

# SAM



THE UNIVERSITY OF  
SYDNEY

EXPLORING THE  
ECOSYSTEM WITHIN

A NEW SPACE RACE  
STARTS HERE

A TEACHER WE CAN  
ALL LEARN FROM

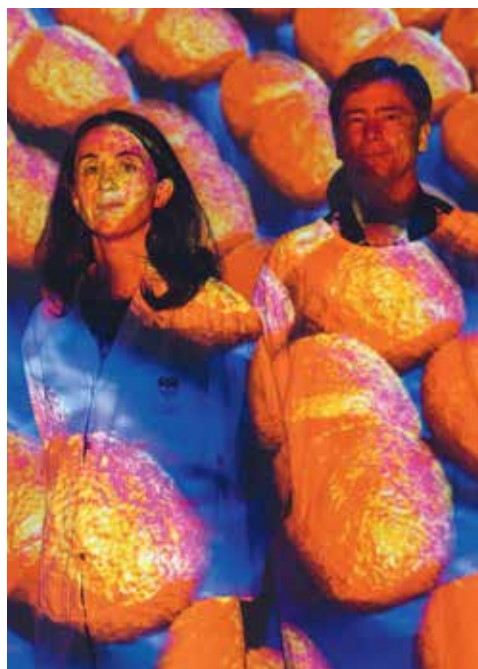
THE REALITY OF ARTIFICIAL  
INTELLIGENCE



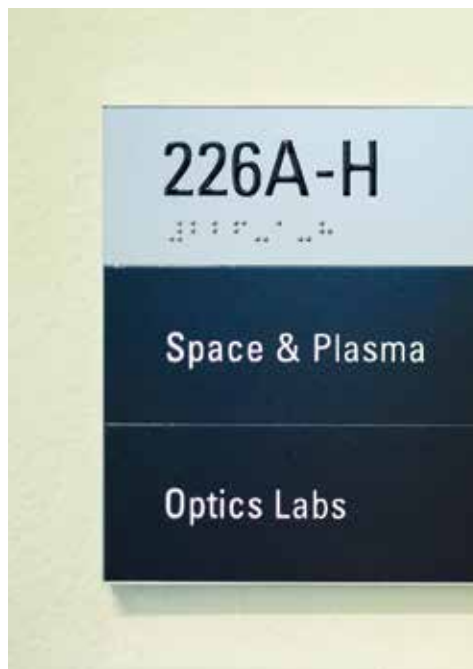
Celebrating a University icon



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# New students need you

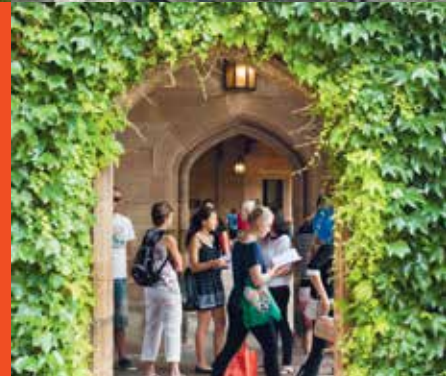
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Settling into a new city can be tough. Give a friendly start to regional and international students by hosting a small, group event through Welcome to Sydney.

A barbecue, picnic, outdoor activity, even a formal dinner. The choice is yours - we'll organise the guests.

Make new friends by helping students do the same.

If you live in Sydney and would like to host a Welcome to Sydney event, please contact:  
**Miriam Waters (02) 9036 6458**  
 or visit:  
[sydney.edu.au/alumni/welcome-to-sydney](http://sydney.edu.au/alumni/welcome-to-sydney)



## MAKING THE CURRICULUM FUTURE READY

The average 17-year-old high school student expects three entirely reasonable outcomes from their university education: to learn, to develop the skills they need to get a job when they graduate, and, hopefully, to have a good time along the way. And for the most part the Australian higher education system delivers that.

But what if an undergraduate education could do much more? What if that student could learn a great deal about one area of interest, and develop expertise in other fields? What if they could spend time working on a real-world problem to which there was yet no answer, in a team with students and teachers from different disciplines and cultures, challenging each other's ideas and perspectives?

And what if their studies prepared them not just for their first job, but for their second, third and fourth careers, and, beyond that, for a life well lived?

This is precisely the challenge that the University of Sydney has embraced for all students from 2018. As part of the new Sydney Undergraduate Experience, we have reviewed and updated all of our professional and broad three-year degrees. Students enrolled in arts, science and business will also have the option to earn a four-year combined degree by adding a Bachelor of Advanced Studies.

Our reimagining of the curriculum responds to two external factors: we know that employment rates nationally for graduates of three-year programs have been falling, and employers tell us that they want graduates who not only have good grades but are digitally literate, critical thinkers and can apply these attributes to real-world problems outside of the classroom.

Every student will be able to build expertise in a second field of study from across the full breadth of the University's offerings. A computer science major can build skills in health, an economics major in design or an anthropology major in project management – every student can create their expert niche.

Further, every student undertaking the new combined degree will have the opportunity to apply their knowledge to an authentic problem in industry or the community, undertake research or even pursue an entrepreneurship opportunity. For example, a student with ambitions to go into business may undertake a work placement in an ASX-listed company. A student committed to community wellbeing may undertake a project in Western NSW, or in Southeast Asia. A student wishing to study at doctoral level may embark on a research project specific to her academic interests. And a student wanting to start a new business venture can participate in an entrepreneurship program.

Regardless of which educational pathway our students choose, the rationale of the combined degree with the Bachelor of Advanced Studies is clear: Sydney students will graduate better prepared for the lifetime of challenges they will face. They will be better prepared for roles in the community, better equipped with the skills employers tell us they need, and better prepared to create their own future, thus making them more competitive in a globalised innovation economy.

For more information, visit: [sydney.edu.au/ug-experience](http://sydney.edu.au/ug-experience)



▲ Belinda Hutchinson AM (BEC '76), Chancellor



▲ Dr Michael Spence AC (BA '85 LLB '87), Vice-Chancellor and Principal

# A mentor can help

The University of Sydney mentor program connects alumni looking for career advice with alumni who have career experience to share. It's free, easy to take part and open to alumni from all disciplines, in all stages of their careers.



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**“I’m still not sure about my career options. I feel like I need some advice.”**

**Jean Vaccari  
(BE(Hons) '15)**



—

**“I want to use a professional network to expand my international opportunities.”**

**Dr Sean Conte  
(MBBS '15)**



—

**“I have just taken on a management role. I’d like to talk through my ideas.”**

**Laura Hanlon  
(BA(Media&Comm) '15)**

You can register for the program now on our website.  
For more information, please email [mentoring@sydney.edu.au](mailto:mentoring@sydney.edu.au)

[sydney.edu.au/mentoring](https://sydney.edu.au/mentoring)

## BRIGHT IDEAS GET A FUNDING BOOST

The University has committed more than \$1 million to an award-winning program that helps turn great ideas into new businesses.

INCUBATE was started in 2012 by two former students and developed by the University of Sydney Union. As a start-up accelerator, it has helped up to 16 students, researchers and alumni a year take their start-up ideas to the next level.

The new funding will mean INCUBATE can increase its support to more than 30 start-ups a year by 2018 and initiate new outreach and support activities, including programs for community mentoring, legal advice and product development.

## MUSIC



## ARTS AND MINDS

A unique recording project will be music to the ears of dementia sufferers.

University student and composer Cyrus Meurant (BMus(Hons) '04, MMus '07) was asked by aged-care facility Beaumont Care to produce a series of soundtracks to play for residents at particular times of the day and for different days of the week.

The project was driven by the well-recognised benefits of music for dementia patients and resulted in a CD titled *Monday to Friday*.

"While I am a composer first and foremost the project gave me the great opportunity to work in a unique area of cross-disciplinary research between neuroscience and music," Meurant says.



## ANOTHER REASON TO EXERCISE

First, the bad news. Alcohol increases the risk of cancer. Now the good news. According to a recent report, exercise may reduce the risk.

"We noticed that the risk of cancer deaths increased as alcohol consumption increased. But this was not the case among physically active people," the report's senior author, Associate Professor Emmanuel Stamatakis from the Charles Perkins Centre and Faculty of Health Sciences, said.

The report came from a Sydney-led, international collaboration looking at UK-based health surveys between 1994 and 2006. It suggests even basic recommended weekly physical activity levels (at least 150 minutes of moderate-intensity activity) may offset some of the harmful effects of drinking alcohol.

## COMMUNITY

## MAKING IT THROUGH YEAR ONE LEADS TO SUCCESS

Research shows that students who successfully complete their first year of university are more likely to finish their degree – and even continue with further study.

With that in mind the University will offer a range of new initiatives to commencing Aboriginal and Torres Strait Islander undergraduate students, including guaranteed and subsidised accommodation and a structured peer mentoring program.

Professor Shane Houston, Deputy Vice-Chancellor, Indigenous Strategy and Services says, "Such practical assistance will ensure the best and brightest Aboriginal and Torres Strait Islander students from across the country can make decisions about their post-HSC future without being restricted by financial and other factors due to our city location."

With all the mixed messages around healthy eating, new research could undo the confusion and address a surprising range of medical conditions.

# Gut feeling

Written by George Dodd  
Photography by Louise Cooper

Your gut is a microbe domain. Inside you right now an estimated 39 trillion microbes comprising 1000 species are breaking down food and toxins, manufacturing vitamins and influencing your immune system. And this microbe empire is vast. The surface area of your gut is up to 100 times greater than the surface area of your skin.

“The gut is the largest immune organ, the largest endocrine organ, and the second largest neural organ – second only to the brain,” says Associate Professor Andrew Holmes, who specialises in microbial ecology. “It’s where you have this – more or less – seamless connection from diet to microbes to metabolic health to immune health.”

People are becoming more aware of the health

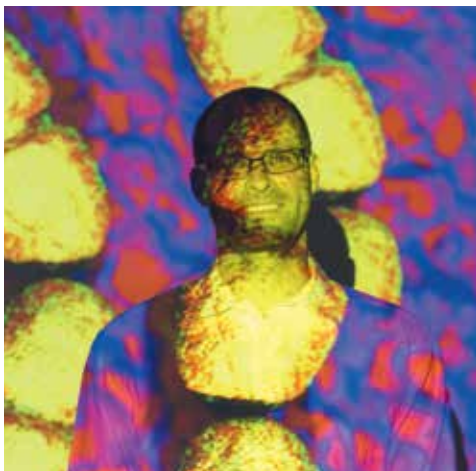
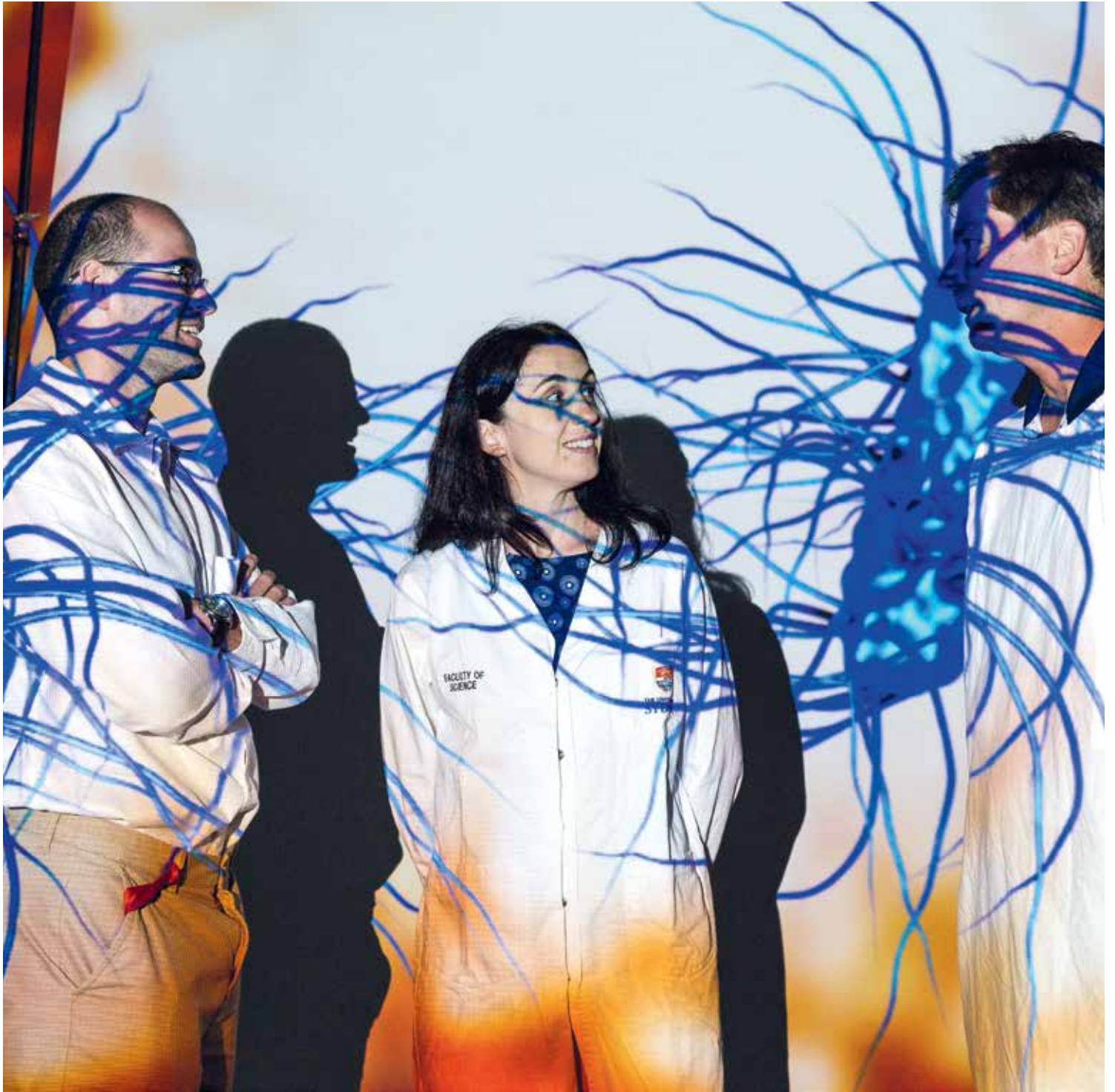
implications of what happens in the gut. But still these microbes are seen as part of a gurgling swamp of unspeakable substances. When things go wrong, you clean it up by adding some good guys or removing some bad guys.

Professor Holmes sees it very differently. “It’s more like a rainforest restoration,” he says. “You don’t restore a complex system by adding or subtracting a few species.”

These ideas are part of a new frontier in medical research that promises different and better options for how we treat everything from obesity to arthritis and emotional disorders.

In the womb, we are microbe free. When we enter the world, it takes about five years to acquire our own distinctive set of microbes. What we eat, the stage of our immune





development and the microbes we are exposed to through family and friends and many other sources, are all key influences on the process.

In research circles, the gut ecosystem is termed the microbiome and its trillions of inhabitants are the microbiota. The human alliance with microbes goes back a long time. They've lived within us since our very, very distant ancestors evolved beyond being microbes themselves. In fact, evolution factored in the action of microbes when it designed our bodies: for example, 10 percent of our energy is supplied through the work of microbes.

Microbes are choosy about where they live. We have roughly 2 kilograms of microbes in our bodies, nearly the

continuing experiment of the Western diet. People eating traditional diets receive 60 to 120 grams of fibre a day to support a diverse community of microbes. Even a 'healthy' Western diet may supply only 10 to 15 grams. Our processed foods are so easily digestible in the small intestine that gut bacteria further along starve, disrupting the metabolic and immune systems.

Dr Laurence Macia is an immunologist and she leads a team at the Charles Perkins Centre that closely collaborates with Professor Holmes. At the centre researchers across a number of disciplines focus on the modern lifestyle diseases that are already threatening to overwhelm healthcare budgets and send life expectancy backwards.



weight of the brain, but most of them prefer to live in the large intestine, also called the colon. After the small intestine has absorbed most of the sugar, fat and protein that's easily available in what we eat, what's left – a range of materials given the general name 'fibre' – is met by hordes of bacteria in the colon. As they tear apart otherwise indigestible molecules they generate what are called short-chain fatty acids, which our bodies need for almost everything to do with metabolism, behaviour and immune function.

So what happens if a reduced amount of fibre makes it through the small intestine to feed the microbes in the colon? This isn't a theoretical question. It is essentially the

"There was a time when we were less sick," Dr Macia says with a look of alarm. "Now you can't put a peanut in a school lunchbox because of food allergies. In the last 20 years, something went wrong."

Part of her research involves varying the diets given to mice then looking for changes in their droppings, microbiome, immune cells and health profiles. "We have already published our findings," Dr Macia says in her warm French accent. "It is clear that mice on low-fibre diets develop a massive peanut allergy compared to mice fed on high-fibre diets."

# “Now you can’t put a peanut in a school lunchbox because of food allergies. In the past 20 years, something went wrong.”

Dr Laurence Macia

Dr Macia believes that understanding how our gut microbes communicate with our immune cells will be critical to developing new treatments or preventing most non-communicable Western diseases.

Advances in DNA sequencing about 10 years ago really opened up the microbiome as a practical field of study. Helping take it forward now are technologies around artificial intelligence and big data that can make sense of the staggering number of touch points in the functioning of the microbiome. This is where Dr Mark Read comes into the picture. True to the Charles Perkins Centre’s multidisciplinary culture, Dr Read is a computer scientist who sounds a little surprised, though excited, to be where he is.

“When I was studying I heard about people building computational algorithms and solutions inspired by biology, which I found fascinating and slightly crazy,” he says. “Now I’m applying some of these techniques to solve biological problems.”

He explains the challenges of getting a handle on the microbiota. “There are many different species of bacteria in your gut. So you’re trying to spot patterns across diets captured in spreadsheets with thousands of columns. Now, what if you want to vary that around say, different kinds of fat in the diet? Data grows exponentially with each additional variable.”

Computers also allow the running of simulations. So instead of weeks of manipulating diets and collecting droppings, the consequences of diet variations can be established almost instantly.

For all the progress and incredible possibilities, Professor Holmes is quick to point out that harnessing the microbiome is not a silver bullet for health because we are also affected by other modern factors such as stress, lack of exercise and sleep deprivation.

“It’s the interaction of everything that determines how the whole system is going to work,” he says.

It’s still early days. That’s where Professor Holmes, Dr Macia and Dr Read are right now: on the edge of a rainforest, taking the first few, eager steps in.

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## LISTEN IN TO LEARN MORE

You’ll find a Sydney Ideas podcast about metabolic health and the microbiome at <https://soundcloud.com/sydney-ideas/gut-microbiome-a-new-target-for-managing-human-metabolic-health>

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## HOW TO GET INVOLVED

This new research has implications for everything from diabetes to depression. If you would like to learn more or support our researchers, please contact Lachlan Cahill, ph (02) 8627 8818 or email [development.fund@sydney.edu.au](mailto:development.fund@sydney.edu.au)

◀ Associate Professor Andrew Holmes,  
Dr Laurence Macia and Dr Mark Read

Image page 7: Projections of microbes from the microbiome.  
The cross-disciplinary team working to understand the human gut.

COMMUNITY





# THE TREE WE ALL KNEW

## A SAD LOSS SPURS AN UNPRECEDENTED OUTPOURING OF SORROW AND REMINISCENCE

On Friday 28 October 2016 the famous jacaranda tree in the Quadrangle was in full flower. Looking at the spread of luxuriant purple, it was easy to see why this tree was such a beloved part of the University community.

But as students and staff walked past it on their way home that afternoon, they couldn't have known they would never see it again.

That night, the jacaranda toppled over, undermined by a fungal infection that had been slowly eating away at its roots over a number of years. As the news spread, there was a huge and emotional reaction from the whole University community, including more than 23,000 clicks on the University's online statement: an all-time record.

Fortunately, it was already known that the tree was reaching the end of

its natural life, so in 2014 cuttings had been taken, and two clones produced.

The clones, one of which will be planted in the Quadrangle, are being nurtured by Jim Warner (BA '63 LLB '67), an alumnus who is now a specialist tree grower. Jim has photographs of himself under the old tree on the day of his graduation in 1967. "Everyone knew that tree," he says. "It was a big part of the character of the Quadrangle and the University, especially in full bloom."

One of the clones will be planted in the Quadrangle. Though it will be genetically identical to the original tree, it will be shaped differently by weather and other circumstances.

The original jacaranda was planted in 1928, part of a spree of jacaranda planting conducted by EG Waterhouse, a professor at the University and keen horticulturist. He planted four jacarandas in the Quadrangle – an aerial photograph from 1949, held in the archives of the City of Sydney, shows them clearly. No one knows what happened to the other three, though some suspect pilfering.

Professor Waterhouse planted the now iconic tree near the rooms where philosophy classes were once held. During the course of the tree's 88 years, students and staff from all disciplines have thought, talked, rested, studied and even kissed beneath its branches.

Countless graduates, brides and tourists have been photographed in front of the jacaranda, and waves of departing students have taken home its image.

As the new sapling grows, it will no doubt also become the living heart of the University, as new generations of students walk past and feel quietly glad it's there.

Black and white photos supplied by the University of Sydney Archives. Above: During the construction of the Western Tower, in 1960 [G3\_224\_1228]. Captions (opposite page: left to right, top to bottom): Students relax by the tree; in 1966, the tree was yet to reach its full spread [G3\_224\_0126]; a graduation ceremony in 1969 where Governor of NSW, Sir Roden Cutler, was a guest [G3\_224\_1023\_1]; framed by the Sydney skyline of 1988 [G77\_1\_0060]; the jacaranda in glorious full bloom; A Gamelan orchestra plays under the jacaranda in 1987 [G77\_1\_0214].



Compassion for a beloved father led to a life-changing new technology.

# Sound with vision

Written by George Dodd  
Photography by Adam Luttick

Search “hearing for the first time” on YouTube and you’ll find a video of 21-year-old Raia, who started to lose her hearing at the age of two. The video was made when her new cochlear implant was activated.

As she realises the implant is working, Raia wants to laugh with joy, but she is so overwhelmed by what’s happening she begins to sob. She covers her mouth as the tears flow

and tries to laugh again, but she can’t. Having this new sense, that so many of us take for granted, is about to profoundly change Raia’s life and how she connects with everyone she knows.

There are many more videos online of people like Raia – men, women and children experiencing hearing for the first time. They’re part of a community of more than 320,000 people around the world whose lives have been

transformed by the inventor of the cochlear implant, Professor Graeme Clark (MD ’89) MB (’58) PhD (Medicine) ’70, MS ’69).

He, of course, was often present as people heard their first sounds. “It’s a very moving experience,” he says in his measured and gentle tones. “It brings tears to my eyes still.”

It's been said that the cochlear implant is the only real advance in hearing technology since the 17th century and the ear trumpet. Even electronic hearing aids are just a sophisticated version of that. Rather than channelling sound into the ear canal to, in effect, be louder, a cochlear implant converts sound into impulses then uses them to stimulate the auditory nerve directly. This bypasses damaged parts of the ear to carry sound signals to the brain.

Professor Clark's journey towards the cochlear implant started in one of the labs in the University's Anderson Stuart building. "That building means so much to me," he says fondly. "It was there that I developed key research that showed we needed to use multiple electrodes to replicate sound."

By the late 1970s he was well advanced with his design but, like many

## "We all stand on other people's shoulders and see further ahead."

Professor Graeme Clark

innovators, he was meeting strong, early opposition from his peers. There was even talk of forcing him to resign from his new role as Australia's first professor of ear, nose and throat surgery.

"They referred to me as 'that clown Clark'," he says without rancour. "One of my colleagues – this was

reported back to me by one of my friends – said that I would kill my patient."

The pressure on Professor Clark was enormous, but he had faith in what he was doing and worked hard to make his idea work. His cochlear implant wasn't just a feat of medicine and surgery. To make it a reality Professor Clark had to become adept at electronics, physics and engineering. He spent countless hours in the lab and the library, but one of his most important breakthroughs, to do with the cochlea itself, happened at the beach.

"Cochlear" is the Latin word for snail shell and that's what it looks like: a snail shell about the size of a pea, and just a couple of millimetres wide at its widest point. For his idea to work, Professor Clark had to thread a super-fine wire into this tiny spiral cavity so it could be used to stimulate the cochlear's array



► (Clockwise from the top) The first commercial implantable bionic ear, Cochlear's mini bionic ear with magnet to hold the transmitting aerial in place, the first prototype.

◄ In his office, Professor Clark still has the magnetic reel recording of the second cochlear implant operation he performed.



of 20,000 sound-receiving nerves. Frustratingly, he was having problems getting the wire to go around the spiral.

“I was sitting on Minnamurra Beach near Kiama in New South Wales,” he recalls. “I was playing with a shell that had the same spiral structure as the cochlear, and I realised I could get a blade of grass to do what I needed the wire to do. The flexibility in the tip of the grass enabled it to negotiate around the turns of the shell. That was a flash of good fortune.”

Even as the implant design came together there was still a major hurdle to overcome. The disapproving medical fraternity was refusing to refer likely candidates for the procedure to Professor Clark. Finally, two candidates emerged and one of them, Rod Saunders, went on to become the first person in the world to receive a cochlear implant in 1978. In fact, it was

the first time anywhere in the world that such a complex set of electronics had been implanted in a human.

Still, the success of this first operation didn't turn the tide of disapproval. While individual surgeons began doing the procedure, the mainstream still rejected it. But the potential benefits of the implant, which came to be known as the bionic ear, were undeniable. So, in the early 1980s the federal government partnered with a medical device company to bring the implant to the market.

As a five-year-old, Professor Clark was already telling his kindergarten teacher that he wanted his job to be fixing ears. His motivation was seeing his profoundly deaf father struggling to communicate with the customers in his pharmacy business. From that time on, Professor Clark's medical ambition was unwavering and he has

transformed an entire area of medical science. His technology is still evolving and it has inspired a new field of research called medical bionics, which is generating ideas around bionic eyes and spinal cords.

Now in his 80s, Professor Clark still works at the Centre for Neural Engineering at Melbourne University, advancing bionic technologies. Talking to him, he is aware of his achievements but without any sense of ego.

“We all stand on other people's shoulders and see further ahead,” he says after a conversation where he has referred with true admiration to colleagues and past lecturers who made it possible for him to achieve what he has. “Ultimately, it's about the benefit it brings to people and seeing the joy that they experience.”

► Made profoundly deaf by an accident, Rod Saunders (left) was Professor Clark's first cochlear implant recipient.

Image page 12: Professor Graeme Clark has been hugely influential and still works to advance bionic technologies.



# ON MY DESK: MAT TODD

Associate Professor Matthew Todd, researcher and teacher in the School of Chemistry and a driving force in the pioneering field of open-source drug research.

Photography by Stefanie Zingsheim

For medical conditions that pharmaceutical companies don't want to invest in, Associate Professor Todd is promoting online, open source drug research. 'Open source' means anyone can contribute and work in the public domain on molecules that might go on to treat conditions such as Ebola and Zika virus. The biggest project founded by Associate Professor Todd is Open Source Malaria, which was in the news last year for working with Sydney Grammar School on the simple synthesis of an expensive drug, Daraprim.



## PEOPLE IN A CIRCLE CANDLE HOLDER

The work I do is about connecting people so we can solve problems together in real time. It's a little like 'Wikipedia for Drugs', because everyone works with no secrecy. To my mind, secrecy poisons research and makes it less efficient. My wife bought me this because she likes the idea that there's an inherent simplicity in people getting together.



## DALI MELTING CLOCK

I'm from the UK. This clock reminds me of the heat of Australia in comparison to where I started my professional life, in cold, wet London. I married my wife in London and then we left on a one-way honeymoon that brought us to Australia. It's the only time I ever bought a one-way ticket. My wife's mother bought me this clock when I moved here. Unfortunately, it doesn't work any more because people usually knock it off the table when they look at it.



## THE UNIVERSE CUBE

Every year Google invites a couple of hundred people to a meeting at its Googleplex in California for an ‘un-conference’. There are rooms and you write what you want to talk about on a post-it note and put it up. And whoever turns up, turns up.

I led sessions on open-source science

with astronauts and software people and goodness knows who else in there. It was a fascinating experience. A couple of years later I got an award for the Open Source Malaria project, and Google was one of the sponsors. They gave me this lasered 3D representation of the stars in our area of the galaxy. It gives a beautiful sense of scale when the light catches it in the right way.

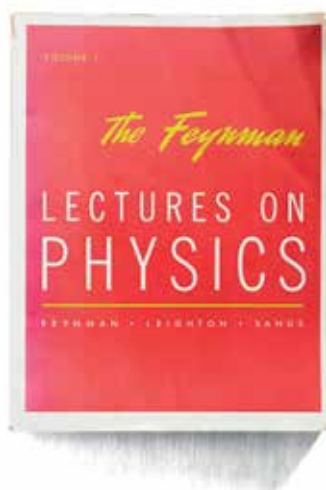


## MY FAVOURITE PICTURE

My son Harvey drew this a while ago and I love it. It’s a piece of modern art, destined for the Museum of Contemporary Art. It’s also accidentally representative of our first open-source project, which was about killing a parasitic worm that lives in human blood. Our starting molecule was a mix of things. This picture has a worm, the word “mix” and spots of red. We eventually solved the worm problem by unmixing the molecule, where the openness of the research enormously accelerated the whole project.

## THE FEYNMAN LECTURES ON PHYSICS

Whenever I open this, I just want to keep reading. Feynman was a great teacher because he made you want to know more. This book aggravates my physics envy – a common feeling among chemists I think – a yearning for the simplicity and precision of that discipline. But then some of the work my collaborators do in Open Source Malaria aggravates my biology envy. I assume that other scientists get chemistry envy when they see us making molecules new to the universe, but nobody has ever admitted this to me ...



## TOY DESK OBJECTS

I’ve had these two things on my desk for years. They remind me of my kids. My son Harvey used to play with them when he was about one or two. He’s now seven. I like the simplicity of the Lego car and the ball is perfect for playing with when you’re on the phone.



## STANDING DESK

I should have one of those big, expensive standing desks, but I much prefer the table I already have, aesthetically. So this is my version of a standing desk. As you can see it’s easily adjustable. I like improvised solutions that work well but don’t cost much.

**Wilo Muwadda has seen some difficult times, but he is defined by his determination and his achievements.**

# A kaleidoscopic life

Written by Emily Cook (BA(Media&Comm) '12)

Photography by Louise Cooper

On paper Laimena 'Wilo' (pronounced 'Willow') Muwadda's life story reads like a catalogue of impossible alter egos. Kindergarten teacher. Homeless man. Professional dancer. HIV advocate. Amputee. Gay rights activist. That anyone should have lived such a kaleidoscopic existence is remarkable, let alone that Muwadda has experienced all this in just 56 years.

Life has thrown obstacles in his path, but Muwadda has not only surmounted them, he's found a new way forward. And now he's on the cusp of adding one more incredible epithet: Indigenous Studies academic.

"To get here took a lot," he says, offering a six-word solution to the cryptic puzzle of his life.

We're sitting in a busy café at the edge of campus, 2400 kilometres from his birthplace of Mt Isa in Queensland and a lifetime away from the troubles he once knew.

The day is warm, and Muwadda is dressed in faded jeans, striped t-shirt and a navy denim jacket, lending him a

certain rock-star quality. His imposing six-foot-four frame is tempered by just a hint of a limp, a subtle reminder of the flesh-eating bacteria in the Daintree rainforest that claimed his leg when he was in his late 30s. He is softly spoken with a gravelly, measured cadence. His deep blue eyes cast about, reflecting both restlessness and curiosity.

Muwadda tells his story with hard-won conviction. A descendant of the Kalkatungu, Eastern Arrernte and Alyawarre peoples, he's been shaped by his struggles and proud of what they've taught him.

His earliest lessons began while growing up on a cattle station near Mt Isa. His mother was forced out of school in year 3 to become a domestic servant, but she kindled a curiosity in her sensitive young son, condensing the week's classes by correspondence into two days so he could explore life outside the classroom.

Muwadda remembers fossicking for fossils as a child among spinifex and questioning why wood turned to stone.



**“Maybe the ancestors gave it to me because I got the mind to do it: to channel it and to take it all in and make something out of it.”**

Laimena ‘Wilo’ Muwadda

He was abused at a very young age by a local man, in a community where such abuse was sadly a common experience for many children, and struggled not to turn to stone himself.

“My thinking, I reckon, comes from abuse,” he says directly. “I’ve turned around the victim-blaming mentality I’ve had, so it’s now a tool of reflective thinking for empowering myself, my family and my communities.”

A chance encounter while working at the post office on Palm Island, where he was staying with his extended family, offered a fresh start and set Wilo on a path to Sydney. The National Aboriginal and Islander Skills Development Association was in town, and Muwadda joined them. He was 19, a talented dancer new to the gay scene and ready to make his mark. The following formative years were a dazzle of performing and marching, even though he was a squatter and sometimes living on the streets.

“I had to fight on the street because there were different gangs from different cultural ways and values, people of colour as well. However, Indigenous people have this law – once you fight and someone’s down, you help them get up,” he says.

“Then it’s done and dusted, you are now brothers and sisters, and they got your back as part of your

Indigenous family.” Muwadda has always held his cultural traditions close – at one point they even saved his life. Years of living rough and pushing himself to the limit took their toll, culminating in a breakdown at the age of 36, when he returned to the care of his mother in north Queensland. It was here, just one year later, that the infection took his leg. His mother helped him through this crisis.

“She started doing traditional things that I’d never done, to bring me back to health,” Muwadda explains. “She started doing rituals. She was actually taking her life and giving it to me, in a ritualistic way. I just love her so much for that.”

Since reconnecting with his culture, Muwadda has completed a Certificate IV in contemporary music and a diploma in community services. He worked as a project officer then manager of the Indigenous Program with the Queensland AIDS Council, going on to graduate in the top 15 percent of his cohort with a Bachelor of Applied Science in Indigenous Community Management and Development from Curtin University.

Muwadda wants to rewrite the record of Indigenous disadvantage from the inside out, acting as “translator” between Western and Indigenous knowledge. The first step will be through his master’s thesis, in which he is challenging



◀ Outside the studio of the National Aboriginal and Islander Skills Development Association in Glebe, 1982. From left: Wilo Muwadda, Dujon Nuie and Agnes Ware. Photo supplied by Elaine Pelot Syron

insider/outsider assumptions of the National Health and Medical Research Council's (NHMRC) Indigenous research guidelines. He also plans to undertake a doctorate at the University of Sydney.

Our conversation touches on raw nerves: teenage suicide, family illness, a best mate's death, incarceration. Muwadda wants to shine a light on these uncomfortable realities and give voice to those drowned out in mainstream conversations. "Background and lived experience puts a different lens on it and I want that to be indexed nationally," he says. "I want those books to be written, I want those articles published."

Until then, Muwadda will continue drawing support from his niece, Kaiya Aboagye, who is herself completing a doctorate at the University of Sydney; and Dr Vanessa Lee, a Wik and Mariam woman and social epidemiologist who is supervising his studies.

As he pursues his master's thesis at the University, Muwadda finds himself remembering his elders, especially his maternal great-grandparents: his great grandfather the law man and tracker and his great grandmother, a quietly confident woman who spoke nine languages and didn't let the racism of the day affect her.

"You've had such a fascinating life," I can't help but say. Muwadda just laughs. "I wouldn't want anyone else to have it, though," he says. "Maybe the ancestors gave it to me because I got the mind to do it: to channel it and to take it all in and make something out of it."

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## LISTEN IN TO LEARN MORE

You'll find a range of Sydney Ideas podcasts on the theme of Indigenous knowledge at <https://soundcloud.com/sydney-ideas/sets/indigenous-knowledges>

Image page 31: Laimena 'Wilo' Muwadda wants to act as a translator between Western and Indigenous knowledge.

## SHILA GHAZANFAR

Shila Ghazanfar (BSc (AdvMaths) (Hons) '13) is a PhD student working in the evolving field of statistical bioinformatics, which models and analyses biological systems involving genes. The goal is to find genetic relationships that might lead to new understandings of diseases such as cancer. She enjoys working with colleagues and collaborators and is also passionate about teaching statistics, believing that statistical literacy is important in today's increasingly data-driven society.

Photos supplied



# MY FAVOURITE

## FOOD

Food definitely tops the list of my favourites! I'm a first-generation Australian with Afghani heritage so I have a keen love of Afghan cuisine. Some recipes I learn from my mum, others I learn from YouTube like everyone else. Pictured is a special dish called mantu – steamed minced lamb and onion dumplings covered in garlic yoghurt and lentil sauce.



## RUNNING

Running or jogging is a great way to escape from the cares of everyday work and life. I like to play some music and run around my local park, especially early in the morning. I pass by a river and see some lovely parklands, and sometimes come across colourful birds like these rainbow lorikeets.





## CAT

I am definitely a cat-obsessed person. Not owning one myself doesn't stop me from hanging out with other friends' feline pets. Who'd have thought you could take a cat for a walk?

## TRAVEL

Doing a PhD has opened up many opportunities to travel, to visit other labs and to attend domestic and international conferences. Last year I presented talks at two international bioinformatics conferences. Making use of a little downtime, I saw snow for the first time! And when it's as fresh as seen here at Yosemite National Park on a sunny January morning, it's sure to be one of my favourites.



## READING

If you know me, you know that I always carry a book in my bag. I love to read, usually on the train. Mostly classics like Jane Austen and the Bronte sisters, but recently I've been throwing some popular science and feminist books into the mix. This photo is of a 'give one, take one' honour system bookshelf in a Melbourne mall.



## TEACHING

All of my time as a PhD student has also been as a Postgraduate Teaching Fellow. This means I have taught many classes, ranging from small tutorials to quite large lectures. It's certainly not easy, but the way I've improved in terms of explaining concepts and increasing my confidence makes teaching one of my favourites.

**As the world becomes smaller and the environment more damaged, the universe beckons.**

# Watch this space

Written by Sian Powell  
Photography by Louise Cooper

University of Sydney scientists are on the frontline of a new space age.

Their leading-edge investigations include searching for alien life in the far reaches of the solar system; a revolutionary rocket thruster that could take a spacecraft from Earth to Mars without carrying a heavy load of fuel; and a new breed of miniature satellites, crammed with sensors.

The satellite project has energised and enthused Australia's space community because the satellites are the first Australian-built spacecraft to be launched in 15 years.

Barely the size of a loaf of bread and known as CubeSats, the satellites' miniature sensors are designed to investigate the Earth's largely unexplored lower thermosphere, between

80 and 700 kilometres above the Earth's surface. The University of Sydney-linked CubeSats will have instruments to gauge the temperature and density of the thermosphere's plasma, vital data for improving the operation of radars and GPS equipment.

The University's Professor Iver Cairns (BSc '83 PhD '87) has been central to Australia's mini-satellite research. He instigated a collaboration between the three Australian universities that built the tiny satellite, INSPIRE 2, as part of a global space project known as QB50. For the project, 27 nations built satellites for launching into space from the International Space Station. Of the 50 CubeSats, three are Australian.



Professor Cairns is now pushing for the next step, a government-funded training centre focused on CubeSats and their applications. “It’s really exciting and it’s a major step,” he says of INSPIRE 2, which was put together without any Australian Government funding, or indeed, the training centre.

“People have been saying for ages that Australia should be showing it’s a high-tech nation. One way to do that is to have a real space effort, one that is world class and is able to do things well,” he says. “We know we can do it.”

Meanwhile, Dr Paddy Neumann (BE(Aerospace) ’07 BSc ’07 BSc (Adv) ’07 MSc ’09, Phd(Research)(Cotutelle) ’15), is working on a trip to Mars. His research focus is on a space craft engine known as an ion drive, which uses electricity from solar panels to rip ions from a piece of metal. As the ions fly out of the back of the craft, the craft is pushed forward. The ion effect is way too gentle to be of any use driving a rocket up from Earth, but in weightless, frictionless space it is a highly effective and efficient means of propulsion.

Neumann has attracted international attention because his ion drive has broken previously published thrust efficiency records by an astounding 30 percent.

Unlike traditional rocket engines, which use a chemical fuel burn for thrust (this remains the only type of engine

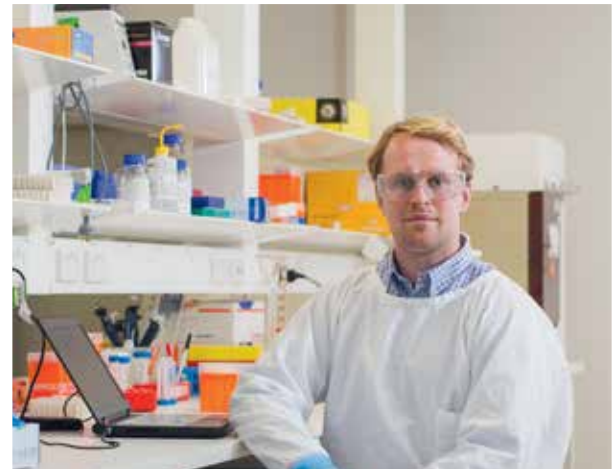
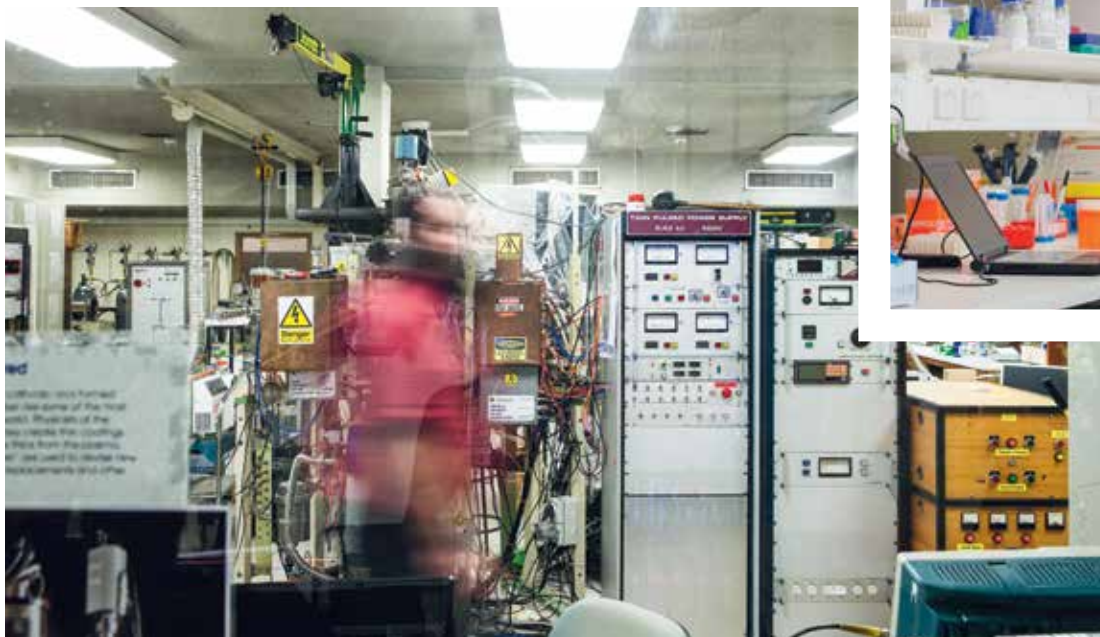
that can push a rocket out of the Earth’s atmosphere), the ion drive can be fuelled by a range of different metals, including titanium, bismuth and carbon. In his testing, Neumann found magnesium to be the most efficient. As a side benefit, this opens up the possibility of recycling magnesium from space junk currently in the Earth’s orbit.

“We believe we could send a payload from low Earth orbit to low Mars orbit in a couple of months – which compares rather favourably with the chemical rocket transfer of six to nine months,” Neumann says with his bright, natural enthusiasm.

Neumann has worked on the ion engine concept for years, beginning with his third-year special project, through his honours degree, master’s degree and doctorate. The idea germinated during his third-year special project when he was measuring the speed of ions being discharged from titanium plasma: “And I thought, that’s pretty fast, we could probably build a rocket out of that.”

Physics professor Marcela Bilek (BSc ’91) designed the ion source that Neumann used for those tests, and she has encouraged and advised him ever since. Along with Professor David McKenzie, Bilek is a co-inventor of the intellectual property. “We’ve just published an article, earlier this year, showing that – for magnesium in particular – we have a

▼ Dr Neumann works on campus in the room where Australia’s first-ever computer used to be housed.



▲ Seamus Thomson wants to use his biomedical engineering skills to advance space exploration.



▲ Professor Marcela Bilek works to maximise the fuel efficiency of the ion drive.



▲ In the Physics Building Professor Iver Cairns sits on the box he used to send the INSPIRE-2 satellite to Holland.



▲ Dr Paddy Neumann checking the coils in a magnetic filter duct that guides and purifies plasma.

specific impulse that's higher than anything that's been recorded in the literature," Bilek says. "In other words, you get a lot more thrust out of every kilogram of fuel you carry."

Neumann has now established a company, Neumann Space, to further develop the ion drive, and he has signed up with aerospace manufacturer Airbus to get the engine space-tested on the International Space Station.

Halfway around the world, in California, Sydney University student Seamus Thomson (BE(Hons) '16 BMedSc '16) is looking for extra-terrestrial life. Working with NASA, he is focused on Enceladus, one of Saturn's icy moons. Originally offered a 10-week internship with NASA, Thomson obviously made an impression as he was asked to stay on.

With degrees in engineering and medical science, Thomson is working on a doctorate in biomedical engineering and sees a future exploring how medical applications might be used in space.

Thomson notes there are many similarities between biomedical engineering and space technology, especially with regard to life-detecting sensors. Biomedical engineering instruments must be accepted by a living body and care needs to be taken to ensure they don't introduce pathogens into

that body. Similarly, with space technology, immense care is needed to ensure planetary bodies are not contaminated by Earth pathogens.

"You have to make sure that you're not detecting life that you brought with you on the sensor," he explains. "You want to detect something unique to that environment."

There are four key requirements for a celestial body to support life, he says: organics, an energy source, nitrogen and liquid water. "Very few objects in our solar system have good data that ticks the boxes for all four of those, except for Enceladus, which has an ocean under the surface and big, icy plumes being ejected," he says. "NASA has determined that Enceladus has the best chance of life, or that it once had life."

As space offers new opportunities for resources, technological advances, scientific understanding, and even tourism, University researchers are staking their place in that vast, final frontier.

**Image page 25:** Dr Paddy Neumann's ion drive could one day take astronauts to the red planet, Mars.

Official figures suggest today's graduates may change jobs more than 17 times. Welcome to the brave new world of employment.

# FUTURE JOBS

Written by Narelle Levett  
Photography by Stefanie Zingsheim

Once it was the expected thing to study, find a job and stay with an organisation until retirement. Now people entering the workforce face a very different experience.

Professor Ron Johnston is the Executive Director of the Australian Centre for Innovation. His work looks at how people can prepare for change

resulting from emerging technologies.

“A person's career will become a process of continual reinvention – reinventing yourself, reinventing your role and reinventing your areas of interest,” he says.

For example, as developing technologies enable computerisation of routine tasks such as reading

documents and assessing information, various professions will be affected. In areas such as law, computers will be able to make preliminary recommendations.

“The advice I give to my first-year engineering students is that if you've done something exactly the same way three times, then you can be replaced by a robot,” Johnston says. “So when it

comes around to the third time, don't do it the same way; think about how you can innovate and try to do it differently and better."

Globalisation has also been a major factor in the changing career landscape. People face greater competition from overseas as companies move work offshore and new technology makes the world a smaller place.

Theodora Chan (BA Media&Comm '10 BA (Hons) '12), is co-founder of Hey Sippy, a content marketing and production company that hires freelancers in various countries. Working with people overseas not only enables her company to give its clients fast service, it means both company and clients can work with the best writers, designers, photographers and videographers from around the world.

"If a client requests a blog post at 5.30pm for the following morning, I can have someone in the United Kingdom work on it during their daytime and have the content to the client by 9am Australian time," Chan says.

These changes don't always mean jobs will be lost. Other jobs are often created or the nature of existing jobs changes. Johnston gives the example of a car robotics centre in Adelaide that avoided closing down by becoming a medical device operation through repurposing existing equipment and using employees' skills differently.

"There is a need to adapt and identify new opportunities in this time of change," he says.

Johnston also sees the tradition of loyalty to employers as long gone, with people doing what's necessary to progress their careers. There is already a shift underway in how people think of employment, with more new graduates setting up their own businesses rather than working for a large organisation. So it's less about getting a job and more about making a job.

"An entrepreneurial spirit has emerged," Chan says. "I think it's symptomatic of the new economy, where people want to control their lives and have a level of flexibility with work.

"If you had told me 10 years ago that I would be running my own business, I would have laughed. But flexibility is important to me and something I didn't have to sacrifice when setting up."

So how can people prepare for the future of employment?

Soft skills such as communication, teamwork, leadership, agility and resilience are still important, as are motivation and being open to learning. Both Johnston and Chan agree that these skills, combined with specific professional expertise, are key to adapting to the multiple roles they're likely to have throughout their careers.

A broad skillset, in particular, will help people approach work differently in various environments. Chan has held a number of positions since completing her bachelor's degree and found that employers want people who can complete a wide range of tasks.



"When I was the online editor at *that's life!* magazine, I managed all the digital tasks associated with my role. I also had to edit copy, write, resize images and edit videos, and help with social media, advertising and marketing," she says. "You need to be willing to learn and adapt."

To embrace the jobs of the future, it's important we change the way we think about our careers and become more open to changing paths and reskilling.

"We don't know what the world is going to be like in five years' time so we have to prepare ourselves for something that's going to be different," Johnston says.

"We no longer need people to be job ready – we want them to be life ready."

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## RESPONDING WITH A NEW CURRICULUM

To prepare students for careers of the future, the University will introduce a reimagined undergraduate curriculum in 2018. It will focus on global perspectives, cross-disciplinary learning and real-world projects. For more information see page 3 of this edition of SAM or visit [sydney.edu.au/ug-experience](http://sydney.edu.au/ug-experience)

▲ Professor Ron Johnston sees a future where careers will be based on constant reskilling.  
◀ Theodora Chan is an alumni mentor. She is also co-founder of a company that uses technology to engage employees working from international locations.

**From the wrong side of the tracks you  
can still find the road to success.**

# In a class of her own

Written by Jocelyn Prasad  
Photography by Stefanie Zingsheim

When Donna Loughran (BEd(Hum) '97) failed Year 10, it came as no surprise. She had always showed up for roll call at Shalvey High School in Sydney's west, but most days she'd "bunk off" early to work at a local milk bar.

"I envisioned I would work at the fish and chip shop and start my own business," Loughran says. "I was just cruising, living for the moment, not thinking about my future."

No one, least of all Loughran herself, imagined that one day she would become an innovative school principal and one of the most respected teachers in the state.

Failing the school certificate was a "kick up the pants", forcing Loughran to rethink her ambitions. She decided she wanted to do the Higher School Certificate but didn't want to repeat year 10 to do it. She eventually landed at Cambridge Park High School at the foot of the Blue Mountains.

Arriving at school at seven each morning and staying late into the afternoon, she spent Years 11 and 12 improving her writing skills.

A turning point came when her legal studies teacher, Steve Duclos, took her under his wing. He pushed her to reach her full potential and, ultimately, win a scholarship to the University of Sydney. He became a key figure in her life as his mentorship continued through Loughran's training as a teacher.

This was the early 1990s, when going to university was a big deal for a girl from Shalvey. Most of Loughran's school friends headed straight into work and quickly started families. Like its neighbour, Mt Druitt, Shalvey was seen by many in Sydney as disadvantaged and undesirable. Loughran's mother worked in a supermarket and her father was a security guard, so her education sent her down a very different path. She was the only one of her four siblings to finish high school.

"It felt my world was becoming a lot bigger," Loughran says of her arrival at university. Previously, she'd been to central Sydney only about half a dozen times.





Of the two university friends she remains in touch with, one was from Brisbane (“she opened my world up to inner-city life”) and the other was from Sutherland, south of Sydney (“a completely different part of the world”). “I gave them an education too – I changed their perceptions of a Mt Druitt girl. I probably challenged a few people in my tutorials when they learned where I was from.”

After doing her practical teacher training at Doonside Technology High School (DTHS), Loughran held permanent roles at various other high schools in western Sydney. She was deputy principal at Campbelltown Performing Arts High School for three years before finding herself back at DTHS in 2016, as principal.

Having a natural warmth and enthusiasm, Loughran engages easily with the students, making a point of mixing with them in the school yard every day. Going against some perceptions, the students themselves are engaged, articulate and eager to learn and participate. There is a lively sense of community at the school.

Loughran is part of a new generation of educators showing kids how best to learn from the information that inundates their daily lives. “It’s far more about how to get kids learning and excited in a world saturated with information,” she says. “How do they unpack the information around them?”

Her forward-looking ethos and drive have earned her Lead Teacher accreditation by the NSW Board of Studies, Teaching and Educational Standards (BOSTES). Put simply, Lead Teachers are the cream of the crop.

At a ceremony celebrating the awards in August 2016, BOSTES President Tom Alegounarias said, “Every day, they are leading by example within their schools, communities and professional networks, actively working to better understand, identify and share strategies that work to improve student outcomes.” This is all very true of Loughran.

Returning to lead a school in an area where she grew up was a thrill, Loughran says. “I felt like I was back at home. I knew the streets. I knew the suburbs the kids came from.”

She bursts with pride when discussing the school’s celebration of diversity. “The tolerance and the acceptance level – whether it’s your culture, race or sexuality – it’s beautiful. The students just embrace it.”

Loughran says many of the families are very aspirational, but for a few students, there are challenges at home around mental health, poverty and English as a second language; some parents and even grandparents have never had a job. For Loughran, one of the standout issues when she arrived was the high suspension rate, particularly of Year 7 students.

“It’s so sad at such a young age,” Loughran says with concern. “When kids feel invisible, it usually results in them disconnecting quietly – or overtly in the case of incidents that can lead to suspensions. Students need to feel that their teachers know them and care about them, so they don’t fall through the cracks.”

To support these at-risk students, Loughran is initiating a new program for 2017 in which each Year 7 class will have four teachers and a maximum of 20 students, so the student/





▲ The young Donna Loughran, could never have imagined that she would one day have a career in education and help others reach their potential. Page 43, Loughran wants to stay connected with her students. Every day she makes a point of mixing with them in the Doonside Technology High School.

teacher relationship has greater connection. Teachers will also use their other capabilities in class: a science teacher who plays in a band will also teach his students performing arts.

The youngest in her family, Loughran was the first to go to university but not the last. Of her two sisters, Jackie is now a Clinical Nurse Specialist in mental health at Cumberland Hospital and Kath is a teacher's aide at Chifley College Mt Druitt, and six months out from graduating as a high school mathematics teacher. Loughran also forged a path for an older generation in her family, encouraging her aunt to become a teacher and her Dad, at 53, to enrol in librarianship studies.

As she tells her students, "There are a thousand ways to get from A to B in a career plan, but your postcode never has to determine your destiny."

**"I felt like I was back at home. I knew the streets. I knew the suburbs the kids came from."**

Donna Loughran

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## LISTEN IN TO LEARN MORE

You'll find a Sydney Ideas podcast about what it means to be a teacher in the 21st century at <https://soundcloud.com/sydney-ideas/sets/education>

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## HELP MORE STUDENTS GO TO UNIVERSITY

If you'd like to learn more about our student support programs, or help more people like Donna receive scholarships, please phone (02) 8627 8818 or email [development.fund@sydney.edu.au](mailto:development.fund@sydney.edu.au)

# BOOKS THAT CHANGED MY MIND

TWO MEMBERS OF THE UNIVERSITY COMMUNITY REVEAL THE BOOKS THAT CHANGED HOW THEY SAW THE WORLD.

## RAE COOPER

Associate Professor and Associate Dean (Undergraduate) at the University of Sydney Business School Rae Cooper (PhD '03) is dedicated to advancing gender equality. Her research has been published in leading journals, with her current focus on flexible working and gender equality in work and careers. Her reading on the subject started early.

### DAMNED WHORES AND GOD'S POLICE (1975)

Anne Summers

I first read *Damned Whores and God's Police*\* as I tackled one of my first undergraduate essays. The essay was on the place of women in Australian society and I would have been 17 or 18 at the time. My copy, which I have to admit I borrowed and have never returned, was well worn by its owner by the time I got it.

It was one of the first academic-style books that I owned and, having been the first in my family to go to university and having very recently moved from a country area, this made me feel somewhat sophisticated. Since then, its pages have yellowed further and its cover shows all the signs of moving with me through undergraduate studies, my doctoral research and from share house to share house, until finally landing in my academic office at the University of Sydney.

I had read a number of the great feminist tomes before reading this one, but they had all seemed rather abstract to me as a young feminist. This book really made me rethink many of my assumptions about Australian society – about



our institutions, history and culture. Anne's argument is that Australian society, its institutions and norms are steeped in sexism. Australian women have been typecast as either civilising angels or troublesome shrews since the first Europeans stepped on Australian soil. She argues that these two images of women persist and continue to marginalise women and limit their ability to participate fully in society and public life.

We've come quite some way in the past three decades, particularly in relation to women's and girls' education, but there is still considerable work to be done.

A lot has changed in my life since I first read this book but Anne Summers' arguments still resonate intensely with me and I proudly call myself a feminist.

\*Anne Summers (PhD 79) was a highly engaged and influential University of Sydney student. *Damned Whores and God's Police* was the first book ever accepted by the University as a doctorate.

## MICHAEL BOWEN

Dr Michael Bowen (BA(Hons) '10 PhD(Research) '14), works to develop new treatments for brain disorders such as addiction and autism. In 2015 he was awarded the Rita and John Cornforth Medal for PhD achievement in the University of Sydney's Alumni Awards, as well as the 2015 NSW Premier's Prize for Early Career Researcher of the Year and the 2016 Eureka Prize for Outstanding Early Career Researcher. This book helped shape his thinking.

### THE SELFISH GENE (1976)

Richard Dawkins

Richard Dawkins is perhaps better known these days for his vocal atheism. However, for me, his greatest work is his 1976 book *The Selfish Gene*, which was written very much by Dawkins the biologist and masterful science communicator.

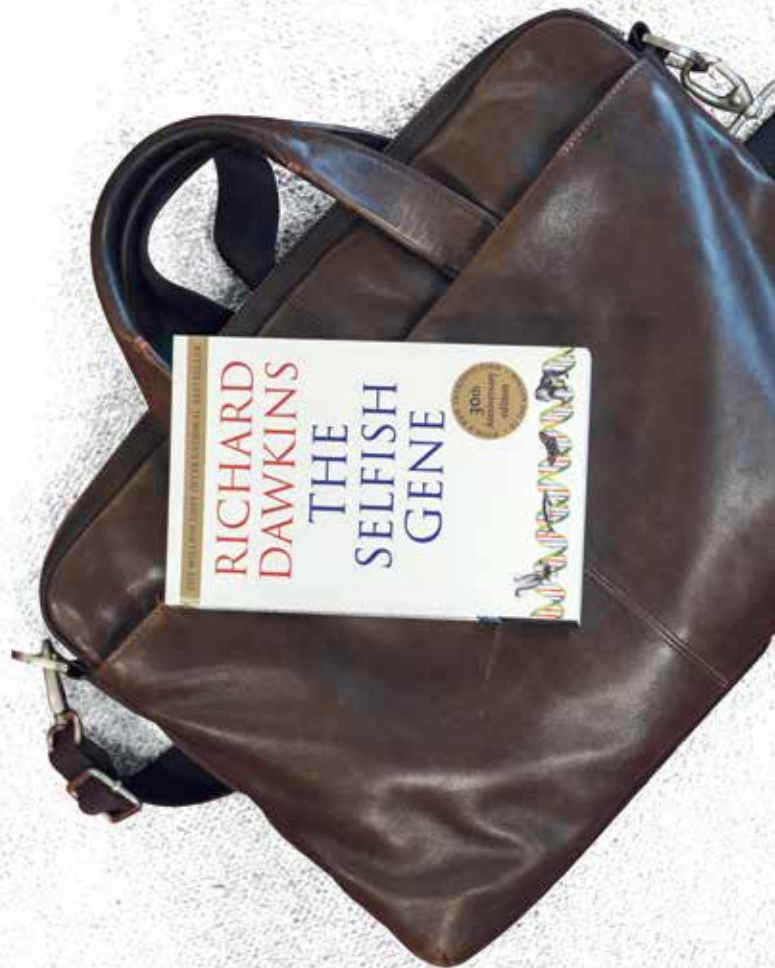
I was 16 when I stumbled across this book, trawling through one of the many bookcases in the family home. In *The Selfish Gene*, Dawkins excels in explaining the gene-centred view of evolution, arguing that selection occurs at the level of the gene but can give rise to, and be mediated by, the behaviours of the organism in its environment.

A major focus of my work is trying to understand the neurobiology of social behaviour. I use this information to help develop new treatments for dysfunctional social behaviour, a core feature of many brain disorders. I can trace the start of my passion for this area of research back to reading *The Selfish Gene*. Dawkins' extremely accessible presentation of complicated

concepts and ideas gave me the foundation I needed to expand my reading to more advanced texts, such as the work of British evolutionary theorist W D Hamilton, among others.

These works gave rise to a massive change in the way I thought, and continue to think, about complex behaviours. They went from being almost mystical to being firmly based in biology and the physical world. I learnt that the capacity of humans to act in ways that benefit others has its basis in evolution, but also that we haven't evolved to always do what is in the best interest of the survival of ourselves as individual organisms.

As Dawkins put it: "Let us understand what our own selfish genes are up to, because we may then at least have the chance to upset their designs, something that no other species has ever aspired to do." And I am dedicated to that pursuit.





▲ The living conditions in refugee camps are often very basic (photo supplied).



▲ Aid workers in the Ebola zone of Sierra Leone had to wash their hands in chlorine repeatedly (photo supplied).



▲ Working in a refugee camp in Sudan (photo supplied).

**For this alumna, an international humanitarian crisis is much more than a headline.**

# A woman of the world

Written by George Dodd

The Ebola epidemic in Sierra Leone was past its peak when Olivia Wellesley-Cole (MInternatLaw '06) went there in 2015 as part of the international response. The outbreak had received enormous media attention as an aggressive contagion that was breaking through its usual borders and threatening the wider world.

That the epidemic was past its peak in Sierra Leone doesn't mean it was over. The virus that causes the disease is tenacious and easily passed on through all bodily fluids. Olivia worked in one village where half the adults had died, but she knew of other villages that had been wiped out. There was understandable paranoia about the disease.

"I was checking my temperature twice a day," remembers Olivia during a leave break in Sydney. "Then at the Response

Centre gate they'd stop you. You had to wash your hands in chlorine and they'd do a temperature check. Two minutes later we were at the main building, same thing. So you'd have your temperature taken 10 times a day and you'd wash your hands in chlorine till they were pickled."

Olivia is what the emergency response community calls a stand-by partner. She is currently employed by RedR Australia, a company that supplies skilled emergency staff to United Nations (UN) agencies such as UNICEF, the Refugee Agency (UNHCR), the World Food Programme (WFP) and the World Health Organization (WHO).

As Olivia gained experience in emergency situations around the world, she developed skills in protecting the vulnerable, the elderly and disabled, and particularly

*Image top page 36, Olivia Wellesley-Cole visited the University in 2016 during a break from her work in Myanmar. Photo by Stefanie Zingsheim.*



▲ A discussion about food options in the Swat Valley, Pakistan. For cultural reasons, Wellesley-Cole (in red), mostly finds herself talking to men. Discussions with women do happen but are more discreet (photo supplied).



▲ Wellesley-Cole (far right) in the newly independent South Sudan of 2011. Sadly, a new conflict broke out in 2013, displacing 2.2 million people (photo supplied).

children. For all the work she has done in conflict and disaster zones, Sierra Leone's Ebola crisis was her first medical emergency, and her skills in protection were desperately needed.

As people thought to be infected were taken to treatment centres, the elderly and children were often left behind alone, and the quarantine process meant they couldn't leave their homes for 21 days. It was Olivia's job to see that these easily forgotten people received the government services they needed. She was particularly focused on enabling the school-aged children to study at home, making sure they had school books and radios for listening to lessons that were broadcast.

There was a psychological perspective to her work as well. "We'd talk to the children across the quarantine tape," she says. "We'd talk about what was happening to them, why their family members weren't there and how they were feeling."

The government-imposed state of emergency shut the schools down for nine months, meaning more unsupervised children and, as any emergency worker would expect, there was also a surge in teenage pregnancy. Fields went unplanted, harvests were missed and a big part of the population fell into poverty. As Ebola wiped out families and communities, Olivia describes some of what she saw as a horror story.

Yet Sierra Leone holds a personal significance for Olivia that spurred her to ask for a work placement in the feared Ebola zone. Olivia was born in London, but her family and much of her history is in Sierra Leone and she was educated there. It was also another, very different crisis in that country that led Olivia to study international law at the University of Sydney.

As Olivia says, there are no straight paths. Remembering herself as a quiet and book-obsessed child, she became one of the top school students in Sierra Leone, eventually winning a national scholarship to study wherever she liked. Having a talent for science, she chose to study electronic engineering in Wales, leading to a career in telecommunications, which brought her to Australia, the country she now calls home.

It was the 1990s, and the telecommunications industry in Australia was booming but, as consumed as she was by her career, Olivia found herself affected by events unfolding in Sierra Leone. A savage civil war had broken out where two rebel groups were fighting government troops and little mercy was shown to civilians by any side. Terrible atrocities were committed in which tens of thousands died and a quarter of the population was displaced.

The 500-strong Sierra Leonean community in Sydney organised and lobbied the Australian Government to accept





▲ One of Wellesley-Cole's favourite photographs because it shows all three modes of traditional local transport. Taken during a hospital rehabilitation project in Darfur, Sudan, in 2009 (photo supplied).

some of the refugees fleeing their homeland. Like all of them, Olivia wanted to do what she could for the country of her parents and her grandparents.

"I knew nothing about refugees," she says. "But I could talk, which meant I could advocate and make speeches. I spoke with very senior government people but there were times when I realised we were talking different languages. They were using legal definitions of words like 'refugee' that I just didn't understand. I decided to learn that language by studying international law.

"For my master's degree, I studied refugee law, human rights law, international humanitarian law – so laws of war, dispute resolution – lots of useful things."

Olivia also became part of the Australian National Committee on Refugee Women (ANCORW), which advocates for better services for resettled refugees. Eventually she was asked to make a bigger commitment so she could represent the organisation at annual meetings with the UNHCR in Geneva. She decided the time was right so she left the telecommunications industry.

"People ask me why I stopped engineering to do this work," says Olivia. "One of the reasons is that I got fed up with talking to computers. I wanted to talk to people."

Now, when she works as a UN protection officer, that's exactly what Olivia does.

"UNHCR Protection Officers interview refugees," Olivia says. "There is a strict definition of who a refugee is and they have to make their case. And if you are asking people about being persecuted, you're hearing really nasty stuff."

As Olivia tells her story in a comfortable café with a beautiful Sydney day outside, she knows she will very soon head back to her current work location, the remote state of Kachin in one of the world's poorest countries, Myanmar, where she is a child protection specialist with UNICEF.

Huge unseasonal floods struck the country in 2015, affecting more than a million people. In Olivia's district, children have been moved from their devastated homes to another village where their education can continue. But being away from parents and home makes these children vulnerable and some are being taken as child soldiers. It's Olivia's job to negotiate, plan, organise and second-guess what's happening in a way that will keep these children safer.

Asked what type of people take up her line of work, Olivia says with a laugh "crazy people like me". She says she did a lot of thinking before she took it on, but she knew that having her home in Sydney would make it possible for her to do what she does. "You have to have somewhere to come back to," she says.

Sydney researchers are at the forefront of new discoveries that could save the endangered Tasmanian devil.

# Devil of a problem



Written by Lauren Sams (BA(Hons) '07)

When we think of the Tasmanian devil, with its ferociously sharp teeth and equally powerful claws, it may be difficult to remember the species is under threat. As the world's top marsupial predator, what could be causing its numbers to dwindle?

The answer is an extraordinary cancer called devil facial tumour disease (DFTD) which is responsible for slashing the devil population by 85 percent since 1996. "Part of the reason DFTD has been so devastating is the devils' lack of genetic diversity," says Professor Katherine Belov (CertEdStud '10), University of Sydney Pro-Vice Chancellor (Global Engagement) and head of the Australasian Wildlife Genomics Group (AWGG). The genetics of both the devil and the cancer are providing Professor Belov's team with plenty of places to look for solutions that might save the devils.

"When the thylacine, or Tasmanian tiger, became extinct in the 1930s, the Tassie devil took up its place as the dominant marsupial predator," says Dr Carolyn Hogg (PhD (Vet Science) '06), research manager for Professor Belov's group. "Being the top predator makes the devil a hugely important part of the Tasmanian ecosystem."

The facial tumour disease is remarkable in that it is a transmissible cancer. It is spread when the devils bite each other, predominantly on the face, hence the name. It's one of only four known cancers that can be spread from host to host. The lack of genetic diversity adds to the threat.

"The more genetic diversity a species has, the better its chances of surviving and adapting to future change," Professor Belov explains. But the devils, which are so genetically similar they are sometimes referred to as



▲ Saving the devil, from left, Professor Katherine Belov, Emma Peel, Dr Carolyn Hogg and Rebecca Gooley. (Photo by Matthew Vasilescu).



▲ Armin was born in a Tasmanian free-range enclosure and was released onto Maria Island in 2012. He now has eight offspring and is considered a Super Dad (Photo courtesy of Save the Tasmanian Devil Program).

“clones”, have such low diversity that their population numbers have crashed numerous times in the past.

Devil facial tumour disease was first spotted in north-east Tasmania, but it has since spread to the south and west. In 2009, it was estimated that within 25 years the entire devil population would be gone unless something was done to prevent it. Enter Professor Belov and her team at the University of Sydney, who have been working since 2007 on both the disease itself and the genetics of the Tasmanian devil insurance population (a captive group of about 700 devils).

University of Sydney PhD student Emma Peel (BAnVetBioSc '13), who is a researcher within the group, made a surprising discovery that could not only cure the devils' cancer, but

may also have incredible benefits for humans.

Peel, like many other researchers, was confounded by the idea that young devils were not succumbing to the cancer like their older counterparts. Devils have very short pregnancies – about 18 days – and their young are born extremely underdeveloped and with little immunity, explains Peel. “When the devils are born they go straight to their mother’s pouch, which is full of potentially harmful bacteria,” she says. “We started thinking, ‘how are these baby devils, with essentially no immune system, surviving in their mothers’ pouches?’”

What Peel found was that the devils’ breast milk is packed with unique antimicrobial peptides, known as cathelicidins, which may protect the babies from facial tumour disease.



◀ Jimmy is part of the insurance population of devils that are bred to be disease free (Photo courtesy of Save the Tasmanian Devil Program).

▼ Devil with Devil Facial Tumour Disease (DFTD), trapped on mainland Tasmania. As the disease progresses, the devils become unable to eat (Photo courtesy of Save the Tasmanian Devil Program).



The peptides were also expressed through the skin of the devils' pouch, providing natural immunity. "Cathelicidins are found in other mammals," says Peel, "and they've been studied quite extensively in humans, where they do have anti-cancer properties."

During testing, Peel discovered that the cathelicidins can kill two types of dangerous and increasingly drug-resistant bacteria: methicillin-resistant *Staphylococcus aureus* (commonly known as golden staph) and vancomycin-resistant *Enterococcus faecalis*. "We've been doing so much work on DFTD, that to find something that could be used one day to help humans is a really great outcome," says Peel. While no research has been performed on live devils to see whether the peptides can combat the disease, this is the next step for the team. In the petri dish, at least, things look promising.

For now, the focus is on securing the devil population as it stands. Dr Hogg works in partnership with the Save the Tasmanian Devil Program, the Zoo and Aquarium Association Australasia and San Diego Zoo Global, to ensure that the insurance population is protected and can thrive, cancer free. "These devils are housed in a range of facilities ranging from intensive enclosures in zoos to fenced peninsulas in Tasmania and on Maria Island, off the east coast of Tasmania," Dr Hogg says. So far, they are all disease-free.

"The challenge here," says population geneticist Dr Catherine Grueber, a post-doctoral fellow in the group, "is ensuring that the captive populations don't in-breed, which would cause a further lack of genetic diversity."

But once again, a University researcher has found a unique solution to the problem.

A PhD student within the Australasian Wildlife Genomics Group, Rebecca Gooley, was working on DNA sequencing of some devil scat found in south-west Tasmania earlier this year when she found significant genetic differences between them and the DNA of other devils. Of the 17 genetic markers she screened for, nine were completely new variants.

"The discovery of the poo was an extremely exciting result," says Gooley. "Finding a population that has a lot more diversity is really valuable for preventing in-breeding and provides an opportunity for us to introduce animals who aren't related to each other for further breeding in insurance populations."

While the Save the Tasmanian Devil Program team has begun to release healthy devils back into the wild population, this is still very much in its infancy.

Despite the promising advances of 2016 there is still a lot of work to be done to ensure the future of the Tasmanian Devil. This summer, an intrepid group of volunteers is in south-west Tasmania searching for more devil scat to test for further genetic diversity. This will allow the team to target areas for intense trapping in 2017. At the same time, Peel will begin to modify and manipulate the peptides to test their wider application – a reason for this beloved Australian animal to flash a devilish grin.

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## HELP SAVE THE TASMANIAN DEVIL

The University recently ran a crowd-funding campaign to save the Tasmanian devil. To learn more or help advance this critical research, please contact Harkeet Puria, ph (02) 8627 8818 or email [development.fund@sydney.edu.au](mailto:development.fund@sydney.edu.au)

► Bathurst Harbour, south-west Tasmania, where Rebecca Gooley found different and precious genetic variants from Tasmanian devil scat samples (Photo courtesy of Dr Carolyn Hogg).

▼ Dr Carolyn Hogg tracks tagged Tasmanian devils after their release into the wild in August 2016 (Photo courtesy of Dr Carolyn Hogg).



► The cancer has spread widely through the devil population because so many of them are genetically similar (Photo courtesy of Save the Tasmanian Devil Program).

▲ After his annual health check, Bosavi the Tasmanian devil is released back on to Maria Island by Dr Carolyn Hogg (Photo courtesy of Dr Carolyn Hogg).

◄ South-west Tasmania, where researchers from the University of Sydney and Save the Tasmanian Devil Program will search for new, genetically different devils (Photo courtesy of Dr Carolyn Hogg).

# ON MY MIND: RANJIT VOOLA

**ASSOCIATE PROFESSOR RANJIT VOOLA IS A MARKETING STRATEGY ACADEMIC AT THE UNIVERSITY OF SYDNEY BUSINESS SCHOOL. HE CHALLENGES BUSINESS LEADERS TO RETHINK THE IDEA THAT WHAT THEY DO IS ONLY ABOUT PROFIT.**



Associate Professor Ranjit Voola (CertEdStud '08), believes business can and will drive improvements in developing countries.

One of my most significant childhood memories is seeing my parents, who were Christian missionary doctors in India, providing medical care to the poor. This had a profound impact on me, shaping my world view and my career goals.

In 2014, I developed a new unit of study for the University of Sydney Business School curriculum titled 'Poverty Alleviation and Profitability', arguing that there is both a moral and an economic imperative for businesses to engage with social issues such as poverty alleviation – and they can do this while making profits.

The idea for this unit emerged from my engagement with the global conversation relating to reimagining the purpose of business. Since Milton Friedman's quote in 1970 that the "corporate social responsibility of business is to make profits", there has been a transformation in thought regarding the role of business in addressing global challenges. Specifically, there has been a critical examining of the notion that profits

can be a means to a greater end – societal wellbeing.

I believe companies that demonstrate ambidextrous strategic thinking by reconciling seemingly contradictory outcomes, such as poverty alleviation and profits, will be the leaders of the future.

There is an obvious economic imperative – there are 4 billion people who live on less than \$5 a day. As developed countries become saturated markets, companies are looking towards these other markets. However, only companies that rethink their business models from the traditional 'low volume and high margins' to 'low margins and high volume', will be able to address social issues ethically, as well as make profits. In other words, the idea is to build your profits on a little money from many people rather than more money from fewer 'rich' people.

For example, there are 2.5 billion people in the world who do not have a bank account, which exacerbates poverty because they have no way of participating in the financial world.

Seeing an opportunity, communications giant Vodafone worked through a Kenyan network operator, Safaricom, to develop a financial product called M-Pesa. This allows their Kenyan consumers (often the poor) with no bank accounts, to transfer money through their mobile phones. When the consumers subscribe they can deposit money with their Safaricom agents, often in easily accessible corner shops. The money is then in the consumer's account and can be withdrawn from another agent. As a result, M-Pesa has enhanced financial literacy and security, and allowed easier access to funds, while simultaneously achieving profits.

Seventeen million Kenyans are now using this product and it has been introduced in Afghanistan, Mozambique, South Africa, Tanzania and India.

In another example, Lifebuoy soap, owned by multinational company Unilever, has run a massive campaign in India to promote regular handwashing. This simple piece of sanitation knowledge could save the lives of thousands of children who die from diarrhoea every year. At the same time, of course, Lifebuoy is accessing a vast new market.

An important global narrative that provided impetus for this counterintuitive business thinking was created in 2015, when the United Nations ratified 17 sustainable-development goals. These goals include ending poverty, increasing gender equality and addressing hunger. The 17 goals have 169 targets that provide a roadmap to a better world by 2030.

The United Nations argues that these goals cannot be implemented without the private sector, which is an important departure from the previous reliance on non-government organisations (NGOs) and governments themselves. This change of focus is already having an effect locally. In 2016,

33 Australian chief executives signed up to the CEO Statement of Support for the sustainable development goals. This push for businesses to reimagine its purpose and engage in ambidextrous strategic thinking is also visible in the Australian Government's current aid policy, 'trade for aid', which revolves around the private sector.

There are  
4 billion  
people  
who live  
on less than  
\$5 a day.

Ranjit Voula

Interestingly, individual consumers also expect businesses not just to do no harm, but proactively to do good for society. In my teaching I see a clear desire in students to learn about how they can change the world for the better, through business. When looking for employment, they are also seeking out companies that are making a difference. Most importantly,

some CEOs are passionately calling for businesses to engage with social issues. The key question for companies, then, is how can they best embrace this new paradigm that challenges the traditional assumptions of business?

I believe such a transformation is possible. Specifically, companies need to unlearn the entrenched notion of the purpose of business (singular focus on profits), before learning about implementing the sustainable development goals. An introspective internal dialogue about their purpose is needed. Complex problems require complex partnerships. Businesses must go beyond their comfort zones to develop partnerships with NGOs, governments and civil society, as well as with the very people affected by these issues. If a company is trying to alleviate poverty, developing genuine relationships with the poor is critical, because they are the experts on poverty!

At their core, sustainable development goals such as ending poverty and hunger require the heart as much as the mind. Business leaders need to reflect on the emotional connection they personally have with the goals. Apart from work, they – and all of us – should ask, what am I passionate about? Climate change? Ending poverty? Supporting a charity? How can we use that self knowledge to motivate engagement with the goals while making a profit at the same time?

For myself, I have two daughters, Charvi, 8, and Leela, who is one year old. My emotional connection to the sustainable development goals is to shape the world by 2030 so that gender inequality will not be a problem anymore.

I believe that businesses that can reflect on the following question will be able to combine profit with purpose, a characteristic that will define the leaders of the future: Where does my passion meet the world's greatest need, at a profit?





Science fiction is here.  
Workplace diversity will soon  
include artificial intelligence.

# Dawn of the artificial employee

Written by Rebekah Hayden  
Photography by Louise Cooper

Workplaces that include artificial intelligence (AI) will soon be reality, say researchers who believe the rise of AI in all areas of life is not only inevitable, it's set to reshape the way we think about consciousness and human identity.

From *Metropolis* to *2001: A Space Odyssey* and *The Terminator*, robots and super-intelligent AIs in film have seduced and terrified our collective consciousness, having an impact on how

we view artificial intelligence. But will they really crush the puny humans and take over the world?

The truth is both less dramatic and more exciting.

Michael Harré (PhD '09), AI enthusiast and lecturer in Complex Systems at the University of Sydney, believes living and working with AI will force us to reassess basic assumptions about our sense of self.

“What will it be like to regularly confront an AI, or a robot with an AI in it, that behaves like a human?” Harré asks. “The fact that we will be interacting with the appearance of consciousness in things that are clearly not biological will be enough for us to at least unconsciously revise what we think consciousness is.”

AI development has a long way to go before then. AI and humans have very

different decision-making processes. Humans rely strongly on intuition, while AI crunches all possible options and calculates the most likely answer. All this data-crunching comes at a cost: the vast computational power that's needed limits the number of tasks AI can do. It tends to be a one-trick pony. This means we won't be relegated to the evolutionary scrapheap just yet.

Though movies often feature robots with sophisticated AI minds, that combination is still a distant possibility.

So what is AI? A very different discipline from robotics, artificial intelligence is a field of computer science that mimics the natural learning process of the human brain by creating what are called artificial neural networks. For example, an AI is given a picture of a wolf and told to trawl through millions of animal photos and find other pictures of wolves. Each

In the last two years there has been landmark evolution of artificial intelligence. Energy-efficient computers and microchips based on the neural structure of the brain are driving the surge in AI advancement. Virtual personal assistants such as Apple's Siri and Amazon's Alexa, movie recommendation services and online customer support are all examples of artificial intelligence in services that we increasingly take for granted.

As useful as neural networks like these might be for interpreting data and identifying patterns, they lack long-term memory and struggle to perform basic computational tasks.

Harré is part of a new wave of researchers exploring the relationship between human thinking, artificial intelligence and economics. He believes that understanding human cognition will drive AI advancement

“We want to know what drives bubbles, whether those drivers are in the current Australian market, and how we deflate the problem of a potential crash by helping inform policy,” Harré says.

For Harré, it's not just the computational power of AI that is useful, it's the potential of a future in which we will work with and interact daily with AI personalities – and he is excited about the diversity of viewpoints this implies. AI, by its nature, will have opinions.

We talk about diversity in the workforce. In the future that will include AIs.

There is no doubt automation will change the workforce; and not just for repetitive tasks. AIs are already being used in law and medicine, not only to read and assess documents but to make recommendations, while advances

## “What will it be like to regularly confront an AI ... that behaves like a human?”

Michael Harré

correct answer reinforces the AI's neural pathways, so it actually learns from experience. The software isn't specifically coded – rather the program evolves its own algorithms and uses feedback to refine the results.

These types of AIs are very good at dealing with massive amounts of data, making them invaluable for services such as fraud detection and security surveillance. Working with these huge inputs of information makes AI a power-hungry beast that devours huge computational resources.

While a robot mastermind might not occupy the next cubicle in the short term, AI has been moving into various industries since the 1990s – from finance to communications, heavy industry and even toys – constantly evolving and becoming more sophisticated.

– and vice versa. “The stronger the connection we can draw between economics, psychology and neuroscience – three very different fields studying humans at very different scales – the better our understanding will be in all three areas.”

To that end, Harré and his colleagues received a grant from the Australian Research Council (ARC) in 2016 to develop simple AIs called agent-based models that simulate the Australian housing market and identify if it is at risk of collapse. Millions of households are modelled by these AIs, which interact with each other to buy and sell houses. The project will allow them to look at different suburbs, cities and regions across Australia to identify the factors that might lead to a system-wide collapse.

in robotics are allowing doctors to perform surgeries remotely. Soon simple surgeries may even be performed by AI. Despite the pervasive fear that technology will innovate whole careers out of existence, Harré believes that people who are flexible and open to learning will continue to be in demand.

“I think we're going to end up with a very dynamic workforce,” he says. “The key thing for the future is going to be people who are more willing to be agile within the jobs they take.”

With huge companies such as Google, Facebook and Microsoft investing heavily in AI systems, the future is looking a lot closer. One advantage of working with AIs? They won't be lining up to use the coffee machine any time soon.

*Image page 46, Dr Micheal Harre is thinking through how the AI future will work.*

# CLASSNOTES

More stories of alumni at work around the world. We love hearing what our alumni are doing. Help us keep track by updating your details at [alumni.sydney.edu.au/updatedetails](http://alumni.sydney.edu.au/updatedetails)

## STORIES THAT MADE AUSTRALIA

After months of work, the University recently unveiled its first *Golden Yearbook*, with 397 stories of alumni who graduated more than 50 years ago.

The huge range of experiences shows that the University has a diverse, hardworking and influential alumni community.

Here is the story of one alumnus who helped shape Australia.

[sydney.edu.au/alumni/golden-yearbook](http://sydney.edu.au/alumni/golden-yearbook)



▲ Alumnus Max Carey, with his wife, Joyce.

### Max Carey (PhC, MPS, '52)

I left Taree High School in 1945 and asked a local pharmacist, Tom Moore, for a job. He said if I returned to school he would apprentice me to study pharmacy. I started work in his pharmacy in 1948. In 1950 I moved to Sydney and attended university.

During my two years at the University of Sydney I attended lectures during the morning and worked in a Coogee pharmacy in the afternoons to gain practical experience. This meant I had little time for University life.

I worked in a number of pharmacies before establishing my own in Taree in 1957, which I sold in 1987. I am proud that this pharmacy is still operating.

I have also been Chairman of Mayo Private Hospital in Taree, an alderman

of Taree Municipal Council and deputy mayor. As part of my 50-year Rotary membership, I visited Papua New Guinea, the Solomon Islands and Vanuatu, working on various medical facilities including Kokoda Hospital.

I regard my happy marriage of 60 years to my wife Joyce as one of our proudest accomplishments. We have two children, Jane and Richard, who have five children between them, which gives us good reason to be proud.

My advice for my 20-year-old self? Work hard. The harder you work the luckier you are. Make the most of your natural attributes, and treat work as an interest not a chore. Look for a good partner and make sure when you buy your first car that it's not a bomb!



### Osmund Mwandemele (PhD

(Agriculture) '83) is a Professor of Plant Genetics and Breeding. Among his many leadership and management roles, he has been Pro-Vice Chancellor for Academic Affairs at the University of Namibia since 2007. During that time he has helped that university grow from three to 12 campuses around the country, giving greater access to education for many. Previously he was founding director of the Sam Nujoma Marine and Coastal Resources Research Centre, which works to develop fisheries and agriculture. In 2013 he was appointed by the Namibian Head of State to serve on the Presidential Economic Advisory Council, and in 2015 he received the African Education Leadership Award. Professor Mwandemele has also been recognised for contributing to community projects that improve quality of life for people in Namibia.

# It led me to fight global warming.

Adrian Enright  
Master of Development Studies

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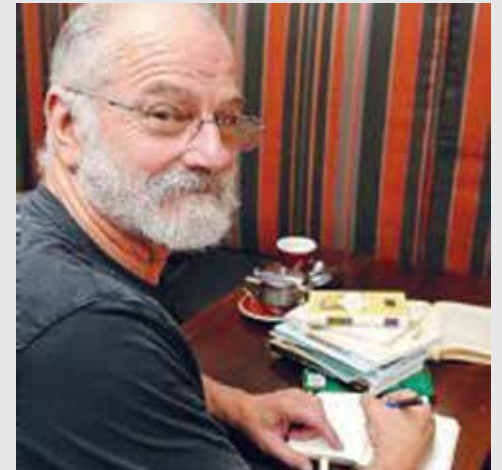


**Adele Dumont (BA '13)**

After finishing her degree Adele spent two years teaching English to asylum seekers at the Christmas Island and Curtin immigration detention centres. Deeply inspired by her many students, she decided to write a book detailing her experiences. Last year, *No Man is an Island* was published by Hachette. Adele is thrilled that the honesty of the book has seen her compared to one of her literary idols, Helen Garner. Since returning to Sydney, Adele has embarked on a primary school teaching career. Later this year she intends to travel to Beirut's sprawling refugee camp to teach Syrian children, many of whom have never had access to formal education.

**Linden Wilkinson (BEc '73) BTeach '05 MEd (Res) '08 PhD(Research) '14)**, completed her first degree at the University of Sydney in economics then auditioned for the National Institute of Dramatic Art (NIDA). After a three-decade career in performance and writing, she returned to the University, completing a teaching degree before going on to a master's and a doctoral degree using performance as a mode of research delivery. Her doctoral thesis, *Today We're Alive – generating cross-cultural performance, an Australian experience* concerns the search for a Reconciliation narrative. A play about the Myall Creek massacre of 1838 and the memorial that was built to commemorate this atrocity evolved from the research and was published by Playlab in 2014.

**Philip Porter (MCW '13)** did a Master of Creative Writing – it was a life changer. After travelling the world seeking enlightenment and finding unemployment that was periodically interrupted with jobs such as prison guard, showman, fisherman, high school and university teacher and educational entrepreneur, the master's degree turned his mind to poetry. It led to forming community groups and the publication of a poetry anthology, *A Patch of Sun*, with fellow editors Luke Fischer and Kit Kelen. Philip has lived, worked and had businesses in Japan since 1974, and is currently the Special Adviser to the President of Meiji University in Tokyo. In this role he helps to internationalise the organisation's profile. Find more about the poetry at [www.northshorepoetryproject.com](http://www.northshorepoetryproject.com)



**Alexander Nash (BE (Chem) '97)** is a chartered chemical engineer who specialises in the water and utilities sector. He has worked in Kenya, Lesotho, Nigeria, Kyrgyzstan, Jordan, the UK and Australia on both large-scale and smaller community projects. Currently working for the European Investment Bank in Morocco, he previously worked for the World Bank in Sierra Leone and on humanitarian relief projects in the Democratic Republic of the Congo (during a cholera outbreak), Namibia (assisting displaced people due to flooding) and Chad (refugee camp construction).

# ASK SYDNEY

IF YOU HAVE A BURNING QUESTION, WE'LL FIND AN EXPERT AT THE UNIVERSITY WHO CAN ANSWER IT FOR YOU. NOTHING IS TOO OBSCURE. JUST SEND YOUR QUESTION TO: [SAM@SYDNEY.EDU.AU](mailto:sam@sydney.edu.au)

**Q. Planting forests is seen as a way of locking up carbon. But doesn't the changing state of trees – burning, decomposing – mean forests are only a temporary store of carbon?**

A. Yes, for the most part, forests are a temporary store of carbon, especially given disturbances such as fire. The only part of a forest that is a long-term store of carbon is the soil. This can remain “stored” for thousands to millions of years. Much of today's fossil fuels were forest carbon, then soil carbon, then “fossil carbon”. Forests play an integral role in the global carbon cycle, taking up (and releasing) carbon in large amounts every year. It is important that we manage forests to maintain that activity and the balance between uptake and release.

**Professor Mark Adams is the Director of the Centre for Carbon, Water and Food. He works across a range of native ecosystems and in agricultural systems, mainly on soil processes such as those that release or mitigate greenhouse gases.**

## BUT WAIT, THERE'S MORE.

You can find more Ask Sydney answers online at [sydney.edu.au/sam/ask-sydney](http://sydney.edu.au/sam/ask-sydney)

**Q. Euler's identity equation has been likened to a Shakespearean sonnet. Why do mathematicians think it is so beautiful?**

A. To understand the beauty of Shakespeare's words, you need to know some English. The same is true for mathematical statements. To contemplate their beauty, you need to learn a bit of the language, and this is nowhere truer than with Euler's equation, which states  $e^{i\pi} + 1 = 0$ , thereby relating five of the most important numbers in mathematics.

Euler discovered a beautifully simple relation between these numbers which underlie much of our modern world: it appears in electrical engineering, computer graphics, flight dynamics and quantum mechanics.

Why is this beautiful? As in life, in mathematics there is no universal notion of beauty. But when something connects important things that seem unrelated in a simple way, then it's hard to argue: beauty is at hand. This is epitomised by Euler's identity – simple, deep and ubiquitous – the hallmarks of mathematical beauty.

**Dr Oded Yacobi is a senior lecturer and an ARC Research Fellow at the University of Sydney. His areas of interest include various aspects of representation theory, which studies abstract algebraic structures and symmetry in linear spaces.**

## OPEN FOR DISCUSSION

You can hear more interesting questions raised and answered by University of Sydney researchers in the new podcast series, *Open for Discussion*.

– [sydney.edu.au/news-opinion/news/podcasts.html](http://sydney.edu.au/news-opinion/news/podcasts.html)

Also available on SoundCloud

– [soundcloud.com/open-for-discussion](http://soundcloud.com/open-for-discussion)

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## CORRECTION

In the last issue of SAM, the story 'Baby steps' was incorrectly credited to Melissa Sweet when it was written by George Dodd. We apologise for the error.





**In 1890 John Henry  
Challis gave an  
everlasting gift.**

126 years on, his gift  
still inspires engineering  
marvels, literary  
classics, legal reforms,  
historic discoveries,  
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medical advances.

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(1806 – eternity)**

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