

Science matters

*CHIEF DEFENCE SCIENTIST
PROFESSOR TANYA MONRO
ON CREATIVITY, WOMEN IN
STEM AND TAKING PRIDE
IN AUSTRALIAN SCIENCE*

STORY PAGE 6

*HIGHLIGHTING
COLLABORATIVE
PARTNERSHIPS AND
PHILANTHROPIC
GIVING IN 2019*



**Australian
Academy of
Science**

CONTENTS

FROM THE PRESIDENT	3
FROM THE CHIEF EXECUTIVE	4
PHILANTHROPIC INCOME	5
WHAT MATTERS: PRIDE AND PASSION	6
MAKING THE GRADE	10
IN HER NATURE	14
TRAILBLAZERS	18
PARTNERSHIP OPPORTUNITIES	23
BRAVE HEARTS	24
MAKE HISTORY WITH US	27
SCIENCE GOES SOCIAL	28
FUTURE-PROOFING SUSTAINABILITY	30
A HEART FOR CURIOSITY	32
THE POWER OF PORTRAITURE	34
A SPARK OF INSPIRATION	36
BANKING ON THE FUTURE	38
ACADEMY AFFAIRS	39
BIG DATA FOR BIG CHANGE	44
COSMIC NOON	46
THE ART OF CHEMISTRY	48
DONOR HONOUR ROLL	50
MAKING A DONATION	51

Thank you to all those who generously shared their stories for this publication—your drive and creativity is an inspiration.

Special thanks to the Fellows of the Academy who volunteer their time so generously and enable our many and varied activities and initiatives.

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Many thanks to the 90 Fellows who generously contribute their time and efforts to serve on sectional committees, ensuring the Fellowship continues to represent the breadth and diversity of scientific excellence in Australia.

Contributors to this publication

Project managers: Isobel Griffin, Tracey Murray. Lead writer: Ellen Rykers. Writer: Olivia Congdon. Editor: Robyn Diamond. Designer: Jen van Dijk. Infographics: Andrew Berthold.

From the President



Your generosity has impact. Thank you.

As a Fellow of the Australian Academy of Science for the past 25 years, I have been inspired by the immense impacts of the many and varied activities of the Academy.

The Academy's work touches every part of science in Australia—from improving primary school education to celebrating lifetime scientific achievements.

None of this would be possible without the backing of our Fellows, donors, partners and supporters. We sincerely thank you for your efforts and contributions.

This new publication highlights the fantastic achievements that we have created together. We have cultivated talented researchers, enhanced scientific excellence and supported the very future of Australian science, the impact of which can have a much wider influence. There is no doubt that the outcomes of giving and partnership are extensive and inspirational.

Australian scientists can lead remarkable lives and have fascinating tales of their trials and triumphs in discovery. Their research and creative thinking form the foundation on which we build our future and we want to capture these stories for all Australians to enjoy and be inspired by—to do this, we seek your help.

None of this would be possible without the backing of our Fellows, donors, partners and supporters. We sincerely thank you for your efforts and contributions.

The Academy is committed to reinvigorating its oral history program, Interviews with Australian Scientists. The Academy's Council has committed \$25 000 to the project and we invite you to contribute to this worthy venture to preserve our shared history. Read on to find more details of this exciting project and how you can contribute.

On behalf of the Fellows, the Secretariat and the wider Academy community, thank you.

Professor John Shine AC PresAA



Thank you for your continued support of the Academy.

From the Chief Executive

For 65 years, the Australian Academy of Science has shaped science in Australia. The collective body that is the Fellowship of the Academy is truly a national treasure. The Fellowship's unique contribution and commitment have allowed the Academy's reach and influence to be stronger than ever.

The Academy guides policy, from developing ten-year plans for fields as diverse as nutrition, space science and women in STEM to advising on issues of national significance such as climate science, the Darling River fish deaths, and immunisation.

The Academy celebrates scientific excellence through our Fellowship and our suite of awards, scholarships and research funding.

The Academy enhances science education via its long-held commitment to quality teaching and learning, developing innovative resources to keep the beginning of the science pipeline healthy.

The Academy produces engaging and accurate science content for our social media audience of more than two million people around the world and stages a year-round calendar of events that shouldn't be missed.

The Academy models and encourages best practice to allow the participation of all the available scientific talent in our workforce. We are a leading national voice on diversity in STEM.

The Academy represents Australia in global scientific networks and establishes links with like-minded organisations around the world, to promote Australian science on a global stage and work collaboratively to enhance science worldwide.

The Academy also conserves the rich history of Australian science through our archive and library collections, and the acclaimed Interviews with Australian Scientists oral history program.

We ask you to join us in supporting the continuation of this valuable program that allows us to capture the voices and stories of our best and brightest scientists while we can.

Most importantly, we wish to acknowledge our supporters and capture the impact of your generosity. Discover in these pages many heart-warming stories of success—all made possible thanks to you.

Anna-Maria Arabia

Chief Executive, Australian Academy of Science

Philanthropic income

2018

90
DONORS

TOTAL
\$1 852 186

\$1 463 879 IN BEQUESTS

\$185 057 IN GENERAL DONATIONS

\$203 250 IN AWARD FUNDING

2019

113
DONORS

TOTAL
\$667 307

\$400 000 IN BEQUESTS

\$74 507 IN GENERAL DONATIONS

\$192 800 IN AWARD FUNDING

Awards

GRAND TOTAL AWARDED OR COMMITTED IN 2019
\$364 896

HONORIFIC AWARDS

Total value of the awards with associated honoraria and lecture funding awarded in 2019. **20** Awardees, **17** Awards, **10** early-career research awards, **5** career research awards and **2** mid-career research awards.

\$17 500

TRAVELLING FELLOWSHIPS

Total committed in 2019. **4** awardees, **6** countries to be visited and **12** universities and organisations to be visited.

\$26 933

CONFERENCE AWARDS AND LECTURES

Total committed in 2019. **4** awards, **3** conferences and **1** lecture.

\$30 500

RESEARCH AWARDS

Total committed in 2019. **17** awardees.

\$289 963

Other philanthropic activities of the Academy include funding of projects, lectures, discussions, meetings and administration costs. More details can be found in our annual reports (science.org.au/annual-and-financial-reports).

For Academy Fellow and Chief Defence Scientist Professor Tanya Monro, Australia's science is creative and fun—and something we can all take pride in.

WHAT MATTERS: PRIDE AND PASSION



Professor Tanya Monro FAA FTSE wears red and a warm smile. She exudes confidence, power and positivity—and cracks jokes as the photographer's camera clicks. It's an unexpected and heartening introduction to the Chief Defence Scientist, who is in charge of applying science and technology to safeguard Australia.

"I get a lot of joy out of creating leadership teams and environments and cultures where people can safely play and explore," she says. "Now that doesn't mean the outcomes of what we do aren't deadly serious! I see in the defence

music as "a big part of [her] life". Now, she is both scientist and musician—and she sees several synergies between the two. "Being a musician gives you the confidence to engage and present, and to accept, receive and benefit from feedback," she explains. "You're seeking to create something in a team, perhaps capturing and harnessing individual brilliance."

She plays the cello and piano, and the night prior to the interview had been to see Yo-Yo Ma in concert in Sydney. "That was extraordinary," she says. "In fact, he described Bach

In 2005, Monro became a professor of physics at the University of Adelaide—the first woman in the School of Physical Sciences' 130+ year history to attain the title. Her trailblazing continued when she became the first woman to take on the role of Chief Defence Scientist in March 2019.

Monro was elected one of the youngest Fellows of the Australian Academy of Science in 2012. The achievement was "exciting, sobering and a huge boost of confidence" as she was recognised for her exceptional contributions to photonics.

Monro is proud to be at the forefront of thought leadership with more than 500 of her peers. "The Academy brings together some of the most notable leaders in science across the country to inform debate and bring independence and gravitas to really big problems we face as a society—I think that's incredibly powerful," she says.

As a Fellow of the Academy, Monro has continued to shape Australia's science sector, in particular by championing diversity and inclusion.

"Bringing a diverse range of views to leadership and to science gets us far better outcomes," she says. "I'm really glad the Academy is taking a leading role."

Monro was instrumental in establishing Science in Australia Gender Equity (SAGE), a joint initiative of the Academy of Science and the Academy of Technology and Engineering, of which she is also a Fellow. SAGE raises awareness of diversity issues within the research sector and implements the Athena SWAN framework, which

"You get much more from what you have in common rather than what separates you," says Monro. "What do people care about? And how can science contribute to that?"

and national security space a lot of challenging problems that really suit our national strength of problem solving."

Monro has always been a problem solver at heart. She recalls being drawn to maths puzzles from an early age—but it was "an amazing physics teacher in Year 9" who inspired her conviction, at age 14, that she would become a physicist.

"Suddenly, I could see maths as the language of the universe," she says. "I realised that science is not about following dry procedures, but it's very much a creative endeavour."

The element of creativity is especially rewarding for Monro. She has long been drawn to the creative arts and describes

as a scientist in the program notes, which I thought was rather lovely."

After dabbling in astrophysics and a placement at an aluminium smelter during her undergraduate studies, Monro chose photonics—broadly, the physics of light—as her area of focus.

"I love the way photonics combines the art of asking questions or exploring new ideas with the ability to predict and test," she says. "You can't really choose to bang two galaxies together, but you can choose to bang two photons together—so it was that ability to combine the crazy idea with real-life testing that really drew me into that world."

Professor Tanya Monro at the Australian Academy of Science's Shine Dome (right) and Ian Potter House (previous page).

PHOTOS: MARTIN OLLMAN.

Far right: At the University of Adelaide, portraits commemorate professors of physics, with Tanya Monro the first woman to make the 'professor wall' in the School of Physical Sciences' 130+ year history. PHOTO: TANYA MONRO.



provides accreditation to institutions for their efforts to establish gender equity.

“SAGE has really shifted the conversation around the country. It’s now a competition for talent,” Monro explains. “It’s changed the conversation from, ‘I don’t know why I haven’t got women in my organisation. It’s the choices they’re making,’ to, ‘If my organisation doesn’t make deliberate decisions, we won’t be able to compete for the talent.’ And that’s a wonderful shift.

“I think we can do more and better as a nation if we can

harness the talents of our population in a way that allows people to contribute the best way they can,” she adds.

For Monro, the best contributions arise from a philosophy that emphasises partnerships—and this means taking science beyond the walls of the lab to industry, policy and the wider public.

“The best science is not about being the best in the lab,” says Monro, “it’s about asking the best questions.”

This potentially means stepping away from a ‘linear’ notion of science, funneling

from fundamental to applied research, to one that is more interconnected. “I’ve learned that challenging practical problems can actually generate some of the best new directions in fundamental research,” she says, “and I’m really passionate about making sure that clever people and good ideas can have real, practical impact.”

But for real, practical impact in light of the daunting challenges facing industries, governments and everyday people alike, Monro says there needs to be a mutual understanding. For this reason,

she is an advocate for opportunities to exchange ideas and experience “the other’s shoes”.

“To work together in any effective partnership, you need to deeply understand the worldview and realities of the other partner,” she says.

For scientists, this may mean seeing beyond the bubble of what matters in their own discipline and engaging with issues that the broader community really cares about. “You get much more from what you have in common rather than what separates you,” says

Monro. “What do people care about? And how can science contribute to that?” She sees this as a strength of the Academy’s outreach activities: highlighting the deep connection between innovation and people’s lives.

“Science is for everybody, and it can enrich your choices, your career and your enjoyment of knowledge all the way through your life,” she says.

But there are still many “unhelpful stereotypes about science and scientists” that persist in Australian society according to Monro, and more work needs to be done to break down those perceptions.

“Whether the stereotype is that we’re individuals with no interests outside science, or whether it’s that science is intrinsically hard and requires a religious devotion to make progress ... it would be lovely for scientists to be portrayed as the people they are,” she says.

One way to achieve this is through storytelling, and Monro sees the soon-to-be reinvigorated Interviews with Australian Scientists program as an excellent opportunity to reveal the diverse and remarkable people who make up the Academy’s Fellowship.

“It’s about confidence,” she says, “both for the individual who is considering their own choices and for us as a nation, our story.

“We need to instill more pride in Australian science. We tend not to be great, as a nation, at realising the breadth of wonderful things our science has led to.”

In Monro’s case, this includes more than 600 journal papers, 18 patents and multiple game-changing advances in the field of photonics and optical fibres—on both fundamental and applied levels.

“There are few other professions where you can feel like you’re making as much difference and having as much fun,” says Monro. “Anything that’s worth doing has challenge—you’ve just got to decide what you really care about. Because then it doesn’t really feel like work. It becomes passion.”

 **Sustainable Development Goals**
Goal 5 Gender Equality. **Goal 8** Decent Work and Economic Growth. **Goal 9** Industry, Innovation and Infrastructure. **Goal 16** Peace, Justice and Strong Institutions. **Goal 17** Partnerships for the Goals.



Making the grade

NSW Science Extension high school students found a treasure trove of inspiration at Science at the Shine Dome 2019.

Waterway health. Childhood maltreatment. Processed meat and cancer risk. They're big, complicated topics worthy of any fully-fledged scientist's attention.

They're also three of the topics tackled by NSW senior high school students as part of the inaugural NSW Science Extension program. This Higher School Certificate course challenges participants to engage in original research by proposing a research question, formulating a hypothesis, and developing evidence-based responses.

Caitlin Wartho, a student at Pymble Ladies' College in Sydney, spent three days "splashing around in a creek with a bunch of sieves and test tubes" for her project investigating the health of

urban creek systems. She analysed litter content, phosphorus levels, bacteria levels and pH in addition to surveying the water bug population across two contrasting waterways—one in bushland, and the other surrounded by streets. Wartho found a "big difference in pollution levels" between the two waterways to an extent that was "unexpected".

It was a project inspired by her passion for the environment. Likewise, other students pursued passion projects for the course. Syed Taimoor Mansoor, a student at East Hills Boys High School, investigated how childhood maltreatment affects interpersonal relationships.

"That interested me both on a personal level and on an academic level," he says. Just like any good study, Mansoor began by reviewing the literature and identifying a knowledge gap: "There were so many studies that talk about loneliness, but they don't really talk about the state of individuals' social support levels," he explains.

Using a survey, Mansoor asked participants about their maltreatment and different interpersonal relationships. His results and

The program challenges participants to engage in original research by proposing a research question, formulating a hypothesis, and developing evidence-based responses.

statistical analysis showed that as self-reported maltreatment increases, the number of interpersonal relationships decreases.

"There are a lot of biases that you have to take into consideration and I don't really think that this paper can be generalised to the population, but if you were to repeat it with lots of people, I could see it going somewhere," Mansoor says.

April Abela's passion for sustainability inspired her investigation of the links between eating processed meat and the risk of colorectal, pancreatic and prostate cancers. A student at Glenmore Park High School, Abela doesn't eat red meat for environmental reasons and wanted to be able to "back herself with evidence".

This led her to conduct a meta-analysis of the existing scientific literature—a difficult undertaking rife with journal paywalls—and conclude that there was a weak correlation between processed meat consumption and risk of prostate and pancreatic cancers, and no correlation for colorectal cancer.

A trip to the capital

In May 2019, Wartho, Mansoor and Abela were selected to attend the Academy's premier annual event, Science at the Shine Dome, along with seven other high-flying Science Extension students and their teachers. The initiative to bring talented young minds to Canberra was fully funded and developed in partnership with global corporate giant 3M.

"Science is at the heart of everything 3M does," says Christopher Ordog from 3M Australia. "We want to help develop the next generation, giving them an insight into what a future career in STEM could look like."

The partnership between the Academy and 3M offered the opportunity to do just that at Science at the Shine Dome 2019 by creating the inaugural Science at the Shine Dome Schools Program. 3M was recognised as 'Presenting Partner—STEM Education' as part of the event.



3M
NSW Science Extension students April Abela (above) and Caitlin Wartho (right) attended Science at the Shine Dome in May 2019, along with eight other students and their teachers.



Left: Christopher Ordog, Debbie Amiradaki, Sing Hii and Richard Lord from 3M meet with students at the Science at the Shine Dome gala dinner. PHOTO: BRAD CUMMINGS.

“There’s an opportunity for students to be inspired by the best scientists in Australia,” says Ordog. “With 3M involved, we can highlight another STEM career path on the corporate side of things, where they can apply their skills to innovate products that improve lives in our communities. They could create products that are more sustainable, save lives or enhance our homes and workplaces.”

“The more we can connect teachers, industry and the science community to support and inspire the next generation, the brighter our future will be,” says Dr Lynn Walker, a senior education specialist and the Science at the Shine Dome Schools Program coordinator. “Through their partnership with the Academy, 3M not only made this happen, but their presence added an important voice to the conversation,” adds Walker.

Across the three-day event, the students networked with top Australian scientists and heard presentations from experts across a variety of disciplines. The students had the opportunity to meet NASA astronaut Dr Andrew Thomas AO, while support and activities led by the Academy’s education specialists enhanced the entire experience.

For Mansoor from East Hills Boys High School, the experience made him optimistic. “It really did shine a light on how different science is to how it is portrayed in the media,” he says. “There’s so much stuff that’s happening, and it’s going in directions I never would’ve thought of and that’s fascinating.”

After the whirlwind trip to Canberra, the students returned to their respective research projects with renewed purpose.

“It re-energised me,” says Abela. “It made me feel more connected and that what I was doing might actually make a difference.”

Mansoor was grateful to meet Academy Fellow Professor Richard Bryant AC FAA, a psychologist, who gave him some useful advice for conducting his survey.

It highlighted how the research project wasn’t just another school assignment—it was *real*. “Hearing about the Fellows’ projects and realising they’re just doing a much harder version of our own projects—but still a version of what we’re doing—it made our research seem so much more important,” says Wartho.

The Science at the Shine Dome experience also offered an invaluable opportunity to connect with others experiencing the same unique challenges of research.

“Getting to hear the experiences of other like-minded students, all with similar passions, was really valuable and I’ve made some great friends out of it,” says Abela.

“It’s nice to have people to bounce ideas off,” Mansoor agrees.

Experience is the best teacher

Of course, it wasn’t just the students who benefited from Science at the Shine Dome—the impact for teachers, too, was huge.

“It was the best experience ever,” says teacher Mikale Christenson from East Hills Boys High School. “It was fantastic to hear the latest research and I got a lot of great strategies just from the way they were presenting. I was just so grateful that you offered it.”

Ashley Mulcahy, from Glenmore Park High School, was also impressed by the “depth of science that’s happening in Australia”.

“I’m trying my best now to research things before I teach them, so that I can be absolutely

current with what’s going on,” Mulcahy says. “That’s something that I’m going to endeavour to do for as long as I’m teaching, so that everyone can be as excited about science as the ten students that we had at the Shine Dome.”

Mulcahy was grateful to 3M for its financial support, saying it was “something that wouldn’t have happened otherwise for many students”. Meanwhile, 3M was pleased to see teachers involved, as they offered the opportunity to “spread the word about the program, and the learnings and experiences from it,” according to Ordog.

“... teachers are a major influence in determining students’ attitudes, beliefs and confidence in STEM”

“The Academy recognises and acknowledges that teachers are a major influence in determining students’ attitudes, beliefs and confidence in STEM,” says Claudette Bateup, Director of Education at the Academy. “This project will impact both those present in person, as well as the other students the teachers are teaching this year—and in the years beyond.”

Two-way impact

Just as teachers can inspire students—with Abela crediting Mulcahy’s teaching style for sparking her interest in science—students can inspire too.

Mulcahy believes curious students who ask questions made him reassess his approach to teaching. “I thought, wow, people genuinely want to know things,” he says. “It made me question whether going through the textbook was actually teaching science, or whether it should be something bigger than that.”

In a similar vein, the students at the Shine Dome altered the conference’s atmosphere, with Abela delivering an inspiring speech to the scientists in attendance.

“I think being reminded by a younger person saying, ‘I’m inspired by you and thank you for that and you changed my life’—it’s impactful on the scientists,” says Ordog.

A bright future

So what’s next for the promising young researchers? Abela plans to study a Bachelor of Science (Advanced) at the University of Sydney. Both Mansoor and Wartho plan to take a gap year before heading to university to study double degrees.

Wartho hopes to end up in the space industry—a career goal she’s had since the age of 11, when she saw a video of astronaut Sunita Williams giving a tour of the International Space Station. That goal has been solidified after meeting NASA astronaut Dr Andrew Thomas at the Shine Dome. “He’s what I aspire to be,” Wartho says. “So to get to meet him and learn from him, that was truly incredible.”

Mansoor is keeping his options open. “I’m not really sure what I want to do,” he says, “but I know I want to have the right skillset so that whenever I do find my career, I’ll have all the skills I need to make it possible.”

No matter where they end up, all three believe the research experience offered by the NSW Science Extension course, although challenging, has been invaluable.

“To get this opportunity to go through everything a project entails, research the ethics and philosophy of science and apply that to my own project, I found extremely useful and interesting,” says Wartho.

Mansoor agrees that it “completely changes the way you think” while Abela says it was “very interesting”.

“The lack of open-source material was tricky, but I feel like it’s a good foundation because it’s what I want to do in the future,” she adds.

As the students leave secondary school behind, there’s no doubt their experiences at the Shine Dome and their forays into original research will stick with them.



Sustainable Development Goals
Goal 3 Good Health and Well-Being. **Goal 4** Quality Education.
Goal 6 Clean Water and Sanitation. **Goal 13** Climate Action.
Goal 17 Partnerships for the Goals.



In her nature

For 20 years, the Margaret Middleton Fund for endangered Australian native vertebrate animals has supported early-career researchers.

Above: Dr Margaret Middleton at the Academy in 2014.

Opposite top: A nobbi dragon sporting a VHF radio transmitting backpack.

It's tricky to track a nobbi dragon in the bush: they're grey-brown, about the length of a ballpoint pen and they run fast.

But Deakin University wildlife ecologist Dr Tim Doherty had a solution to keep up with the speedy lizards: tiny VHF transmitter backpacks. This tech allowed Doherty to record the movements of nobbi dragons and eastern bearded dragons as they navigated remnant mallee woodlands in central NSW farming areas.

"We recorded GPS locations and how high off the ground animals were in trees, because both of the species are semi-arboreal," says Doherty.

Why track dragons? "We wanted to find out how far they move and if they can move far enough to disperse between potentially isolated populations," explains Doherty. It's a part of his broader work studying how environmental change impacts species and communities. "I've been looking at how plants and animals persist in farming landscapes," he says. "When their habitat is cleared or becomes fragmented, how do populations cope with these sorts of changes?"

Doherty had recently completed his PhD when he received a grant from the Margaret Middleton Fund in 2017. "It's really important that grants like these are available to early-career researchers because they provide a good way for PhDs and postdocs to establish their own track record and become independent," he says. "Even relatively small amounts of money can open up huge opportunities."

For Doherty, that opportunity was studying reptile movements in an agricultural landscape. While eastern bearded dragons are relatively common, nobbi dragons may be declining across his study system.

"We did pitfall trapping surveys, which showed that the nobbi dragon was in lower abundance and captured at fewer sites than it had been previously," explains Doherty.



He did manage to catch some, and tracking them using the VHF radio transmitting backpacks revealed that their movements were in the range of tens of metres. In contrast, the larger eastern bearded dragon moved hundreds of metres. "Maybe due to its larger size or more generalist ecology, the eastern bearded dragon is better adapted to living in these disturbed environments," says Doherty. "This work has really highlighted the importance of nature reserves in farming landscapes and maintaining habitat quality."

It's this kind of research that Dr Margaret Middleton hoped to foster: knowledge that has real-world conservation impacts for threatened species.

Dr Margaret Middleton was the generous benefactor behind the fund. She passed away in March 2019 at the age of 90. Middleton left a final bequest of \$400 000 to sustain her namesake fund after 20 years of giving to the Academy.

"Margaret was a dedicated supporter of science at the Academy and a shrewd investor in its outcomes," says Professor Emeritus Andrew Holmes AC FAA FRS FTSE, former President of the Academy. "We shall miss her wise counsel and remember her great generosity with gratitude."

"I think experimental work, that leads to some consequence for conservation, has been the big

winner in Australia from these awards," says Dr David Spratt, a CSIRO parasitologist who served on the award committee for the Margaret Middleton Fund for more than a decade.

Middleton had a degree in psychology, which shaped her vision for the fund, according to Spratt. "She wanted it to be experimental with a strong field component, and to have it set up in a properly designed way," says Spratt.

Dr Middleton hoped to foster knowledge that has real-world conservation impacts for threatened species.

Another 'experiment' supported by the fund looked at helping endangered northern quolls survive the onslaught of invasive cane toads. The northern quoll is a cute, cat-like native marsupial found in pockets across northern Australia.

Unfortunately, quolls have a habit of toad-munching which is a threat to their survival. "Quolls inadvertently eat them, causing population crashes," explains Dr Ella Kelly, an ecologist at the University of Melbourne.

Kelly received a grant from the Margaret Middleton Fund in 2016 to support her first season



Above: Dr Tim Doherty.

Right: 'Toad-smart' northern quolls have enhanced ability to co-exist with cane toads. PHOTO: ELLA KELLY.

Opposite: Dr Marissa Parrott with a critically endangered mountain pygmy possum.

PHOTO: PAULA WATSON/ZOOS VICTORIA.



of PhD field work with northern quolls. “I looked at populations that had survived the cane toad invasion. These individuals knew not to attack toads, and they passed this behaviour onto their offspring genetically,” she explains.

Kelly investigated breeding ‘toad-smart’ quolls, thereby enhancing quolls’ ability to adapt to living in the presence of cane toads.

The breeding idea has been implemented in a trial run on an offshore island in the Northern Territory—and Kelly is hopeful for future successes. “I think the idea has real merit in increasing the survival of northern quoll populations being impacted by cane toads,” she says.

Aside from the critters and creatures, the Margaret Middleton Fund has also impacted the lives of the early-career researchers who study those species.

“The Margaret Middleton Fund, and the work it allowed me to do, has led on to a really amazing career in conservation—my dream job,” says Dr Marissa Parrott, the reproductive biologist at Zoos Victoria.

“I’m really passionate about helping endangered species and hopefully one day being able to take them off the endangered species list and know that they’re safe in the wild,” she says.

Parrott received a grant from the Margaret Middleton Fund in 2007 for a postdoctoral project studying mate choice in a tiny carnivorous marsupial, the stripe-faced dunnart. Although the species doesn’t have a national threat status, it is known to be declining across its range.

Parrott had access to a captive-bred colony of stripe-faced dunnarts, and she wanted to figure out the best way to play matchmaker, combining knowledge of preserving genetic diversity (avoiding inbreeding) with the female dunnart’s choice.

“Females were allowed to choose their mate based on a simple 10-minute test,” Parrott explains. “We gave the females a choice of different scent-marked objects that the males had been playing with.”

How did Parrott know when a dunnart gal liked what she smelled? There were a number of telltale signs, including how much time she



spent lingering with the smelly object, how many times she went back for a sniff, and licking the scent or rubbing it over herself.

The results of incorporating a female dunnart’s preferences were stunning. “We more than doubled the number of matings and the number of pregnancies,” says Parrott. In further research at Zoos Victoria with the mainland eastern barred bandicoot, a species listed as extinct in the wild, it took an average of 13 days for the loved-up lady bandicoots to give birth, compared to 49 days for those paired with a male they didn’t express preference for. Breeding success in females paired with a chosen male was also much higher at 83 per cent compared with 33 per cent.

“By using mate choice we can keep the animals happier and healthier,” says Parrott. “We can also shorten time to birth, which is important in a program where you may be breeding for a particular release date.”

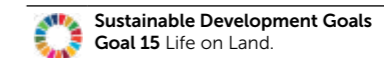
Parrott has taken the mate choice concept and applied it to a variety of other species’ breeding programs, including critically endangered

mountain pygmy possums, eastern barred bandicoots, orange-bellied parrots and even Lord Howe Island stick insects. For each different species, research is needed to figure out what the female’s choice looks like in terms of her behaviour.

“Having these grants gives us the opportunity to make those new discoveries, to hone those skills and to make a real difference for the species,” says Parrott. “I’m extremely grateful for the opportunity and I’m sad I didn’t get to meet Margaret, but she has left such an amazing legacy for researchers and for conservation.”

Although Middleton led a private life, she will be remembered as a person with a sharp mind with a generous heart. Spratt says he hopes she would be proud of her legacy—but for Middleton, giving was simply in her nature.

Thank you to the Margaret Middleton Fund Committee Members: Professor Chris Dickman FAA (Chair), Dr Amanda Edworthy, Professor Mark Westoby FAA and Professor Ian Hume AO FAA.





Bradley Moggridge is researching Indigenous water management and policy.

Below right: The inaugural winners of the Aboriginal and Torres Strait Islander Scientist Travelling Research Award at the Science at the Shine Dome gala dinner. PHOTO: BRADLEY CUMMINGS

Trailblazers

The inaugural recipients of the Aboriginal and Torres Strait Islander Scientist Travelling Research Award are leading the way for the next generation.

Bradley Moggridge was a fresh geology undergrad at the University of Technology Sydney, undertaking industrial experience in the Great Sandy Desert looking for uranium in a national park. It was a turning point. He realised, “This doesn’t sit well.”

The realisation spurred a shift to environmental science and to a career in water management and policy: from completing a Master’s in Science investigating the Aboriginal relationship to groundwater, to leading local and state government teams on water policy and Aboriginal engagement.

three inaugural recipients of the Academy’s Aboriginal and Torres Strait Islander Scientist Travelling Research Award.

“Water science really connected with me, because of my connection to country,” says Moggridge, who is from the Kamilaroi Nation in north-west New South Wales. His research looks at ways to incorporate cultural values and Aboriginal

perspectives into environmental water planning and management.

“It’s about acknowledging a gap in science: Aboriginal people don’t have a voice in water,” he says. “The question is, how can Aboriginal knowledge influence western water management?”

The Aboriginal and Torres Strait Islander Scientist Travelling Research Award

“The question is, how can Aboriginal knowledge influence western water management?”

Now Moggridge is a PhD candidate at the University of Canberra, the Indigenous Liaison Officer at the Threatened Species Recovery Hub, and the 2019 ACT Young Tall Poppy of the Year for Science. He is also one of the





Far left: Tui Nolan develops algorithms for datasets that are impossible to store in computers.

Left, above and overleaf: Amy Searle's work developing targeted drug therapies for heart disease is partly driven by her heritage.

is generously financed by an anonymous donor and administered by the Academy. The award provides travel funding for outstanding PhD candidates or early- and mid-career researchers of Aboriginal or Torres Strait Islander descent.

It aims to support the growth of the recipients' research networks through visits to international centres of research.

As a result of the award, Moggridge was able to travel to Aotearoa New Zealand to connect with Māori iwi (tribes) and learn about their experiences with water management. This served as a case study that Moggridge can now compare with situations in Australia and beyond.

"Speaking to the Māori, I heard about the way they do things, the way they negotiate, the way they influence policy and the best-practice structures they have in place to influence discussions," says Moggridge. "They have similar challenges to us here in Australia. They have the Treaty [of Waitangi] which is a massive bonus, but they're still struggling for the right to access and own water."

Moggridge is now writing up his findings—but the visit provided inspiration for more than just a journal paper.

"In New Zealand, NIWA [the National Institute of Water and Atmospheric Research] has their own Māori research unit and the Landcare branches also have

"It's not just about having education for oneself, but about spreading the positive consequences of education throughout the community"

strong Māori components," he says. "Just imagine if CSIRO had an Indigenous science arm. That's on the wish list."

Tui Nolan is another emerging leader in science and recipient of the 2019 Aboriginal and Torres Strait Islander Scientist Travelling Research Award. A PhD candidate at the University of Technology Sydney, Nolan develops "algorithms for

datasets that are impossible to store in a computer".

"These kinds of models come up in education, health and physical sciences," he says. Supported by the award, Nolan visited the renowned Alan Turing Institute in the United Kingdom where he contributed to machine learning research.

Nolan has both Aboriginal and Māori heritage that links him to Australia and New Zealand. "It can be a bit of a problem when the Bledisloe Cup comes around. I'm probably the only person who sits on the fence for that rugby competition!" he laughs.

Citing pride in his heritage as a key source of motivation, Nolan also feels a responsibility to "encourage more Indigenous

students to study at university and take up these kinds of opportunities".

"It's not just about having education for oneself, but about spreading the positive consequences of education throughout the community," he says. "My long-term goal is to give back to the Australian education system that has provided so much to me. And I think that is a result of my Indigenous ties to the country."

Amy Searle is another high achieving scientist recognised by the award. A PhD candidate at the Baker Heart and Diabetes Institute, Searle's research works to develop targeted drug therapies for heart disease, "essentially, delivering the

drug directly to the site of the disease, rather than having complete systemic effects of the drug," she explains.

It's a field of research with special significance for Searle, whose grandfather had an abdominal aortic aneurysm (AAA). "His abdominal aorta dilated until it was eight centimetres, which is four times the normal size," she explains. "He was at extremely high risk of rupture, which is a catastrophic event."

"Currently, patients with AAA have no therapeutic intervention, only surgical options," Searle says. "We want to develop a therapy that patients could have before they reached the point of needing surgery. It's been



validated in an animal model, but the future prospects include further validations and moving to clinical trials in the long term.”

Although unable to take up the travel component, Searle was “elated” to receive the award’s recognition and attend the Academy’s premier annual event, Science at the Shine Dome. “It’s such a prestigious award, and to be the inaugural recipient as well, it’s very meaningful,” she says.

“It opens up so many doors. Getting this award means that I’m more competitive in the future for other awards and fellowships,” says Searle.

She also sees the award as a platform to inspire greater Indigenous participation in science. “This gives us the potential to succeed and get to the higher levels and hopefully within our networks get more Indigenous students into science,” she says.

Searle’s heritage is from Kamilaroi country in New South Wales. “Being a First Nations

person, you are from this land, you are from this country and these are your people,” she says. “You can’t put it into words. You can’t describe it. It’s just a feeling that you have of belonging.”

After her PhD, Searle plans to attend medical school and eventually become a clinician scientist, combining lab research with patient interaction. “We call it from bench to bedside,” she explains. “Clinician scientists really have a broad idea of what patients need and then they can apply that to the lab setting and develop those new technologies.”

Potential impacts for Indigenous communities are “a big driving force” for Searle’s research, as Indigenous Australians are three times more likely to develop heart disease compared to non-Indigenous Australians. “If I find a therapy that makes it into the clinic that influences how people are treated for heart disease, then this could be used for future generations and I could be

...there’s a sense that science can benefit from diversity and different ways of perceiving the world.

saving my grandkids’ grandkids,” she says.

In the short term, however, Searle hopes to be a role model for other Indigenous students, offering words of encouragement: “It’s not out of our reach to be successful. There is a lot of help along the way. Just go for it,” she says.

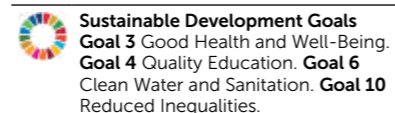
Beyond increased Indigenous participation in tertiary science education, there’s a sense that science can benefit from diversity and different ways of perceiving the world. It’s an aspect of the “science culture” that Moggridge in particular hopes to influence.

“When you break it down, thousands of generations of knowledge and observation and testing the environment and getting the most out of the environment in a sustainable way, that’s science,” he says.

“There’s methodologies there in the language, in the lore, in the songs—but that is really only seen as myth and legend.

“They might sit alongside each other, but I think we need to have a closer look and see whether they can actually merge and come to a better outcome.”

Thank you to the award committee members: Professor Wendy Hoy AO FAA, Professor Elizabeth McKinley and Professor Alex Brown.



Partnership opportunities

The Academy is open to partnering with like-minded organisations. Your organisation can collaborate with the Academy to promote science in Australia, support excellence, and strengthen your organisation’s reputation as a champion of STEM. An alliance with the Academy is an alliance with excellence.

PARTNERSHIPS VISION

To partner with organisations or individuals who share mutual values and are committed to an ongoing strategic alliance of benefit to the STEM sector and the industries that rely on STEM.

With any successful partnership, collaboration is key to success. As an Academy partner, you can enable a diverse range of science projects, events, initiatives and engagements—with options to suit corporate businesses, government agencies and research institutions alike. From delivering meaningful education programs to staging world-class events and creating engaging science video content, a partnership with the Academy has great impact. Learn more at science.org.au/partnerships

For more information about partnering with the Academy, please contact Academy Partnerships Manager, Tracey Murray on 02 6201 9480 or email academy.partnerships@science.org.au



Top: Academy Chief Executive Anna-Maria Arabia (right) greets German Ambassador to Australia Dr Anna Prinz at the Science at the Shine Dome gala dinner.

PHOTO: BRADLEY CUMMINGS.

Above: Academy Partnerships Manager Tracey Murray.



Dr Emma Beckett's career as a molecular nutritionist was kick-started by the Adam J Berry Memorial Fund award. PHOTO: EDDIE O'REILLY.

Brave hearts

A legacy borne of tragedy fosters generations of health researchers.

Dr Emma Beckett never dreamed she was actually going to get the award. She was just a year into her PhD when she applied. "I deadset thought I was just applying to make my supervisor happy and get some practice in doing applications," she says.

In 2014, Beckett became the ninth recipient of the Adam J Berry Memorial Fund award. Speaking about her experience, she simply says, "It changed my life."

Adam Berry was just 25 years old when he tragically passed away in a car accident in 2002. A promising young Australian scientist, Berry was working at the National Cancer Institute in the United States. He had been there just over a year and had already made huge strides in the research, developing methods for figuring out the genotypes of genetically modified mice for studying cancer pathogenesis.

The following year, Berry's parents, Michael and Susan, established the Adam J. Berry Memorial Fund in memory of the bright son they lost. The aim of the fund is to support early-career Australian scientists to travel to the US and spend a stint working at the National Institutes of Health (NIH).

For Beckett, the story behind the award resonated. "I was actually doing this application very shortly after I'd lost one of my brothers in a car accident, so I felt a great deal of solidarity and empathy with the family and the reasoning behind this scholarship," she says. "I felt a very personal connection and personal honour to be able to be one of the people who got to have this experience in his memory."

Beckett is a molecular nutritionist at the University of Newcastle, researching at the interface of genetics, taste and the food we eat. In search of an exciting PhD project, she was intrigued by the field in part because of her family. "I'm an identical twin and I have nine brothers and sisters, so I'd always been thinking about how genetics makes us who we are," she explains. "I was a vegetarian at the time and my twin sister was not, so I'd been thinking about how that was going to make us different, even though we are the same genetically."

For her visit to the NIH, Beckett contributed to a project investigating the effect of a mother's diet on DNA in the placenta and offspring. It was

"I felt a very personal connection and personal honour to be able to be one of the people who got to have this experience in his memory."

a large study involving women from the US, Norway and the Netherlands who had donated umbilical cord blood post-birth, which could be analysed for DNA differences. With her nutrition background, Beckett took the data relating to folate consumption and searched for any links to changes in DNA methylation—a structural modification of DNA.

Folate supplementation is recommended for pregnant women as it is known to be important for preventing certain defects in a baby's development. But the relationship Beckett found in the data was surprising. "We found that there were a number of genes where the DNA methylation was down-regulated as the maternal consumption of folate went up—which is almost the opposite of what we expected to find," Beckett explains.



PhD candidate Patrice Jones has followed in her supervisor's footsteps to a stint working at the NIH in the US. PHOTO: EDDIE O'REILLY.

Now, she's mentoring the next cohort of emerging health scientists, such as PhD candidate Patrice Jones.

As Jones' primary PhD supervisor, Beckett encouraged her to apply for awards. Jones is now having her own life-changing experience at the NIH in the US thanks to the Adam J Berry Memorial Fund.

Based for six weeks at the National Institute of Environmental Health Sciences in North Carolina, Jones is researching the relationship between sex hormones and breast cancer. "The aim is to look at the epigenetic modifications that might be happening that might explain why there's a relationship between being pregnant and having a lower chance of developing breast cancer," Jones explains.

It's a research topic quite different to her PhD, where she studies the relationship between vitamin D, folate, sun exposure and genetics. "We know vitamin D and the sun are very well linked, but a lot of people don't know that folate can be broken down by the sun," explains Jones. "I look at both how the environment and how the genetics individually change our requirements."

In addition to expanding her suite of lab skills, Jones is relishing the opportunity to work with a new team. "It's so much more than what it seems on paper," she says. "You're gaining the experience of being able to work with another team, and showing incentive—those types of things that are really important at this stage of your career coming forward. I'm just about to start my career in science and so to already be able to have this achievement is wonderful."

It's one wonderful achievement for Jones, and one life-changing trip for Beckett. But these are just two of *many* career-shaping experiences made possible by Berry's legacy.

Thank you to the Adam J Berry committee members: Professor Jonathon Stone FAA and Dr Alexis Berry.



Sustainable Development Goals
Goal 3 Good Health and Well-Being. **Goal 17** Partnerships for the Goals.

"Figuring out why that happens is the next research step," she adds.

Five years on from her NIH visit, Beckett is leading her own lab. She has a portfolio of taste research: examining how the way we taste food changes our food choices, and also investigating the diverse roles of taste receptors—which aren't just on your tongue, but located throughout your body. And, Beckett has continued researching folate genetics.

The NIH experience did more than just equip Beckett with new experimental skills—it led to a realisation and newfound source of motivation: high quality science can be done anywhere.

"I went there thinking it was going to be intimidating and that their labs would be all shiny and CSI-like, and my little lab on this side of the world would pale in comparison," says Beckett. "I got there and everything was the same, it was the same equipment, it was the same people, they were just as messy!"

The experience also boosted Beckett's confidence. "Before I went to the States, I thought that I was just going to do very standard science things," she says. "But this experience made me brave. It made me realise that if you want to do big and exciting things, you just have to put up your hand and ask for them."

"There are so many things in my life that I can absolutely say came from this experience and being made to be brave like that."

Among her achievements since receiving the Adam J Berry Memorial Fund award, Beckett has been selected to attend the 65th Lindau Nobel Laureate Meeting in Germany, been named a NSW Young Tall Poppy, and received a 2016 NHMRC Early Career Fellowship.

Make history with us

From 1995 to 2012, the Australian Academy of Science documented the remarkable stories of Australian scientists through the Interviews with Australian Scientists program.

The Academy recorded interviews with nearly 150 leaders, from Dame Bridget Ogilvie AC DBE FAA FRS, the 'girl from the bush' who became Director of the Wellcome Trust, to pioneering microbiologist Professor Frank Fenner AC CMG MBE FAA FRS who oversaw the eradication of smallpox.

There are still so many tales waiting to be told.

You can help us capture them before they're lost to the mists of time.

Today, we are committed to reinvigorating Interviews with Australian Scientists in audio (podcast) format. Join us to support this project recording stories that will enrich and inspire the next generation of exceptional scientists.

"It's investing in our future," says Professor Robyn Williams AM FAA, ABC science journalist and broadcaster. "When you hear these stories about how things can be transformed, you are both inspired and excited."

Interviews with Australian Scientists goes beyond the soundbite to delve deep into the extraordinary lives and achievements of our best and brightest. "All of these stories show how marvellously human and broad are our scientists," says Williams.

"You need to know when something's important and worth paying attention to, and if it's from the Academy, it will be," he adds.

Your donation today will contribute toward the costs

of preparing for and conducting the interviews of Fellows of the Academy.

The Academy has committed \$25 000 to the project and we invite you to add to this venture to preserve our shared history.

In the fast-paced age of technology and endless emails, the importance of taking the time to document our scientists' amazing lives cannot be underestimated, says Williams. "The number of science media publications and broadcasts is getting smaller and smaller, so if you don't do it, no one else will."

science.org.au/donate



Science goes social

Social media has a reputation for being a hotbed of misinformation, but the Academy's presence is a beacon of fact-checked content among the fake news fog.

When the Australian Government Department of Health wanted to create a public awareness campaign about immunisation, it partnered with the Academy. Together, the organisations designed a public health message with impact, distributed to an audience of millions.

The 'Science of immunisation' campaign, which commenced in October 2018, included six short-form videos and five articles designed to engage the unengaged. Topics included the safety of vaccines and a look at the ingredients that make up a life-saving shot. As with all of the Academy's outreach content, each piece of communication went through rigorous fact check and review by independent experts.

The immunisation campaign was so successful, it inspired the Department of Health to partner with the Academy for campaigns specifically about meningococcal disease and measles. The meningococcal campaign, in

November 2018, encouraged the public to get vaccinated for the different strains of the disease.

The measles campaign was launched in early October 2019 with five videos and four articles.

"I am concerned about the recent increases in measles cases in Australia and want to make sure our community is well protected against this very serious disease," said The Hon Greg Hunt MP, Minister for Health, in a media release.

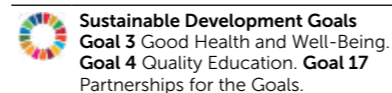
"The Australian Government has commissioned the independent and highly qualified Australian Academy of Science to work closely with measles experts to develop materials to raise awareness about measles amongst the community, with a particular focus on those most at risk of the disease such as travellers and health professionals," he added.

The campaign has generated significant mainstream media coverage, while numbers from social media distribution continue to build.

By combining scientific accuracy and excellence with a brilliant in-house video production and writing team, the partnership has generated a suite of compelling communication outputs with powerful messages. Then, by tapping into the social media distribution expertise and the Academy's Facebook audience of two million, these important public health messages have reached huge numbers of people and continue to be shared online.

All videos and articles produced by the Australian Academy of Science are rigorously fact-checked by our Fellows and other subject matter experts. Their insights and expertise are crucial for maintaining the high quality standards seen across all of our content. We thank them for their invaluable contributions towards our science outreach efforts.

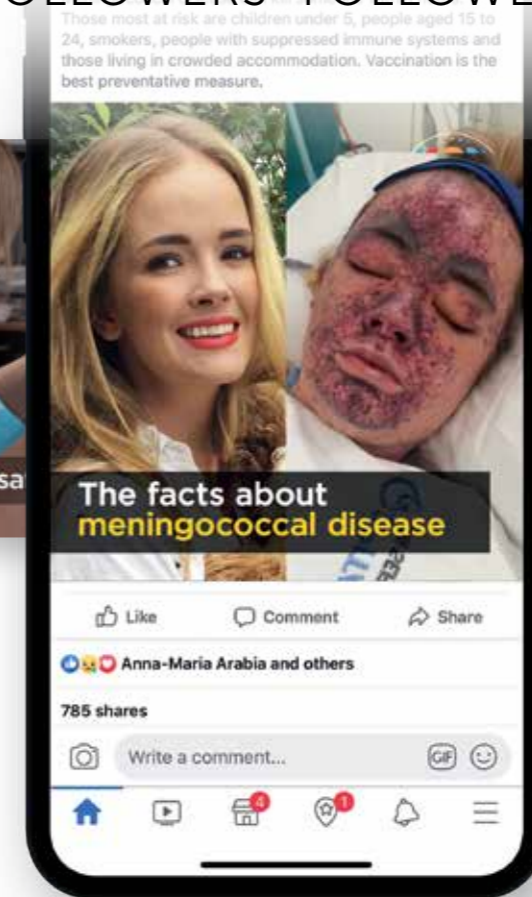
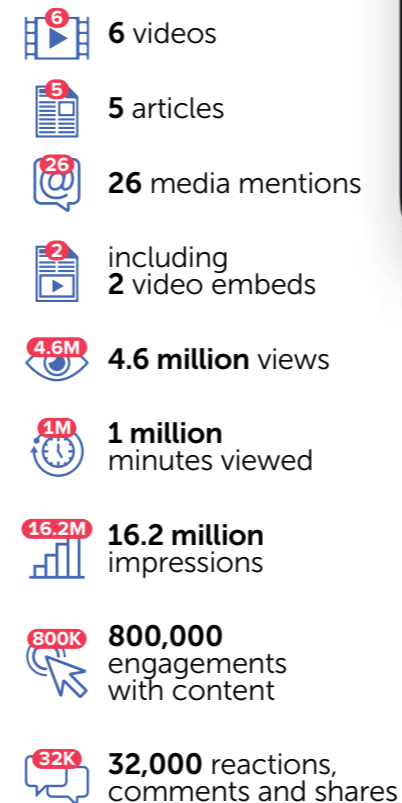
Digital Oversight Committee Members
 Emeritus Professor Hans Bachor AM FAA
 Professor Michael Barber AO FAA FTSE
 Professor Pauline Ladiges AO FAA
 Professor Suzanne O'Reilly AM FAA
 Professor David Day FAA



As at November 2019



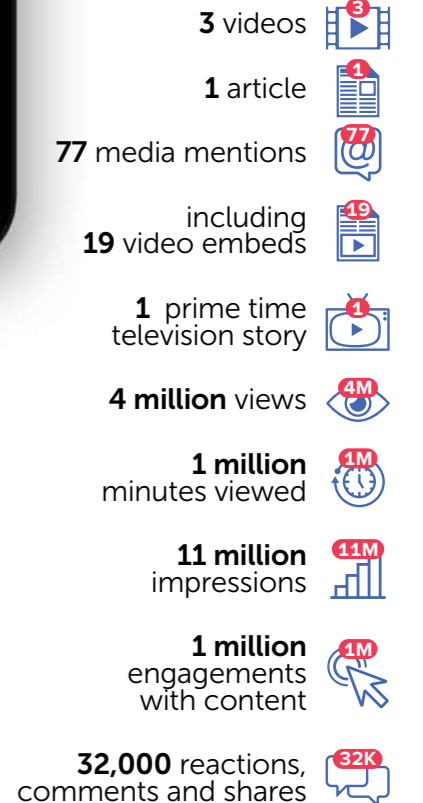
The Science of Immunisation



Just wanted to touch base and introduce myself as I lost my daughter Zoe to meningococcal W last year after 16 hours of being unwell. ... Such great work and I will be sharing these ...

I keep delaying the vaccine for this for my newborn because she's been sick on and off (colds and such) and the vaccine made her older sister quite sick when she had it 2 years ago. After reading this I'm making an appointment. I'm so sorry for your loss xo

Meningococcal Disease



Future-proofing sustainability

New initiatives are set to empower a generation of sustainability changemakers, thanks to the McDougall family.



Above: Ian and Pam McDougall.

Main photo: The Goyder Lagoon is a large ephemeral swamp in South Australia. PHOTO: MARTIN OLLMAN.

Take, make and throw away. That's been the business modus operandi for decades. But we are beginning to realise that this is not a sustainable way of doing things. Now, some businesses are exploring the potential of systems that emphasise reusing and recycling: a circular economy.

A circular economy was the subject of a new initiative run by Future Earth Australia called Catalysing Change: Moving towards a circular economy.

The event brought together 20 top honours students from across Australia with an interest in sustainability. For two days in November 2019, the selected attendees gathered at the Shine Dome to hear from experts across a range of disciplines and tackle waste-related scenarios.

Speakers included Academy Fellow Professor Veena Sahajwalla FAA FTSE from UNSW Sydney, known for her innovative work to revolutionise recycling science, and Dr Jennifer Yarnold from the Centre for Policy Futures at the University of Queensland.

The Catalysing Change workshop was fully funded by a philanthropic donation from the McDougall family.

Emeritus Professor Ian McDougall FAA was an internationally renowned geologist and geochemist at the Australian National University. McDougall was elected as a Fellow of the Academy in 1988 for his pioneering work in geological dating, which contributed to figuring out the

geomagnetic reversal timescale, and explained how the Pacific tectonic plate moves relative to the underlying mantle.

McDougall also advanced our understanding of human evolution by precisely dating fossil beds in Kenya and pinpointing the age of fossil skulls from Ethiopia, pushing back the evolution of *Homo sapiens* by 40 000 years. McDougall passed away in November 2018, but his legacy will live on through his important scientific contributions and his family's generous gift to Future Earth Australia.

Pam McDougall, Ian's wife, was inspired after reading about Sahajwalla in the Weekend Australian.

"I feel that, as a country, we should be able to build and produce items according to best environmental practice and then recycle the items within Australia when their time comes," says Pam. "Students studying STEM subjects would be an obvious cohort, but those studying architecture, industrial design, law, journalism and education—to name a few—could also benefit and use this thinking in their future professional lives."

The McDougall family's philanthropic contribution has also enabled the commencement of a bursary program, the Ian McDougall Bursary Program, hosted by Future Earth Australia.

The program aims to promote cross-institutional collaboration among early-career researchers and practitioners (ECRPs), with three \$4000 bursaries available each year. Groups could be working on any project or topic that seeks to integrate the United

Nations' Sustainable Development Goals for societal transformation.

It is hoped that the Catalysing Change workshop and the bursary program will work in tandem. "We hope that those at our ECRP events are inspired to form interdisciplinary groups to enact real change, with the support of the Ian McDougall Bursary Program," says Dr Tayanah O'Donnell, Director of Future Earth Australia.

"The McDougall family's donation will enhance sustainability in Australia by equipping young people with the skills, knowledge and capacity to create positive change," she says.

"We are thankful to receive this donation to support Future Earth Australia activities and our mission: connecting people with expertise and creativity to tackle the sustainability challenges facing Australia and the world."



Sustainable Development Goals

Goal 9 Industry, Innovation, and Infrastructure. **Goal 11** Sustainable Cities and Communities. **Goal 12** Responsible Consumption and Production. **Goal 13** Climate Action.

About Future Earth Australia

Future Earth Australia is a national peak sustainability initiative and a program of the Australian Academy of Science. It aims to translate the Sustainable Development Goals from research into practice, and to enable collaboration between Australian researchers, governments, industry, NGOs and international networks. The Future Earth Australia vision is an Australia where people thrive in and contribute to a sustainable and equitable world.

A heart for curiosity

On a tour of Australia, Germany's Professor Stefanie Dimmeler shared her passion for discovery—and secrets from the 'dark genome'.



When the entire human genome was sequenced in 2004, scientists found that only around two per cent of the DNA actually coded for proteins. The rest, some 98 per cent, makes up the 'dark genome'. This is the mysterious world that cardiovascular researcher Professor Stefanie Dimmeler explores.

Dimmeler is Director of the Institute of Cardiovascular Regeneration, Centre for Molecular Medicine at the University of Frankfurt in Germany. She studies tiny microRNA molecules, short strands of linked

nucleotides similar to fragments of DNA. These microRNAs are 'network managers' controlling multiple biochemical pathways at once.

"The beauty is that these microRNAs bind to hundreds of proteins at the same time. They control processes that are more complex," Dimmeler explains.

This attribute makes microRNAs a potentially powerful target for new drug therapies.

"We know that it is not only one pathway that is injured in disease, but many. We hope with these microRNAs that we may have a control to reset networks."

In particular, Dimmeler investigates the role of microRNAs in regrowth of blood vessels after a heart attack.

"Our long-term vision is to repair the heart after acute myocardial infarction, to enhance the growth of vessels to bring in oxygen to the heart and also hopefully repair the cardiac muscle tissue," she says.

In January and February 2019, Dimmeler travelled across Australia, visiting eight research institutes and universities as part of the Selby Fellowship. This included a six-week sabbatical at the Victor Chang Cardiac Research Institute in Sydney.

Selby Fellowships are awarded to distinguished overseas scientists to visit Australia's scientific centres and deliver public lectures.

Since 1987, more than 30 world-leading researchers have visited Australia on Selby Fellowships to share their knowledge, connect with Australian researchers, and inspire others. These long-running awards are financed through the generosity of the trustees of the Selby Scientific Foundation.

The Selby Scientific Foundation was established in 1980 with contributions from HB Selby Australia Ltd, members of the Selby family and several shareholders in the Selby company, who wanted

to enhance science education, research and development in Australia.

True to these goals, Dimmeler's visit continued this enduring tradition of engaging top scientists, which strengthens Australia's international research links.

Since 1987, more than 30 world-leading researchers have visited Australia on Selby Fellowships to share their knowledge, connect with Australian researchers, and inspire others. These long-running awards are financed through the generosity of the trustees of the Selby Scientific Foundation.

"I really enjoyed visiting all these universities and institutes, meeting so many colleagues and having the chance to interact on a less tense schedule," says Dimmeler, who was able to establish new collaborations and enhance existing partnerships.

"This fellowship provides a unique opportunity to foster worldwide collaborations and exchange of science," she adds.

Dimmeler also networked with students and postdoctoral researchers, where she discussed her projects and fielded career-related questions.


For the outreach component of the fellowship, Dimmeler presented to the general public in Canberra and Sydney, explaining her cutting-edge research and sharing her enthusiasm for biomedical and basic science.

"It's really the curiosity that drives me," says Dimmeler. "Of course the long-term vision is fantastic: to hopefully help patients with heart disease. But on a day-to-day basis, it's so exciting to find new functions for molecules and to understand what they are doing."

Thank you to the Selby Fellowship committee members: Professor John Fincher AO FAA FTSE (Chair), Professor Naomi McClure-Griffiths, Professor Jennifer Martin AC FAA, Professor Thomas Healy AO FAA FTSE and Dr Anna Koltunow FAA FTSE.

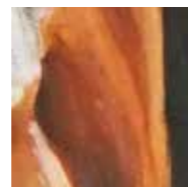
Left top: Professor Stefanie Dimmeler visited Australia in 2019 thanks to a Selby Fellowship.

Left: Artwork at the Institute of Cardiovascular Regeneration in Frankfurt inspired by Professor Dimmeler's research.

 Sustainable Development Goals
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THE POWER OF

PORTRAITURE



In the age of endless selfies, there's something strikingly personal about an old-school portrait.



Something stirs when you catch eyes gazing from canvas, a face made carefully with brush-strokes instead of pixels. The portrait of Sir Gustav Nossal AC CBE FAA FRS is certainly more than just a record of physical appearance.

The portrait of Nossal, created in 2005, will soon reside at the Australian Academy of Science thanks to a donation through the Australian Government's Cultural Gifts Program by acclaimed artist Dean Home.

Nossal is an immunologist renowned for his discoveries in antibody formation and his directorship of the Walter and Eliza Hall Institute of Medical Research. He also served as Academy President from 1994 to 1998.

The donated portrait was a precursor to a larger piece painted for the National Portrait Gallery. Home painted Nossal from a photograph instead of the classic but intensely time-consuming technique of painting a subject from life.

"My process is about collecting what I want with a camera and then transposing it to a painting," he explains. "But I also recognise that you cannot be mastered by the photograph. Every step in the process is an increasing discovery of and ownership of what you are going to paint."

It took several rolls of film to find a shot that sparked Home's interest, which he used as a springboard to craft the portrait.

"Photography is just a collection of data which you can use but you have to drive more into a portrait," Home says. "There's something about it that gives you a feeling of complete integrity, that you know them, that you trust them, or that there's something exposed about them and you don't entirely know why. I hope I've done that."

The result is a simple but powerful portrait that captures Nossal's warmth. "The portrait has his body language, his immediate smile, a little light zinging off the side of his face," says Home, who wanted to focus on the person rather than trying to portray a complex scientific narrative.

"I wanted to focus a bit more on his personal immediacy," says Home. "With Gus, as soon as

Top right: Artist Dean Home with his portrait of Sir Gus Nossal, which will be on display at the Academy. PHOTO: DEAN HOME.



you meet him, you think you've known him for years, he's a mate straight away."

In addition to the portrait of Nossal, the National Portrait Gallery houses depictions of many other Academy Fellows. Thanks to the generosity of the gallery, 34 of these arresting images were displayed at the 2019 Science at the Shine Dome gala dinner.

"... it can put a good foot forward for science in our community aesthetically and cast scientists in a somewhat heroic light"

Dating back 5000 years to ancient Egypt, portraiture has a long history of recording likenesses of people—usually with a generous dose of flattery. In the age of digital photography, portraits embody a thoughtful kind of reverence. And according to Home, the art form is making a comeback.

"I think it can put a good foot forward for science in our community aesthetically and cast scientists in a somewhat heroic light," he says. "I think it's really cool that people that are involved in science can see themselves transposed into a different image of themselves that recognises their success."

Please direct enquiries about the Cultural Gifts Program to Philanthropy Manager Isobel Griffin (see page 51).

Dr Lara Malins is breaking new ground in organic chemistry thanks to the JG Russell award.

A SPARK OF INSPIRATION

“Like playing with lego.” This is how Dr Lara Malins, Research Fellow at the Australian National University, describes working in an organic chemistry lab.

An emerging leader in her field, Malins researches at the interface of organic synthesis and chemical biology, looking to nature for inspiration for new antibiotics.

“I’ve always liked puzzles and trying to figure out how to piece together small fragments to make a bigger whole,” says Malins. “Organic synthesis is exactly that. I piece together amino acids to generate the larger structures of peptides and proteins.”

There are 20 common amino acids in nature—small ‘building blocks’ which join together to form long chain-like molecules called proteins, or shorter-chain peptides.

“Part of my aim is to understand how it is possible that this small set of building blocks leads to all of the diversity that we see in structure and function,” says Malins.

She is specifically studying peptide antibiotics which contain cyclic structures, and figuring out how to replicate the formation of these shapes in the lab. Then, Malins uses these as a springboard to generate leads for molecules that might be more potent, more specific, or cheaper and easier to produce. “Our methods are mimicking nature with the intent of improving on it and understanding it,” she explains.

With antibiotic resistance looming, the need for new therapeutic molecules has never been greater.

With antibiotic resistance looming, the need for new therapeutic molecules has never been greater. “I see organic chemistry as a way to have an impact medicinally by discovering a new therapy or treatment,” says Malins, who wanted to become

Left: Dr Lara Malins mimics nature in the chemistry lab with amino acid molecules.

PHOTO: MARTIN OLLMAN.

a medical doctor before discovering her passion for organic chemistry.

An outstanding recipient of an Australian Research Council Discovery Early Career Research Award, Malins also received a JG Russell Award, which is administered by the Academy.

“It’s really exciting to break into this space, which could lead to some nice ways of making our target structures using a green and economical approach.”

The Academy’s award recognises talented younger researchers in the basic sciences, and provides top-up funding for experimental equipment, maintenance or travel. It is supported by the generosity of the late Miss J Russell.

Malins used the extra funding to purchase “a really cool set of equipment”: an electrochemical apparatus called the ElectraSyn. The apparatus can be used to perform chemical reactions similar to a battery, and Malins said it has been “transformational” for her research group.

“We now have three projects utilising electrochemistry to form new bonds in peptides, which hasn’t been looked at extensively,” says Malins. “It’s really exciting to break into this space, which could lead to some nice ways of making our target structures using a green and economical approach.”

For Malins, the JG Russell Award is more than just extra funding. “It was just really fantastic to have that support,” she says. “Awards that recognise early-career researchers set them on a trajectory that helps them be more successful.”

As an advocate for women in science, Malins sees “support from the Academy and funding agencies” as “crucial to breaking down barriers”. She hopes to be a visible role model for others, passing her own spark of inspiration to the next generation.

Thank you to Dr TJ Higgins AO FAA FTSE and Professor Jim Williams AM FAA FTSE for their contribution to the selection of this awardee.

 Sustainable Development Goals
Goal 3 Good Health and Well-Being. Goal 5 Gender Equality.

Banking on the future

A partnership brings value to Australia's emerging science talents.

More than 70 early- and mid-career researchers (EMCRs) from across Australia descended on Canberra to take advantage of a specially tailored Science at the Shine Dome program in May 2019.

In addition to all the usual events and presentations, EMCRs enjoyed a networking dinner, four professional development workshops, and a masterclass focusing on wellbeing and work-life balance. The expanded EMCR program was enabled by the support of presenting partner UniBank.

"The support of UniBank facilitated invaluable network-building opportunities, and feedback from our EMCRs highlights the significant benefit they get out of these programs," says Dr Michael Bowen, incoming Chair of the EMCR Forum Executive.

For UniBank, supporting EMCR engagement would "make the biggest difference and add the most value", says Mike Lanzing, the bank's General Manager.

We understand that researchers at this stage of their career can face a number of challenges," says Lanzing. "This is a time where a bit more financial and emotional support can help



PHOTO: BRADLEY CUMMINGS

them keep going and stick with a STEM career, rather than taking their talents elsewhere."


Through its partnership with the Academy, UniBank aims to help EMCRs with their wellbeing by facilitating opportunities for connection and collaboration, and providing information on issues such as money management and fraud prevention.

UniBank also collaborated with the Academy for the Women in STEM Decadal Plan as an exclusive presenting partner for the Pathways to Equity in STEM Symposium.

"The partnership seemed a natural one for UniBank," says Lanzing. "We believe in the power that education has to change lives and change the world and so we want to partner with organisations that also place great value on education and knowledge."

Lanzing also feels a "deep personal connection" with the

goals of the Academy. "My dad was a marine biologist, my grandfather was a mining engineer, my great grandfather was a professor of mathematics and my great aunt was the first woman to be Doctor of Chemistry in the Netherlands," he explains. "Partnering with the Academy, for me, feels like I'm continuing the work of my family in being an advocate for the value and importance of scientific research and the beneficial impact it can have to improve society."

 Sustainable Development Goals
Goal 8 Decent Work and Economic Growth. Goal 10 Reduced Inequalities. Goal 17 Partnerships for the Goals.

UniBank

Above: EMCRs participating in a Science at the Shine Dome 2019 workshop in Canberra, supported by UniBank.

Academy affairs



Recent highlights from the Academy's event calendar

The Academy partners with a range of organisations to bring audiences a diverse offering of events. There is something for everyone: from highlighting scientific excellence and the cutting edge of current research, to uncovering everyday science and connecting with pop culture. The Academy is always in search of new partnerships to deliver its ever-changing suite of exciting science experiences. Visit the Academy's website at science.org.au/events for the full calendar of upcoming events.

Above: Professor David Day FAA kicks off a night of delicious science at 'The Chemistry of Wine'.

Changing Lives with Science

Canberra Speaker Series, 2019
Across six events spanning 2019, speakers regaled audiences with remarkable stories—stories of innovation, research, breakthroughs and how science is solving the big challenges of our time. In collaboration with exclusive presenting partner the University of Canberra, we heard the story of cochlear implant development, learned how 3D printing is revolutionising prosthetics and envisioned a high-tech, equitable future for farming—among many other innovations.



The Chemistry of Wine

Adelaide, 10 April

Behind every good glass of vino, there's good chemistry. Presented in conjunction with South Australia's Tasting Australia, attendees at 'The Chemistry of Wine' went on a molecular journey of taste, colour and aroma with Yalumba chief winemaker Louisa Rose and Professor Kerry Wilkinson from the University of Adelaide.

Shine Dome Tours

Canberra and Region Heritage Festival, 5 May

To celebrate the 60th birthday of the Academy's beloved Shine Dome, members of the public were invited to discover this heritage-listed building's history, tales and quirks. The tours were sold out, while others enjoyed the film *Hidden Figures* on the big screen inside the Ian Wark Theatre.

BeakerStreet@TMAG

Hobart, 16 August

The Academy partnered with BeakerStreet@TMAG to bring four fantastic Fellows of the Academy to a 'pop-up science' event in Hobart. Professor Martina Stenzel FAA brought to life the weird and wonderful elements of the periodic table. Dr Steve Rintoul FAA chatted about the fate of Antarctica in a warming world and Professor Jenny Graves AO FAA intrigued audiences with the possible extinction of the male Y chromosome. Professor Mike Archer AM FAA talked about de-extinction, long-lost frogs and the search for the mysterious thylacine.

Adults-Only Science

Questacon Canberra, 2 September

Nearly 2000 people descended on Questacon for a special night of science. Attendees enjoyed

interactive displays and live music with 30 emerging science leaders as guides. For some, the drawcard was the opportunity to see Academy Fellow and Nobel Laureate Professor Brian Schmidt AC FAA FRS chatting to *The Bachelor's* Dr Matt Agnew about astrophysics. The partnership between the Academy and Questacon was a huge success for the alumni of the Lindau Nobel Laureate Meeting Fellowship program.

Falling Walls Lab Australia

Canberra, 24 August

Twenty emerging innovators gathered at the Shine Dome to present their ideas, research and initiatives on the theme 'Which walls will fall next?'

Each participant had just three minutes to make their pitch in front of a jury of eminent academics and leaders from government, business and finance.

Opposite page: Canberra locals and visitors were keen to get a glimpse inside the Shine Dome during the Heritage Festival.

Above: Professor Brian Schmidt in conversation with *The Bachelor's* Dr Matt Agnew at Adults-Only Science.

Right: Academy Fellow Emeritus Professor Hans Bachor (left) with Kate Secombe, Dr Elena Schneider-Futschik and Rhys Pirie in Berlin for the Falling Walls Lab competition.

Dr Elena Schneider-Futschik from the University of Melbourne won first place for her pitch on 'breaking the wall' of pharmacology for cystic fibrosis patients. Second place was awarded to Kate Secombe, a PhD candidate at the University of Adelaide, with University of Queensland PhD candidate Rhys Pirie in third place.

The three winners went on to represent Australia at Falling Walls Lab in Berlin, Germany, with the support of the Falling Walls Foundation. The Academy congratulates Rhys Pirie, who became the first Australian to win Young Innovator of the Year, competing against 100 finalists from more than 60 countries.

The Australian Lab was made possible by sponsors CSIRO, ANSTO, AT Kearney, the German Embassy, and the Department of Industry, Innovation and Science.

World Science Festival Brisbane

Brisbane, March

Two Academy events shone 'after dark' at the World Science Festival Brisbane in March 2019. At the Queensland Museum's After Dark event, the Academy presented a theatre show '10 elements in 10 minutes—or near enough!' featuring ABC science journalist and Academy Fellow Professor Robyn Williams AM FAA, and Dr Nicole Lawrence from the University of Queensland. The Academy also ran an interactive

'chemistry of gin' booth in conjunction with the Art of Booze, a boutique Australian distillery.

Emerging Issues in Science and Society

Melbourne, 2 July

This symposium, supported by the Academy's National Committee for History and Philosophy of Science, brought together social science and humanities scholars with those in the physical and life sciences. Speakers addressed challenging issues such as genetic testing, creating clean water in remote communities, the future of food sustainability, and bias in artificial intelligence.



Far left: Professor Wendy Hoy AO FAA introduces speakers at Science at the Shine Dome 2019. Above: EMCRs at Science at the Shine Dome. Left: Glinda Major (left) from Teachers Mutual Bank Limited meets retired astronaut Dr Andrew Thomas AO at the Science at the Shine Dome gala dinner. PHOTOS: BRADLEY CUMMINGS.

Science at the Shine Dome 2019

Shine Dome Canberra, 28–30 May
The Academy's premier annual event, Science at the Shine Dome, brought together more than 500 attendees for a three-day event featuring 36 speakers. The event kicked off with a one-day symposium 'Power up Australia, the sustainable way'. Twenty-two new Fellows were formally admitted to the Academy, and presented their work in a series of engaging presentations. The celebration of scientific excellence continued with the glamorous gala dinner at the National Museum of Australia. On the final day, Academy supporters and donors mingled with awardees at a special breakfast, and honorific awardees received their medals.

This celebration of scientific excellence would not be possible without the generous ongoing support of 18 event partners spanning academia, corporate businesses and government agencies. In 2019, four event

partners supported specific areas of interest, including STEM education, the gala dinner, EMCR engagement and diversity and inclusion.

A further thirteen event partners received recognition packages tailored to their interests and goals, while 11 research institutions provided funding for 31 EMCRs to attend the event. Each partner

Above: Delegates at Science at the Shine Dome 2019 enjoyed presentations on cutting-edge science. PHOTO: BRADLEY CUMMINGS.

helps to make Science at the Shine Dome a special experience and a hotly anticipated fixture for the Australian science community. See also 'Making the grade' (page 10).

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Please contact Isobel Griffin on **02 6201 9480** or email isobel.griffin@science.org.au to discuss leaving a legacy gift to the Academy.

Australian Academy of Science ABN 90 700 613 342

How can it be that a pregnant Aboriginal or Torres Strait Islander woman in Australia is *ten times more likely* to have type 2 diabetes than a non-Indigenous pregnant Australian?

Diabetes during pregnancy increases the risk that the child will also develop diabetes. From 2014 to 2018, there was a 52 per cent increase in early-onset type 2 diabetes in Indigenous Australians aged 15–24. It's a self-perpetuating cycle that's creating a massive burden of disease in First Nations Australians.

But it hasn't always been this way. Dr Matthew Hare, a clinician and researcher at the Menzies School of Health Research, says these concerning trends can be reversed—with the introduction of public health measures based on evidence from in-depth intergenerational studies.

...one of Douglas's great wishes was to support young researchers. Her bequest to the Academy enables the fulfilment of this wish—with huge impact for the early-career researchers who benefit.

Hare is at the early stages of one such study, looking at the instances and risk of chronic disease in mothers and their babies. To do this, he will investigate records of around 170 000 Indigenous and non-Indigenous people in the Northern Territory from the last three decades. This includes a close look at how high or low birth weights may influence the risk of developing diabetes later in life.

Before undertaking this research for his PhD, Hare was working as a doctor, specialising in endocrinology and diabetes. He has noticed that in the community there can be a “sense of inevitability—everyone in my family has diabetes, so I'll get it too”, despite the fact that type 2 diabetes is a metabolic disease, highly influenced by lifestyle and circumstance, rather than solely on genetics. Through this big data study, he hopes to unlock more evidence about these links, with the strong motivation that it may lead to change.

First Nations populations across the globe have shown similar trends in metabolic disease since experiencing rapid lifestyle and diet changes, trauma and loss of culture during colonisation. Hare cites evidence from the Pima Indian nation

Opposite page: Dr Matthew Hare used his award to purchase a computer that could handle analysing the large sets of data that the project required.

in Arizona USA and from First Nations Canadians, which, like those in Australia, have shown a rise in early-onset type 2 diabetes as well as a high prevalence of diabetes and related complications.

Hare's project has been assisted by the Douglas and Lola Douglas Scholarship in Medical Science. The award covers costs of small items of equipment, research materials, travel or research assistance.

The scholarship was made possible by Lola Douglas, a philanthropist with a keen interest in medical research. Douglas's main charity was the Royal North Shore Hospital in Sydney, but one of her great wishes was to support young researchers. Her bequest to the Academy enables the fulfilment of this wish—with huge impact for the early-career researchers who benefit from the scholarship.

Hare is one of many highly ranked PhD candidates studying public health supported by this annually awarded scholarship since 2005.


“As a research student, having access to and control of these additional funds has been very helpful. We've been able to strengthen the project in ways that we weren't planning to otherwise,” Hare says.

The \$7000 was used to buy a new computer that could handle analysing the large sets of data that the project required—making the process much more efficient. It also supported some of the fees needed to acquire national mortality statistics; getting your hands on data is a large part of the budget and the process.

Looking forward, Hare is considering projects related to chronic diseases.

“There is a lot more to be done to better understand chronic diseases, such as obesity and diabetes, that are becoming so highly prevalent. We need to develop population-wide strategies that benefit everyone and reduce inequalities, rather than just targeting high-risk individuals.”

Thank you to Dr TJ Higgins AO FAA FTSE and Professor Jim Williams AM FAA FTSE for their contribution to the selection of this awardee.

 Sustainable Development Goals
Goal 3 Good Health and Well-Being. Goal 10 Reduced Inequalities.



For a PhD candidate researching Indigenous health, a scholarship was just what the doctor ordered.

**BIG
DATA
FOR
BIG
CHANGE**

Lift off for an Australia–Europe collaboration to unravel an astronomical enigma.

Cosmic noon

Ten billion years ago, in galaxies across the universe, stars were forming at a record rate. Known as the ‘cosmic noon’, this period in cosmological history remains something of a mystery. What caused the rise and fall of this star-birth peak?

This was a central question at the 2019 Elizabeth and Frederick White Conference, ‘Linking galaxies from the epoch of initial star formation to today’.

Held in February 2019, the conference was the first time Australian researchers have joined forces with the European Southern Observatory (ESO), which focuses on astronomical research in the Southern Hemisphere.

“Australia recently joined the ESO,” says Dr Tayyaba Zafar, a research astronomer at Macquarie University and

chair of the event’s scientific organising committee. “They have a big suite of instruments, so one purpose of the conference was to see how we can make the most of those facilities.”

The collaboration aims to bring together observational, theoretical and modelling researchers to figure out the story of star formation and galaxy evolution across cosmological time. Zafar says there are a few discrepancies to tease out.

“According to prediction, there should be more metal, for example. So is this a problem we can’t see because of our telescopes? Where is that missing metal? Or is there some problem in the underlying physics?” says Zafar. “It’s important to have everyone present for those discussions so we can figure out how to

...it is important for researchers to meet face-to-face—especially in Australia, where time zones isolate us...

maximise scientific return in the future.”

The conference was partially funded by the Elizabeth and Frederick White research conferences.

The late Sir Frederick White KBE FAA FRS was an influential figure in Australian science post-WWII. Trained in physics under Sir Ernest Rutherford, he was chief of the radiophysics division of CSIR (now CSIRO) during the war, helping to develop radar capability. He went on to serve as Chairman of CSIRO from 1959 to 1970.

Sir Frederick’s wife, the late Lady Elizabeth White MBBS, had a keen interest in bushwalking and birdwatching, which inspired Sir Frederick to dabble in ornithological studies during his retirement.

The couple’s generous contributions have allowed the Academy to administer a series of conferences in the physical and mathematical sciences, with specific aims to advance fundamental scientific understanding, enhance homegrown research and bring overseas scientists to Australia.

With this support, the Linking galaxies meeting was able to be “more accessible” says Zafar. “It helped us keep the registration fee very low and meant we could cover a large fraction of students. We also contributed towards childcare subsidies.”

As a result, 162 attendees converged on Sydney for the five-day event. More than half the participants travelled from overseas, while a number of other innovative measures diversified attendance in positive ways.

The scientific organising committee selected from a pool

of anonymised abstracts: they didn’t know the gender, nationality or seniority of the applicant, and instead chose solely on the strength of the science.

“Based only on the science, we were pretty close to 50 per cent gender balance,” says Zafar. There was a strong early-career researcher presence, with students and postdocs giving presentations. “That was surprising,” says Zafar. “Even a masters student is doing good science worthy of selection, but we miss them because we usually wouldn’t pick someone with no publications.”

Geographical distribution was another demographic that surprised, with 19 countries represented. “Other countries are doing good science, we just don’t see it that much because we pick ‘famous’ nationalities,” says Zafar.

Zafar also says that the conference served as an effective advertisement for Australian science, potentially attracting a number of overseas students to pursue opportunities here. “It showed that we have excellent scientists working

here who can supervise and mentor you,” she says.

Although we are more connected digitally than ever, Zafar thinks it is important for researchers to meet face-to-face—especially in Australia, where time zones isolate us from communities in Europe and America. “In person, you can do things in real time,” she says. “Your research becomes more effective, because you have more time for discussion and questions.”

The resulting collaborations promise to be fruitful for investigating the mysterious ‘cosmic noon’, while the success of the first gathering down under has convinced ESO to fund a conference series here. The next Australia–ESO Joint Conference will be held in Perth in February 2020.

Thank you to the Elizabeth and Frederick White Research Conferences committee members: Professor Benjamin Eggleton FAA FTSE (Chair), Professor Maria Forsyth FAA, Dr Jeremy Mould FAA and Professor Martina Stenzel FAA.

Below: More than 160 scientists gathered in Sydney at the 2019 Frederick and Elizabeth White Conference, ‘Linking galaxies’.



PHOTO: AUSTRALIAN ASTRONOMICAL OBSERVATORY



The art of chemistry



An Academy-funded competition challenged students to infuse their art with science.

Chemical elements come in all kinds of shapes, textures and colours: from the bright lights of neon to lustre of gold.

In the first half of 2019, school students from across Australia used the elements as inspiration in a chemistry-themed art competition, scienceXart, to celebrate the International Year of the Periodic Table. Spearheaded by the Academy's National Committee for Chemistry, the competition asked students to create artworks on the theme 'elements in everyday life', or to reimagine the periodic table.

The judges were impressed by the diverse and creative submissions and selected entries were displayed at the International Union for Pure and Applied Chemistry (IUPAC) World Chemistry Congress in Paris, France on 8 July.

In the Primary School category, Year 2 student Makan Wang took first place with his elemental depiction of a Spinosaurus, writing, "Even the oldest and

biggest carnivores are made of elements".

Year 9 duo Jade Williams and David Zhan won the High School category with their inventive representation of the periodic table. "Our artwork represents the periodic table through displaying the elements categorised by which cosmic phenomena created them," they said. "Starting from the bottom left going clockwise, these phenomena are: Supernova, Mankind, Yellow Dwarf Stars, Colliding Neutron Stars, Red Dwarf Stars, Red Giant Stars, Red Supergiant Stars, and Blue Giant Stars."

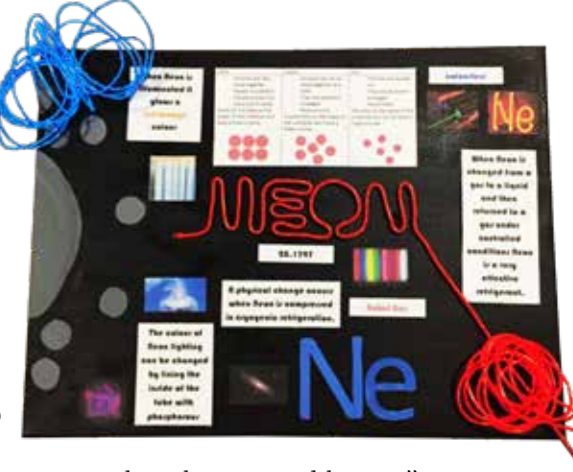
Year 8 student Lily Wigan won the Middle School category with her project on neon. "The electro luminescent light is wrapped in wire to show that the element neon can be harnessed using human ingenuity," she said.

The students who produced the winning entries and their guardians travelled to Canberra in August for a 'behind the science' tour of the capital's top science landmarks, including the Shine Dome, the Australian National University's Heavy Ion Particle Accelerator, Questacon, and Mt Stromlo Observatory, where they attended a stargazing night.

The tour proved to be a valuable experience for the budding scientists, with Lily and her father Chris writing that the

tour "made a huge difference to the way we appreciated the many wonders that were explained to us".

The impact of the tour has expanded beyond the four attendees and their guardians, as Lily "fielded many questions from her peers and school staff



as to what she saw and learnt," according to Chris. "The competition and her achievement has been very exciting and motivating to a lot of people on her school campus," says Chris. "The Academy's spirit and enthusiasm for inspiring young people in science is evident from this type of initiative."

The competition was designed to align with the science syllabus and "offered a fantastic opportunity for students of all year levels to engage hands-on with the periodic table," says project manager Indigo Strudwicke.

"It facilitated a deeper understanding of key principles of chemistry and fostered an appreciation of the wider impact of the chemical sciences throughout life and society."

Opposite: highly commended artwork by Lily Talbot, Year 11. Right: Makan Wang's 'Spinosaurus'. Above right: Lily Wagan's prize-winning entry on neon.



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For more information about giving to the Academy or supporting Interviews with Australian Scientists, please contact Philanthropy Manager, Isobel Griffin on **02 6201 9480** or email isobel.griffin@science.org.au

Above: Recipients of the 2019 Max Day Environmental Science Fellowship Award Dr Tim Doherty and Nicole Foster with Jon Day, son of Dr Maxwell Day AO FAA, at Science at the Shine Dome. Tim also received a grant from the Margaret Middleton Fund in 2017 (see page 14). PHOTO: BRADLEY CUMMINGS.
Right: Philanthropy Manager Isobel Griffin.



*A collection
of stories
highlighting
collaborative
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