establishing the carbon content of soil is time consuming and expensive.

Minasny and his team are working to make it easier through a system that allows tests to be done on site with a minimum number of samples needed

The key technology is infrared spectroscopy (IRS) which reads light reflected from a sample to identify the elements present. IRS is already used by museums to identify paint pigments, in the food industry to establish purity and in forensics.

"The challenge is to get rid of the external signals that we don't want – the effect of moisture, for example," says Minasny. "That is done if you test through a lab. We have to work out how to do it on the farm."

This is happening under the umbrella of Minasny's main research task. He is part of the effort to advance the relatively new field of



By simplifying how the carbon content of soil can be measured, Minasny hopes to help climate-aware farmers lock more carbon away.



Soil is an incredibly complex mix of living and non-living elements that varies significantly across landscapes. Identifying all its elements can give valuable insights.

“Compare the soil under Australia’s natural vegetation to the soil of croplands and you’ll see about half of the organic matter has been lost since European-style agriculture began here.”

– Budiman Minasny

digital soil mapping (DSM), which has seen him become one of the most cited soil researchers internationally – an unexpected achievement for someone who liked science and mathematics but didn’t plan on a career in agriculture.

The mathematical part of Minasny’s brain is particularly handy in his work because DSM involves a lot of statistical algorithms, starting with existing knowledge and extrapolating it across larger areas.

Traditional soil mapping is still done but it’s a laborious process best suited to finding the boundaries between soil types. Digital soil mapping is more holistic, having grown out of the dramatic improvements in satellite photography that saw this tool become highly detailed, information-rich and easy to access.

Allowing that DSM is partly predictive, there is an ongoing focus on enhancing accuracy. To that end, the team that Minasny works with has developed a more nuanced way of expressing the forces that create soil and change it over time that can be applied to the digital map calculations.

The acronym is SCORPAN: soil, climate, organisms (that are present), relief (the shape of the landscape), parent material (what the soil is made of), age (of the soil), and spatial location. How SCORPAN differs from the previous model is that it adds in the reality that the various elements don’t just change the soil, they can change each other. It also adds an allowance for error or uncertainty.

Healthy soil has two types of carbon: biomass carbon made up of living bacteria and fungi, and non-biomass carbon which is the degraded remains of dead plants which had previously pulled carbon out of the air during the process of photosynthesis. Minasny has a particular respect for the bacteria and fungi; what he calls the ‘bugs’.

“Bugs are sort of the soil engineers,” he says. “They create a more habitable region for the plants and other things. They’re the soil’s fuel of life.”

Yet some modern farm practices work against the bugs, through over-tilling and over-reliance on chemical fertilisers. “Fewer bugs mean less fuel for the soil. So all the systems start to slow down. Some of the systems will break down.”

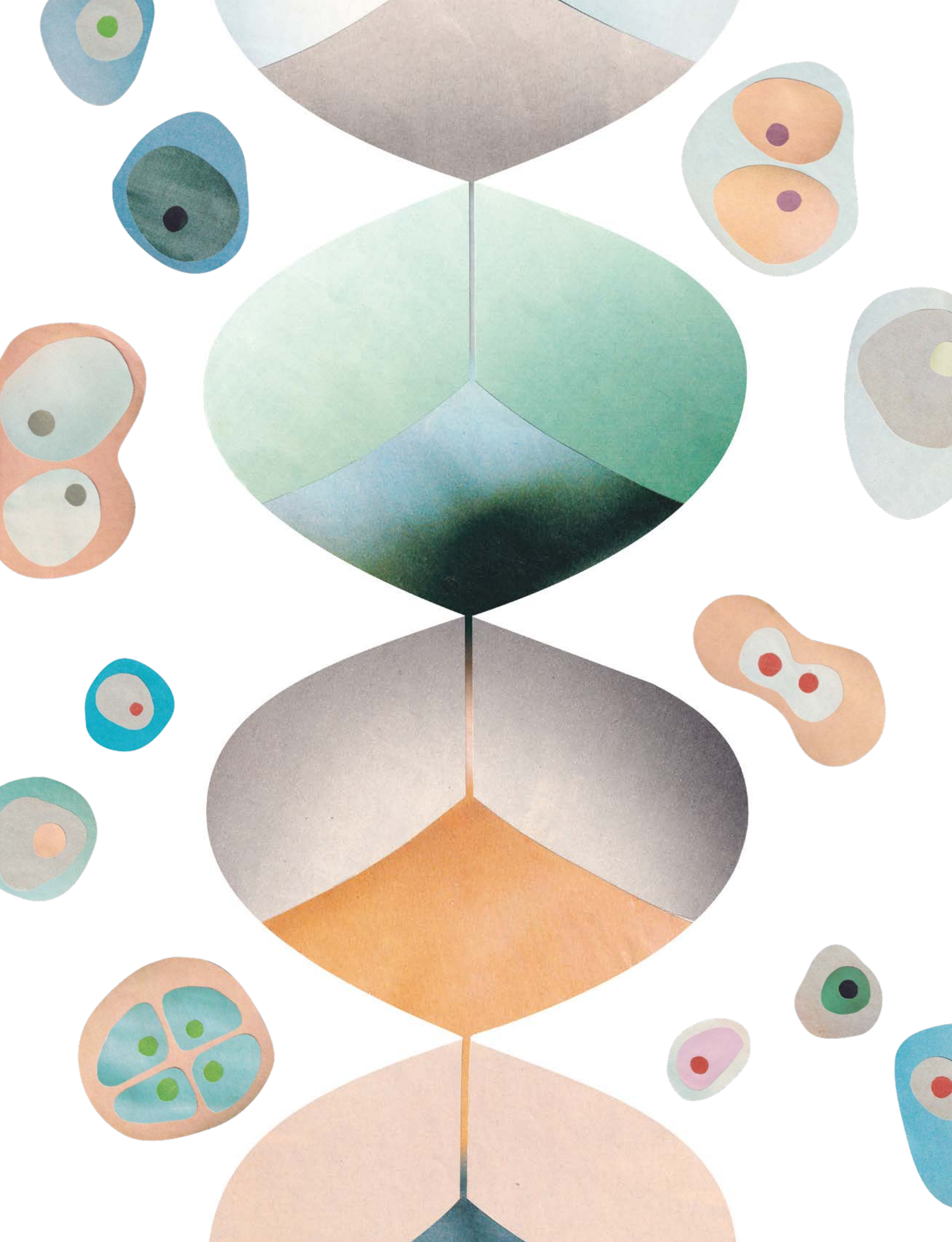
That said, Minasny clearly sees the practicalities: “Farming itself is not a natural system. It’s a human system created to feed humans,” he says. “So it’s good to pull back on chemical fertiliser, but we still need it.”

A great advantage of working with soil is that as an ecosystem, it is massive. According to the UN’s Food and Agriculture Organisation, approximately five billion hectares, or 38 percent of the global land surface, is devoted to agriculture. A small, positive change in such a huge area could bring real benefits but, as Minasny notes, there is a caveat.

“It’s not a substitute. We still have to stop using fossil fuels.” ●

SAVING THE EARTH

Support research like this and you’ll help tackle some of the world’s biggest problems. To learn more, call the Alumni and Supporter Relations team on +61 2 9552 2539 or email alumni.office@sydney.edu.au





All cancers begin as a cellular mishap involving DNA, and finding cures for most of them has been a long and difficult road. But what if there was a way to prevent that original cellular mishap from happening at all?

Immortal enemy

Written by
George Dodd

Illustration by
Clemens Habicht

👉 Search online for the word ‘telomeres’ and you’ll quickly fall down a rabbit hole of ideas about dramatically improving longevity or even reversing the ageing process itself.

There is no shortage of snake oil on offer, but a cohort of international researchers is studying telomeres to understand what potential they truly have in terms of delaying the onset of old age – and, more than that, how they might be manipulated to control many of the cancers we currently wrestle with.

One of that cohort is Associate Professor Tony Cesare. “I set out as a PhD student in 2000, working on telomeres,” Cesare says in his bright and amiable American accent. “There was a time when I wanted to be a baseball coach. Then I found cell biology and genetics. It just kind of clicked.”

Despite the ‘fountain of youth’ associations, telomeres have not fully gripped the public imagination probably because it is hard to describe what they do in a punchy sentence or two, though what telomeres do is vitally important.

“Telomeres are caps of inactive DNA material at the end of all our chromosomes,” explains Cesare. “Put too simply, they are involved in the important process of cell division. If there’s no cell division to create new cells, there’s no

way for kids to get bigger, or cuts to heal, or damaged cells to be replaced.”

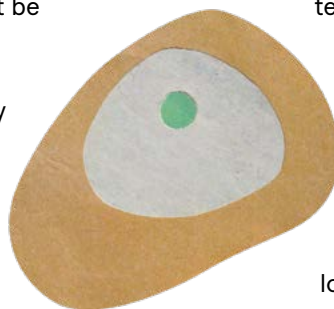
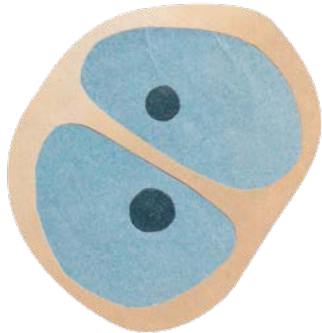
Still, it is a reality that with every cell division, a little bit of each DNA molecule is lost, a scenario called ‘the end replication problem’. But because of the telomere caps, the active DNA material is protected. It is the inactive telomere material that is lost.

Long telomeres suggest a cell is well equipped for many future cell divisions. Short telomeres suggest a cell has nearly run its race and may be producing damaged copies. In time, the proportion of cells in the body with short telomeres increases, which is a harbinger of the onset of age-related conditions.

So, what if there was a way of keeping telomeres long? In fact, there is, through a set of obscure behaviours with names like exercise, balanced eating, no smoking and low alcohol intake.

Then there are the telomeres we all have that are naturally and permanently long, making the cells that house them effectively immortal. It is in understanding this group of immortals that Cesare has made huge strides in recent years.

The immortals we all carry are stem cells, which are like universal patches that convert into whatever cells are needed at that moment – skin cells, bone, hair, gut.





Associate Professor Tony Cesare

FAVOURITE CHILDHOOD TV SHOW

US sitcom *Cheers*

HIDDEN TALENT

I am not bad with a yo-yo
and was once a respectable
10-pin bowler

QUALITY YOU MOST ADMIRE IN OTHERS

Compassion

Stem cells must be ever ready, so their telomeres are kept permanently long by an enzyme called telomerase. Stem cells are the only cells in the body that get this telomerase attention.

“That means, once a stem cell becomes a specific type of cell, it no longer has a way to keep its telomeres long,” says Cesare. “From then on, the telomeres shorten every time it divides.”

The internet snake oil sellers have grabbed onto telomerase as a possible doorway to health and extended longevity, recommending it as a supplement to keep telomeres long. However, as one of the world’s most knowledgeable people on the subject, Cesare advises against.

“By giving a cell telomerase, and artificially extending its life, you’re interfering in how telomeres prevent damaged cells multiplying and how they prevent tumours from happening,” he says. “Use telomerase in this way, and I believe the result could be cancer.”

To underscore the point, consider this: there is one other group of cells unexpectedly kept immortal by telomerase: cancer cells.

Cancer is a wily adversary, evading the immune system, hijacking the body’s nutrition sources to feed itself, riding the bloodstream to other parts of the body. And yes, cancer tricks telomerase into elongating telomeres, thereby allowing its cells to replicate ad infinitum.

It is a strange contradiction of short telomeres that while they are associated with the conditions of ageing, they are also critically important in preventing cancer. Cesare was the first to understand a key step in this cancer prevention mechanism and how it relates to cell division.

When actual DNA (as opposed to telomeres) is damaged, a signal stops cell division happening until the DNA is repaired. Then cell division starts again. Cesare found that short telomeres can turn on the damage signal to stop cell division, while also preventing repair from happening – in effect, permanently retiring the cell.

Allowing that cells with short telomeres are reaching the end of their usefulness, and may indeed be making poor copies of themselves, preventing these cells from multiplying reduces the possibility of cancers developing.

Another key insight concerns a mechanism called the “telomere loop”, which is literally a loop at the end of the telomere. It has been known to exist for some years, but its function was a mystery until Cesare’s team used super-resolution fluorescent imaging to uncover more detail.

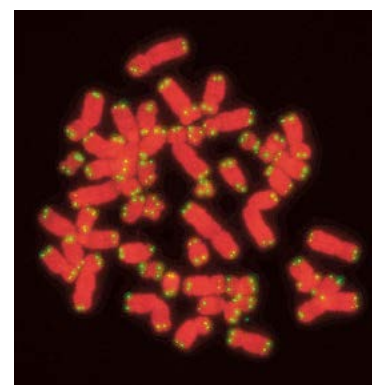
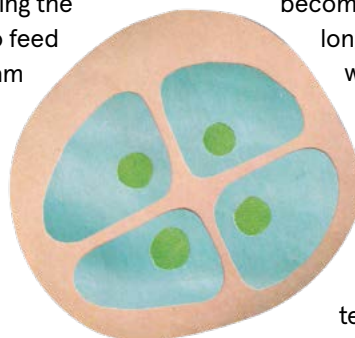
They found that the opening and closing of the telomere loop controls those signals allowing or preventing cell division. It is also an extra safety feature intended to keep the end of the telomere hidden from the body’s repair system, which would see it as broken DNA to be fixed by stitching to another piece of DNA, with possibly serious consequences.

Telomere loops are created by a protein called TRF2. Demonstrating its importance, if you remove TRF2 from adult cells, telomere loops fail to form, telomere ends are exposed and chromosomes become stitched together into one long string, which is incompatible with life.

Surprisingly, however, it turns out that this is not true of stem cells. Remove TRF2 from stem cells and almost nothing happens: no effect on chromosomes, telomere loops or cell division.

Cesare still has a sense of wonder when talking about it: “I’ve been in the field for 20 years, and this was the single most surprising thing I’ve ever seen – hands down.”

This suggests that stem cells have a system of telomere protection yet to be discovered, which may give us a deeper understanding of ageing and cancer – or indeed provide tools to make stem cells life-saving in ways yet unimagined. ●



The yellow dots are telomeres attached to DNA molecules. They protect crucial DNA information from damage during cell division.

MORE HEALTH, MORE LIFE

Support research like this and you’ll help tackle some of the world’s biggest problems. To learn more, call the Alumni and Supporter Relations team on +61 2 9552 2539 or email alumni.office@sydney.edu.au

SWEATING THE SMALL STUFF

Add carbon to iron, you get steel. Add hydrogen to steel, you get a potential catastrophe. The condition, hydrogen embrittlement, has so far resisted all attempts at an answer. Professor Julie Cairney is looking closely at the problem.

Written by
George Dodd

Illustration by
Nigel Buchanan

👉 You might never have heard of hydrogen embrittlement (HE), but you have definitely heard of its consequences.

It was implicated in the 2011 Fukushima Daiichi nuclear disaster, the Deepwater Horizon oil spill in the Gulf of Mexico (the largest marine oil spill in history) and countless other structural failures affecting aviation, shipping, construction and energy production.

It affects a range of metals, but it's a big problem with steel, like the steel in the screws that were holding up your cupboard that suddenly dropped off the wall for seemingly no reason.

Since it was first identified in 1875, HE has been a focus of international research, but no solution has emerged.

As the name hydrogen embrittlement suggests, the villain here is hydrogen. If it diffuses its way into steel during the manufacturing process or through corrosion, the steel becomes brittle.

STRENGTH IN KNOWLEDGE

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Strangely, the stronger the steel, the more likely it is to eventually suffer from HE. The question is, what does hydrogen do to the atomic structures of the susceptible metals?

The answer could come through an exquisitely precise technology called atom probe tomography and the work of Julie Cairney, who is a professor in the School of Aerospace, Mechanical and Mechatronic Engineering at the University and Director of the Australian Centre for Microscopy and Microanalysis.

In effect, Cairney and her team of PhD students and early career researchers are explorers of the impossibly small worlds that have been opened up by advances in microscope technology.

"I first used a microscope in my final undergraduate year of materials engineering, for a subject called Failure Analysis," says Cairney, who has an easy energy and a talent for communicating ideas. "We looked at some actual bone replacement implants that had failed inside someone's body.

"Through a scanning electron microscope, they looked beautiful and said so much about why the failure happened. We then wrote a diagnosis of the failure for the technicians at the hospital."

The word 'microscopic' slightly underplays the places where Cairney does her work. She observes the behaviour of actual atoms, with atom probe tomography (APT) allowing the creation of 3D images of clusters of atoms and how they connect with each other, including where hydrogen atoms might rest destructively in the atomic structure of steel.

Describing atom probe tomography takes us into an area of deep science. To demonstrate that it is used with any number of substances, including steel, the following explanation is based on a substance previously studied by Cairney's team: tooth enamel.

The first step is to form the tooth enamel into a super-fine needle. Atoms like to move around, so the needle is put into an ultra-high vacuum chamber and the temperature reduced to a stabilising 100 Kelvin (which is lower than -170 degrees Celsius).

The needle is pointed at an ion detector, which is not unlike a home smoke detector responding to ion-rich

smoke. Applying an electrical pulse to the needle unbinds one atom, making it an ion. When the first ion hits the ion detector, progressively followed by others, the puzzle starts piecing together.

Different ions can be light or heavy, so the time an ion takes to reach the detector identifies what element it is. The detector also records where the ion hits, allowing its position in the needle to be calculated. This information creates a 3D image showing how the different substances in the tooth enamel are arranged atomically.

Looking at the 3D image, Cairney's team saw something unexpected. They saw magnesium.

It was already known that tooth enamel is made of rods of a crystalline substance called hydroxyapatite. What Cairney's team discovered was magnesium discretely trimming the rods. The rods themselves are only 20 nanometres long (for scale, a piece of paper is 75,000 nanometres thick), so maybe it's not so surprising that such a tiny amount of magnesium was previously missed.

With this insight, researchers can now think differently about how tooth enamel is formed, the pathways that cause decay and how to regenerate it.

This list is not unlike the questions around the current steel project which has a particular relevance for Cairney, who has a background in the science of metallurgy.

Cairney was born and raised in the mining city of Broken Hill in far western

"IF YOU CAN USE HIGHER-STRENGTH STEEL TO MAKE CARS BECAUSE YOU KNOW IT WON'T BECOME BRITTLE, YOU CAN USE LESS OF IT"

– Julie Cairney

New South Wales. “The professional people you meet in mining towns are likely to be geologists or metallurgists or mining workers,” she says. “That was the industry that I grew up with, and all that geology stuff is so fascinating to me.”

What made it possible for Cairney to study the subject she loves was a scholarship. She remains a strong advocate for helping young people through their study. “Scholarships are a powerful way of fighting disadvantage,” she says.

Now a leader in her discipline, Cairney is ideally placed to investigate the mystery of hydrogen embrittlement. Part of the reason an answer is so elusive is that hydrogen is the smallest of all atoms and won't stay put long enough to be observed, even by APT. By the time the needle of steel has been prepared, the hydrogen is gone. But Cairney and her team might have found a solution.

“There is another type of hydrogen called deuterium. It's like standard hydrogen but it's heavier, so we can identify it, and it marks where the hydrogen is in the micro-features of the steel,” she says.

Early results suggest problems may arise when hydrogen atoms settle in load-bearing locations or where metal



Professor Julie Cairney

FAVOURITE CHILDHOOD TV SHOW

UK sitcom *Blackadder*

OCCUPATIONAL HAZARD

Sitting still for so long
I can barely move by
the end of the day

MOST-USED WORD

My most *overused*
word is ‘strategic’

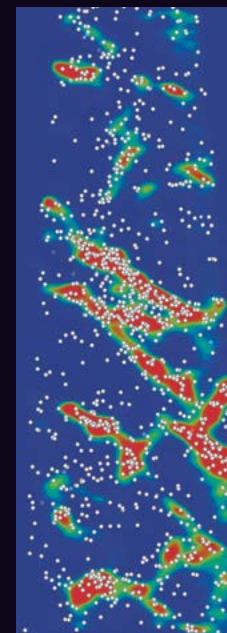
needs to be bendable. Every piece of new knowledge brings a solution closer. While the key goal is improving safety and reliability in construction, there could be other benefits.

“If you can use higher-strength steel to make cars because you know it won't become brittle, you can use less of it,” says Cairney. “That means lighter vehicles using less fuel and a massive reduction in emissions over time.”

Beyond the steel problem, Cairney's team is also working towards what would be a dream project: analysing samples brought back to Earth from a Mars mission. Currently they're in what could be termed an audition phase.

Working with Glasgow University, they've analysed Martian meteorites to see if they hold evidence of water on Mars, which they do. Now they're confirming those results.

“We need to demonstrate that our team can provide accurate information so that we can get to work on actual samples from Mars,” says Cairney with obvious excitement. “That's the thing that I absolutely love the most about my job: being able to be part of the process of discovery.” ●



(Far left) Professor Julie Cairney is a world authority on atom probe tomography. Her University group also helps other research organisations and industry use the technique. (Near left) An enhanced APT image showing hydrogen atoms (in white) dotted through martensitic steel as used by the automotive industry. It shows hydrogen atoms coinciding with carbon atom concentrations in the steel's defects.

PERSPECTIVE SHIFT

Classical music lovers listening to the compositions of Professor Matthew Hindson AM (BMus '90, PhD (Arts) '03), might know that he is Deputy Head of the Sydney Conservatorium of Music and that his works are much performed, including by the Birmingham Royal Ballet, the San Francisco Ballet and the Sydney Dance Company. They may be less aware of one of his key musical influences.

👉 I remember it well - a cold Melbourne winter's night in 1992. After a hard day's work on my master's dissertation, I was lying in bed, listening to the local community radio station, 3RRR.

At the time, I was a postgrad student at the University of Melbourne, and in vogue in the new-classical world was a style called 'New Complexity'. Its student adherents were intolerant acolytes - a musical Red Guard who denounced anything not New Complexity as backwards-looking or rubbish.

As it turns out, I didn't write music in the New Complexity mould. It didn't speak to me at all. Did I have any future as a composer? It would seem not.

Now, back to 3RRR, which is a publicly funded broadcaster and can be relied upon to play stuff that is a bit out of the ordinary. I was listening to it, and suddenly I heard something unexpected.

Death metal.

I sat upright, absolutely astonished. It may well have been a song such as *Hammer Smashed Face* by Cannibal



Corpse. I had never heard anything like this! It was visceral. It was virtuosic. It was enthralling. It was rhythmic, adrenaline-filled, pure energy in sound.

The contrast between the hedonism of death metal and the 'correct' world of academia could not have been more stark. My future was now in not obeying what others said was right or wrong.

The next piece written after I finished my degree in 1993 was for two violins and

called *Chrissietina's Magic Fantasy*. In it, I recontextualised some aspects of death metal. No-one had done this before. It was a stab in the dark.

Chrissietina turned out to be one of my most popular pieces of music, still performed to this day.

Hammer Smashed Face showed me that you must follow your own heart, and your own instincts, to make a true difference. It changed my life. ●

Serving a purpose

Written by
George Dodd

Photography by
Stefanie Zingsheim



Public enemy number one in the modern world is the weighing scale. Every diet has been tried, yet the kilos multiply while diabetes and heart disease are still prevalent. Is there something we're missing?

“It’s grossly oversimplistic to say animals, humans included, eat for energy. That’s fundamentally untrue in biology.” – Professor David Raubenheimer



PREVIOUS PAGE
THE CONGO
BAYAKA HUNTER-GATHERER DIET

Bananas, manioc, plantains, sugarcane, yams, seeds, peanuts, caterpillars, honey, tubers, aquatic animals (e.g. freshwater fish), land animals (e.g. duiker, pangolins, birds)

THIS PAGE
THE ORANGUTAN DIET

Mostly fruit and young leaves, supplemented by shoots, bark, flowers, seeds, and the occasional tasty insect

NEXT PAGE
THE WESTERN DIET

Processed and fast foods, high sugar and fat content, low fibre content

Remember when low fat seemed like the answer? Then the research was stretched out of shape by an international food industry dazzled by the massive profit potential of low-fat product lines and soon, low fat became its own problem.

At least now we know the real problem is sugar. Or is it?

Don’t look for an easy answer from Professor David Raubenheimer. Yes, he is a world expert on human and animal nutrition, but his work, at its core, has always been about getting the world to accept that there are no clear-cut dietary villains.

“We’ve been treating this like an engineering problem,” says Raubenheimer. “Tell people to eat less fat and problem solved. But we’re not dealing with a linear system here. Animal nutrition, human nutrition, is an ecology. You have to factor in all the players.”

The comparison can be made to how an animal in nature is affected by its food environment: where the animal forages, the season, the weather, the actions of other animals. Humans aren’t so different. We also forage, but in supermarkets and restaurants, and what we find to eat in our landscape is affected by the actions of our culture, governments and the food industry.

An insight into the problems of the human foraging landscape came from a 2019 Deakin University study which found that, on average, supermarkets discount junk foods twice as often as healthy foods – a clear case of industry changing the human food environment and driving bad choices.

These ideas are investigated in an emerging discipline called nutritional ecology, and throughout his career, Raubenheimer has been gathering evidence to define and test its implications. One question has particularly motivated him: why is the

developed world in the continuing grip of an obesity and diabetes epidemic?

Part of the answer could be that there is a fundamental misunderstanding of our main driver for eating.

“It’s grossly oversimplistic to say animals, humans included, eat for energy. That’s fundamentally untrue in biology,” says Raubenheimer, who came to the University to take up the Leonard P Ullmann Chair in Nutritional Ecology, which was established through the sale of a painting by Picasso, *Jeune Fille Endormie*, provided by an anonymous donor.

“Humans, like many other species, actually have a stronger appetite for protein than for the main energy-providing nutrients – fats and carbohydrates. That means that if the protein in our diet is diluted with fats and carbs, we will eat more energy to get the protein that our bodies crave.”

A good illustration is that universal favourite, hot chips. Consider somebody who needs 75 grams of protein daily. To get this on a diet containing 15 percent protein – comprising, say, vegetables, rice and fish – she would need to eat 2000 calories of energy, which is the daily energy intake recommended for women.

“But if she was trying to get the same amount of protein from chips, which

contain only 5 percent protein, she would need to eat a whopping 6000 calories,” says Raubenheimer. “That’s three times more than the recommended number.”

This mechanism, now called the ‘protein leverage hypothesis’, was identified by Raubenheimer with his colleague of 35 years, Professor Stephen Simpson, who is the academic director of the Charles Perkins Centre. Together, they’ve written books and numerous papers on the subject of nutrition, including their latest book, *Eat Like the Animals*, now translated into nine languages.

So why is protein such a driver of appetite?

Proteins are part of almost every element and function in our bodies. They’re in the structure of our cells, present in enzymes and hormones and active participants in our immune responses. It’s estimated there are over a million expressions of protein that build the human body and allow it to function. Is it any wonder we hunger for it?

“The protein mechanism in appetite is a revolutionary insight,” Raubenheimer says. “Obesity, diabetes, cardiovascular disease – they’re all driven by diet and we have to use what we’re learning to bring them under control.”

The quest is being pursued in the labs of the University’s Charles Perkins Centre, but for years, Raubenheimer has sought knowledge in some of the most remote places on the planet, travelling from the lush and humid jungles of Borneo to the austere peaks of the Himalayas.

The wild places he most often goes to, though, are where he can observe primates: gorillas, orangutans, chimpanzees, lots of species of monkeys and baboons, “Not just because they’re

very like us,” Raubenheimer says, “but because they habituate. In time, they regard you as just a normal part of the environment, so long as you treat them correctly, and you behave correctly.”

Raubenheimer describes a typical day observing an orangutan.

“We get up at half past three or four, and head into the forest before the sun comes up to locate an orangutan that we’d previously identified. She’d still be up a tree in her sleeping nest, so we string up hammocks around the tree and wait until she wakes.”

When the orangutan finally wakes and starts feeding, the observation team is on.

“We record everything she does. Everything she eats. What she excretes. We take samples for nutritional analysis, chemical analysis, then translate those very detailed observations into the nutritional geometry models that we have created to give shape to the information.”



Professor David Raubenheimer in the field.

Nutritional geometry was created by Raubenheimer and Simpson as a graphical tool to represent complex nutritional information and allow the outcomes of changes to be predicted.

So if these two nutritional thought leaders agree that the answer isn’t a low-fat, low-sugar, low-carb, keto or paleo diet, then what is it? Again, we return to the word ‘ecology’ and the ecology of the Western diet.

The natural food ecology of an orangutan presents it with fruit, young leaves and sometimes insects. The food ecology of many humans presents us with highly refined, high-sugar, high-fat foods – all of which dilute the protein in our diets. That leads to overconsumption and the all-too-familiar diseases of the Western diet.

“This isn’t really about individuals gaining or losing weight,” says Raubenheimer, who is establishing the Centre of Excellence for Food System Transformation to solve problems of the Western diet through ecological methods.

“Governments should use tools like taxation, subsidies, labelling laws and health education; industry should prioritise the production of affordable, healthy foods; and consumers should use their purchasing decisions to push government and industry into making healthy eating easier.” ●



THE WEIGHT OF THE WORLD

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He has a quality of leadership that others recognise, and it's taken him from the struggles of life on Palm Island to the highest levels of government. Now Robert Blackley is a doctor determined to make people's lives better.

Equal to the task

Written by George Dodd
Photography by Wayne Quilliam

👉 Sometimes medical students come up with images to convey the immense struggle of staying on top of their subject. It's drinking water out of a gushing firehose. It's eating an ever-growing stack of pancakes that could overwhelm you at any moment.

Dr Robert Blackley has his own analogy. "You're drowning as you swim towards an island," he says. "In final year, you somehow reach the beach. Then you look up and see this incredibly high mountain. But by then, you think maybe you can climb it."

A couple of things made Blackley's swim unusual. He was 40 when he started his medical studies. He was also powerfully motivated by his years growing up on Palm Island in Queensland, where Aboriginal men like him had a life expectancy of just 42 years.

"I was actually born in Townsville, because babies weren't often delivered on Palm Island because of high mortality

rates," he says. "They still don't let babies be born, by choice, in the hospital there."

With very few questions needed from *SAM*, Blackley tells his story in an easy flow that touches on remarkable experiences, some lived in a beach shack with no running water, others in the glossy corridors of government power. His voice is calm and his facial expressions subtle, but they richly convey happiness, nostalgia, optimism and, at times, deep sadness.

"Since being a small child in the playground, I thought that there should be a sense of justice and fairness in things, and that's how I acted, too," he says. Events in his life soon told him that not everyone thought that way.

Many things shaped Blackley into who he is today: the threat of being removed from his white schoolteacher father and Aboriginal-Torres Strait Islander mother because mixed marriages were unacceptable; the positive time later

spent in an Anglican boarding school with the prophetic dormitory motto 'Equal to the task'; being in the bush with strong tribal people who gave him his cultural knowledge: "I walk in the world very much as an Aboriginal person, grounded in the Aboriginal cosmology of creation."

Still, it was Palm Island and the needs of its people that most strongly marked Blackley's path through the world.

As a young man living on the island, he was so appalled by the poor quality of the food sold in the state-run store ("People talk about eating healthy food, but what if it's just not available?") that he started his own business selling fresh fruit and vegetables from a shipping container. Not long after, that shipping container had a sign out front announcing that Blackley was running for council.

His step into public life gained its own momentum. By the age of 21, and as a new father, Blackley was sitting on the Palm

“One day I looked in the mirror to shave, and I couldn’t. I had the razor and couldn’t shave my own face.”

– Robert Blackley



Dr Robert Blackley

DEGREE
(MD '19)

THE NON-WORK THING YOU'RE A PERFECTIONIST ABOUT:

Cooking eggs. I like to think I could make it in the egg game if medicine doesn't work out.

YOUR FAVOURITE KIND OF SHOP

A bookstore. There is a sweet melancholy in wandering the aisles, dreaming I'd have time to read everything I want to, but knowing I never will.

THE THING YOU ALWAYS PUT OFF DOING

Burying our bokashi compost. We eat a lot of fruit and vegetables so the task seems to come around too often.

Island Council. He was soon pushed forward to confront government ministers about the poor legislation that governed Aboriginal people.

By 24, Blackley was Palm Island's mayor, making him Australia's youngest ever, although thanks to some of the problematic legislation he was working to change, he could only be called chair of the Palm Island Aboriginal Council. He lasted only a year before his push against corruption saw him ostracised. He then moved to Cairns.

The events of the following years are too numerous to list here, but two stand out.

The first was when the possibility of a medical career first crossed his path. “A medical school opened in North Queensland,” he recalls, “and they said, ‘Come and do medicine. Rio Tinto will pay for everything.’ It was hilarious!”

The second was when he was tapped on the shoulder by then Queensland premier Peter Beattie, leading to Blackley becoming a ministerial adviser in Aboriginal and Torres Strait Islander Policy and Women's Policy.

“I'm twenty-seven. I'm in a suit. I'm in Parliament House. The work was interesting, but we'd drink \$200 Scotch and talk about managing the drinking of Aboriginal people. I didn't like what I was becoming. One day I looked in the mirror to shave, and I couldn't. I had the razor and I couldn't shave my own face.”

Not long afterwards, Blackley was back on Palm Island and re-engaged with improving things for the people there: their environment, education and health care.

The following years were a tug of war between energetically working for his community and fighting a heavy darkness that would drop him into listless despair. On his 34th birthday, Blackley had his last drink, cleaned himself up and embraced some lifelines that had come his way, including his now wife, Marisa.

Again, medicine entered the frame.

“A minister turned up to Palm Island, and I could see what was happening. He was thinking, ‘I'm on Palm Island. There's cameras, the media's here – I have to announce something.’ So he did.”

The announcement was that two Palm Islanders would be trained as paramedics. Blackley applied, was granted one of the positions and began training with the Queensland Ambulance Service. He studied online while being part of the Palm Island ambulance team.

“It was tough, but I was loving the life,” says Blackley. “Fast-driving the ambulance to all sorts of mad stuff. And all those patients, they all had their own human stories. But I was cutting down friends who had hung themselves from trees. Eventually, I had to ask for a transfer to Cairns.”

With urging from his wife, who herself had two degrees from the University of Sydney and was then finishing undergraduate medicine at James Cook University, Blackley eventually did the exam to study medicine at the University of Sydney, and was offered a place.

“The University does good things for the Aboriginal students,” he says. “There's a support team, a little a bit of financial assistance. I was given a public transport travel card – I loved that card. And they gave me a laptop, which I've only just upgraded.”

Study soon threw Blackley into the deep water, where he had to swim for all he was worth. As others fell by the wayside, to his own amazement, he continued on.

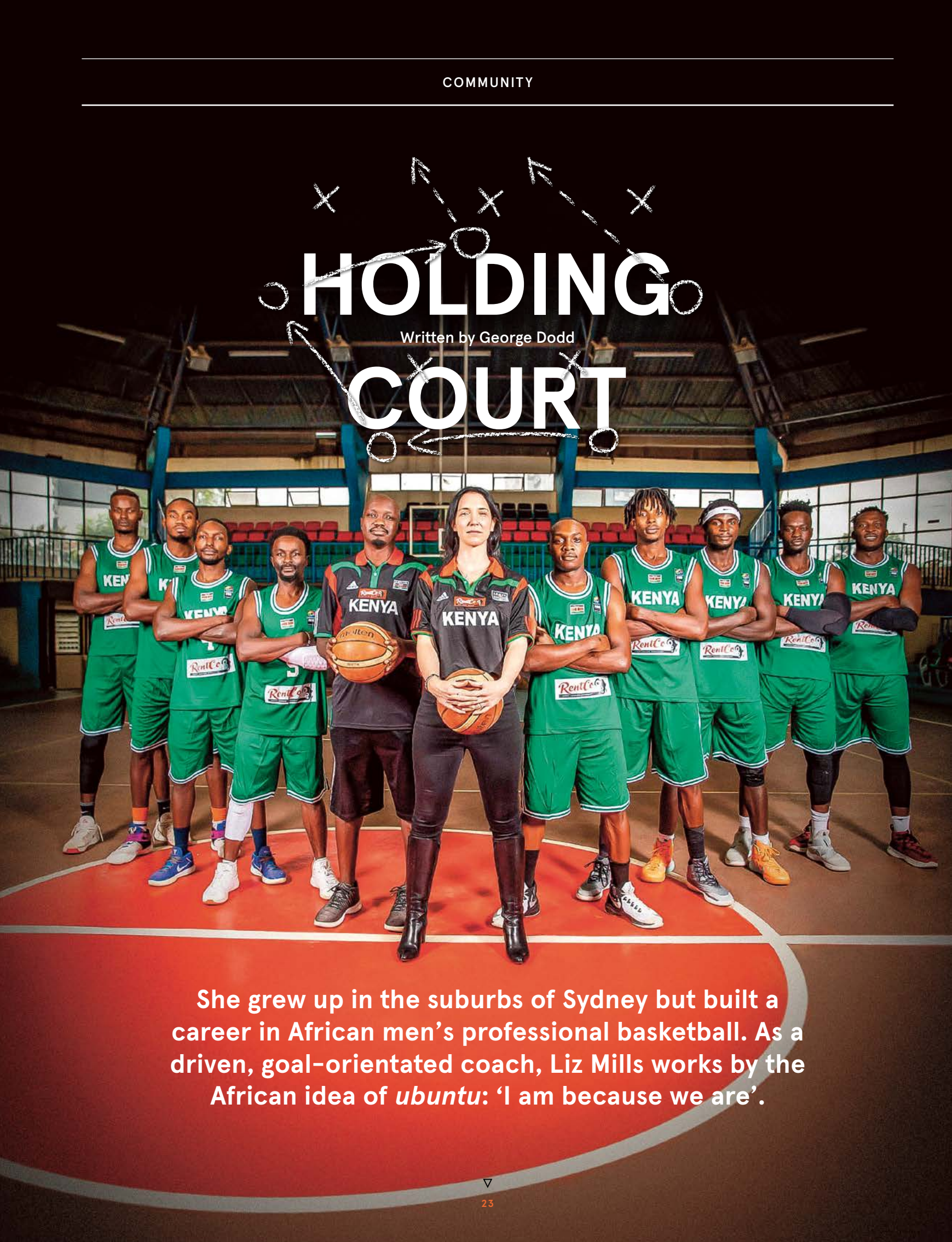
“Clinical medicine, I did really well at because I was already a paramedic and knew how to talk to human beings,” he says. “Then, just before one of the toughest exams, our baby came along.”

Clearing every obstacle, though sometimes just barely, Blackley graduated in 2019. He is now a 45-year-old resident medical officer at Royal Darwin Hospital with a strong goal driving him: to help break down the intergenerational distrust of the medical system that exists in Aboriginal communities.

“In places like Palm Island, there are memories of terrible mistreatment and medical experimentation” says Blackley. “And today, the health care system is still notorious for short-changing the Aboriginal patient.”

The difference that Blackley hopes to make is based on one of his own memories.

“When I first saw an Aboriginal doctor on Palm Island, I cried,” he says. “And the line outside his door was long.” ●



HOLDING COURT

Written by George Dodd

She grew up in the suburbs of Sydney but built a career in African men's professional basketball. As a driven, goal-orientated coach, Liz Mills works by the African idea of *ubuntu*: 'I am because we are'.

✎ Not many people would have had the nerve to do it, but for Liz Mills, it was absolutely in character.

She was visiting Zambia in 2011 with her twin sister, Vic. It was a return trip for both of them after they'd fallen in love with the country during a world tour they'd done after graduating from their respective universities in Sydney.

Being a keen player of netball and basketball herself, and also a coach of junior reps and women's basketball teams since she was 16, Mills went to see a preseason game of the Zambian men's national Super League.

At the end of the game, the 24-year-old Mills, who had never coached a male team, approached the president of one of the clubs and asked to coach his team. Mills can see how that might appear brazen or egotistical, but for her, a clear-headed strategic thinker, it was based on a calculation.

"Australia is the second or third best country – male, female juniors – in the world of basketball," she notes. "We've actually had some of the best coaching development anywhere, pioneering a lot of the frameworks that are now used by other countries."

In other words, Mills felt as an Australian she would be seen as having something of substance to offer. It also helped that she was asking this of Zambians, "They're really welcoming and gentle people. It's kind of their culture."

No doubt impressed by Mills' confidence and passion for the game, the club president agreed to let her coach his team for an hour. That hour for Mills has turned into a 10-year career in African men's basketball, boosted by early success when the low-ranked Zambian team she was coaching won the national championship that season.

Her greatest triumph, though, came this year as coach of the Kenyan men's team. Kenya went up against 11-time champion Angola for a place in the AfroBasket 2021 competition. They won by a single point on the final shot of the game, putting Kenya in the African

championship for the first time since 1993. The Kenyan people erupted in ecstatic celebrations.

For Mills, each success is confirmation that her particular approach to coaching gets results, that approach being to build relationships within the team.

"It starts by understanding how each of them ticks, what kind of people they are off the court," she says. "It's honest conversations with individuals and with the team as a whole. If everyone understands what they bring to the team, we can move towards a goal as a cohesive unit."



Elizabeth Mills

DEGREE
(MEd '14)

YOUR MOST PRECIOUS POSSESSION

After 15 years of travel, there isn't anything I own that I could not live without.

EARLIEST MEMORY

With my twin sister at four or five years old, building trains with cardboard boxes.

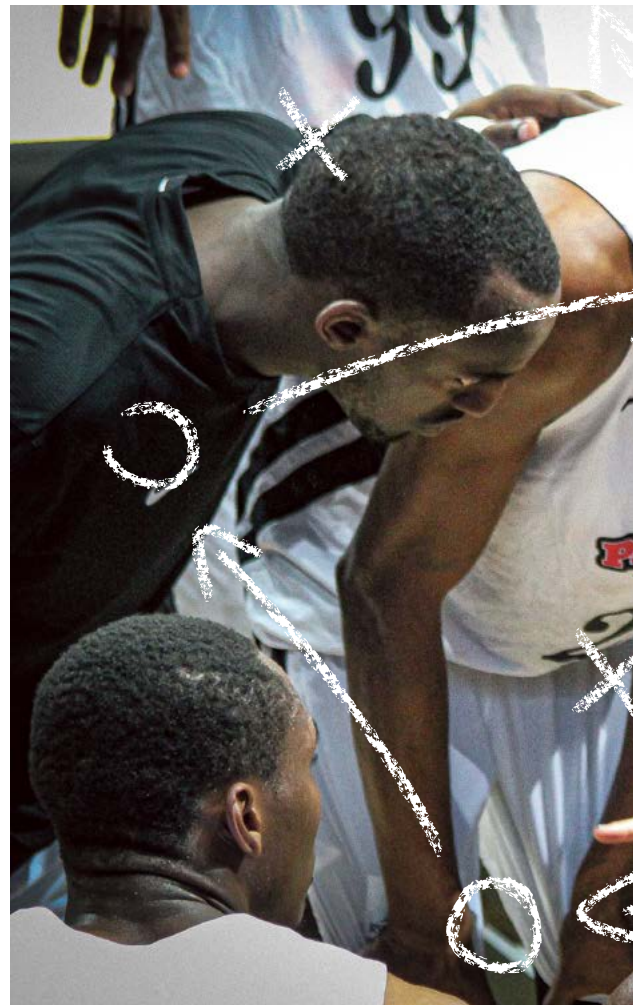
THE PLACE YOU'VE ALWAYS WANTED TO VISIT

The resting place of the Plantagenets at Fontevraud Abbey in France. And the Maldives.

"I don't mind losing someone if that's the way to get the team dynamic right. For me, it's character over skillset every time."

Though Mills now has a trail-blazing, pan-African career in basketball, her interest in the sport began on Sydney's North Shore. Her parents, both proud University of Sydney economics graduates, actively encouraged their three girls to explore all their interests ("I played flute for a while, then decided to be cool, so I moved to the saxophone"), though sport became central.

Since her success with Zambia, Mills has coached senior men's club teams, men's national university teams and men's senior national teams across the African continent. She has also become an international basketball consultant and promoted basketball analytics in the African competition, which has helped enhance strategy and improve performance generally.



“I don’t mind losing someone if that’s the way to get the team dynamic right. For me, it’s character over skillset every time.”

— Liz Mills

As well, she is always working to improve herself, which led her to do a Master of Education (Sports Coaching) at the University of Sydney in 2013. Usually a two-year course, Mills had to get back to Africa for 2014, so crammed her studies into just one year.

“It was an intense but very rewarding program, and great for networking,” she says. “And it wasn’t all basketball coaches, which really opened up my mind. I could see ways that I could use what I was learning in my non-coaching work.”

Reading previous articles profiling Mills, it is easy to see how outspoken she is about Australian sport and sports federations. This confidence in speaking truth to power comes from an obvious reality.

“I brought myself to where I am,” she says. “No-one helped me to do what I’ve done, so what can anyone do to me?”

One subject she addresses frequently, both from experience and as an advocate

of change, is that of women in Australia being routinely fenced out of the male-dominated world of sports coaching – a career that, on the face of it, could be thought of as gender neutral.

“There’s not much physical activity required of a coach,” she notes. “You might get a ball on the rebound and have to pass it, but not much else. All a coach really needs is a brain that works.”

Still, female coaches are relatively few in number, with Mills noting that the Australian swimming team for Tokyo was about half women but had no female coaches. Mills sees a boy’s club at work.

“It’s guys helping each other up the ladder,” she says matter-of-factly. “And there’s this idea that women can only coach juniors or other women. I have huge respect for junior coaches, but when I came back to Australia, after coaching men’s teams, I went back to my club and they offered me an under-14 boys team.”

There are signs things might be changing, with Basketball Australia setting up the Elite Female Coaching Advancement Program. Mills has been invited to take part.

Though Mills feels Africa has given her opportunities that would not have come her way in Australia, Africa has not been all smooth sailing either. On court, she has been mistaken for a water girl, shooed away from her own coach’s chair, and seen opposing players and managers obviously talking her down.

Unfazed, she went a perhaps provocative step further by taking to wearing black leather boots on court, an idea inspired by the female coaches of Australia’s Women’s Basketball League who have pointedly worn power suits and high heels.

“People are very offended by my boots sometimes and I’m told I can’t wear them in tournaments, which is ridiculous,” says Mills, obviously enjoying the ruffling of feathers. “They’ve become my signature now because they project a sense of authority; they make a real boss statement.

“That said, they’re also easy to walk around in.” ●



Mills has found that men’s teams can be reticent about a female coach, “but once we’re on the court and I’m yelling at them, that falls away”.

CLASSNOTES



PHILLIP SIMPSON (MEc '76 MA '83)

After 56 years formulating, developing and reviewing public policy and legislation, Simpson recently retired as a policy manager in the NSW Public Service. Across his career, he worked at Parliament House on a Royal Commission, selected beaches for nude bathing, assessed childcare centres, protected trees on vulnerable land, preserved our railway heritage, regulated the taxi industry, wrote official style guides and was appointed the state's first ethics adviser. Simultaneously, Simpson studied public administration at UTS and the universities of London and Sydney. Then came postgraduate qualifications in historical archaeology and a decade as chairman of the National Trust's Industrial Heritage Committee. An avid collector of maps and books, Simpson also wrote, over 30 years, the *Historical Guide to New South Wales* (Australian Scholarly Publishing, 2020).



PRUE CLARKE (BEc '95 MIS '03)

Clarke is an international journalist and media development and innovation expert whose commentary and reporting from six continents have appeared in *The Washington Post*, *The New York Times*, *The Guardian* and *Foreign Policy* magazine and on the BBC. Clarke was at Ground Zero for the September 11 attacks and reported on their aftermath for the ABC and the *Financial Times*. She created and led BBC radio and social media programming during the 2014 Ebola crisis in West Africa. Clarke co-founded New Narratives, an NGO supporting independent and news business innovation in low-income countries. She was Associate Professor and Director of International Reporting at the Newmark Graduate School of Journalism at the City University of New York.



ANNE-LOUISE SARCS (BA (Hons) '05)

Before graduation, Sarks was the president of the Sydney University Dramatic Society (SUDS), and artistic co-director of the inaugural Verge Arts Festival in 2003. As a director, writer and dramaturg, her works have premiered in Sydney, London, Mexico City, Mumbai, Warsaw and New York. She was artistic director of the acclaimed Hayloft Project, resident director at Belvoir and director-in-residence at Melbourne's Malthouse Theatre Company. She has been artistic director of the UK's Lyric Ensemble, directed her award-winning reimagining of *Medea* for Theatre Basel and premiered *Avalanche* at London's Barbican Centre. Sarks is now the incoming Artistic Director of the Melbourne Theatre Company.



ASHLEY GRAY (BA '96)

On leaving St Andrew's College, Gray began a life in journalism via the tried and trusted route of a failed rock 'n' roll career. He has since edited some of Australia's biggest-selling magazines and worked on *The Sydney Morning Herald* and *The Daily Telegraph*. His stories have appeared in *The Guardian*, *The Times of London*, *Wisden* and *Rugby League Week*. In 2019 he was a finalist in AAP's national headline writer of the year award. Now also an author, Gray's book, *The Unforgiven: Missionaries or Mercenaries*, details his efforts to track down cricketers who'd toured apartheid-era South Africa in defiance of world sanctions. The book is shortlisted for the MCC, William Hill and Cricket Writers' Club Book of the Year awards.

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IBRAHIM SAMAAN
(BHlthSci(Phty) '08
BAppSc(Phty) '08)

Samaan is a musculoskeletal physiotherapist turned inventor, thanks to his hygiene observations in the field. Starting at Bankstown-Lidcombe Hospital working on all aspects of physiotherapy, Samaan moved to the private sector in 2009, earning an unsupervised caseload by 2010 while actively pursuing further professional development. Soon becoming a senior physiotherapist in a medical centre, he also started a clinic for family and friends. By 2013 this had become his own physiotherapy business and he began looking at the industry-wide hygiene problem of multiple clients being facedown on the same therapy beds. The result was the Purifas® FaceShield, now sold internationally and winning the 2021 Asia-Pacific Gold Stevie Award for most innovative start-up.



MARK LATCHFORD
(BA '82)

With his degree taking him unexpectedly into a corporate career via the IBM graduate program, Latchford stayed with that company for nearly 35 years. Appointed vice-president of various divisions, including software and IT services, he was deployed worldwide including to Adelaide, Tokyo, Paris and Hong Kong. Throughout his career, Latchford used his communication skills, forensic hunger for evidence and ability to critically review problems and opportunities – skills that he points out were learned at the University. Post-retirement he has served on various boards and travelled when that was possible. Latchford also realised his dream of writing and publishing a book, *Letters to Lily Vale*, which is part-military history, part-biography – something of a return to his essay-writing days in Fisher Library.



PETER NICHOLL
(BVetSci '85)

Most of Nicholl's 36-year career as a veterinarian has been spent in and around Sydney. However, in his early years, Nicholl worked in the UK and South Australia. Returning to Sydney, he was employed managing the veterinary services for RSPCA NSW. Nicholl also worked part time in the media, including voiceover work and 12 years working for radio station 2UE on a gardening and pets program. Always having a strong interest in animal welfare led Nicholl to representation on several animal care and ethics committees and government-appointed panels. For the past 24 years, Nicholl has run a successful small animal practice in suburban Sydney as well as working as a racecourse veterinarian at several harness racing tracks in and around Sydney.



HELEN DAI
(BCom(LibSt) '08)

As a first-generation migrant from China, Dai is passionate about diversity and inclusion and works for a future where Australia's private, public and civic institutions represent the diversity of its people. Majoring in a perhaps curious mix of philosophy, accounting and finance, Dai decided to pursue a career in the Australian Public Service. She has served as an Australian diplomat in Indonesia, provided consular services for Australians in need overseas, and contributed to Australia's economic prosperity through trade and investment advisory and policy development. Recognised in the 40 Under 40: Most Influential Asian-Australian awards in 2019, Dai also believes strongly that the arts can catalyse social change. She was recently appointed treasurer on the board of Griffin Theatre Company in Sydney.

JUST THE FACTS

Dealing with vast amounts of information is just another day at the office for University researchers and academics. Here, three researchers explain an idea at the centre of their current work.

ON REDUCING CAR USE

My research looks at two related areas: how to shape built environments to promote community health; and encouraging people in Australian cities to reduce their car usage. An example of the second is the effects of banning dogs on public transport. Typically, cities in Europe permit dogs to ride public transport with their carers. Australian cities, in contrast, are more restrictive, meaning that the popular practice of owning a dog in Australia is a relatively car-dependent affair. By designating dog-friendly train carriages, this prohibition could be removed, opening up the possibility of less car dependence to Australia's households with hounds.



Dr Jennifer Kent

Like many machines, cities can be tuned for better performance. As a Senior Research Fellow in Urbanism at the Sydney School of Architecture, Design and Planning, Kent works at the intersection of urban planning, transport and human health.



ON USING MICROBES

Several important vitamins and nutrients originate from microorganisms. Vitamin K2 is present in fermented foods, while seafood's omega-3s originate in algae. My research group uses microbes to produce fat-soluble vitamins and other nutrients: bacteria to produce vitamin K2, fungi for vitamin A and vitamin A-related retinoids, and algae for pigments and omega-3s. There are three expensive and time-consuming processes to improve: selecting the best organism; ensuring the best growing conditions; then upscaling from a flask to a large bioreactor. My team has developed computer models for bioreactors that can predict the performance of a wide range of microbes at industrial scale.



Associate Professor John Kavanagh

We hear about taking vitamins. Not so much about making vitamins. Kavanagh is Deputy Head of the School of Chemical and Biomolecular Engineering and leads a team that designs bioprocesses to produce commodity chemicals at scale.

ON FOOD SECURITY

My research seeks to understand the link between food insecurity and obesity across diverse settings so the health and economic costs can be estimated. For example, food insecurity may drive consumption of low-cost, energy-dense processed foods, or cause binge-eating through the episodic nature of food insecurity (e.g. the feast-famine cycle associated with monthly food assistance benefits). As an interesting contrast, there is some evidence that in developed economies like Australia, obesity may be more prevalent among food-insecure individuals, while in emerging economies, such as India, it is a problem of the rich and food secure who may have more sedentary lifestyles.



Dr Chandana Maitra

To make a positive difference in people's wellbeing, Maitra looks at the economic forces that affect them. She is an Academic Fellow in the Faculty of Arts and Social Sciences, with a particular interest in maternal, neonatal and child health and the economics of food security.



Students in a University lecture hall. Photo: Jamie Williams

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