

SAM



THE UNIVERSITY OF
SYDNEY

Above and beyond

STORIES OF OUR
RESEARCHERS
GOING WHERE
THE ANSWERS ARE.



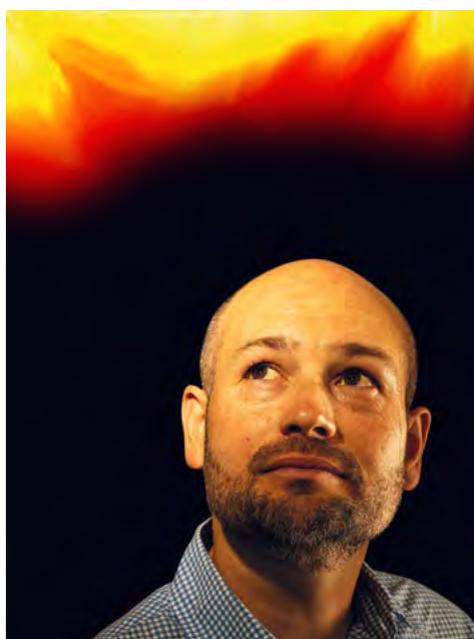


Students on the steps of the
Macleay Museum, 1910.
Archive photo: G3_224_0998.

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PROGRESS AMID THE CRISIS

✦ What a year this has been! Our resilience has certainly been tested but I am pleased that the University of Sydney has in so many ways met the challenges and overcome them.

Our students have been heavily impacted and our staff have been simply extraordinary, pivoting to teach classes online and managing a huge administrative load. Their effort has been rewarded with really gratifying positive feedback, and our most recent survey showed that the first semester student experience was just as positive as that of second semester 2019. That is really a remarkable achievement.

As well as teaching online, we have been doing all we can to maintain the usual rhythm of the academic year, including a virtual Welcome Week for new students and our first ever virtual graduation celebration. These bookends to academic life are important.

Our researchers have been contributing in myriad ways to the fight against COVID-19 and you can access a specially curated section under Research on our website.

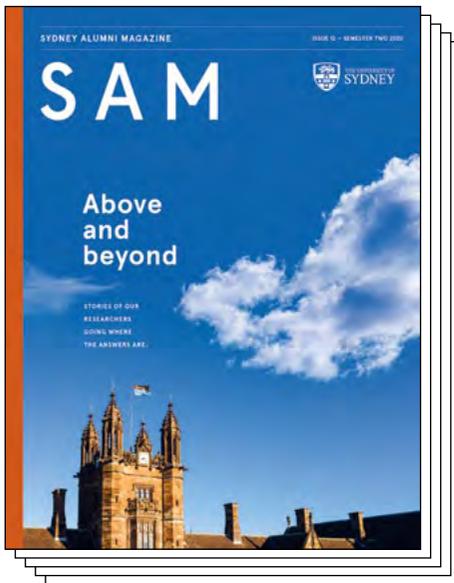
Aside from the pandemic, it's important to remember that there are other issues to address, and many of the stories in this edition will give you a snapshot of the ways our researchers are looking to the future. I am proud that we have just launched a sustainability strategy that will see the University take practical steps to protect our planet and embed a focus on sustainability into our research and teaching.

In looking to the future, though, I must express our thanks to the Vice-Chancellor, Dr Michael Spence, who is leaving in December to take up his new position as President of University College London. Michael has been an inspirational leader and a great colleague. He has transformed our University in so many ways, leaving a great legacy, and I wish him all the best in his new role.

Whilst we are continuing the international search to find a new Vice-Chancellor, I welcome Professor Stephen Garton who takes on the role from January 2021. Stephen has been a wonderful contributor to the University for over 32 years, most recently as Senior Deputy Vice-Chancellor and prior to that as Provost overseeing our academic community. ●



Belinda Hutchinson AC
(BEC '76), Chancellor



NOTE FROM THE EDITOR

Why is SAM smaller?

Numerous media stories have talked about the profound effect COVID-19 has had on universities. Certainly it has changed the University of Sydney landscape. For SAM, we've also had to streamline what we do.

Despite there being fewer pages in this issue, we have made every effort to maintain the substance and value of SAM. The stories will demonstrate that even in these constrained times, great things are happening at your University.

George Dodd
SAM Publishing Editor.



MEDICINE

Fixing up the joint

Even the most advanced medical device implants – organ and joint implants, biosensors, tissue engineering scaffolds – can be rejected. So how do you encourage the human body to welcome alien visitors?

For a team of University biomedical engineers, the answer is hydrogel. Similar to soft tissue in the human body, it can be used as the point of contact between the implanted device and the body.

Though hydrogel itself was once problematic because it was structurally weak, progress has been made.

“We’ve created a hybrid structure that combines hydrogels with hard, solid polymers,” says Dr Behnam Akhavan, a Research Fellow working in Applied Plasma and Surface Engineering. “This gives hydrogels structural integrity and mechanical support.”

Other reinforced hydrogel ideas include loading it with slow release drugs or using it to mimic structures such as bone-cartilage.

SUSTAINABILITY

Not forgetting that other major crisis

Like COVID-19, dramatic action is needed to minimise climate change. To this end, the University has committed to a wide-ranging sustainability strategy, including a target of 100% renewable energy by 2025. Other strategy elements will look at the University’s water use, single-use plastic, procurement procedures and sending zero waste to landfill.

The University’s investments in fossil fuels will be reviewed by a panel reflecting all parts of the University community. It will make recommendations to the Senate later this year.

“The pandemic has prompted discussions about the world we want to build back, post-pandemic,” says Sydney Environment Institute Director, Professor David Schlosberg. “Our sustainability strategy is about systemic change, and the way we care for the Country on which the University is built.”



Written by George Dodd
Photography by Stefanie Zingsheim

SCALING UP



The earliest known aquaculture sites were created more than 6000 years ago by Australian Aboriginals to grow eels. About five thousand years later, the Chinese began farming carp. Today aquaculture is the fastest growing, food-related primary industry in the world. And we need it to be.



Associate Professor Joy Becker at the Sydney Fish Market. Though farmed fish is still a small (though growing) part of overall turnover, the top selling fish at the Sydney Fish Market, for 2019 by weight, was farmed Yellowtail Kingfish.

👉 World production of farmed fish overtook the production of farmed beef more than ten years ago. Then in 2018, farmed seafood for human consumption exceeded wild-caught seafood for the first time.

These aren't just interesting and perhaps surprising pieces of trivia. They're markers of a profound change in how we humans are producing our protein-rich foods.

The motivators towards aquaculture are not unfamiliar. Farming land animals is resource intensive, hard on land and waterways and too often, hard on the animals themselves. At the same time, there are about 4.6 million fishing vessels plying the seas, including massive factory ships, which have turned parts of the ocean into fish ghost towns and threaten some species with extinction.

While aquaculture is by no means a penalty free alternative, as the world population grows from around 7.8 billion today to a projected 9 billion by 2030, it presents opportunities to produce more protein using less, not just through farming fish, but also molluscs and crustaceans. This plays very much to the goals of Associate Professor Joy Becker.

"What gets me out of bed in the morning is food security," she says from her office at the University's Centre for Carbon, Water and Food in Camden, west of Sydney. "The fact is, we need to be able to farm fish so it's sustainable, safe for people to eat and affordable. Affordable is a big one."

Growing up in a fully land-locked part of rural Canada, Becker was always around beef and poultry but somehow became fascinated by fish. So what brought her to Australia? "I was following the salmon," she says. "I did my PhD in parasites and salmon have parasite problems. Suddenly, I was in Tasmania where the salmon farming industry was going gangbusters."

Tasmania isn't the only aquaculture state. "It's everywhere in Australia," says Becker with some excitement. "New South Wales has oysters, Murray cod, silver perch. In Victoria it's abalone and rainbow trout. WA and the Northern Territory do barramundi. Lots of prawns in Queensland. South Australia has southern Bluefin tuna and oysters as well. There's also barramundi and yellowtail kingfish hatcheries. There's lots more happening and nowhere is untouched."

Her aquaculture focus is fish diseases, giving Becker plenty to think about because it's a serious issue for the industry. Fish farming is intensive, tending to put lots of fish in relatively small spaces, either ponds, tanks or enclosed by nets in the ocean. There are knock-on effects.

“What gets me out of bed in the morning is food security. We need to be able to farm fish so it’s sustainable.”



– Joy Becker

With sea cage farms, the copious fish waste falls into a very localised part of the ocean wreaking havoc on water quality and the ecosystem. Tank and pond fish farms can use lots of energy maintaining liveable environments for their fish. Plus they need plenty of water that then becomes tainted with fish waste.

Intensive fish farming also makes disease outbreaks virtually inevitable and the effects can happen on a grand scale. In one six month period, a salmon farm in Tasmania lost more than a million fish to Pilchard orthomyxovirus, most likely caught from native pilchards. Of course, it works the other way too; a fish farm disease can easily spread to wild populations.

Addressing these problems comes under the remit of the University’s Aquatic Animal Health team which has been operating now for 20 years. Through strong affiliations with a number of industry organisations, the team is responsive to issues as they arise and works to ensure new information quickly goes where it’s needed

A large part of what Becker does in the team, is looking at how to prevent disease outbreaks and how to treat them in ways that don’t compromise the food value of the fish or fall foul of the rightly strict Food Safety Act. In fact, exported Australian seafood is highly regarded specifically because it’s clean and safe, meaning minimal chemical or drug residues.

“In Australia drugs are only used if the fish are sick, not as a preventative,” says Becker. “It’s all licensed drugs and you have to have a veterinarian prescribe them.”

Another vital element for healthy farmed fish is feeding them the right food, complicated by the fact that some of the most desirable and profitable farmed fish – salmon, trout, tuna, barramundi – are carnivores. They eat other fish. So any thought that farming fish takes pressure off wild fish populations, doesn’t fully play out.

However, farmed fish aren’t fed whole fish. They’re fed pellets containing fish meal made from anchovies and pilchards caught off the coast of South America. The fishmeal market is growing as vigorously as the aquaculture industry.

“The cost of the pellets is greatly impacted by the El Nino/La Nina weather cycles which affect wild fish numbers,” says Becker. “We have years

with lots of fishmeal and fish oil, with relatively low prices. We have lean years when prices can double, impacting the farmers.”

Minimising the amount of fish meal in food pellets, while maintaining fish health, has been the subject of intense research for a number of years. Various vegetable-based options have been considered, but they lack something essential in feed for carnivorous fish; enough omega 3 fatty acids. The search continues.

Still, the core benefit of fish farming remains; it’s efficiency in converting feed into useable protein.

Where land animals carry themselves heavily across the earth, fish are in a buoyant environment, and therefore able to grow on substantially less food. Carp, shunned in Australia but a popular food source internationally, requires fifteen times less food to produce, kilo for kilo, than beef.

Another key benefit of aquaculture is it can be established in more places. Some Australian graziers are converting land to aquaculture, particularly for freshwater crustaceans like crayfish, while Indonesia, and many other South East Asian countries, are finding huge economic and employment benefits in sating China’s ravenous hunger for seafood.

“The Indonesians produce high value fish species for export – grouper and barramundi,” says Becker who is often in Indonesia working with local fish producers. “The income from those fish means people can buy food they want to eat in their local economy.”

Soon we might have to rethink the idea of plenty more fish in the sea.●

FOOD SECURITY AND ANIMAL WELFARE

To find out more about this story or to help sustainably advance aquaculture please call Judith O’Hagan on +61 2 8627 8818 or email development.fund@sydney.edu.au



Joy Becker

DEGREE
CertEd '10

OCCUPATIONAL HAZARD
Falling into a sea cage

MOST PRECIOUS POSSESSION
My university gold medal for my PhD thesis

EARLIEST MEMORY
Wanting a suitcase for Christmas when I was about 5 years old

The Australian sea lion is one of the rarest sea lion species in the world, and though they are protected and mostly live in isolated locations, their numbers are falling. Dr Rachael Gray and her team are trying to find out why.

Sealed* section

Written by George Dodd
Photography by Louise M Cooper



* More correctly, sea lioned.



👉 It isn't the first time that Australian sea lions have been under threat. Voracious hunting by European settlers in the 19th century dramatically slashed their numbers. While the main target of the hunt was fur seals, the Australian sea lion's pelt meant it was caught up in the carnage.

The mass-scale hunting stopped only because there were so few seals left it was no longer profitable, allowing fur seal populations to mostly recover. Not so Australian sea lions. They are unique in only breeding every 18 months (12 months for a fur seal), so even in ideal conditions, Australian sea lions are relatively slow to recover.

That said, the current conditions are not ideal. Though Dr Rachael Gray is a leading expert on Australian sea lions, even she was surprised to realise how many things are working against the health and even survival of this intelligent, playful, ecologically significant marine species.

“For a long time, we didn't look at



Meeting the locals. Seal Bay Conservation Park is a key sea lion breeding site. The majority of pups here are micro-chipped for individual identification.



Scanning the sea lion colony looking for pups ready to capture, at Seal Bay Conservation Park.

environmental toxicity. These colonies are so isolated, I thought, ‘there's nothing there. Everything will be zero'. But when we did study toxicant concentrations, the pups had mercury concentrations similar to those of adult fur seals in the Northern Hemisphere.”

Gray has boundless natural enthusiasm and joy in her work, but the shock is still there as she talks about the mercury result. She has loved ocean mammals since childhood, after seeing them in David Attenborough documentaries. In high school she wrote to Taronga Zoo looking for marine





Right. He looks friendly enough. Scanning a bull sea lion for a previously implanted microchip sees research team member, Melanie Stonnill, ready to run.



mammal work experience and spent a blissful time at the zoo sorting fish for the seals and sea lions and cleaning out penguin burrows.

“I also love penguins,” she says. “Not so much dolphins, for me. I don’t know why.”

The presence of mercury in the sea lion pups wasn’t the only red flag. Gray and her team have also detected persistent organic pollutants, a type of *Escherichia coli* (*E. coli*) bacteria normally associated with humans, and perhaps particularly concerning, antibiotic resistant bacteria. “This in animals that have never had exposure to antibiotics in the marine ecosystem,” Gray notes.

There is one more, overarching feature of the Australian sea lion population. Every pup has hookworm. Every one of them. It’s more than likely this has always been the case. It’s also likely that hookworm plays a role in the sea lions’ immunological development and intestinal microbiome. Which isn’t to say hookworm is benign.

“It can be deadly,” explains Gray. “It causes a serious infection in the small intestine, so the sea lions lose blood, they lose protein, they lose a lot of weight. They can also cause secondary bacterial infections.”

With sea lion populations declining



Above: While not her pup, this adult female decided to defend it none the less, resulting in a quick getaway by the research team. The pup escaped, hopefully to be microchipped another day.

for reasons not fully understood, the question has to be asked: is hookworm part of the reason for the population decline, or is something else at work?

To find the answer, Gray makes regular trips to the sea lion colonies in South Australia with her PhD students. After fourteen years, it’s still a singular experience for her, “It might sound a bit clichéd, but when I walk into a colony, it is always a privilege to be there.”

Gray and her team-work with other institutions including Macquarie University, the University of Adelaide and the Department for the Environment and Water (DEW), South Australia, with funding coming from a number of sources, including through bequests to the School of Veterinary Science, DEW and the Hermon Slade Foundation.

One key location is Kangaroo Island

which was so devastated by the bushfires at the start of the year. In the immediate aftermath, Gray rushed from Sydney to visit the island and the Seal Bay colony and was enormously relieved to find the latter untouched by the furnace, except for the ash washed ashore.

The island is a tourist centre in normal times, so when the team goes there they get to stay in a house with luxurious amenities like running water and electricity. Things are different on the very isolated Olive Island and Dangerous Reef, where they sleep and do their lab work in a tent and cook on a little stove. Gray isn’t complaining.

“The beautiful thing about Dangerous Reef is you lie in your tent and you hear a mum calling and hear about five pups responding,” says Gray. “Then you hear the mum reuniting with her own pup.



Dr Rachael Gray

DEGREE
(BVSc '96, PhD
(Vet Science) '05,
GradCertEdStud '07)

HIDDEN TALENT

Dancing (and embarrassing my kids)

FAVOURITE MUSICIAN

Neil Finn

THE THING YOU NEVER WANT TO DO AGAIN

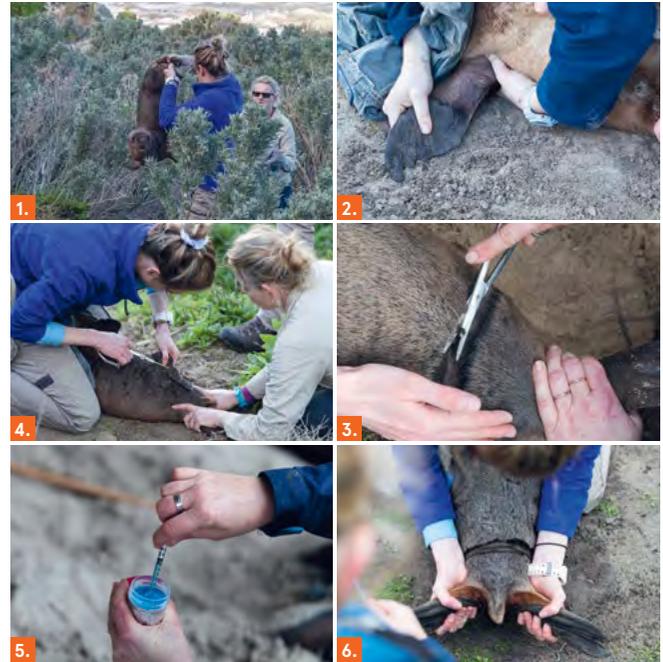
Be evacuated from the sub-Antarctic!

“Though there are times during the night when you think a massive sea lion is going to run right through your tent.”

This reuniting happens because once the pups reach about 10 days of age, sea lion mothers spend days away foraging in the ocean for food like squid, octopus, cuttlefish, fish, small sharks, rock lobsters, even birds. It’s when the mother’s away that Gray and her team capture and examine sea lion pups, “We’re measuring length, weight and body condition. We also collect a faecal sample and blood sample. Sometimes running is involved.”

That’s running to catch the pups of course, but there are times when a mother sea lion appears unexpectedly and in a bad mood (“We call them

1. Catching a pup in the dunes;
2. Restraining the pup for foreflipper blood collection;
3. 'Hair cut' to identify captured pups. The hair is collected for toxicant analysis;
4. A microchip goes under the skin for lifetime identification;
5. Drawing up a dose of ivermectin that's applied to the skin of 'treatment' pups;
6. Restraining the pup to take a faecal sample, used to ascertain hookworm infection status and *E. coli* phylotyping.



Cranky Girls”). Gray has been bitten a couple of times. Another time she turned around to find one of the notoriously bad tempered, 350-kilogram sea lion bull males looking over her shoulder to see what she was doing, “Luckily, he was just curious,” Gray says.

At Seal Bay on Kangaroo Island, during the 2019/20 breeding season, half of the pups are caught and treated for hookworm and their health and survival monitored for the next few years, while a control group is monitored but not treated. By comparing the progress of the two groups, Gray hopes to know whether treating hookworm can improve overall animal health and aid the population’s recovery.

Allowing that sea lions have always had hookworm, one possibility is that human pollutants are suppressing sea lion immune systems, allowing hookworms to do more damage than usual. If that’s the case, the plan would be to treat the sea lions for hookworm so they’re not battling threats on both fronts (there is a highly effective hookworm treatment called ivermectin, which can be applied to the skin).

If treating hookworm is not shown to increase pup survival, and thereby improve population numbers, large

scale treatment wouldn’t happen.

Minimal invasiveness in the lives of the sea lions is a core commandment. Though there are things well beyond Gray’s control.

“Walking through the colonies you see a lot of marine pollution. A lot of plastic. A lot of rope. You see the impact of animals getting entangled,” she said. “And to actually detect the level of organic pollutant in neonatal pups that we’ve seen – that was pretty scary for me.”●

THE FATE OF SEA LIONS

To find out more about this story or to help save sea lion populations, please call Kate Parsons on +61 2 8627 8818 or email development.fund@sydney.edu.au



With few signs that greenhouse gases are being sufficiently reined in, adapting to higher temperatures is now more necessary and urgent. The little known field of thermoregulatory physiology is developing lifesaving strategies.

PLAYING IT COOL

Written by
George Dodd

Photography by
Stephanie Zingsheim



👉 The hottest place on the planet on January 4, 2020 was in Australia. But it wasn't Alice Springs or Coober Pedy. It was Penrith, an outer suburb of Sydney nestled at the foot of the Blue Mountains.

The people, plants, animals and plastic fittings of Penrith wilted under the oven-blast of an unheard of 48.9C in the shade and about 65C in the sun. Other parts of Sydney and indeed Australia, also sizzled. And like any hellscape, there were flames, with bushfires raging around the nation and disaster emergencies being declared.

So how will we live in an Australia where climate change has made such unexpectedly high temperatures a more regular occurrence? Finding the answers, is Associate Professor, Ollie Jay, who works in the increasingly important field of Human Thermoregulatory Physiology.

"Basically, I study how people are affected by, and can best deal with, extreme temperatures; both hot and cold," this said with his naturally enthusiastic energy and an accent that he brought to Australia from the tiny North Wales village where he was born, via Canada where he worked in his chosen field for a number of years.

At the centre of Jay's work is a powerful motivator: every year in Australia, heat waves kill more people than all other natural disasters combined and are estimated to cost the Australian economy \$6.1 billion.

Extreme heat affects the lives of people in agriculture, construction, mining, factory work, warehousing, pregnant

women (heat is implicated in premature and still births), young children, seniors and people who don't have access to air conditioning; being those on low incomes and in developing countries.

Yet for all the human and environmental implications of extreme heat, it is a surprisingly ill-defined area. "Even what authorities tell people to do during heatwaves is rarely informed by any physiological evidence," Jay says with a note of frustration. "It's basically a bunch of old wives tales."

He cites the World Health Organisation's advice not to use fans during very high temperatures because it's like a fan-forced oven pushing hot air round a roast. The action of a fan is less straight forward than it seems.

When the air is hotter than the skin, which is 35C, blowing air on the skin actually adds some heat to the body. At the same time, the extra air flow makes sweat evaporate faster, creating coolness irrespective of the temperature. There is a limit to this benefit though. On a day above 43C, with low humidity, sweat evaporates without needing the fan, so the extra heat is still added to the body but without the evaporative cooling effect. So the fan can have a heating effect.

"We've simulated very hot/dry heatwaves (47°C, 10% relative humidity) where fans worsen body heating, dehydration and cardiovascular strain," says Jay. "But in cooler, more humid heatwave conditions (40°C, 50% relative humidity) fans worked a treat."

There's air conditioning, but for Jay, it has serious flaws, "It's expensive, which excludes many of the most vulnerable people from using it. It also uses lots of electricity, often from coal-fired power plants producing CO2 that contributes to climate change. It's a classic vicious circle. So we've been looking at low cost cooling strategies and sustainable alternatives to air-conditioning."

The answer could be a hybrid system where air conditioned environments incorporate moving air, with the motion giving the sense the air is cooler than it is. In effect, you get the same cooling effect but with the air conditioner set at a higher, less energy-hungry temperature. This is being investigated in collaboration the School of Physics and the School of Architecture with the possibility this new approach could reduce greenhouse gas emissions.

To investigate these ideas and others, Jay uses the toy that every thermal physiologist must dream of; a climate chamber. It resides at the Thermal Ergonomics Laboratory, where Jay is



Moving day. As the University's new, soon to open, Susan Wakil Health Building is completed around him, Jay supervises the installation of its state-of-the-art climate chamber.

“THIS GIVES US THE PHYSIOLOGICAL EVIDENCE SO WE CAN SAY ‘IF YOU DO THIS, IT WILL KEEP YOU COOLER. BUT IF YOU DO THIS, IT WON’T WORK.’”

– Ollie Jay

Director, and is part of the Sydney School of Health Sciences, Faculty of Medicine and Health. By using the chamber, Jay and his team can exactly recreate the conditions of any day at any location on Earth.

“Recently we mimicked the Chicago heatwave of 1995, which had massive health impacts,” he says. “Then we had some human participants come in.”

Wired up with physiological measuring systems, the participants were carefully exposed to the climate features of that day, tracking core temperature, dehydration, the work their hearts had to do, heat perception and comfort level. With those results recorded, various cooling strategies were introduced and likewise, the effects and benefits were measured.

“This gives us the physiological evidence so we can say ‘if you do this, it will keep you cooler. But if you do this, it won’t work.’”

Not all of Jay’s work is done from the relative safety of the lab. During the previously mentioned heatwave year of 2014, temperatures during the Australian Open tennis in Melbourne ranged from

41.5C to 43.9C in the shade, with water bottles and shoes melting, a ball boy fainting, nearly a thousand fans needing treatment for heat exhaustion and a number of the players withdrawing

Tennis Australia knew of Jay’s work in developing successful heat policies for the National Rugby League (NRL) and Cricket Australia and they asked if he could help them protect fans and players from future severe heat events.

In the following years, and working with Tennis Australia’s Chief Medical Officer, Dr Carolyn Broderick, Jay and his team went courtside at the Australian Open. They measured the environmental factors that can contribute to heat exhaustion with its symptoms including, dizziness, vomiting, weak pulse, muscle cramps and fainting.

Key to this process was John Eisenhuth, a leading senior technical officer at the University. He and Jay created a bespoke device called an EMU (Environmental Measurement Unit) to measure temperature, radiation, humidity and wind. It was deployed around the Australian Open complex with information

being sampled live at Jay’s computer, then fed into a specially designed algorithm to generate what’s now called the Australian Open Heat Stress Scale, giving conditions a one to five rating.

“I was worried the players would be saying ‘What’s the temperature?’” says Jay. “Instead they’d say, ‘I just want to know the number. What’s the number?’ That was really satisfying because we’d hit on a clear and easy way of communicating the conditions.”

Of course, with a one-to-five Heat Stress Scale, with five meaning ‘stop play’, stopping play was always on the cards, and in 2019, it happened.

“It was kind of dramatic because it was in the middle of the women’s semi-final,” Jay remembers. “But the scale reached five so play was stopped and the roof closed. I think the people most happy about that decision were the fans. As the roof closed, there was a massive roar.” ●

KEEP CLIMATE CHANGE A PRIORITY

To find out more about this story or help find strategies to beat the heat, please call Aleesha Kumar on +61 2 8627 8818 or email development.fund@sydney.edu.au

“I leave with great pride at what we have achieved together to help Sydney’s teaching and research become rightly recognised as among the best in the world.”

– Dr Michael Spence AC

captained INSPIRED, the most successful fundraising campaign ever run by an Australian university. More on that later.

The story of what happened as Spence went to work at the University of Sydney quickly becomes a record of change on a grand and often seismic scale, both physically and culturally.

Physically, the campus has been transformed and modernised, with 13 major new building projects including the soon to open Susan Wakil Health Building and Chau Chak Wing Museum, plus four student accommodation buildings and two new sports facilities.

No less impactful has been the cultural transformation. To help guarantee the longer-term viability of the University, Spence prepared it for a world rapidly changing both technologically and economically.

He transformed the University from a collective of 16 independent faculties into a unified institution. With this breaking down of silos came a new focus on ways in which different disciplinary perspectives could be brought together to solve pressing real-world problems, leveraging the extraordinary breadth and depth inherent in the University.

A sweeping modernisation program saw investment in multidisciplinary research environments like the Charles Perkins Centre which tackles modern diseases like diabetes and heart disease; the Brain and Mind Centre, which brings together patients, support groups and carers with scientists and clinicians to research mental health and neurological diseases; and the Sydney Nanoscience Hub, purpose built to research the extraordinary possibilities that exist at the atomic scale.

Under Spence’s watch, the University introduced a new undergraduate curriculum further leveraging its depth and breadth, better preparing students for a rapidly changing world. In this curriculum, cultural competency, real-world experience and digital literacy stand alongside the more traditional graduate attributes of critical thinking, problem solving and communication.

That focussed framework is now in place and producing graduates ready for more fluid and productive careers.

One particular goal reflected Spence’s personal values. He wanted to promote gender equality, and under his leadership, almost half the University’s senior executives and Senate members are now women, and there’s been a significant increase in the number of female professors.

Always a strong believer in the value of international diversity in universities, Spence has regularly pointed out how the higher education sector is Australia’s number three export industry. He also emphasises how a truly international student body enriches the learning environment for everyone.

In talking about the many issues facing universities, Spence has helped reshape how the sector talks about itself, at the same time helping the community to understand its importance. He has been an articulate champion of universities in many times of crisis

Indeed, his willingness and talent for engaging with people helped drive the University’s record-breaking INSPIRED fundraising campaign. A significant proportion of the \$1 billion raised was directly linked to Spence’s ability to enthuse donors about the University’s mission and make them want to be part of it. The funding generated by INSPIRED has underpinned the building program and the growing ambition and success of our research.

Spence will take up the position of President and Provost of UCL (University College London) in January 2021, leaving this University in December. Though he announced his departure before the onset of COVID, he leaves the University strengthened by blue-sky thinking and well prepared to engage with and rise above the challenges.

It is now outward looking and future focussed, regularly ranking in the world top 50. We are ranked 1st in Australia and 4th in the world for graduate employability by QS World University Rankings, and second in the Times Higher Education Impact Rankings because of the value of our work in tackling the problems of the age, including climate change, health and poverty.

This has all been achieved during the tenure of Dr Michael Spence. It is by any measure a legacy to be proud of. ●



Good pain arrives, raises the alarm, then quickly leaves. Bad pain stays. No-one is sure why. People with chronic pain often hear it's all in the mind. The truth is, it's in the brain and the spine, and Professors Greg Neely and Paul Glare are working to fix it.



A world of pain

Written by
George Dodd

Illustrated by
Oslo Davis

👉 Asking him about the worst pain he feels, causes a slightly awkward moment for Professor Greg Neely.

“Well, I go surfing with my kid all the time but I’m terrible and she’s good,” he says in his quietly Canadian accent. “And my back kills afterwards. I mean, I’d give it a three. But it’s not what a real pain patient feels.”

Allowing that Neely is a pain researcher, having found his way there via immunology, he is aware of the profound ordeal pain can be. It seems so elemental, but pain is surprisingly complex, even subtle. Think how the eye can deliver a picture with colour, texture, shine, sharpness and softness. The pain system, with specialised sensors throughout the body, can deliver something just as detailed but composed of sensation.

“Long-term pain changes the whole thing,” says Neely from a bright and airy staff area in the Charles Perkins Centre where he and his team do their work. “That pain from your peripheral injury or your back, changes your spinal cord and it changes your brain.”

When these biological changes lock in for some still unknown reason, chronic pain is the result, persisting long after the original source of the pain has righted itself. This ongoing, sometimes life-destroying, pain affects one in five Australians, both young and old, and costs the nation nearly \$140 billion a year in treatment and lost productivity. The focus of Neely’s work is how to isolate those biological changes and change them back.

Though the main focus is on pain research, what happens in Neely’s lab is wide-ranging with new technologies opening up new ideas. “Once we master the technology, team members in different areas say to me, ‘Oh hey, why don’t we try using it for this?’ I’d say that 90% of what we’re doing right now has come from discussions like that.

“For me, the two key questions for a new research project are; is it technically feasible and is it interesting?”

An early pain therapy success, using pluripotent stem cells derived from blood, has been encouraging. Allowing that stem cells can shapeshift into a range of cells needed by the body, Neely’s team caused them to shift into a

form of neuron known to be pain-killing. The neurons were then transplanted into the spinal cords of mice at the location where a specific pain signal was known to originate.

The pain not only stopped, but the results were long term and without side effects. Another benefit is how site-specific the treatment is, meaning there is no apparent overflow that effects other parts of the body in the way that opioids cause drowsiness, breathing problems and indeed, addiction. This is because the technique doesn’t really treat pain, it restores normal functioning.

There is one more transformative possibility with this technique. When people present at a hospital with an injury that might end in chronic pain, as 10% to 20% of injuries do, the stem cell therapy, or drugs achieving the same effect, could be applied as a preventative part of the initial treatment.

Human trials of the stem cell therapy are expected after more exploratory work is done.

“Most people who come off the long term use of opioids realise that the drugs weren’t doing that much.”

– Professor Paul Glare

Chronic pain is not all in the mind, but Professor Paul Glare and his team help patients use their minds to rise above the pain. (Photograph by Louise M Cooper)





Professor Greg Neely works out of the Charles Perkins Centre.
(Photograph by Stefanie Zingsheim)

“Long-term pain changes the whole thing. That pain from your peripheral injury or your back, changes your spinal cord and it changes your brain.”

— Professor Greg Neely



Professor Greg Neely

MOST ADMIRED PERSON

My mother. In an era when she couldn't follow her dreams, she put all her intelligence and kindness into her family. That allowed me to take risks in my life.

THE THING YOU NEVER WANT TO DO AGAIN

Shake hands!
My clammy hands cause huge anxiety for me. A minor COVID positive is no shaking hands.

YOUR LEAST FAVOURITE BIT OF HOUSEWORK

I like it all, but my dirt detector is not at all sensitive. So, I need help knowing when something should be cleaned.

And there is plenty more for Neely's team to explore, especially around the genetics of pain.

“Forty to sixty percent of your experience of pain is genetic. And out of 22,000 genes in the human genome, I'd say maybe 5,000 genes are involved in chronic pain,” says Neely. “I mean, there could be 400 genes related to heat pain alone.”

As Neely's team, which includes seven post-doctoral researchers across a range of specialities, teases out insights that might one day end chronic pain, there has been an update on how to help people currently living with the condition.

The University's Pain Management Research Institute (PMRI) is a multidisciplinary unit reflecting the fact that pain itself can be discussed in medical, psychological, even philosophical terms. Professor Paul Glare (MBBS '81, MM(ClinEpid) '05) is the Director of the PMRI and Head of the Discipline of Pain Medicine in the Sydney Medical School, and he has a particular interest in giving people with chronic pain the tools they need to function without using opioids.

“Opioids are good for acute pain. With chronic pain they only work short to medium term,” he says. “But after about six months, you become tolerant and have to take bigger doses. Then there's the growing risk of accidental overdose, even accidental death.”

For many people though, opioids seem like the only way to numb the pain that constantly attacks them. But do they in fact, numb the pain?

“Most people who come off the long term use of opioids realise that the drugs weren't doing that much,” says Glare. “They'd already stopped working, so the pain without them is often no worse. In fact, the drugs were just messing with their heads. Still it's a huge psychological step to let the drugs go.”

Gently spoken and with a great sense of compassion for the people he works to help,

Glare started his career in palliative care which took him into the area of cancer pain, then pain more generally. Because it's difficult to tell people battling chronic pain that there is no satisfactory pharmaceutical answer at this time, the PMRI has a large and active pain education unit.

The unit offers a Masters of Medicine Pain Management that is conferred as a Masters of Science for non-medical graduates. It also runs cognitive behavioural therapy classes teaching strategies for rising above the pain.

“The classes are challenging,” says Glare. “But many people who learn the self-management techniques can reduce or even stop their opioid use. It's about them not being afraid of their pain anymore.”

It's the nature of chronic pain that the injury it's warning you about, sometimes very loudly, isn't actually there. This can be seen in a person's posture as they sit and walk in a way that protects that non-injury. By gently confronting the pain, the person can eventually reclaim their normal posture and walk more confidently. Through that, they feel stronger within themselves and more in control of their pain.

The PMRI is now looking at digital support resources for people dealing with pain, “We're developing an SMS based text messaging service and a more sophisticated chat-bot tool, to help people get over the hump of opioid tapering,” says Glare. “It's new in the pain world.” ●

AN END TO PAIN

To find out more or to help research into understanding pain please call Lachlan Cahill on +61 2 8627 8818 or email development.fund@sydney.edu.au

PERSPECTIVE SHIFT

With the new Chau Chak Wing Museum (CCWM) soon to open, it's been a busy time for Katrina Liberiou (BVArts '97), assistant curator for the University Art Collection. Her previous work at the Museum of Contemporary Art Australia (MCA) and the Biennale of Sydney deepened her love of international and Australian contemporary art, so she's thrilled that for the first time, her chosen piece will be displayed at the CCWM exactly as the artist specified.

Photography by Louise M Cooper

While it wasn't initially a happy discovery, in 2017 during a research project, I found that a museum database glitch had digitally erased the artwork of the late Austrian artist, Lily Greenham (1924–2001). Investigating the details of Greenham's work and incredible life, I soon made her the subject of my research degree in Art History.

Born in Vienna in 1924, Greenham fled Nazi-occupied Austria for the relative safety of Denmark then Sweden. Returning to Vienna in the 1950s, she studied music and connected with European neo-avant-garde groups. In the 1960s she lived in Paris and made the work I'm showing you here, *Study in visual perception*, in her tiny 2.5 x 3 metre flat. In the 1970s she moved to London and became a pioneer of sound poetry.

Study in visual perception (1962–65), was acquired by the University in 1967, after it was first exhibited in the ground-breaking Op/kinetic exhibition *Lumiere et Mouvement*, at Musee d'Art Moderne de la Ville de Paris in 1967; a time when Greenham was represented by the legendary Paris gallerist, Denise René. This is the only work of Greenham's held in an Australian collection.

Given its remarkable provenance, we had very little information about the work and there was almost nothing available online. This absence led me to look for answers and, importantly, it gave me insight into how precarious women artists' legacies are; especially those like Greenham, affected by the trauma and displacement of war. To think that she could be erased with just the click of a button.

Intended to be viewed from a distance, each section appears to be identical, however, on closer inspection, you see they are altogether different geometric patterns, this only apparent as you move in. The colours are fluorescent when hit by UV light and once installed in the Chau Chak Wing Museum in 2021, the work will include Greenham's original lighting design.

I feel this work is in some ways a metaphor for her life, you need to take the time to look closely, to be inquisitive and to care and in the end, you will be rewarded. ●



Artist: Lily Greenham
Study in visual perception
1962–65.
JW Power Collection,
the University of Sydney.

Too much to bear

Written by
George Dodd

Photography by
Stefanie Zingsheim

Most Australians have never heard of obstetric fistula. Yet in other places, it is a source of terrible suffering and shame for many thousands of women every year. Dr Andrew Browning AM is helping those women reclaim their lives.



Dr Andrew Browning AM, was a 2020 Alumni Achievement Award winner for Services to Humanity.

👉 It's a not an uncommon scenario. A woman in the delivery ward finds her baby isn't coming as quickly as it should. The doctor assesses the situation and realises that the baby is actually too big to pass through the mother's birth canal so a caesarean procedure is organised. Soon the child is resting safely in its mother's arms.

Now switch the location of this story to rural Ethiopia, or indeed many developing areas around the world: no hospital, no doctor, no way of doing a caesarean. What happens to that too large baby and its mother then?

As a 26 year old junior doctor coming from Sydney, Andrew Browning went to Ethiopia in 1996 and saw first-hand the 'what then?' being lived out by thousands of women, often shunned by their communities and their loved ones. The condition is obstetric fistula and it strikes up to 100,000 women around the developing world every year.

The name itself is unsettling, but it doesn't prepare you for its reality, described here by Browning using the story of one of his own patients. And a warning, this is not an easy read:

"She was married when she was 14 or 15, which is normal for her village. She is pregnant pretty quickly with the nearest hospital being 120 kilometres away, but with no money, roads or transport she couldn't get there regardless.

"She goes into labour and it lasts for days with her desperate, illiterate husband unable to help. Inevitably, the baby dies within her and collapses enough to be delivered. After the birth, she is unconscious for two days, waking up to find her bowel and bladder leaking uncontrollably through her vagina.

"During labour, the baby's head was pressed against her pelvis, and all the tissues between the bladder, vagina and rectum died, leaving a hole, or fistula, connecting them all. The smell and mess she makes cause her husband to divorce her and her mother won't let her in the family house. She must live alone in a small backyard hut.

"This story is not unusual. I've heard tens of thousands like it."

First visiting Africa as a student doctor in 1993, Browning had a baptism of fire at a desperate Tanzanian border hospital where he first saw how much had to be done with so little, especially when it was suddenly flooded by refugees escaping the start of the Rwandan genocide.

It was a strong sense of mission that saw him return to Ethiopia in 1996 as a qualified doctor and decide to stay. Browning has now spent 17 years living in Ethiopia and Tanzania and is a world authority on obstetric fistula. He's built three hospitals in Africa dedicated to its treatment and prevention, and trained hundreds of doctors to do the often tricky surgery. Those doctors now work everywhere from Sierra Leone to Afghanistan and Nepal.

"There's still refinements in the surgery techniques to improve their outcome," Browning says in his soothing, radio-ready voice. "We've made great strides in the making of new vaginas and urethras that were destroyed in labour. The cure rate has gone from fifty to almost 90 percent."

The first qualities you might notice in Browning are his intelligence and a gentle inquisitiveness. Then a sense of calm that he attributes to his strong, Christian faith, shared with his wife and many in his extended family which includes a number of clergymen and medical professionals working with a philanthropic intent.

"I'm not a preacher or an evangelist or whatever," he says. "I'm a surgeon and I love doing surgery. I serve God with the skills he's given me."

In a way, Browning's arrival in Africa was set in train when he was just six years old. A missionary nurse told his Sydney Sunday school class about her time there, and the sense of work needing to be done stayed with him, though he wouldn't be the first of his family to go to Africa.

When Browning refers to Aunt Val, she is Valerie Browning AM who has spent more than thirty years living and working with the Afar people of Ethiopia. Her influence has been transformative for



Dr Andrew Browning

DEGREE
MBBS '95

THE THING YOU NEVER WANT TO DO AGAIN

Fly in anything less than a 20 seater. I suffer hopelessly from motion sickness, but for my job, I fly to some of the more remote areas of the world.

FAVOURITE CHILDHOOD TV SHOW

In the Wild with Harry Butler. I still put things back the way I find them when out in the bush. Thanks Harry.

WHAT REALLY MAKES YOU LAUGH
My kids.



1. The Afar region of Ethiopia where the Barbara May Foundation (BMF) built its first maternity hospital.
2. Village life in the Afar desert.
3. The local transport parked outside Browning's hospital in Afar.
4. Browning prepares a Tanzanian fistula patient for her operation.
5. The theatre team in the BMF-funded maternity hospital in Tanzania. (Photos supplied by Dr Andrew Browning)

“I’m not a preacher or an evangelist or whatever. I’m a surgeon and I love doing surgery. I serve God with the skills he’s given me”.

– Dr Andrew Browning

the 1.5 million Afar, in everything from education to health care, even dam building. Though Browning notes, “She’s tiny. She could have been a jockey.”

Working with his Aunt, he became aware of the now late and lauded Dr Catherine Hamlin AC (MBBS ’46 MD ’05), who was running the world’s only fistula specific hospital in Addis Ababa, Ethiopia. Hamlin offered Browning a job and later he started her organisation’s first regional fistula hospital where he and two Ethiopian nurses operated on up 700 fistula patients annually.

Knowing more hospitals were desperately needed beyond Ethiopia, Browning set up a foundation (barbaramayfoundation.com) so he could build his own in other locations.

“In those environments, there are needs that the government can’t meet, so you have the chance to do things of true value,” he says. “Women are dying in labour, you need to do something about it. Or the kids aren’t being educated, so build a school.”

Indeed, Browning’s wife, Stephanie, built two schools so their two sons, and the children of other people around them, could have an assured education.

On the day Browning tells SAM his story, he is on a park bench near Royal Prince

Alfred Hospital, and a long way from his Tanzanian home. A couple of years ago, he and his wife moved their family back to the New South Wales Central Coast, where they have family connections, so their sons could finish high school here.

The boys, who were raised in the active and freewheeling environment of African children, are still adjusting to the more technology-centric interests of their Australian school friends.

After the move back to Australia, Browning would commute between the two countries, but the global pandemic put paid to that. From Australia he still administrates his hospitals and fund raises on their behalf, but he very much misses his work, the people and the sheer, chaotic energy of Africa, where the streets are full of noise and interaction.

“I walked past a bus stop near here a while ago,” he says. “I wanted to take a photo to send home because everyone was lined up in a straight line looking at their phones. My African friends would have laughed their heads off.”

Asked about what he still needs to do, Browning laughs dryly, “There’s the need for a few thousand maternity units across Africa so women don’t have to die during labour or get a fistula. We’ve built three.” ●

Professor Tannatt William Edgeworth David in 1909, just after his history-making Antarctic ordeal. Photo: University Archives. G3_224_1206.



TIMELINES:

PEOPLE AND EVENTS THAT SHAPED THE UNIVERSITY OF SYDNEY

Pioneering geologist and national hero: **Tannatt Edgeworth David**

✦ Wanting to explore the Antarctic in 1908 could have been thought of as a form of madness.

When famed explorer and University graduate, Douglas Mawson, with team mate Alistair Mackey, set out to be the first to reach the magnetic South Pole, it meant bodily dragging their supply sleds almost 2000 kilometres across a treacherous, snow-covered landscape.

An earlier explorer had described how the extreme Antarctic cold had killed the nerves in his teeth which then began to crack; a confronting idea for anyone. Mawson and Mackey were 35 at the time, and this environment pushed them to their limits.

So consider the other member of the team who was nearly 50 at the time. His name was Tannatt Edgeworth David, and he was a Professor of Geology at the University of Sydney.

David had been Mawson's geology lecturer and mentor at the University, and Mawson recommended he be one of the team leaders in the multi-team Antarctic expedition being organised by that other renowned explorer, Ernest Shackleton.

David was already a household name in Australia for identifying the Greta coal seam which became the motherlode of the Hunter Valley coal industry, setting New South Wales on a path to previously unimagined prosperity.

Talking about it at public meetings, David demonstrated he was a compelling speaker with great charm, intelligence and humour. His fame grew, as did his capacity

to fundraise for his projects, including the Shackleton expedition – part of the reason Shackleton included him

Born in Wales, David first came to Australia in his early 20s to recover from a nervous breakdown likely caused by the loss of his Christian faith; a tricky situation in a deeply religious era, especially when his father was an admired reverend who expected David would take holy orders.

Returning to the UK still faithless, David pursued a longstanding interest in geology and quickly began producing learned papers that impressed the geological academic community.

Meanwhile in New South Wales, the job of Assistant Geological Surveyor to the NSW Government became available and David returned to Australia take it. This led him to identifying the Hunter Valley coal seam, putting him in good stead to apply for the chair of geology and palaeontology when it came up in 1891 at the University of Sydney.

A subsequent mining boom allowed David to convince the University that it needed a school of mines, and soon his one man geology department in a shabby cottage became a new building and a lecture hall with a growing number of students.

More international attention came to David as he led a team to Funafuti Atoll, in the central western Pacific, to deep-drill for evidence to prove a theory about how reefs were formed. Two previous teams, including one from the Royal Society of London, had had failed the

drill attempt, spurring David on. With the world watching, his attempt was a spectacular success, though the reef evidence uncovered was inconclusive.

Returning to the University, David's already immense popularity grew, with students fondly calling him "The Prof". But with the start of World War I, David had an audacious idea. He convinced the government to let him lead a team of Australian geologists and miners to France and the Western Front, which he did in 1915. He was 58 at the time.

The specialised knowledge of David's team, the so-called Australian Mining Corps, led to pioneering thinking on how to place and dig trenches and deal with ground water. But David had come with another, much bigger idea.

His plan was to dig tunnels under the German lines on the Messines-Wytchaete Ridge, fill them with TNT and detonate them. Which he did spectacularly in 1917, changing the course of the battle.

Tannatt Edgeworth David died in Sydney in 1934, aged 76, after being Professor of Geology at the University of Sydney for 35 years. Unheard of for a lowly geologist, he was given a State Funeral and thousands crowded the streets to farewell a person of truly heroic stature. ●

**Written by
George Dodd with thanks to
Professor Maxwell Bennett**

CLASSNOTES



CAROLINA ARE
MCrim '17

Being a pole dance instructor is just one thing engaging Are creatively and conscientiously. Now a writer, blogger, visiting lecturer, activist and UN #GenerationEquality ambassador, she previously spent six years in journalism and PR. After a childhood loving detective novels, she pursued criminology and is now doing a PhD at City, University of London about online abuse and conspiracy theories in high profile criminal cases. At the 2019 Sexual Freedom Awards, Are won Activist of the Year for her work on algorithm bias and Instagram's censorship of women, and soon after helped found anti-censorship group @everybodyvisible supported by influential burlesque artist and businesswoman, Dita von Teese. An Italian based in London, Are continues researching links between technology, crime and people, writing academically and creatively and dancing. Find her @bloggeronpole



CRISTINA HERRERA
GradDipPsych '13

Wanting to be an artist, Herrera evolved into being an art teacher. She then realised her true love was people and problem solving. With her father a psychologist, she decided psychology could provide career options for both. Work in a consultancy saw Herrera with an in-the-deep-end project conducting learning needs analysis while developing people strategies and change management functions. Winning a US Green Card Lottery, she moved to New York in 2015 taking on a travel-heavy national transformation project with a major biotech company as a client. Next was work in the US architecture and interior design industry with national and global clients. Suddenly, COVID-19 put the brakes on everything. In response, Herrera successfully started her own New York consultancy saying it's "exciting and scary stuff!"



DEIRDRE HAY
SJD '05

Already a lawyer when she started her Masters, Hay studied antitrust with Professor George Hay, whom she later married. Switching to antitrust at Phillips Fox, she went with Professor Hay to the USA, working in Washington, D.C. at best-rated antitrust firm Cleary Gottlieb, then at a boutique antitrust firm. Upgrading her Masters to a Doctor of Juridical Science, her thesis on comparative merger analysis was published as a book. Becoming involved in women's bar leadership, Hay was President last year of the 4,300 member strong Women's Bar Association of the State of New York, which advocates for women in the legal profession and women generally. Hay currently works at Cornell Law School, has three children, passed the first sommelier exam, and plays polo.



JOHN RAMSLAND OAM
Med '72

With a mind for study, Ramsland gained degrees at four different universities while teaching full-time. His teaching spanned 41 years from 1962, with ten years in NSW state comprehensive schools, becoming an English/History Master and authoring four school textbooks. He was a demonstration teacher and lectured in the teacher education sector, then spent 26 years at Newcastle University rising to Professor of History (he is now Emeritus Professor) and Dean of various arts and humanities faculties. In 2002 Ramsland became a full-time author producing 25 books and much else across everything from modern industrial warfare to historical biography and sport. In 2006 he was awarded the Medal of the Order of Australia for his extensive writings on child poverty and abuse and the Indigenous experience.

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LUCY LIN
MCom '12

After 15 years working in corporate marketing roles across four continents, Lin started her own emerging technologies marketing consultancy (Forestlyn.com), to assist entrepreneurs grow and scale their products and services. Her work has helped startups and scale-ups in artificial intelligence, blockchain, smart cities, augmented reality/virtual reality, robotics, the internet of things (IOT) and fintech to gain traction, raise capital and build global customer bases. A champion of female entrepreneurs and more women in tech, Lin is a board member, a featured writer and she spoke at the Sydney Opera House this year on International Women's Day. Also passionate about education, she is the current President of the University of Sydney Business Alumni Network helping to drive alumni strategy and engagement.



JUSTIN LURIE
MIntBus '03

Experienced in mergers and acquisitions, strategy consulting, policy, and commodity markets, Texas resident, Lurie, is also a public speaker, author and political pundit making frequent media appearances. Prior to investment banking, Lurie was a strategy consultant at JLS, advising companies primarily in the oil, gas and complementary industries. He has also sold commodity price hedges, and founded a custom clothing label, Bond St Custom Clothiers, focused on mass-customisation. Lurie is a founding partner of boutique investment bank, Sterling Concord Partners, specialising in sell-side advisory of domestic and international middle market, recently expanding to equity investments in purchasing lower middle market firms. The author of the book "The Profit" on corporate strategy, Lurie was a Republican candidate for the US 2018 Midterm elections.



MATTHEW BRIGHT
BA '04, MCom '11

A field trip to Silicon Valley during graduate school made Bright want to build tech companies. After a corporate career, he leapt into the entrepreneurial space in 2016 working to establish the Australian operations of global fintech company, Spotcap. In late 2019, the company was acquired by ASX300 consumer payments company Zip Co, just before a massive growth phase in 2020. Bright is now rolling out the Zip Business product. He is also actively involved in the local entrepreneurial community. He's a mentor at the fintech hub, Stone & Chalk, an expert at startup resource, WeWork Labs, and an instructor at tech skills educator, General Assembly. As a mentor with the University, Bright is focused on alternative career paths for students in conventional coursework.



CHARLIE MARRIOTT
MMgt '15

As a Product Manager at technology company, Atlassian, Marriott is interested in delivering value to customers and improving how teams function. He is passionate about climate change and always looking for ways to make a difference both in and out of his workplace. A sideline he has developed over the years is raising research money for cancer by driving unsuitably small cars across challenging terrain. He participated in the 2015 Mongol Rally where he travelled over 17,000km from England to Mongolia, and the 2019 Shitbox Rally from Melbourne to Townsville. He has stayed involved in the University community since 2016 as a mentor in the Business School's Alumni Mentoring Program.

JUST THE FACTS

ON WHAT QUANTUM CONFINEMENT MAKES POSSIBLE

My special interests are the unique properties of quantum nanomaterials in the atomic range. When excited, these chameleon-like materials can emit a tuneable rainbow of colours - and beyond - through what's called quantum confinement. These quantum dots can shine light into hitherto inaccessible depths of the human body for disease diagnosis and targeted delivery of therapeutic payloads. Other exciting possibilities include their electrochemical properties which can be harnessed for splitting water for renewable hydrogen generation among other electrifying prospects. What mechanisms drive these phenomena and how can we harness these materials to engineer a brighter new world?



Associate Professor Vincent Gomes

Polymers are necklace-like chains of molecules. As Director of the Integrated Polymer and Systems Engineering at the School of Chemical and Biomolecular Engineering, Gomes finds innovative uses across waste and water treatment, energy storage, food and pharmaceuticals.

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

ON FOOD SECURITY IN A CLIMATE CHANGE WORLD

Wheat is one of the world's staple food crops with over 730 million tonnes consumed globally each year. The increase in extreme heat events as a result of climate change, heavily impacts the growing season of a wheat crop. A rise of just a few degrees above average ambient temperature during the reproductive growth stage can have devastating impacts on final yield and quality. I'm interested in identifying types of wheat that are tolerant of temperature extremes and better understanding why they are biologically superior so that we can improve our genetic material and mitigate the effect of climate change.



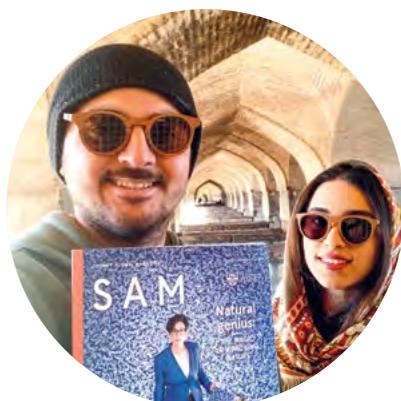
Dr Rebecca Thistlethwaite

As a postdoctoral researcher, Thistlethwaite is currently advancing her heat-tolerance work at the University's Plant Breeding Institute in Narrabri, northern New South Wales.

YOU AND SAM

Where in the world do you read your SAM? Send us a photo and we'll put it in a future SAM edition.

sam@sydney.edu.au



Shantia Esmaeili (MCom '18)

Living in historic and beautiful Esfahan, Iran, Shantia is teaching tennis. Here, with his partner.



Jorybell Masallo (MEnvSc '17)

Two year-old Raj loves looking at SAM with her mother, Jorybell, who is a Senior Weather Specialist working at Philippine Atmospheric, Geophysical and Astronomical Administration (PAGASA).



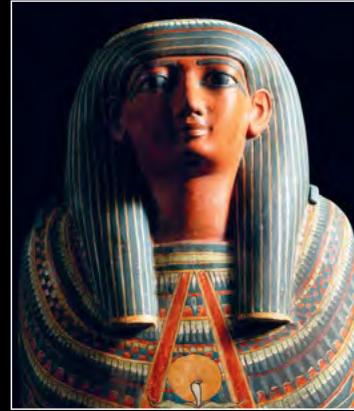
Dr Mark Jacobs (MBBS '86 MPH1th '91)

Photographed in Vientiane, Laos. Mark is the World Health Organization's representative to the Lao People's Democratic Republic.



The new Chau Chak Wing Museum awaiting the treasures that will make it a preeminent art and history showcase. (Photograph by Brett Boardman)

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