

↗ **A GUIDING HAND**  
Smart gloves coach young surgeons

↗ **EDUCATION FOR ALL**  
Supporting kids with disabilities

↗ **BOT THE BUILDER**  
Robot helpers on construction sites

# FUTURE-MAKERS

## ROOM FOR GROWTH

Mega-greenhouse a fertile test-bed



WESTERN SYDNEY  
UNIVERSITY

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embracing Australia's global city, Sydney.  
Established in 1989, the University proudly  
traces its history to 1891 through the  
Hawkesbury Agricultural College. Today the  
University has more than 200,000 alumni,  
45,000 students and 3,300 staff.

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global university ranking systems, and is  
in the top 2% of universities worldwide.  
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strengths and facilities, the University  
continues to build its profile as a research  
leader in Australia and is nurturing  
the next generation of researchers. Western  
Sydney University graduates go on to  
take up rewarding careers that make real  
contributions to societal change, lifting the  
pride of students, staff and the community.

A guiding principle for the University  
is that there is no limit to potential success  
for those with drive, talent, confidence  
and ambition.  
westernsydney.edu.au

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A photograph of a man and a woman in a laboratory setting. The man is on the left, wearing glasses and a dark t-shirt. The woman is on the right, smiling broadly, wearing a dark sleeveless top. The background shows laboratory equipment and a grid pattern.

**INVESTING IN  
SUCCESS**

**50**

**FUTURE  
LEADERS**

Building on our established research excellence, Western Sydney University is recruiting 50 top performing early and mid-career researchers, nationally and internationally. Over the next five years we will expand our already burgeoning research reputation, and enhance the research strengths of our Schools and Research Institutes.

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ON THE COVER



➤ Bringing agriculture indoors  
page 39

Cover image:  
© Daniel Boud

# WESTERN SYDNEY RESEARCH: EMPOWERING PEOPLE ACROSS THE GLOBE

Welcome to the fourth edition of the *Future-Makers* publication, which showcases Western Sydney University’s innovative and impactful research.

At Western Sydney University, we proudly use our knowledge to help create a better future, locally, regionally and globally. The pioneering research highlighted in this edition focuses on four key themes: education and work; environment and sustainability; health and wellbeing; and urban living futures and society. The exciting stories that are shared intersect and address the challenges these global themes present.

Western Sydney University’s breadth of research expertise and effective collaborations with external partners including industry, community, government and policy makers, are reflected in these stories of research excellence and shared-endeavour.

The accounts of research achievement presented in *Future-Makers* showcase Western’s efforts and approach to societal challenges – the grand and the everyday. The stories presented range from the

benefits of controlled ‘cool’ burning of bushlands by Indigenous people, identifying the critical need to normalise naked foods to reduce plastic packaging waste, broadening gender diversity through curriculum change, developing language inventories and communication skills in Indigenous children, giving a voice to children and mothers in enhancing global nutrition, and boosting diabetes prevention among Samoan-Australians in Western Sydney through a community intervention program.

We trust you will enjoy reading the stories of Western Sydney University’s world-class research and the extraordinary researchers behind the exemplary work. ♥

**Professor Barney Glover AO**  
Vice-Chancellor and President

**Professor Deborah Sweeney**  
Deputy Vice-Chancellor and Vice-President  
(Research, Enterprise and International)



The UN’s Sustainable Development Goals (SDGs) are a blueprint towards a better, more sustainable future (see: [sustainabledevelopment.un.org](https://sustainabledevelopment.un.org)). Western Sydney University has many research projects aligned with these goals. We have indicated the most relevant SDG above each article in this issue of *Future-Makers* where applicable.



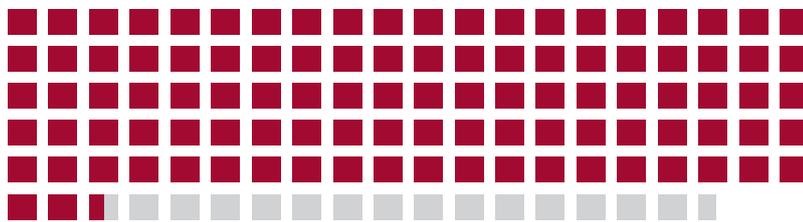
# WESTERN SYDNEY UNIVERSITY IN NUMBERS

Located in Greater Western Sydney, one of the fastest growing regions in Australia, Western Sydney University is home to a vibrant and diverse community of staff and students.

## STAFF

### ACADEMIC STAFF COMPOSITION ■ = 10 people

**1,176** TOTAL STAFF    **1,025** RESEARCH STAFF



### GLOBAL PERSPECTIVE



## STUDENTS

### EDUCATIONAL ATTAINMENT IN FAMILY



**48,533**  
TOTAL  
STUDENTS

**66%**  
FIRST IN FAMILY  
TO OBTAIN  
UNIVERSITY DEGREE

## ALUMNI

**200,000+**  
GRADUATES

**20,000+**  
WORKING OVERSEAS  
IN 128 COUNTRIES

## GLOBAL RANKINGS

**TOP 2%** 2020 Times  
Higher Education  
World University  
Rankings

**THE WORLD UNIVERSITY RANKINGS 2019 TOP 60 YOUNG** **58th**  
in the THE Young  
University Rankings

**THE UNIVERSITY IMPACT RANKINGS 2019 TOP 20**  
**1st** in Australia  
**11th** in the world

**5 GENDER EQUALITY** **1st** in the world  
**10 REDUCED INEQUALITIES** **2nd** in the world

Ranking for individual sustainable development goals

### 2019 LEIDEN RANKINGS FOR RESEARCH COLLABORATION



**80th** in the world    **3rd** in Australia

**QS WORLD UNIVERSITY RANKINGS TOP 100 2020**

Communication & Media Studies, Nursing, and Sociology

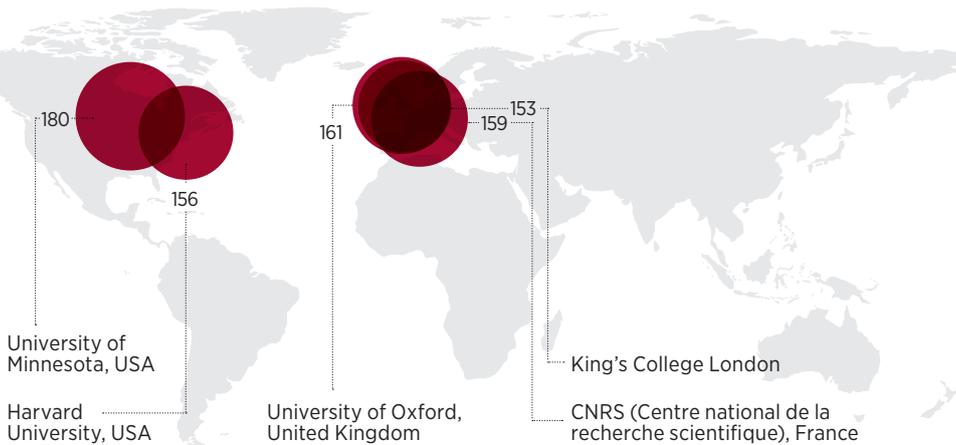
### ACADEMIC RANKING OF WORLD UNIVERSITIES

**41st** Ecology  
**TOP 75** Agricultural Sciences & Civil Engineering  
**TOP 100** Education and Nursing

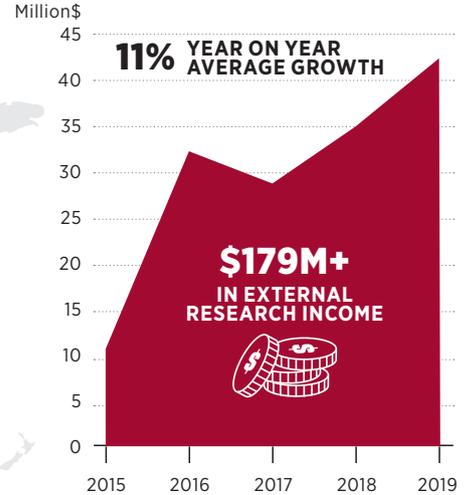
# RESEARCH

## TOP 5 INTERNATIONAL COLLABORATORS

based on co-authorship for 2014 to 2019 in Scopus-indexed publications ● = Number of co-authored publications

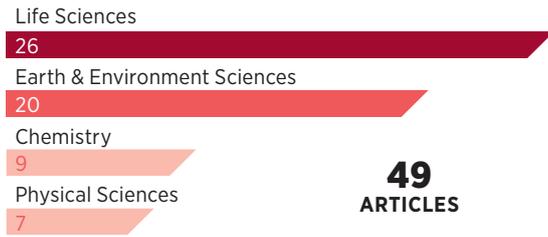


## RESEARCH INCOME



## RESEARCH OUTPUT BY SUBJECT IN THE NATURE INDEX

(1 October 2018 - 30 September 2019)



\* Articles in the Nature Index ([www.natureindex.com](http://www.natureindex.com)) may appear in more than one subject category

## HIGHER DEGREES COMPLETED IN PAST 5 YEARS

(2015 - 2019)



**995 COMPLETED DEGREES**

## PRODUCE DONATED TO FOODBANK IN 2019 FROM PROTECTED CROPPING RESEARCH



**22,655kg**

# 2018 EXCELLENCE IN RESEARCH FOR AUSTRALIA DISCIPLINES ABOVE WORLD STANDARD



- Agricultural and Veterinary Sciences
- Biological Sciences
- Complementary and Alternative Medicine
- Cultural Studies
- Ecological Applications
- Ecology
- Electrical and Electronic Engineering
- Environmental Sciences
- Evolutionary Biology
- Forestry Sciences
- Microbiology
- Nursing
- Oncology and Carcinogenesis
- Pharmacology and Pharmaceutical Sciences
- Plant Biology
- Soil Sciences
- Zoology



- Applied Mathematics
- Biochemistry and Cell Biology
- Communication and Media Studies
- Environmental Science and Management
- Human Geography
- Human Movement and Sports Science
- Language, Communication and Culture
- Linguistics
- Macromolecular and Materials Chemistry
- Materials Engineering
- Mathematical Sciences
- Medical and Health Sciences
- Performing Arts and Creative Writing
- Psychology
- Psychology and Cognitive Sciences
- Pure Mathematics
- Sociology
- Statistics

# FAST-TRACKING GREEN CITIES



Light rail tracks offer an unexpected opportunity to add greenery to cities.

## Planting vegetation

along light rail tracks could add the equivalent of two football fields of green space to the middle of Parramatta, according to Western Sydney University research.

In a viability study commissioned by Transport for NSW for the Parramatta Light Rail project, Western researchers found that installing what will be Australia's longest green track will have multiple benefits.

After receiving the team's report, Transport for NSW committed to adding three separate sections of green track totalling 900 metres, as part of the Parramatta Light Rail project which is expected to open in 2023.

Lead researcher Dr Sebastian Pfautsch, from Western's School of Social Sciences, says that replacing hard surfaces such as concrete and bitumen along light rail with grasses and groundcover offers a rare opportunity to green Parramatta city, where land is in high demand.

"If you put it together, we are adding more than one hectare of green space in Parramatta downtown," says Pfautsch. "It's amazing!"

The Parramatta Light Rail program director Mr Anand Thomas agrees, adding that the "green track will make the light rail blend in better with the existing local landscapes".

The team's review of green track around the world found that

it can make cities cooler, quieter and improve their air quality, which would be particularly beneficial around areas such as Parramatta's Westmead hospital complex.

They also found that greenery along light rail tracks not only provides habitat and biodiversity, it filters and reduces stormwater runoff. The team's report notes that in Parramatta, where annual rainfall is 960 millimetres, between 480-670 litres of stormwater would be retained yearly for each square metre of green track. Any runoff would be filtered by the vegetation and contain less pollutants than if it had fallen on hard surfaces such as concrete.

Pfautsch says green tracks can even increase property values and

viability of businesses along the tracks, such as cafes, because they create pleasant streetscapes.

While green track is found all over the world including Spain, France and Japan, it has never been tried in a hot, dry climate like that of western Sydney. Pfautsch's review found that green track is suitable in western Sydney if appropriate plant species are used.

"We proposed ground covers which had low mowing, nutrient, and watering requirements," says Vanessa Howe, PhD student and co-author of the report.

"The species are native to western Sydney and are pretty tolerant to being walked over," she adds.

The team also identified the need for proper irrigation and maintenance. As temperatures in Parramatta may regularly reach the high 40s in the next five to ten years, irrigation will be essential.

"Without regular maintenance it will look ugly and people won't like it," says Pfautsch.

Pfautsch is confident that the Parramatta green track will become a model for the rest of Australia.

"The positives are so overwhelming and the risks are manageable once you have the right strategies. Green track is a good example for progressive, functional urban design," says Pfautsch. ■

## NEED TO KNOW

- Western researchers conducted a viability study on green tracks for the Parramatta Light Rail Project.
- After receiving the report, Transport for NSW agreed to add 900 metres of green track.
- This will add more than one hectare of green space in Parramatta.

This research was funded by Transport for NSW. © ddoevmore/iStock/Getty



Green track will help filter rainfall and reduce flooding, among other benefits.

---

“WE ARE ADDING MORE THAN ONE HECTARE OF GREEN SPACE IN PARRAMATTA DOWNTOWN.”

---

3 GOOD HEALTH AND WELL-BEING



# ACTING ON MENTAL HEALTH PROBLEMS

A play that challenges perceptions of perinatal mental health.

**A dramatisation of the anguish and doubts** experienced by many women during pregnancy and in the early months of parenting aims to help mothers realise that they are not alone.

Discussing mental health is difficult, despite its ubiquity. Around one in five women experience a mental health problem during pregnancy or in the year after childbirth. Many are hesitant to ask for

help, but without the right care, perinatal mental illness can become an intergenerational trauma by affecting the mother-baby relationship, and can ultimately increase the child's risk of mental illness. With the aim of helping these women, Western Sydney University contributed to the creation of a play, which is helping reduce the feeling of isolation for women who feel shame about their ability to cope.

## “IT’S A POWERFUL VEHICLE TO PROMOTE EMPATHY.”

Dr Diana Jefferies, senior lecturer from the School of Nursing and Midwifery at Western Sydney University, wanted to give a voice to women who experience mental illness in the perinatal period. With more than 25 years of experience as a mental health nurse, Jefferies investigated historical representations of mental illness after childbirth. She used this research to contribute to Lisa Brickell’s *Mockingbird*, a black comedy about motherhood and mental health. The play follows four generations of Brickell’s

### NEED TO KNOW

- Mental illness during the perinatal period can harm both mother and child.
- Western researcher, Dr Diana Jefferies, contributed to a play about mental illness after childbirth.
- The play has been seen by 2,000 people.

family through mental illness after childbirth.

The play separates the women from the medical accounts normally used to describe their mental illness. Actors in the performance interact with a masked character that embodies their thoughts, to build a picture of their lived experience. “It acts as a powerful vehicle to promote empathy and gives patients a chance to share their experience,” says Jefferies.

*Mockingbird* has been performed at conferences for healthcare professionals to encourage them to view perinatal mental health in a different light. It has also been performed to sold-out audiences in Melbourne, Sydney, and around New Zealand, seen by around 2,000 people.

Jefferies hopes to see *Mockingbird* performed to wider audiences in regional NSW and at the Edinburgh Fringe Festival. She believes that bringing issues out into the open is the first step towards understanding and improving mental health care for women and their babies. ♥



Lisa Brickell in a scene from *Mockingbird*.

This research was supported by the Australian Government through the Australian Research Council (ARC) Centre of Excellence for the History of Emotions. © Lisa Brickell

## 3 GOOD HEALTH AND WELL-BEING



## BOOSTING DIABETES PREVENTION

A community intervention program has improved the health of Australian Samoans with diabetes in south-western Sydney.

### A doctor approached

a Western Sydney University diabetes expert, Distinguished Professor David Simmons from the School of Medicine, at a conference, and explained how she was struggling to treat patients of Samoan heritage. She described how many of her patients in south-western Sydney were being treated in hospital, or dying from avoidable complications from diabetes.

Professor Simmons relayed the conversation to his colleague at Western, Dr Freya MacMillan, a senior lecturer in the School of Health Sciences, and the chance meeting became the impetus for Simmons and MacMillan to establish a pilot study. They liaised with three Samoan churches in south-western Sydney and set up a reference group of community leaders to

advise them in the project. Churches are the central meeting point for the Samoan community both in their home country, and in Australia.

Australia has a significant number of immigrants from the Pacific Islands. According to the 2016 census, 75,755 people are of Samoan heritage and more than 40% of them live in New South Wales. Samoans have an inherited predisposition to diabetes, but prior to the Western study, there was little research on the effectiveness of public health interventions to reduce the health risks of diabetes.

MacMillan and Simmons' team developed a program called *Le Taeao Afua* (the new dawn) derived from evidence-based research on community interventions and tailored by participants themselves to fit the Australian-Samoan lifestyle. The University trained a Samoan community activator, who in turn trained 20 church volunteers to become peer support facilitators.

Of 187 participants enrolled at the start of the program, 96% were overweight or obese and 32% had Type 2 diabetes. "The really worrying thing was that 13% didn't even know they had diabetes until we tested their blood," says MacMillan.

Volunteers developed workshops and more than 100 activities covering 12 public health messages dealing with diet and exercise.

IN THE 2016 CENSUS

75,755 PEOPLE

were of Samoan heritage



lived in New South Wales



\$4.5 MILLION

Funding was secured from the Australian Government to roll out *Le Taeo Afua* to 48 CHURCHES



These included cooking classes that introduced people to new vegetables, and also revived others used in Samoan culture that may have been forgotten, or promoted steaming and grilling instead of deep frying.

"We looked at affordable and seasonal options to take away the stigma that healthy eating is expensive," says Ronda Thompson, the community activator. Zumba classes, resistance band exercises and family power walking were some of the physical activity favourites.

After 3-8 months, the participants had statistically significant reductions in average blood glucose levels (HbA1c), showing that the project had improved people's health.

Following the pilot's success, the University secured \$4.5 million in funding to roll their program out to 48 churches encompassing other Pacific communities across greater western and south eastern Sydney. The team will train more community activators to reach more than 3,600 adults, and their children.

"We're thinking about affordable translation," MacMillan says. "By empowering communities, our goal is to embed this program into the health care system and sustain it. We hope it can then be translated across New South Wales and Australia." ♥

### NEED TO KNOW

- Many people of Samoan heritage in south-western Sydney are at risk of diabetes.
- Western's Simmons and MacMillan developed a community intervention program called *Le Taeao Afua*.
- Program participants had significant reductions in average blood glucose levels.

5 GENDER EQUALITY



# TACKLING INCLUSIVITY

Flexibility in dress codes makes sport a more inclusive pursuit.

**When Amna Karra-Hassan founded** the first mostly Muslim women’s Australian Rules football (AFL) team in 2011 she had no idea of the impact it would have.

Although the western Sydney club welcomed women and girls of all religions, cultures and ethnicities, the sight of Muslim players deftly drop-kicking a ball while wearing headscarves, tights and long sleeves as part of their uniforms soon attracted media attention and commentary. Western Sydney University sociologist, Dr Jennifer Cheng, was not surprised.

As a member of Western’s Challenging Racism Project, Cheng has been observing Muslim women and their relationship with sport since a chance meeting with Karra-Hassan in 2016.

She believes the female AFL players were seen as a bit of an oddity because their participation went against the general belief that Muslim women were not allowed to play sport because of their religion.

Cheng says there is a clear association between sport and ‘Australianness’ in society and failure to participate in sport is viewed as a failure to integrate into Australian culture and adopt Australian values.

Yet, through interviews with 13 members of the Auburn Giants AFL team, Cheng found religion had little bearing on the participants’ decision to play a sport. Instead, she found that many of the women had played sport since they were young, with the support of their families.

Modest clothing is an important factor for some Muslim women and girls when deciding what kind of sport to play. “A major barrier to Muslim women’s participation in sport is lack of accommodation by the various sports codes of their dress requirements,” says Cheng. “That’s why it’s important to give them a full range of choices in sporting uniforms.”

For the participants in the AFL study, dealing with Islamic dress requirements



This research was funded by the Freilich Project Early Career Research Small Grants Scheme. © Quinn Rooney/Staff/Getty Images Sport/Getty

An Auburn Giants player during an exhibition match in Melbourne, 2015.

was possible because the AFL code allowed them to wear long sleeves and leggings or tights underneath the standard uniform.

Cheng says the Auburn Giants AFL example shows that small accommodations can be significant in enabling Muslim women to participate in sports of their choosing.

“Wearing conservative garments while playing Aussie Rules has not made the participants any less integrated or Australian, nor have they had to be less Muslim or less ostensibly Muslim,” she says. “Indeed, the participants have to some extent normalised wearing a hijab while playing competitive sport.”

Karra-Hassan agrees, adding that Cheng’s research was an important contribution because it captured what they knew anecdotally as a club: “That we need to create inclusive practices, and codes need to create inclusive policies to allow Muslim women to dress in a culturally and religiously appropriate way so they can participate.”

Cheng has followed her 2016 AFL study with a further examination of Muslim women’s participation in sport. This included interviews with Punchbowl United Football Club members, the Swim Sisters — a religiously diverse female swimming group — and mothers whose children played AFL Auskick. Cheng says this recent study,

although yet to be published, has reinforced many of her earlier findings.

One new observation she made was that many Muslim women involved in sport reject the idea that they are breaking down barriers and stereotypes. “In a way putting them up as examples is confirming this idea that they are not the norm and they don’t want to spread that image,” she says.

Supporting this view is the Swim Sisters participant who said: “We don’t get up and train at 5am because we want to challenge stereotypes, but because we want to train and you want to achieve the goal you set yourself.”

---

**“CODES NEED TO CREATE INCLUSIVE POLICIES SO MUSLIM WOMEN CAN PARTICIPATE.”**

---

Punchbowl United Football Club president, Natasha Hill, agrees with the sentiment. She says the club took part in the study to provide more information about Muslim women’s participation in sport. “It helped give an insight into why we do it and how we do it,” she says. “What we know is playing sport is becoming the norm in communities and Jennifer’s research gave us a platform to highlight that.”

### NEED TO KNOW

- Sport is associated with ‘Australianness’.
- Muslim women are keen to participate in sport.
- Accommodating religious dress requirements can make sport more accessible.

Like the AFL, the local football association in Canterbury-Bankstown supported Punchbowl’s female Muslims by agreeing to allow the club flexibility in its uniform to meet modesty requirements.

Similarly, the invention of the burkini in 2004 by Australian Aheda Zanetti was a game changer for Muslim female swimmers. One Swim Sister said, while in the beginning women wearing the burkini had to highlight the swimwear was “approved” to avoid criticism, its popular adoption meant “nowadays nobody says anything”. Cheng says this example highlights how increased awareness can change attitudes.

Cheng believes her studies show the contribution of sport to social cohesion is not as simple as minorities integrating into mainstream competitive sports. Rather she says sporting codes can go a “long way” in engaging Muslim women by acknowledging the need to accommodate religious requirements such as dress code, women-only hours, and even alcohol-free social gatherings.♥

4 QUALITY EDUCATION



# A CHECKLIST FOR SPEECH SUCCESS

A new tool can assess communication skills in young Indigenous children in the languages they speak at home.

**Spoken language difficulties** are one of the most common developmental hindrances in early childhood, with about 10-20% of children affected across the world's many cultures. In Australia, Aboriginal children also have relatively high rates of middle ear infections (otitis media) leading to hearing loss. But there are few tools that are culturally and linguistically appropriate for assessing early communication for Aboriginal and Torres Strait Islander children.

At Western Sydney University's MARCS Institute for Brain, Behaviour & Development, Professor Caroline Jones and her team have designed a checklist guided by Indigenous families who speak more than one language or dialect. Available as an app or a hardcopy list, the Early Language Inventory (ERLI) is designed to be a conversation starter between parents and professionals, to help spot children who might have speech, language or hearing difficulties, and promote joint decision-making and early intervention when needed.

The checklist can be used by parents in collaboration with speech pathologists, early childhood educators, health workers, or researchers, to assess children aged between 8 and 36 months, or older if the child has special needs. It includes 112 early acquired words and 8 hand signs, and asks the parent how they say each item at home, respecting the diversity of Indigenous languages and cultures in Australia.

## NEED TO KNOW

- MARCS researchers have designed a checklist to help identify children with speaking, language or hearing difficulties.
- The ERLI checklist was developed in consultation with Indigenous families.
- It is now being used by speech pathologists in urban, regional and remote areas of Australia.

"ERLI is a new local, short-form adaptation of the internationally known MacArthur-Bates Communicative Development Inventories," says Jones. "We know that early support is vital in speech, language and hearing. This checklist can help professionals accurately assess children's communication in partnership with the parent, so the parents can get support for their kids if

needed, before communication difficulties affect their social and academic success."

ERLI was first developed in 2014 through interviews with Aboriginal parents from the Katherine region in the Northern Territory in partnership with Sunrise Health Service and The Smith Family, and funding from the Australian Research Council (ARC).

Jones and her group have teamed up with Hearing Australia and National Acoustic Laboratories (NAL) to explore how ERLI can complement NAL's Parent-evaluated Listening & Understanding Measure (PLUM) and Hear and Talk Scale (HATS), which are short parent-checklists that can be used by early childhood education and health professionals to assess whether a child may need a referral for hearing or speech-language support.

In partnership with Wurli-Wurlinjang Aboriginal Health Service in Katherine, Northern Territory and Tharawal

Aboriginal Corporation in Campbelltown,

New South Wales, in 2018-19 the three tools were trialled, with full hearing and language assessments to cross-validate their accuracy.

The large research team also ran co-design workshops with Aboriginal health and education professionals across New South Wales, Northern Territory and Queensland to fine-tune training materials. The project has received funding, through NAL, from the Department of the Prime Minister and Cabinet.

Jones and her team, together with health services, early childhood centres, and speech pathologists, are exploring how families and professionals from across Australia may benefit from the assessment tool. The project is currently funded with the ARC Centre of Excellence for the Dynamics of Language.

Chantelle Khamchuang, an Aboriginal woman and an honours student within the project, is working with Aboriginal families living in Sydney to investigate how ERLI can be used by families who use Aboriginal ways of speaking English, at home.

Eugenie Collyer (left) and Jaidine Fejo (right) presenting the Early Language Inventory to the Speech Pathology Australia Darwin branch.



This research was supported by the Australian Government through the Australian Research Council (ARC) Centre of Excellence for the Dynamics of Language; and the Department of the Prime Minister & Cabinet.

© Caroline Jones

4 QUALITY EDUCATION



A drawing from one of the children in the project.

In research with Aboriginal communities it is important to ask permission and listen to the advice and input from the elders. “Parents are still speaking home language, so children are speaking home language. This is how our children talk,” says Aunty Pat Field. “There’s a need for a culturally appropriate tool.”

In June 2019, Jones and her project team members, Jaidine Fejo and Eugenie Collyer, presented the ERLI tool at the Speech Pathology Australia National Conference. Since then, speech pathologists in remote, regional and urban areas of Australia have started using the tool to assess communication skills in young Indigenous children, by asking the parent about the local home language words that their child knows, such as ‘tidda’ for ‘sister’.

“One immediate positive outcome of the collaborative project was that some children who had been on waitlists for audiology received a hearing test and follow-up,” says Jones.

Laura Doig, speech pathologist at Sydney Children’s Hospital Randwick says that the ERLI tool has helped spark conversations with parents about their child’s communication development.

“Some families have said that they had not realised how many words their child can understand,” says Doig. “It is great to have a tool that values the parents as the experts on their child’s communication.”

## COURSE OF NATURE

Child-led activities with animals and the outdoors can broaden the scope of learning in unexpected ways.

**Through an open-ended project** observing children’s interaction with nature, researchers are taking leads for a new style of education.

The project is about broadening literacy skills and fostering a sustainability mindset in early-childhood education. “The children of the 21st century live in the time of climate change – the question is, how can we develop powerful teaching methods that prepare these children for the unexpected?” asks chief investigator, Professor Margaret Somerville, of Western Sydney University’s School of Education.

In the earliest phase of the project, the researchers — Somerville, Tessa McGavock from the WSU Early Learning Centre, and Dr Sarah Powell from Macquarie University — took photos and videos of children during their everyday play with nature. Unlike the adults children would usually encounter, the researchers did not instruct or educate. Instead, the adults participated in child-directed play and closely observed the children. “The process was child-led and very much about making

discoveries along the way,” says Powell.

Through this, the researchers identified seven categories of child’s play which they named: 1) becoming animal; 2) movement, gesture, mime and performance; 3) artefacts and imaginative play; 4) naming bodies, naming self; 5) drumming, singing, dancing, rhythm; 6) bodily immersion in elements; and 7) becoming plant.

Educators at a day-care centre in western Sydney then brainstormed how they might develop creative pedagogical responses to these

categories. One such project, *What we can see outside*, based a range of learning experiences around the observation of “birdies” by zero to three-year-old children. The toddlers learned songs, colours, textures, movement, co-operation, communication, reading, painting, among other skills, through their construction of a bird-bath and repeated engagement with the birds who visited.

The project improved important developmental skills for the children, while deepening their understanding of sustainability and nature more generally.

The idea has expanded to find global connections with a project that involved exchanging regular stories about nature with a Finnish school. This served to deepen the children’s mutual understanding of national differences and exposed them to novelty. “There’s so much potential to recreate the terms that young children learn under. They learn so much when we just let them be,” says Somerville.

### NEED TO KNOW

- Western researchers sought to broaden literacy skills and foster a sustainability mindset in early childhood education.
- They identified seven categories of child’s play, and brainstormed pedagogical responses.

This research was supported by the Australian Government through the Australian Research Council.



# CUSTODIANS OF THE ICE

At the southernmost reaches of the globe, five ‘Antarctic cities’ are discovering a shared identity in relation to a fragile frozen continent.

**Western Sydney University** is leading an initiative for five diverse cities to unite around one commonality: their ties to the Antarctic.

Five key cities surround Antarctica and are officially recognised as gateways to the ice continent: Christchurch (New Zealand), Puntas Arenas (Chile), Ushuaia (Argentina), Cape Town (South Africa), and Hobart, Australia. Professor Juan Francisco Salazar, of Western Sydney University’s Institute for Culture and Society and the School of Humanities and Communication Arts, has led the Australian Research Council Linkage Project, Antarctic Cities and Global Commons, since 2017. The project team includes 15 researchers in five countries, and aims to unite these gateway cities as a Southern Ocean rim cooperative network of Antarctic urban hubs.

“We want to think of these five cities as more than thoroughfares on the way to Antarctica, rather as urban centres embodying the values of Antarctica — international co-operation, scientific innovation and environmental protection — as a custodianship network that can learn from and benefit each other,” Salazar says.

“WE’RE ENCOURAGING PEOPLE TO THINK CAREFULLY ABOUT CULTURAL COMPONENTS.”

Developing such a network is a twofold challenge. First, the initiative must strengthen

This research was supported by the Australian Government through the Australian Research Council.



each city's ties to the Antarctic on economic, ecological, political and cultural levels, and secondly their ties to each other, overcoming historic separation and rivalries.

**ANTARCTICA**  
is nearly  
**TWICE**  
THE SIZE  
OF AUSTRALIA,  
at 13,661,000 km<sup>2</sup>



The Australian Antarctic Territory spans

**42% OF**  
**ANTARCTICA**

In Hobart, Salazar's collaborator, Professor Elizabeth Leane, from the College of Arts, Law and Education, University of Tasmania, says magnifying each city's Antarctic ties will require a genuine cultural shift in the cities. "We're essentially creating a series of tools for the councils to use from this project. We're encouraging people who are connected with the Antarctic sector to think really carefully about cultural components," Leane says.

Bringing the cities together for a united purpose poses an array of obstacles. "On many occasions the cities chose to compete for scarce resources and international investments, rather than find ways to cooperate and share resources," says Salazar. A memorandum of understanding was signed in 2009 by city mayors requiring the cities to explore the

### NEED TO KNOW

- Five southern hemisphere cities are gateways to the Antarctic.
- An ARC Linkage project team seeks to unite these cities into a cooperative network
- The cities' youth are being recruited to lead the initiative.

benefits of collaborative best-practices for Antarctica. However, as Salazar notes, the substantive relationship between these cities remains tenuous. The project aims to address these issues, and the first step has been to engage young people.

Alongside an online, educational game *Antarctic Futures*, led by Associate Professor Liam Magee, simulating Antarctic policy decisions on a 50-year scale, an Antarctic Cities Youth Forum is also being launched. Through an expedition to Antarctica in February 2020, five exceptional young people from each city will travel to the frozen continent to develop the guidelines for a youth custodian network.

The initiative aims to recast these five cities from simply north-serving gateways at a far-flung periphery, into five capitals of a new united focus on the Antarctic. Together, they might then become true custodians of a fragile region, celebrating and stewarding this vital part of our planet. ■



10 REDUCED INEQUALITIES



# RAISING THE ROOF ABOUT HOUSING INSECURITY

Using the stories of society's most vulnerable to effect positive change for renters.

**Single, older women who rent** on low income and with no support, live in constant fear of eviction and often have to rely on charities for food so they can pay their rent. Western Sydney University's Dr Emma Power has gathered first-hand accounts from these women and is using their stories to lobby for change in tenancy laws.

One of the most striking accounts Power heard was that of a Sydney-based tenant in her late 60s. Afraid of eviction,

the tenant hesitantly asked her landlord to repair a leaking roof. By the time he acted, after two years of requests, her rental accommodation was mouldy and 40%, including the bedroom, was uninhabitable. After fixing the property, the landlord increased the rent by 20%, which forced the tenant to move.

While recent amendments to the NSW *Residential Tenancies Act 2010* now mandate minimum standards to be maintained

throughout a tenancy, it is still very difficult for poorer, older tenants to negotiate with or challenge landlords to repair things because they fear rental increases or retaliatory eviction.

"Single, older women are facing a housing crisis. They are one of the fastest growing groups of homeless people in the country," says Power.

This grim statistic prompted Power to find out more about the experiences these women had in securing housing, their interactions with landlords and real estate agents, and how rental insecurity affected their sense of home and their capacity to care for themselves.

She interviewed 46 female Sydney-based renters, aged from 55 to their early 80s, who were either on Newstart (an Australian government scheme providing income support for unemployed people), the disability or aged pension, or had very low or erratic earnings. Three of the women had previously been homeless and lived in cars.

The soaring Sydney property market meant that a large proportion of their income was absorbed by rent. To make do, many women cut down on electricity, heating or food. Some relied on food handouts from charities or food banks.

Power described a woman who worked in a low paid community services job. The woman relied on vegetables the

## NEED TO KNOW

- Single, older women are one of the fastest growing groups of homeless people in Australia.
- Emma Power conducted interviews to find out more about their experiences.
- She is lobbying for changes to NSW tenancy laws.

local greengrocer bundled and discounted before throwing out. In winter, when heating bills were high, she relied on a local church with a weekly food pantry. This food, which was donated by local supermarkets and community members, was frequently past its best before date. As a low paid community worker living in an area with a significant number of disadvantaged families, she collected food alongside her clients.

Power is writing a report for policy-makers and key stakeholders, who are trying to drive change in the sector. She would like to see changes to NSW tenancy laws so minimum standards of housing are quantified, as they are in New Zealand, and an end to evictions without grounds. ♥

With rental prices soaring, many single, older women on low incomes in Sydney have to cut down on food and other necessities.



11 SUSTAINABLE CITIES AND COMMUNITIES



## A BRIDGE TO THE FUTURE

An experimental geographical study captures the traditional socioeconomic fabric of monsoonal Asia as a lens for the future.

### Built every year

for more than half a century, and dismantled before the annual floods, a 1.5-kilometre bamboo bridge spanning the mighty Mekong River between the rural island of Koh Paen and the booming city of Kampong Cham in Cambodia epitomises the ingenuity and resourcefulness of local communities. In 2017, the bamboo bridge was rebuilt for the last time, replaced by a permanent concrete bridge. Progress had come, and with it an end to a generations-long tradition and all its cultural, social and economic significance.

Capturing, understanding and gaining insight from these fading traditions is the focus of the work of economic

geographer, Professor Katherine Gibson, at Western Sydney University's Institute for Culture and Society.

"This research fits within the broader agenda of the Community Economies Research Network, which is an international network of researchers, activists, artists, and others who are interested in new and different types of economies and building more ethical economic and ecological relationships," says Gibson.

"People living in Monsoon Asia have developed ways of adjusting to dramatic seasonal climatic variations," she says. "They also practice forms of mutual support that share workloads, mitigate against

risk and distribute wellbeing across the community.

"Although urbanisation and the modernisation of agriculture has destroyed some knowledge of these practices of resilience, our research shows that there is still much that can be documented."

She says these ways of working are unusual in an Australian context, but could provide lessons at home. "In the area of disaster preparedness

and response, keeping diverse community economic practices alive can be crucial. For example, traditional ways of preserving food, collectively repairing buildings, saving and sharing finances, these are strategies that come to the fore in the aftermath of severe climate events that cut off communications and leave paths of destruction."

By collaboratively working with scholars in Australia and Asia, Gibson has documented current community economic practices in a multi-authored article published in the journal *Asia-Pacific Viewpoint*. She also produced a documentary called *The Bamboo Bridge*, written and directed by anthropologist and filmmaker Juan Francisco Salazar, also a Professor at the Institute for Culture and Society, which premiered in October 2019 at the Antenna Documentary Film Festival in Sydney and went on to screen internationally at several film festivals, and academic and community events in 2020. ■

### NEED TO KNOW

- For more than 50 years, a bamboo bridge was rebuilt every year in Cambodia due to annual floods.
- The bridge was replaced by a permanent concrete bridge in 2017.
- Western researchers produced a documentary about this called *The Bamboo Bridge*.



10 REDUCED INEQUALITIES



# OPENING SCHOOL GATES FOR PARENTS

A Western Sydney University team is examining the barriers to parental participation in their child's education.

**Children tend to achieve more** when their parents are involved with schooling. Western Sydney University researchers have now published recommendations for improving how schools

and parents from diverse communities interact. Parent engagement encompasses everything from active participation in learning activities to attendance at school events or simply being up to

date on their child's progress. "With growing awareness that parents' contributions make a difference, there has been interest at the government level to strengthen engagement," explains study lead, Associate

Professor Christine Woodrow, from Western's Centre for Educational Research.

The government, in partnership with the Australian Research Alliance for Children and Youth (ARACY), commissioned researchers from Western's Centre for Educational Research to conduct focus groups on parental engagement. Woodrow focused on low socioeconomic families whereas Associate Professor Loshini Naidoo focused on culturally and linguistically diverse families, and Professor

This research was funded by the Australian Research Alliance for Children and Youth.



## NEED TO KNOW

- Children achieve more when parents are involved in their schooling.
- Western researchers investigated obstacles to parental engagement for those of low socioeconomic, culturally and linguistically diverse (CALD), or Indigenous backgrounds.
- They released recommendations aimed at increasing engagement.

The lack of a common language can be a hurdle for parents from CALD backgrounds engaging in their child's education.

Margaret Somerville focused on Aboriginal families.

The team found that parents of low socioeconomic status frequently felt insecure about being involved in their child's education, especially if they had been unsuccessful in school themselves. "Schools have a tendency to reinforce the insecurity. The research indicated that the only interaction that some parents have with schools are phone calls for their children's bad behaviour," Woodrow explains. "The implication here is that

schools should establish rapport with the parents as soon as the children progress into primary school, so that they have grounds for better communication."

The challenges differed considerably for culturally and linguistically diverse (CALD) families. "Most parents from CALD backgrounds felt that there was a cultural mismatch between the teachers and students, and a lack of effort to develop intercultural sensitivity," says Naidoo. The lack of a common language was also a hurdle.

On the other hand, for Aboriginal parents, there was a discord with schools in the understanding about learning, one issue was the loss of cultural authority. "For Aboriginal parents, the framework for learning must be based in Aboriginal culture, with land, language, history and story playing an integral role. They also regard learning as lifelong and themselves as the child's first teachers," says Somerville.

The team translated their findings into a series

of recommendations at the policy level, including the need for professional learning, training and resources for parents and educators that support children from low socioeconomic, cultural and linguistically diverse, and Aboriginal backgrounds. "A clear message from the study was that school administrators are genuinely interested in getting parents involved," says Woodrow. "A challenge now is overcoming the lack of school resources to foster relationships with parents." ♥

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

# FROM PLASTIC FANTASTIC TO A WASTE QUAGMIRE

Charting the history of plastic packaging can lead to new insights on how to manage it.

**From food packaging,** to contact lenses and credit cards, plastic is used in almost every aspect of daily life. How did it become such a ubiquitous material in just a few decades?

Professor Gay Hawkins, director of engagement at Western Sydney University’s Institute for Culture and Society, is investigating the history of plastic packaging and how it has transformed food production, markets and waste streams. Her insights can be used to develop

better strategies for managing plastic waste and reducing our reliance on plastic packaging.

“Just like the Iron Age and Bronze Age, the 20th century can be thought of as the Plastics Age,” says Hawkins. “It’s the material that has defined our culture.”

While most research on plastics focusses on unravelling its environmental impacts, Hawkins is exploring how plastic became a normal part of everyday life and the factors that shaped our reliance on it.

“Plastic has had an unbelievably profound impact on how we live, and our environment,” says Hawkins. “I wanted to understand how it became so popular.”

To trace the emergence of plastic over the last century, Hawkins delved into the history of the material and how it was promoted to the public. Before 1950, food was packaged in glass, cardboard, paper or metal. But the development of light and flexible thermoplastics — plastics that can be moulded using heat — heralded a new era of food products. Fresh fruit and vegetables were covered in cling wrap on polystyrene trays, coffee was served in Styrofoam cups and polyethylene bottles replaced cartons of milk.

With the advent of plastic packaging came various tactics to convince the public of its

## NEED TO KNOW

- Gay Hawkins is investigating the history of plastic packaging.
- The rise in plastic packaging transformed attitudes towards food and freshness.
- ‘Naked’ food needs to be normalised again to reduce waste.

virtues and life-changing uses. In post-World War II Australia, Hawkins says that the transition to plastic was driven by promotional material from the fast-growing plastics industry.

Ads and articles in newspapers and women’s magazines touted plastic as a new ‘miracle’ material. Cling wrap promised to keep food fresh, and frozen goods sealed in plastic packaging were promoted as convenient and economical.

Plastic industry newsletters also began landing on the desks of executives of food production

**IN 2016-17, ONLY ABOUT 12% OF WASTE PLASTIC** was recycled in Australia



(Source: National Waste Report 2018, Department of the Environment and Energy)

“IT COMPLETELY CHANGED OUR PERCEPTIONS OF FOOD, FRESHNESS AND CLEANLINESS.”



This research was supported by the Australian Government through the Australian Research Council. (Background) © Photoboyko/Stock/Getty; (Left) © Irina\_Strelnikova/Russia/Getty Images

and packaging companies. They promoted plastic as a superior industrial material that would open new pathways for circulating goods.

“It completely changed our perceptions of food, freshness and cleanliness,” says Hawkins. “People thought food was better and safer in plastic, but it also changed how we managed waste.”

But not everyone was sold on the idea of plastic-wrapped cheese sticks and frozen peas. A 1972 article in *The Canberra Times* titled ‘Women Drop Wraps’ revealed that a group of women unwrapped their newly bought groceries and dumped the packaging in front of the supermarket in protest.

The article reported that the demonstration aimed to educate people about unnecessary and polluting packaging and to offer alternatives to carting home huge quantities of plastic and cardboard packaging with the weekly shopping.

While plastic remains pervasive in daily life, efforts to reduce its detrimental impacts have gained momentum in recent years, from supermarkets banning single-use plastic bags, to popularising reusable coffee cups.

Hawkins points out that removing plastic isn't the only work to be done to tackle wasteful habits. Just as the public became accustomed to throwing plastic packaging away decades ago, there is a need to normalise ‘naked’ foods once again.

“It’s a matter of reconfiguring cultural attitudes so that people aren’t disturbed by the absence of plastic,” says Hawkins. ♥



## MAKING CONCRETE CHANGE

Recycling construction and demolition waste to reduce the amount going to landfill.



Demolition of apartments in Hong Kong inspired reuse of concrete waste.

In Australia, more than a third of all the 54 million tonnes of waste generated each year comes from the construction and demolition sector. Much goes directly to landfill. Even when it is recycled, it is usually into low-grade applications such as road-base. Professor Vivian Tam from the School of Built Environment at Western Sydney University has an idea that could help reduce construction waste.

“It was when I was living in Hong Kong, where all the buildings are high-rise, that I thought about all the material going to landfill when they are demolished. I thought it’s a better option if we can reuse the material and save the landfill space,” says Tam.

Concrete, a mix of rubble, cement and water, is an extremely versatile material. Tam and her colleague, Associate Professor Khoa Le from Western’s School of Engineering, have developed a method to use carbon dioxide

to strengthen recycled concrete aggregate. The resulting product is as strong, but cheaper than virgin concrete, and up to 29% stronger than normal recycled concrete, when tested using the Australian Standard AS1012.

Tam puts commercially available crushed recycled concrete into a pressure chamber and injects 99.9%

pure carbon dioxide. This forces the calcium hydroxide in the aggregate to undergo a chemical change into calcium carbonate, “which is a good thing for concrete,” says Tam. It’s an accelerated version of the curing reaction that usually takes place over the lifetime of concrete.

She’s not the only researcher exploring the idea, but with commercial partner Volumetric Concrete Australia, she’s had some success in pouring test concrete slabs. A year later, the slabs are showing no signs of cracking or shifting and strength-test results are all clear. She believes her process delivers better economic and practical benefits compared to existing solutions and hopes that her spin-off company Ecobond will find investors as a result.

If adopted widely she says the technique could easily displace some of the 24 million cubic metres of virgin concrete used in Australia each year. ♥

### NEED TO KNOW

- Much of the waste from construction and demolition goes to landfill.
- Concrete waste is usually recycled for low-grade applications.
- Western researchers have devised a way to strengthen recycled concrete aggregate using carbon dioxide.

This research was supported by the Australian Government through the Australian Research Council. © subtitk/E+/Getty Images



# A COOL APPROACH TO LAND MANAGEMENT

Researchers are collaborating with Indigenous people to understand the benefits of controlled ‘cool’ burning of bushland in natural hazard management.



Aboriginal and Torres Strait Islander peoples should be aware that this story contains the images and names of people who have passed away.

**With unprecedented bushfires** raging across southeastern Australia in the summer of 2019/20, Australians are all too aware of the continent’s intrinsic relationship with fire. Western Sydney University researcher, Dr Jessica Weir is documenting the cultural practices and intimate knowledge that Australian Aboriginal people have with fire in order to gain a better understanding of how to manage bushfires.

Weir has learned from her collaborative work that many Aboriginal people involved in land management engage with fire differently. Fire is understood

to be central to living with and respecting Country.

Australia has always had large destructive bushfires, and for tens of thousands of years Aboriginal people have used ‘cool burns’ to mitigate their impact, as well as to assist plant growth, hunting, protecting species, and accessing areas.

Cool burns are distinct from prescribed burns, in that fires are lit not just for hazard reduction; a range of ecological and cultural considerations go into the choice of where, when and how to set the fire. These fires don’t destroy tree canopies, wildlife have time to escape, and by reducing fuel loads they can also protect lives and property from destructive ‘hot burn’ bushfires.

Working with fire on these terms can have local, regional

and national benefits as a way to mitigate bushfire risk, create social-ecological spaces, and support Indigenous cultural practices and land management, including support for Indigenous rangers and firefighters.

However, carrying out cool burns presents many challenges, due to historical and contemporary land justice issues, and many conflicting interests vying for a stake in land management, from timber, to farmland, to mining.

“We’re very good at debating the science involved in land management, but we need to involve more research about our values, and that’s what we’re doing at the Institute for Culture and Society. We’re looking at what society thinks is normal and appropriate in bushfire risk mitigation,” says Weir.

Weir is co-leading a research project with Deakin University, with funding from the Bushfire and Natural Hazards Cooperative Research Centre, that examines the relationship

## NEED TO KNOW

- Cool burns have been practised by Indigenous people for tens of thousands of years.
- The Bushfire and Natural Hazards CRC is investigating the relationships between hazards, culture, and Indigenous communities.



(below) The National Indigenous Fire Workshop organised by the Firesticks Alliance in Bundanon in 2018. An event bringing Aboriginal people together to learn and share burning techniques. (right) Uncle Karl Brown lighting a cool burn.



## COOL VS PRESCRIBED BURNS

The difference between cool burns, and prescribed or controlled burns is the intention and who is setting the fires. Cool or cultural burns are done by Indigenous people for a multitude of reasons including food, access and reduced bushfire risk; whereas hazard reduction burns are intended to reduce risk to properties and lives. Both require permission from relevant fire agencies.

between hazards, culture, and Indigenous communities.

One of several places where cool burns are influencing the fire sector is the Australian Capital Territory, where the ACT Parks and Conservation Service staff carry out a cultural burning program centred on learning from cool burns. “It’s about changing industry practices in the ACT,” says Weir.

In the ACT Parks and Conservation Service program, the Ngunnawal people, the traditional custodians of Canberra, identify priority areas and then a *Ween Bidja* (fire boss) lights the fire. “We call them ‘the fire boss’ because we are in control of the fire, it is not in control of us. Fire is a tool,” says Dean Freeman, a Wiradjuri man and Aboriginal

Fire Officer from the ACT Parks and Conservation Service.

“You can imagine it was very exciting when we got an elder, Uncle Karl Brown, to light the first match in Canberra in an area which hadn’t been lit for 200 years. We are bringing our ancient techniques into the modern world. We also use it to protect our own cultural sites,” says Freeman.

“It’s extraordinary because it’s a community of practice. Indigenous and non-Indigenous fireys working on risk-mitigation together,” says Weir.

Weir’s qualitative research involves interviewing Indigenous and non-Indigenous government staff involved in the burns and tracking their different assumptions, knowledge and practices they bring to fire management.

In public debates it is sometimes assumed that Aboriginal fire management and other traditions are set in the past and irrelevant to modern Australia. The interviews have revealed further understanding, that these are living traditions, always adapted to contemporary contexts, including bringing in new techniques and new knowledge. “This is a critical gear change in our maturity as a nation,” adds Weir.

Weir is exploring how reinstating cultural burning in Canberra can support Indigenous peoples’ cultural practices. “It’s an opportunity to showcase Indigenous peoples’ authority and care with respect to fire and the land.” The work has also revealed that if traditional owners are to lead

their own fire management, a much greater sharing of land management resources is required.

As part of the project, Weir and Freeman travelled to southern Western Australia to participate in a knowledge exchange on fire management with Indigenous groups there. “We’ve networked with groups doing similar practices across southern Australia, as well as learning from the north. It’s about a nation healing itself through developing a community of practice. There’s still a long way to go yet.

“Ultimately, it’s about continuing to respectfully learn from each other about how to live best in Australia, and how to manage bushfire risk — which is only increasing.”

16 PEACE, JUSTICE AND STRONG INSTITUTIONS



# TAKING ON THE CYBER HACKERS

Understanding contemporary cyberspace attacks protects businesses and individuals.

## Western Sydney University's Dr Abubakar Bello is

developing proactive security and defence strategies to thwart cyber criminals and make the internet a safer place.

Bello, a lecturer at Western's School of Social Sciences, is an expert in ransomware attacks. These attacks begin with malicious software encrypting a user's system or personal files, and is followed up by a demand for the victim to pay before they can regain access to the files, which is not always guaranteed.

The internet of things (IoT) makes data even more vulnerable to hackers. Individual smart appliances could be infected and rendered inoperable, with a ransom demand of as little as \$20. The ransom amount is often much lower than the cost

of repair for damage caused by forcing a smart door or fridge, for example.

Bello and his colleagues are intrigued by the human behavioural factors that make ransomware so profitable to online thieves. They aim to identify what type of cybersecurity awareness and education programmes are



**IN TELSTRA'S 2018 SECURITY SURVEY**

**\$208,000**

was the average cost of downtime due to a ransomware attack

needed to protect the public against these attacks. "The more people know and understand about the risks, the better their chances of staying protected," he explains.

Bello sees significant gaps in national and international research around the development of effective cyber security awareness and educational programmes that aim to improve users' safety. "Even in cyber-advanced nations like the US, where several government-sponsored security initiatives encourage secure cyber behaviour, there is a lack of protective measures against current and future methods of ransomware attacks."

Bello is investigating contemporary types of ransomware attacks and seeking to understand patterns in the

## NEED TO KNOW

- Ransomware is a cyberattack where a user's files are made inaccessible until a ransom is paid.
- There are gaps in cybersecurity awareness and education.
- Abubakar Bello is trying to develop proactive defence strategies against such attacks.

behaviour of the attackers. He has a strong interest in the role that cyber security has on performance and satisfaction, including security in social networks.

An important aspect of Bello's project is to link Western Sydney University's cybersecurity work with local corporations and government organisations to provide cybersecurity audits and risk management services. This includes Gridware, one of the few firms in Australia at the forefront of cyber defence. Gridware's involvement in the project will include the development of artificial intelligence and machine learning based monitoring and reporting technologies, as well as incident response and management control frameworks.

"My research has been about the chance to make a critical difference in our increasingly digital world," says Bello. "With my research in areas such as the IoT and ransomware, I believe I am providing a vital support service for the vast number of businesses, individuals and organisations targeted by cyber criminals." 📌





## MAKING A SUSTAINABLE DIFFERENCE

Australian enterprises are working towards a just, sustainable, and financially viable economy.

### It is possible to be both ethical and profitable,

according to several case studies involving Australian manufacturers.

While industrial manufacturing is a key driver for economic growth, it is also a major contributor to climate change, and growing social inequality.

To find out how manufacturers can help solve global challenges, Dr Stephen Healy, and colleagues from Western Sydney University and the University of Newcastle, surveyed 10 manufacturers with bases in Australia, including makers of mattresses, furniture, and carpet, a dairy producer, a blueberry processing plant, a mattress recycling enterprise, a niche clothing producer, as well as an engineering firm, and an e-waste recycling plant.

Healy says that businesses chosen for the study shared two common values: a commitment to thinking beyond the bottom line and demonstrated concern for their workers. Healy and the team say that these values are reflected by the term 'just sustainability' in which a better quality of life is sought in a just, equitable manner. The term was coined by social science academics and could describe emerging cultures of

the manufacturing sector in Australia, the researchers say.

One of the companies, Interface, the world's largest manufacturer of carpet tiles which has a manufacturing plant outside Sydney, started minimising its environmental impact in the 1990s. It has since removed carpet waste by reusing each part of the product, is powered entirely by renewable energy and is now on track to eliminate oil from the production of synthetic carpet tiles by 2020 as part of a plan they call Mission Zero™.

Varley Group, an engineering firm that builds specialised vehicles and equipment for spacecraft, specifies that suppliers provide everything needed for a

### NEED TO KNOW

- Businesses can be both sustainable and profitable.
- An Australian team surveyed 10 manufacturing companies who value 'just sustainability.'
- Future research should examine other sectors.

production run in kits that are tailored for the job, as part of its efforts to minimise waste.

Soft Landing is a mattress recycling social enterprise that recycles about 75% of an innerspring mattress that would otherwise end up in landfill. Soft Landing takes mattresses apart so the individual components of steel, wood and fabric can be used in other products such as roof sheeting, garden mulch and acoustic panelling.

In terms of caring for workers, Interface collaborates with an NGO that works with villagers in the Philippines and Cameroon to collect discarded nylon fish nets to be reused in the carpet production line. Soft Landing proactively employs disadvantaged people, while Varley Group's strategy helps find jobs for ex-offenders, Indigenous people and people suffering from mental health issues.

"This commitment to work force integration was part of the ethos. It was treated as a condition for enterprise viability," Healy says.

But how do businesses stay profitable while being ethical? The

researchers point out that a decision made at a critical time for a company's survival was often linked to values associated with just sustainability.

When Interface's plant in Sydney burnt down in an accident, rather than ceasing carpet production and shrinking the workforce, employees were involved in helping with design of the new setup; production workers moved temporarily into customer service; and others did community projects in and around the company's location all on full pay. All were assured continuing roles in the business. Not only did this retain rare textile skills within the company but added strength in existing services while it rebuilt the site.

Through ethical operation, these enterprises are redefining business common sense, the researchers say. Enterprises that can be associated with just sustainability could help realise a regenerative, circular economy in Australia that is based on caring for people and the environment. Further research should investigate how the concept of just sustainability can be adopted to other sectors and regions. ♥





# A CHANGING VIEW OF OBESITY MEDICAL CARE

People who are overweight are more prone to diseases and less likely to seek help.

People who are overweight are at increased risk of a range of chronic diseases, but are less likely to seek medical help. Western Sydney University researchers are working with healthcare professionals to break stereotypes surrounding people with obesity, and ensure they receive the care they need.

Western's Kate McBride at first became aware of this problem when she was doing her PhD research on the feasibility of cancer screening for Li-Fraumeni Syndrome, a hereditary predisposition to multiple types of cancers. "I became interested in this obesity space through breast screening," she says. "We've shown that obesity is a barrier to breast screening. Often women with obesity will go once, but won't return, because they didn't have a particularly good experience. It's really concerning because obesity is the number one risk factor for postmenopausal breast cancer."

A large part of this reluctance to see medical professionals is the stigma associated with obesity. "Healthcare professionals might not see that a person hasn't deliberately chosen to be obese," explains McBride, who is a senior lecturer at Western's School of Medicine and the Translational

Health Research Institute. "There are many contextual factors like where they live, their economic status, their education level

**"THERE NEEDS TO BE A SOCIETAL CHANGE IN THE WAY PEOPLE WHO ARE OVERWEIGHT ARE PERCEIVED."**

Healthcare professionals need to consider the contextual factors of obesity.



and their cultural background. All these factors contribute to whether a person is going to become obese or not." McBride notes that healthcare professionals can sometimes exhibit a victim-blaming mentality. "They just tell that person: 'You need to do something about your weight. Go and exercise. Go and eat healthily.' But they don't consider those contextual factors."

This stigma can lead to dire outcomes. "Some people can't leave their homes because they don't have the support or motivation to get out there and even start to think about trying to lose weight," says McBride. "They know that they're dying because they've got high blood pressure; they've got high cholesterol; many of them have got diabetes. They can't even go to the kitchen without feeling breathless and unwell, and they're trapped in their homes."

This problem is especially acute in parts of western Sydney, for example the Nepean-Blue Mountains region where the obesity rate of 29.3% exceeds the national average of 27.5%.

## NEED TO KNOW

- The obesity rate in parts of western Sydney exceeds the national average.
- People who are overweight are less likely to seek medical help.

This is due to factors such as low health literacy, an obesogenic environment, including a plethora of fast-food outlets, and a low socioeconomic demographic. This is creating a crisis in the public health system in western Sydney where hospital admission rates for chronic disease complications are soaring," says McBride. "People tend to sidestep their GPs and then present at emergency departments when things get to a really acute phase."

McBride and her group are attacking the problem on various fronts. They are constructing a comprehensive picture of how obesity affects healthcare access by measuring rates of presentation and analysing the issues faced by people with obesity and their healthcare providers. This information will inform the development of better healthcare management. The team is also working with the primary-health network in western Sydney to consider how to improve GPs skills to help them be more supportive.

But McBride realises that more is needed in the long term. "It requires a societal change in the way people who are overweight or obese are perceived because they suffer greatly by people being judgmental about them." ♥

This research was funded by Nepean-Blue Mountains Population Health. © cienpies/Stock/Getty

3 GOOD HEALTH AND WELL-BEING



## PUTTING CHILDREN AT THE TABLE IN THE NUTRITION DISCUSSION

The views of young people and mothers to shape global nutrition policies.



Researchers asked adolescents about their views on healthy eating.

### In the first study of its kind to span six continents,

Western Sydney University researchers have found adolescents had a limited understanding of the nutritional value of the foods they commonly encounter.

Many adolescents who took part in the study believed that nutritious foods were either not sold near their home, or were too expensive. Similarly, mothers of infants and young children under two years, overwhelmingly reported that cost was the main barrier to feeding their children more healthily during the first two years of life.

“When unhealthy foods are the only choices around, there is no choice,” says Dr Catharine Fleming, from the School of Health Sciences.

Led by Professor Amanda Third from Western’s Institute for Culture and Society, a team of social and cultural research, nutrition, and midwifery experts, developed workshops delivered by trained facilitators who consulted with 464 adolescents (age range 13-18) and 396 mothers across 18 low and middle income countries, as well as Australia and the US, about their eating patterns. Participants in the five-hour session completed surveys and short-answer questions both individually and in groups. However, knowing that it can be hard for children as well as adults to speak out in such activities, the team also invited them to take part in creative interactive exercises, such as brainstorming and drawing.

Asking adolescents directly for their input on healthy eating

was considered to be a novel research approach. Fleming, along with Professor Virginia Schmied, from the School of Nursing and Midwifery, worked

with global leaders in public health nutrition to deliver the workshop content to ensure the views of all participants were captured across a variety of socioeconomic and geographical areas.

The team found that adolescents do want to improve their diets and to work with community leaders to implement change. “Solutions need to involve adolescents — many nutrition policies are made without young people having a seat at the table,” says Fleming.

The team’s findings were published in UNICEF’s *State of the World’s Children* 2019 report and will inform global policy and programming. Two in-depth companion reports, focusing on the insights of adolescents and mothers respectively, will be released later in 2020. ■

### NEED TO KNOW

- Western Sydney University researchers helped design the methodology for the *State of the World’s Children* 2019 report.
- They talked to adolescents and mothers across 18 countries
- They found that healthy eating solutions need to include input from adolescents.



# READING BETWEEN THE LINES

The connection between mothers and babies may provide important clues for early identification of dyslexia.



A BabyLab participant.

This research was supported by the Australian Government through the Australian Research Council.

## Western Sydney University research

is trying to get a jump on dyslexia, identifying tell-tale signs before a child can even read.

“Dyslexia is commonly thought of as a learning disability, but it is really a different way of processing information,” says Professor Denis Burnham, founder of the MARCS BabyLab at Western.



Child interacting with audio-visual input at BabyLab.

Around 8% of the population has dyslexia, but if a baby has a parent with dyslexia, the likelihood of their developing dyslexia increases to 60%.

It has always been necessary to wait until a child starts to read before dyslexia can be diagnosed, but Burnham and his colleagues hope to change this by investigating the earliest signs of the onset of dyslexia in babies for the first time.

“We are not looking at literacy skills. Instead we are investigating auditory processing and perception abilities, starting with babies at five months. We follow them until they turn five to see if their early abilities can predict their eventual literacy skills,” says Maria Christou-Ergos, research assistant on the project.

In this study, babies were regarded as ‘at risk’ if they had one parent with dyslexia. The

researchers have found that these babies process auditory information differently. The auditory index they use is called ‘rise time’ and this is the time it takes for sounds to reach maximum loudness. Consider, for example the sounds ‘baa’ and ‘wah’. The time it takes to get to maximum loudness is short for ‘baa’, but it takes much longer for ‘wah’.

“Rise time had never been tested in infants. In our study we found that babies at risk for dyslexia don’t discriminate very well between rise-time differences, but other babies do,” says Burnham.

In addition, they found that rise-time discrimination ability is related to the degree to which parents exaggerate vowels when they speak to their baby (called vowel hyperarticulation). Parents naturally use hyperarticulation when speaking to babies. According to detailed measurements, the greater the vowel articulation by the parent, the better the baby is at differentiating rise times.

This is interesting because the researchers also found mothers interacting with babies at risk of dyslexia don’t use vowel hyperarticulation.

Burnham, along with another Western researcher who also works at the Basque Center on Cognition, Brain and Language, Dr Marina Kalashnikova, conducted a study in which mothers of at-risk infants and mothers whose infants were not at risk, talked to their own or another baby.

They found that mothers of at-risk babies did not hyperarticulate to any babies in the study.

Meanwhile, mothers whose babies were not at risk did hyperarticulate to their own baby, but, surprisingly,

**DYSLEXIA**  
affects up to  
**8%**  
**OF THE**  
**POPULATION**

Fellow researcher at Cambridge University, Professor Usha Goswami, had previously found that children with dyslexia are worse at noticing differences in rise-time than children without dyslexia. Having trouble mapping auditory information to visual cues later affects the child’s ability to learn to read.

“If babies don’t have all the auditory information worked out, then when they start to learn to read, they can’t map the sounds they already know to these new squiggles on the page, squiggles that we know as letters,” says Burnham.

## NEED TO KNOW

- Children at risk of dyslexia process auditory information differently.
- Mothers also speak differently to babies who are at risk of dyslexia.
- Babies at risk of dyslexia may convey cues about tone.

did not hyperarticulate to an at-risk baby. The researchers believe infants must provide some cue that prompts the adult’s hyperarticulating. “This evidence suggests that babies are ‘telling’ their mothers to make the vowels nice and clear, and that at-risk babies appear to be conveying different information.

“The next research question is to find out what these babies want. Maybe there is something else they are ‘asking for’ but we don’t know yet,” says Burnham.

Fortunately, they have many willing participants to help answer this question. Research at the MARCS BabyLab has involved hundreds of children, including Nathan and Daniel. Their mother, Alix Madden says “I think it’s important to contribute to these things. This research benefits many people.”





# REVEALING THE HIDDEN SHAPES OF EATING DISORDERS

Western Sydney University researchers are helping deliver suitable treatment strategies for eating disorders, to those who need them – and dismantling a few stereotypes along the way.

## One in 10 people in Australia aged 15 and older

have an eating disorder, but fewer than 20% seek appropriate treatment. This is among several grave insights revealed by an extensive and long-running work by Western Sydney University's Eating Disorders and Body Image (EDBI) group.

"Reducing delays in seeking treatment, and barriers to care, are my biggest challenges," says Professor Phillipa Hay, EDBI leader.

To better pinpoint who needs treatment and help them access it, Hay and her team of clinicians and researchers are unmasking the many and varied types of

eating disorders in Australia, and evaluating what therapeutic techniques work.

The field first piqued Hay's interest when, as a trainee psychiatrist in New Zealand, a mentor encouraged her to explore research into eating disorders

At the time, the mental health field recognised one eating disorder: anorexia nervosa, which was defined by restrictive eating and an intense fear of gaining weight, despite being severely underweight. Its formal description can be traced back to the 1870s, but Hay realised that, more than a century later, anorexia treatment techniques were still not based on evidence.

Anorexia nervosa has one of the highest fatality rates of any non-substance-abuse psychiatric disorder, even greater

### NEED TO KNOW

- Not everyone with an eating disorder fits the stereotype.
- Personalised out-patient treatment plans offer a higher chance of success.
- Early intervention is crucial.

than major depressive disorder, but early treatment regimes were crudely designed.

"Looking back on it now, they were quite punitive, restrictive behavioural programmes," Hay says.

"People were admitted to hospital and only given privileges if they gained weight, with very little psychological understanding of what they were experiencing."

Hay later completed a PhD on the features of emerging eating disorders, bulimia nervosa and binge eating disorder, and in 1995, set in motion one of the world's few large-scale longitudinal projects in the field.



## CHANGING CLASSIFICATIONS

➤ The two main classification systems for eating disorders are the Diagnostic and Statistical Manual of Mental Disorders (DSM), compiled by the American Psychiatric Association, and the World Health Organization's International Classification of Diseases (ICD).

"Even though the DSM, now in its fifth revision, is the most widely used of the two, the ICD – being an international classification system – reflects more people", Hay says.

They're revised every few years and, apart from anorexia nervosa, all eating disorders were added in the past three decades.

In the 1990s, Hay and others recognised binge eating disorder was prevalent enough to be considered a third major eating disorder after anorexia nervosa and bulimia nervosa.

At that time, a person with what we now know as binge eating disorder would be diagnosed with an 'Eating Disorder Not Otherwise Specified' by the DSM, and classed as having an 'Other Eating Disorder' by the ICD.

The DSM, in 1994, added binge eating disorder to its fourth edition as a disorder meriting further study and in the 2013 fifth edition it was added as a major disorder. For the ICD's 11th revision, Hay's research led to her role on the eating disorder working group and, in 2019, binge eating disorder was also included as a separate feeding or eating disorder in the ICD-11.

In the study, which is part of the annual South Australia Health Omnibus Survey and continues today, thousands of people aged 15 years and older are questioned about, among other health aspects, eating behaviours and treatment for disorders. Their responses often contradict the eating disorder stereotype of the thin, white, affluent teenage girl.

### DISMANTLING THE STEREOTYPE

The latest survey snapshots, published in 2017, showed that a binge eating disorder, characterised by uncontrolled rapid consuming of large quantities of food, was the most

common major eating disorder, affecting one in 70 respondents.

In comparison, bulimia nervosa, anorexia nervosa (broadly defined) and avoidant/restrictive food intake disorder were each reported by one in 100, 200 and 300 people, respectively.

People with an eating disorder who did not meet full threshold criteria to be classified under the major types of eating disorders were much more prevalent. These 'unspecified' and 'other specified' eating disorders made up around 10% and 3% of the surveyed population, respectively.

Hay's survey also showed that eating disorder rates

have, over time, become more evenly distributed across sociodemographic sectors. For instance, even though eating disorders develop most often in young women, they're rising on a faster trajectory in women over 45 years old and men.

But the group with both high body mass index (BMI), and disordered eating, is increasing faster than either factor alone, Hay says.

Hay says that incidences of eating disorders in Aboriginal and Torres Strait Islander people are as high, or higher than in the general population, but they don't fit the generally accepted profile.

Behaviours behind this high eating disorder prevalence in Indigenous Australians are not clear cut, according to Dr Deb Mitchison, an EDBI research fellow, who found a similar incidence in a survey of adolescents.

"First Australians in general usually have a higher BMI, so you might think the behaviours are all about binge eating. But it's other types of disordered eating too, like extreme dieting and purging."

### RESTRICTIVE TO RESPECTFUL

In addition to revealing the true extent of eating disorders, Hay's group develops and evaluates



Group therapy as an out-patient is an important part of recovery.

treatment techniques and strategies. Their work informs clinical practice guidelines locally and abroad.

“Her clinical leadership has been enormous in Australia and internationally,” says Professor Susan Paxton, a psychologist from La Trobe University.

Hay and Paxton have collaborated on evaluations of eating disorder treatments and interventions and have shown that not all people with an eating disorder necessarily need specialist intervention.

For instance, findings from a randomised clinical trial showed guided self-help, provided by a GP to people with bulimia nervosa, an eating disorder defined by cycles of binge eating followed by compensatory behaviours such as vomiting, had similar outcomes to psychological therapies delivered by specialists.

Other treatment trials show cognitive behavioural therapy,

delivered by a psychologist or psychiatrist, is most effective for recovery from long-term anorexia nervosa.

“THEY MIGHT THINK ‘I CAN’T HAVE BULIMIA NERVOSA BECAUSE I HAVE A HIGH BMI.’”

“Vital to knowing what works in treatment interventions for eating disorders, is speaking with people with an eating disorder about their lived experiences,” EDBI researcher and clinical psychologist Dr Janet Conti says.

“Aspects of Phillipa’s research are dedicated to understanding eating disorders from the perspective of the person with a

lived experience, and using these insights to inform treatment.”

Clinicians now know that treating the person with respect, and keeping their normal life as intact as possible rather than a “doctor knows best” paternalism, is crucial to long-term recovery. Current treatment approaches for people with an eating disorder focus on providing a personalised out-patient treatment plan, so patients don’t lose connections with people, school or work – an approach used at Wesley Hospital Ashfield, where Hay is director of the Wesley Eating Disorders Centre and involved in a day programme. “People come in, get peer therapy, and group therapy, and dietetic support while continuing with their lives,” Hay says.

“Change might be slower than an intensive inpatient programme, but it’s far more likely to be sustained in a person, who can also maintain other important parts of their life.”

**BRIDGING THE GAP**

Identifying those with an eating disorder, and facilitating recovery is of critical importance, but with so few people accessing treatments, how can interventions reach those who need them?

This is the question that plagues Hay. Behaviours such as binge eating and strict dieting in the general population have increased over time, and one in five people with an eating disorder are, according to the BMI metric, considered overweight or obese.

A significant barrier to overweight people receiving eating disorder treatment is the skinny stereotype, which endures not only in patients’ minds but also, frequently, in the perception of doctors. “Often when a person presents to a GP, the GP doesn’t see someone who’s not very thin as having an eating disorder,” Hay says.

“The person might also think ‘I can’t have bulimia nervosa because I have a high BMI’”

GPs asking the right questions, too, seem to influence the likelihood of people accessing treatment. In 2019, Hay, Conti and colleagues found people with an eating disorder were likely to seek specialist mental health intervention when a GP asked about their mental health, but not if the GP enquired about their diet or eating habits.

Like all mental health conditions, early intervention in eating disorders is important. Left too long, treatment becomes more difficult, but it’s never too late to seek help. Hay says: “I’ve seen people recover from eating disorders who have had the illness for 20 or 30 years. There is always hope.”

3 GOOD HEALTH AND WELL-BEING



## WHY PAYING A VISIT PAYS OFF

Volunteer visits are helping isolated parents feel more confident and optimistic

A volunteer home visiting program is helping vulnerable parents in need of extra support. Volunteer Family Connect (VFC), matches families of young children with trained volunteers who visit once a week for three months to a year.

“My visits could involve reading to the kids while the parents cook dinner, going to the doctor together, or simply listening to their concerns,” explains Kathleen McKinnon, a volunteer who has worked with several families. “It’s only two hours a week, but it makes a huge difference to the families.”

In addition to anecdotal evidence, social scientists are working to demonstrate empirically that programs like VFC make a difference.

In 2012, the government cut funding from volunteer home visiting programs citing a lack of evidence for their effectiveness, explains Associate Professor Rebekah Grace, chief investigator and Director of TeEACH (Centre for Transforming early Education and Child Health) at Western Sydney University. “If the only reason for the funding reduction was the lack of evidence, what we had to do was clear,” says Dr Jayne Meyer Tucker, a former CEO of one of the three national not-for-profits that partnered on the research. She initiated crisis meetings with the research team. “We chose to run a randomised control trial, the gold standard

### NEED TO KNOW

- 15% of Australian parents report feeling isolated.
- The Western team’s study was the largest trial of volunteer home visiting worldwide.
- The program demonstrated financial, social and health benefits.

methodology in assessing program effectiveness, which randomly allocates families to either receive the service or to continue on without the support of a volunteer.”

Getting the program implementation staff, the volunteers, and volunteer coordinators on board with the trial, however, was a challenge. “The volunteers and coordinators are very motivated by the drive to help families make positive change. They worried that families in the control group were essentially being denied help, and the idea was heartbreaking for them,” says Grace. “We went to each of the seven trial sites many times to talk to program volunteers and staff about why we needed to employ this methodology, to help them understand that the trial would give us the

strongest evidence possible to argue for the survival of this program. This helped reframe their thinking.”

The trial commenced in 2015, and the first analysis has been completed, showing that families who received the service felt more competent with parenting, were better connected to the community, experienced improved wellbeing, and were more optimistic about the future than those in the control group. Moreover, they showed volunteer improvements such as wellbeing, community connection, and sense of purpose. “It’s lovely building bonds with young children,” says McKinnon.

VFC currently operates with funding from an anonymous philanthropist, and the team continues to advocate for government reinvestment. The team’s analysis shows that government investment in programs like these ultimately produce savings by preventing small problems from worsening and requiring more intensive intervention.

A social impact evaluation, underwritten by Ernst and Young, was performed in tandem with the study to value the improvements and social benefits generated from Volunteer Family Connect. They found that every dollar invested achieved a \$1.78 to \$5.42 return in social benefits.

“Even if you’re economically well off, it’s quite alarming how isolated and distressed you can feel as a new parent without a

support network,” explains Dr Kelly Baird, project manager and Research Fellow at Western. “Services are already available for parents who need professional care, like treatment for clinical depression, or who require more intensive tertiary parenting interventions. But we need to remember that the families who aren’t at that level now, without intervention, could be at the edge.”

“The issue with belonging is significant,” adds Grace. “People are more isolated now than any other time. We need to be addressing social inclusion with the same seriousness and sense of urgency as we do with issues like smoking, alcoholism and obesity.”



A Volunteer Family Connect participant.

8 DECENT WORK AND ECONOMIC GROWTH



# SLIPPING THROUGH THE CRACKS

A report identifies areas in western Sydney where youth unemployment is double the national average.

## Western Sydney is

Australia's most significant urban growth corridor, but this is not reflected in job opportunities for young people in the region.

Through detailed cross-analysis of census, education, and labour-force participation data, a Western Sydney University study has found geographic clusters in western Sydney where cohorts of young people, aged 15-24 years, have disengaged from further education and the labour force.

Written by the Centre for Western Sydney, the *Youth Unemployment in Western Sydney* report was commissioned by Youth Action, the overseeing body for youth services in NSW, which represents 1.25 million young people in the state.

Lead author, Professor Phillip O'Neill, says the report points to a compounding set of problems behind the growing number of 'disengaged' young people in western Sydney.

This includes a marked deterioration in the labour market for young people since the global financial crisis; unsuccessful education outcomes; and government approaches to welfare assistance.

He says official statistics fail to capture this 'not earning or learning' group, yet when they are taken into account, as in this report, there are areas in western Sydney where youth unemployment is double the official rate.

For example, average youth unemployment for central western Sydney is 13.8%. But this average figure obscures significant sub-regional variations — two neighbouring suburb groups in that area, Lethbridge Park-Tregear and Bidwell-Hebersham-Emerton, have youth unemployment rates of 26% and 24% respectively.

In collaboration with .id — their report partners and

### NEED TO KNOW

- A group of 15-24 year olds in western Sydney who are not 'earning or learning' can be overlooked in official statistics.
- Western is studying this group
- The decline in full-time jobs for youth in western Sydney is one of the main issues.

demographers, the team identified a further 23 areas in western Sydney with high levels of young people 'not earning or learning'.

"Typically these areas involved a collection of two or three adjoining neighbourhoods where we found around 500 15-24-year-olds that are officially unemployed,

meaning they qualify for unemployment benefits and pass work-ready tests. We identified another 500 young people who have dropped out of the system all together," he says.

"It is very difficult to find this 'not earning or learning' group in the statistics. You have to do a lot of cross tabulation between welfare, education and labour market data."

In many of these clusters of disengaged youth, there were also high rates of young mothers, low rates of car and home ownership, low rates of school completion, low English language proficiency, and high levels of intergenerational welfare.

One of the main issues identified in the report was the long-term decline in the availability of full-time jobs for youth in western Sydney.

"Sydney is constructing a geographical imbalance where the growth in the young labour

This report was funded by Youth Action. © OcusFocus/Stock/Getty Images Plus



force in many neighbourhoods isn't matched by growth in accessible jobs. Getting people to work involves a very expensive public transport system and highly congested road systems," he said.

"To a certain extent the problem has been hidden because we collect data in ways that don't pick up this 'not earning or learning' group, but now we have developed ways of tracking them, the pressure to be doing something is growing."

"Predictive models tell us the most likely outcome for this group is a lifetime of welfare support. The effect on the public purse is enormous, approaching \$1 million per person over a lifetime.

"Poor education and work outcomes are not only undesirable from an individual point of view, they are unsustainable from a taxpayer point of view." ■

10 REDUCED INEQUALITIES



## SUPPORTING CHANGE

Navigating the transition from school to adult life with a disability.

### More than four million people in Australia

have some form of disability, according to the Australian Network on Disability. The unemployment rate for working-age Australians with disabilities (9.4%) is almost twice that of those without (4.9%).

Bridget found it very difficult to find a job after she left school. She wanted to get into childcare, but was not able to receive the help she expected to make her ambition come true. Bridget has an intellectual disability. "I don't comprehend properly and I muddle my words," she explains.

Bridget went from one adult disability service to another, until she settled at Alive4Life, a community and disability organisation where she is both a client and an employee. At Alive4Life, she gets help with reading and building her self-confidence. She also supports others.

Bridget found communication especially difficult during her transition from school to adult life. She also struggled to find someone who really understands people with disabilities, she says.

Bridget, now 24, is part of a five-member advisory group for a Western Sydney University research study funded by the Endeavour Foundation. All five members of the advisory group are between 16 and 25 years old and have an intellectual disability.

The study aims to understand how young people with intellectual disabilities experience the transition from school to adult services.

"I'm interested in finding the best research approaches and methods to include the views of children, young people, and people with a disability who might have different means of communication," says Lise Mogensen, a senior lecturer in medical education at Western and the principal investigator of the study.

Mogensen and her team, including community child health specialist and Western medical education senior lecturer, Jenny McDonald, are interviewing young people with intellectual disabilities, their carers, educators, and service providers to understand their experiences six to 12 months before and after the

transition from school to adult life. An online survey aims to reach around 100 young people with intellectual disabilities and to explore their experiences two to five years after leaving school. Survey participants who opt in also receive an invitation to participate in more in-depth interviews about their experiences.

In 2015, the Australian government began rolling out its National Disability Insurance Scheme, which should be fully operational in 2020. The scheme aims to address problems with the country's earlier model, in which funding went directly to organisations. The new scheme's consumer model aims to provide personally tailored support for those who need it. But there have been teething problems. Mogensen and her colleagues hope their research will provide the scheme with information about the gaps that still need to be addressed and will identify the necessary factors for a good transition process from school to adult disability services, training or employment. ■

Western researchers are asking young people with disabilities about their transition to adult life.



# EDUCATION FOR ALL

An Australian-led research project is helping teacher-educators in Papua New Guinea promote inclusive education for students with disabilities.

This research was supported by an Australia Awards Fellowship funded by the Australian Government.  
© Stockbyte/Stockbyte/Getty Images

## The 'UN Convention on the Rights of Persons with Disabilities (CRPD):

recognises the universal right to inclusive education. This can be difficult to facilitate, especially in countries like Papua New Guinea, where 85% of the population lives in remote and rural areas.

“Children with disabilities in these areas are often refused entry to formal schooling,” says Genevieve Nelson, the chief executive officer of Kokoda Track Foundation (KTF). “Sometimes teachers and schools are the ones who refuse entry because they do not have the specialist skills to support children with disabilities to engage meaningfully in learning. Sometimes it’s the parents who refuse to send them to school.”

KTF, a not-for-profit organisation that aims to establish the right to “an inclusive, equitable and quality education” for all, was a major partner in a project led by Western Sydney University researchers, Danielle Tracey and Katrina Barker. The project provided specialist training to 10 teacher-educators to develop their capabilities to promote inclusive education at Papua New Guinea teacher colleges.

“We wanted to explore the level of understanding among officials within the National Department of Education, the Papua New Guinea (PNG) Education Institute, and various teachers’ colleges, and to support them to strengthen policy and practices related to inclusive education, especially in remote and rural areas,” says Nelson.

### RESEARCH SKILLS

The teacher-educator fellows received four weeks of training at Western followed by a week of further training, several months

later, back in Papua New Guinea. At the end of the project, they reported that one of the most highly valued outcomes of their training was learning to conduct ‘action research’. In other words, the fellows learned how to use research methodologies to critique and improve specific areas of teaching practice.

## “IT HAS BEEN AMAZING FOR OUR TRAINERS AND EDUCATORS.”

One of the fellows, Cathy Sowi, a curriculum officer of inclusive education at Papua New Guinea’s National Inclusive Education Unit, used focus group interviews and surveys to investigate the inclusive education program carried out in a school in the National Capital District of Port Moresby. Her research aimed at understanding the program’s context,

### NEED TO KNOW

- Children with disabilities in rural areas of Papua New Guinea (PNG) have trouble accessing inclusive education.
- Researchers from Western led a project that helped PNG teacher-educator fellows promote inclusive education.
- The fellows’ experiences will help inform PNG education policy.



Cathy Sowi at the National Inclusive Education Unit.

effectiveness, and the implications for teaching and learning. After the project conclusion, she expanded her research to cover schools in three other provinces. “The recommendations that emerged from the fellows’ action research will contribute significantly to the developments of inclusive education in Papua New Guinea,” says Sowi.

The fellows presented their findings to the directors of Papua New Guinea’s Department of Education, which is in the process of restructuring the country’s schooling system. “We have an exciting opportunity to ensure that inclusive education and education for all is front and centre of this new agenda,” says KTF’s Nelson.

### CONTINUOUS LEARNING AND TRAINING

The fellows also helped put together a manual that provides teachers in remote and rural areas with practical strategies, skills and techniques to engage parents and communities with the aim of improving access to education for children with disabilities.

They also learned how to improve curricula, assess

students’ learning needs, use assistive technologies, and received teaching on the sociocultural construct of disability and on models of leadership.

Tracey and Barker, along with the ten fellows, are working collaboratively to disseminate the results of the research project. “Disseminating the results in collaboration with the Fellows is important to developing their capacity and ensuring the findings are meaningful to educators in Papua New Guinea,” says Tracey. Additionally, following Tracey and Barker’s initiative of offering Western’s Master of Inclusive Education internationally, several fellows and their institutes have already expressed interest in joining the program. They have also hosted shorter training sessions at Western for 26 Papua New Guinea teacher-educators in collaboration with KTF.

“It has been amazing for our trainers and educators to experience first-hand the professional university life at Western and to have access to their resources,” says Nelson. ■



Chenchen Zhao (front) and Chelsea Maier (background) examining eggplants in Western's glasshouse.

2 ZERO HUNGER



# BRINGING AGRICULTURE INDOORS

Australian-led advancements in indoor cropping technologies provide hope for an increasingly strained agriculture sector.

## As Australia's climate becomes more volatile

and protracted droughts and extreme floods undermine the reliability of food production, Western Sydney University researchers have embarked on an ambitious protected cropping initiative to lay the groundwork for the future of agriculture.

Distinguished Professor David Tissue's group at Western's Hawkesbury Institute for the Environment is investigating how plants might respond to a changing climate, including variations in carbon dioxide levels, temperature, water and nutrient availability, and extreme climate events, in order to develop technologies that could help improve productivity in an increasingly uncertain future.

"Historically, the Australian environment has been highly variable, but climate change has increased that variability, leading to much higher temperatures and greater intensity of extreme climate events, including heatwaves, droughts and floods," says Tissue. "These environmental challenges and a rapidly increasing population demand action to provide food security. Protected cropping is one solution for horticultural crops."

While conventional cropping is vulnerable to the elements, indoor or protected cropping allows food growers to control all aspects of the crop's environment and manage resources such as

water and nutrients in a more systematic way. This can dramatically improve yields

## NEED TO KNOW

- The future of food production may lie in protected cropping.
- The Hawkesbury Institute for the Environment has opened a 1,700 m<sup>2</sup> greenhouse to investigate ways to optimise food production.
- Photovoltaic 'smart glass' may help reduce a greenhouse's energy costs.

This research was funded by Horticulture Innovation Australia and supported by the Future Food Systems Cooperative Research Centre. © Daniel Boud



(Left to right) Chelsea Maier, Chenchen Zhou, Yagiz Alagoz, Norbert Klause and Xin He.

and reliability, but comes at a significant increase in cost.

One of the technologies that Tissue's team is investigating is transparent solar cells or 'smart glass' for glasshouses. "The idea is that innovative smart glass technologies and films can reduce the heat load inside a glasshouse and so reduce energy costs, while maintaining or improving crop productivity and quality with reduced water and nutrient use and the possibility of renewable energy generation," says Tissue.

In 2017, with the support of the industry research and development agency

Horticulture Innovation Australia (HIA), the Hawkesbury Institute for the Environment commissioned the National Vegetable Protected Cropping Centre (NVPCC) — a huge, 1,700 m<sup>2</sup> research glasshouse with eight rooms that can be independently controlled to adjust environmental parameters such as carbon dioxide level and temperature. It also provided an ideal structure for the trial of smart glass technologies.

"We found that while the smart glass reduced energy use inside the glasshouse, it also reduced overall light intensity and some wavelengths of light, including

red light which is important for photosynthesis," says Tissue. "Two plant varieties, eggplants and capsicum, were tested inside the smart glass," says Dr Chenchen Zhao, a postdoctoral fellow in Tissue's lab. "The larger fruit, eggplants, had a decreased crop yield, compared to the smaller fruit, capsicum, which were not affected as much in terms of crop yield in the smart glasshouse."

"The reduction in light led to reduced carbon availability and subsequently reduced crop production, although it also led to lower nutrient and water use," explains Tissue. "Importantly, we identified the limitations to the current smart glass specifications and have developed some ways to improve it."

"The research group is working toward developing a film that will reduce wavelengths of light unnecessary for plant development while allowing full transmission of wavelengths that are," says Chelsea Maier, the glasshouse's facility co-ordinator.

Research developed at the NVPCC will inform the research that will be carried out by the newly established Future Food Systems Cooperative Research Centre (CRC) at Western Sydney University in collaboration with the University of New South Wales and other institutions nationwide.

"Through the substantial support of HIA and, soon, the Future Food Systems CRC, we have been able to address many of our main objectives by involving technicians, PhD students, and post-doctoral researchers in the research, and developing new technical solutions to maximise food production while minimising resource use and costs," says Tissue. "We plan to expand on our significant progress on the smart glass project through Western's role in the CRC, where we can further modify the technology to provide even greater benefit to crop production by leveraging greater technical capacity including robotics and hyperspectral cameras." ■



An aerial view of the glasshouse, the blue-tinted glass is the Smart Glass.

(top left) © Daniel Boud

11 SUSTAINABLE CITIES  
AND COMMUNITIES

# RESTORING THE HERITAGE OF LANGTANG

An interactive exhibition will help preserve the history of Nepal's Langtang valley.

When Western Sydney University researchers, Hayley Saul and Emma Waterton left Langtang, Nepal, on the morning of the 25th of April, 2015, their contacts in the remote Himalayan village bid them a fond farewell, already anticipating their return the following year. But two hours into their hike back to Kathmandu, an earthquake struck, triggering deadly landslides across the region. Langtang, and the community that had lived there for hundreds of years, was almost destroyed.

Saul and Waterton, who were led to safety by local guides, have been using their research into the culture and history of the region to create an interactive heritage trail around the valley that will tell the story of its people and their past. The first exhibition hut was opened last year, and another two are under construction.

Langtang is a region of the Nepalese Himalayas just north of Kathmandu, on the border with Tibet. Langtang village sits at 3,400 metres above sea level in a narrow valley beneath the region's highest peak, Langtang Lirung. It was once a thriving community of more than 400 people, including many porters who guided trekking tourists.

Saul, an archaeologist, first visited Langtang in 2011, after

a non-government organisation (NGO) worker with Community Action Nepal invited her to see an ancient monastery in dire need of repair. "This was an opportunity to observe restoration work carried out locally, and the traditional methods used." When Saul began talking to the monks at the monastery, she heard about other sacred landmarks dotted around the region that held historical or mythical significance to the people of Langtang. Fascinated, Saul returned each subsequent year to document Himalayan heritage by gathering stories that had been passed down through generations.

Waterton, a heritage specialist, joined Saul on a visit to Langtang in April 2014 and together they travelled with the locals to significant places

in the valley, recording tales of the folklore written into the surrounding landscape. They discovered how the local people engaged with the past, both

physically and emotionally. The pair returned to Langtang in April 2015 to continue their research. During that trip, one of their new friends, Son Norbu, invited Saul and Waterton to help build a Himalayan Heritage Museum in the village. They parted ways with heads already buzzing with ideas.

Saul and Waterton were already hiking back to Kathmandu when the ground began to shudder. The 7.8 magnitude earthquake shook loose an immense chunk of rock from Langtang Lirung mountain, which toppled onto a glacier and sent a wave of rock, ice and mud down the valley. Langtang village was blown away by the shockwave and whatever remained was buried under 100 metres of rock. Only one home survived, along

**NEED TO KNOW**

- Langtang village was almost destroyed by the April 2015 earthquake.
- Researchers from Western Sydney University are helping to restore the heritage that was lost.
- The first exhibition space opened in 2018 and two more are under construction.

© Quentin Peileiter / 500px/500Px Plus/Getty



The Lirung glacier in Langtang valley

with a handful of people who had found shelter. More than 200 people died in Langtang that day, including some 70 tourists trekking in the scenic valley. Approximately 2,900 historical sites were damaged or destroyed. For the Himalayan communities, rebuilding these sacred sites was a priority.

In the aftermath of the quake, Saul and Waterton raised funds to help rebuild Langtang, but they wanted to contribute something more than financial aid. They owed their lives to the local guides who had led them to safety, one of them was the brother of Son Norbu. They realised their anthropological research could be used to protect and pass on the lost heritage. In December 2016, Saul and Waterton visited Langtang for the first time since the tragedy and began planning the commemorative museum they had agreed to help the villagers build, 18 months before.

“Instrumental to our work on the Langtang Heritage Trail project has been our collaboration with the NGO, Flagstaff International Relief Effort (FIRE),” says Waterton. Spearheaded by Meredith Potts, FIRE has been working with Saul and Waterton for the past three years, collecting oral histories and survivor stories, and working with the local community to site the three exhibition huts.

The design for the exhibition is simple and sustainable. It will comprise three huts, built in the traditional style, that use mountain streams to turn a prayer wheel and generate hydroelectricity. In each hut,



Emma Waterton (left) and Hayley Saul (right) at Langtang in 2014.

an iPad, powered by nature, will play back the stories of local people. Visitors will be guided to the special sites relating to each story as they wander along a carefully laid heritage trail. “Each hut can be a rest stop for weary travellers,” says Saul, “but also a place to learn and reflect on the cultural history of the area.”

But simple design does not always translate to simple delivery. “Because the area is so remote,” explains Saul,

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## THEY OWED THEIR LIVES TO THE LOCAL GUIDES WHO HAD LED THEM TO SAFETY.

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“everything must be brought up by porters, donkeys, or helicopter, which makes

building an infrastructure like this extremely expensive.” The project initially received \$20,000 via a Western Sydney University Vice-Chancellor’s Research Award, and will receive another \$40,000 each year for three years. “When we opened the first exhibition hut in 2018, the locals’ reaction was overwhelming. Everybody came out to celebrate with us, bringing tea and cakes. They presented us with traditional white scarves called khada and then paraded with us all the way around our tour of the sites.”

The researchers’ culturally-sensitive approach has already inspired other heritage projects in the region. “For the mountain communities of Nepal, natural and cultural heritage sites provide spirituality, sanctity and security,” says Dr Anu Kumari Lama, a tourism specialist at the International Centre for Integrated Mountain Development (ICIMOD). “The project in Langtang will generate positive outcomes for tourism, heritage conservation and community wellbeing”.

Saul is now working with ICIMOD on a Kailash Heritage Route in Humla, Nepal, which is the gateway to the sacred Mount Kailash. They want to create a similar interactive exhibition that is eco-friendly, sustainable and respectful of local culture. “Himalayan communities and their regions are prone to natural disasters, poor living conditions and weak economic foundations,” says Dr Lama, “making them some of the most sensitive heritage sites and therefore extremely important for protection and preservation.” ■



# GENDER AND SEXUALITY IN THE CLASSROOM



When it comes to gender and sexuality, classroom education can be contentious. A new survey aims to advance the conversation.

## When debate about the 'Safe Schools Coalition Australia' programme

raged in late 2017 and early 2018, many mainstream media outlets reported that parents didn't want their children taught about sexuality and gender diversity in the classroom. But research suggested the contrary. Western researchers are now surveying parents across the nation to establish a clearer picture of their views.

"Studies have indicated that parents overwhelmingly feel there should be some education around these issues in schools," says Associate Professor Tania Ferfolja, from the Centre for Educational Research in Western Sydney University's School of Education. She explains, however, that those studies, including those she performed with her colleague, Associate Professor Jacqueline Ullman, were small and limited: "Because nothing has been done on a large scale in Australia, we really don't know what parents want."

Intent on rectifying this, Ferfolja and Ullman have embarked on the country's largest and most detailed exploration of sexuality and gender diversity education to clarify exactly what parents would like to see their children taught in schools and when. Funded by the Australian Research Council, data collection for the first part of the project — a nationwide parent survey — was completed at the end of 2019. The survey was advertised via Facebook to the parents of children who attend any public school in Australia, from kindergarten to the final year of high school.

"The second phase involves contacting parents whose children are gender and sexuality diverse to ask about their experiences of the schooling system, for themselves and their children," Ferfolja says. "This is to get a sense of where they have been best supported, and where more support is required."

This is seen as critical because research shows that young

sexuality diverse, transgender and gender diverse people are extremely vulnerable to mental health concerns. Their rate of depression and anxiety is considerably higher than for

adolescents in the general population and they experience extraordinarily high levels of self-harm and suicide attempts.

"Part of the reason we wanted to do this work is that from existing research we are aware that a number of gender diverse or same-sex attracted students have quite a hard time, for a variety of reasons, but primarily to do with their experiences at school," Ullman confirms.

The third major component of the research project by Ferfolja and Ullman is the development of a "performed ethnography". This involves collating the voices of the research participants and creating a play for the purposes of instruction and education. Professor Tara Goldstein, who is an academic and a playwright from the Ontario Institute for Studies in Education at the University of Toronto, in Canada is collaborating on the work. "We are working with her to develop a performance piece that can be used for the professional development of teachers and

### NEED TO KNOW

- There was heated political debate about the Safe Schools Coalition Australia programme in 2017-2018.
- Preliminary studies suggested that parents feel there should be some education about sexuality and gender diversity in schools.
- Western Sydney University researchers are now conducting a nationwide survey of parental attitudes regarding sexuality and gender diversity education.

This research was supported by the Australian Government through the Australian Research Council.



Studies have shown parents believe there should be curricula related to sexuality and gender in the classroom.

other interested people working in support services in this area,” Ferfolja says.

Recommendations for practice and policy are also expected to come out of the research, suggesting that the findings will help guide and streamline curriculum development, possibly nationwide. “We will be working with an advisory committee, which helped refine the survey content, to really feed results back into every state and territory,” Ullman says. Because there will be location data from participants, it may be possible to provide tailored feedback to states and territories about what parents in different locations want taught at school and for what age groups.

One of the major stakeholders in the advisory committee has

been the Australian Council of State School Organisations. The council’s chief executive, Dianne Giblin, says the main reason for her organisation’s keen interest and support, is to ensure that school curricula are able to properly represent and reflect diversity across the Australian community.

“Not only do we need to give a window into sexuality and gender issues for all young people but particularly for young people who are gender diverse,” she says. “The diversity of sexuality in our community needs to be mirrored in our curriculum, so all young people have that broader perspective. It’s also needed for the mental health and wellbeing of our young people who may be transgender or

same sex attracted. That needs to be reflected so that they feel comfortable about who they are.”

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**“THE DIVERSITY OF SEXUALITY IN OUR COMMUNITY NEEDS TO BE MIRRORED IN OUR CURRICULUM.”**

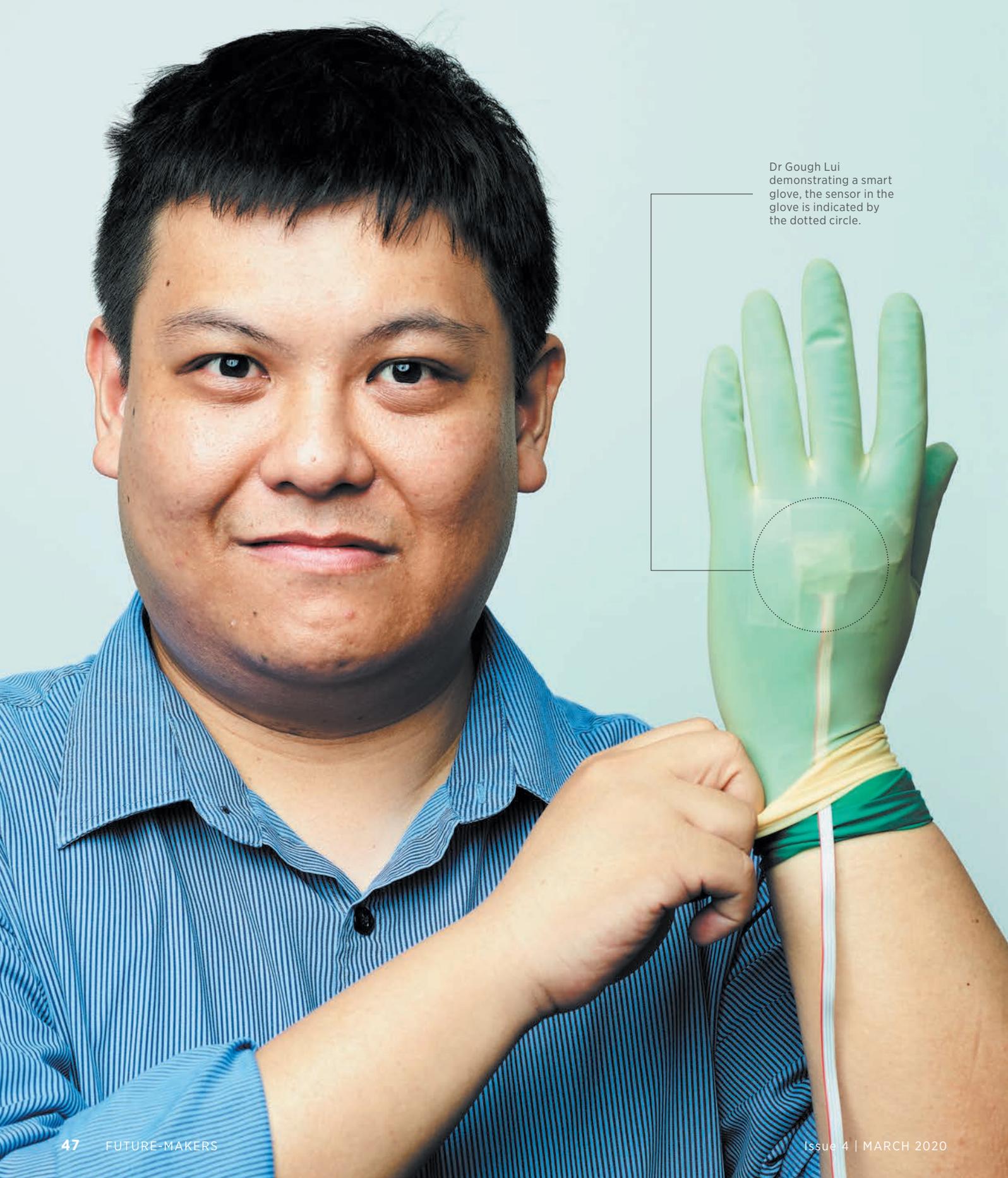
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**MORAL CODE**

“We are delving more deeply into the reasons why parents might support [particular classroom] inclusions and

reasons why parents might be opposed to them,” Ullman says. “This is really intertwined with people’s sense of morals and values and their code of ethics. We’re trying to take something really complex and distil it down into a measurable set of items.”

This sort of information will also help teachers better navigate what is for many of them a potential minefield. “Teachers themselves are very uncertain about what they can actually say in the classroom; what might or might not get them into ‘trouble,’” Ferfolja says. “So, we really do need to know and, whatever the outcomes actually are, use them to inform policy and curriculum and syllabus documents, so teachers have some sort of guidance.” ■



Dr Gough Lui demonstrating a smart glove, the sensor in the glove is indicated by the dotted circle.

## 3 GOOD HEALTH AND WELL-BEING



# A SAFER HANDOVER

Electronic gloves help transfer knowledge from master surgeons to students.

Researchers from Western Sydney University, in consultation with Liverpool Hospital, have developed tools to help trainee surgeons master intricate surgical procedures.

Gough Lui, a biomedical engineer at Western's MARCS Institute for Brain, Behaviour and Development, has worked closely with Liverpool Hospital for a number of years. "We get engineers to sit in with clinicians to identify problems and inspire solutions that can really make a difference," he says. In one of these sessions, Clinical Dean and Foundation Professor of Surgery and Colorectal Surgery, Professor Les Bokey, discussed with Lui the possibility of training surgeons in a more objective and evidence-based manner to ensure evidence-based competency.

A big hurdle is that the surgical skills needed now are more complex than in previous decades. Surgeons must master open surgery, keyhole surgery with cameras, and robotic surgery, for instance. But while techniques have advanced, teaching methods have not greatly changed.

In training, an experienced surgeon watches over the student's shoulder, giving feedback. "Often they say, 'that wasn't very good,' but can't concretely articulate what is wrong," says Lui. "That's very frustrating when you're trying to master a skill, but not seeing a way forward."

One positive advance in training has been that students can now practise on simulators. But these are hugely expensive, and trainees in typical hospitals rarely have easy access.

To solve the problem, Lui has developed surgical gloves containing electronics to record the subtle, fast and controlled hand movements of skilled surgeons. When worn by students, the gloves can monitor how their hand motions differ from the experts'. Lui hopes that the gloves will eventually be coupled with a smartphone app, so trainees can practice tasks at home, for as little as \$100 — a fraction of the cost of a simulator.

Creating the perfect gloves is a work in progress. At first, Lui placed electronics on the back of the glove, to detect acceleration and hand orientation, and added force-sensors in the

fingertips. But experienced surgeons reported that they reduced their touch sensitivity and were too bulky, hindering movement. Lui has looked at alternatives including the use of force sensors further up the forearm and motion sensors on the back of the hand for an upgraded version.

"Now we have a tool that can assist in objectively measuring the intricate hand manoeuvres," says Bokey. Trainees who have participated in the development

of the prototype can readily appreciate their potential contribution to training. Lui laughs that students even loved the clunky early version. "They are excited because they can see the promise," he says.

Lui is working out how best to deliver useful instructions to trainees. The gloves collect motion data and relay them to a screen, where even the tiniest jitters are visualized. This can be distracting to students concentrating on difficult tasks. Alternatives include 'haptic' feedback — the fingertips buzz — or audio feedback to guide trainees along the right path. But Lui is cautious in case students become overly reliant on the technology. "In reality, human debriefing is always better than computer feedback alone," he says. "This is not a replacement for trainers, but it will augment their ability to give advice."

The plan is to do a pilot trial in mid-2020, says Lui. If successful, the gloves could have unexpected uses. "We've already had requests from musicians asking if these gloves could help people become more skilled performers," says Lui. "They could have a wider impact than we ever hoped." ♥

## NEED TO KNOW

- The surgical skills needed today are more complex than in previous decades.
- Gough Lui and the team at MARCS have developed electronic gloves to help trainees learn from the movements of skilled surgeons.
- The gloves have proven popular with students.



# BRAIN

**Accidents can sometimes spark innovation.** About six years ago on a normal day in the lab, Western Sydney University neuroscientist, Yossi Buskila, was looking for signs of how brain diseases progress in sample slices taken from mice. Brain slices typically only remain viable for around six hours before the cells die, so Buskila usually disposed of them at the end of his day. This time, he forgot. When he returned next morning, he was surprised to see that a small number of cells had survived.

“I asked myself, why did some survive, and can we enhance that process?” That led him and colleague, Paul Breen, from The MARCS Institute, to develop the ‘Braincubator’ — an incubation system that prolongs the slices’ longevity by up to six times, to around 36 hours. The apparatus opens new avenues of research into memory and learning, and into neurodegenerative disorders.

Buskila studies slices from mice that have been genetically modified to replicate how diseases such as Alzheimer’s, epilepsy and amyotrophic lateral sclerosis (ALS) affect electrical and chemical signals between the brain’s neuron and glial cells. He is also driven by a fundamental desire to reveal the brain’s workings. “How do brain-waves code information? How do thoughts come about?” Buskila says. “These questions are my passion.”

The short lifespan of a brain slice was a huge obstacle for research. Taking the brain out of the body and cutting into it immediately destroys 20-30% of cells. The rest become exposed to bacteria, which release toxins that kill cells within a few hours. And preparing new samples every morning took up to two hours.

Buskila’s braincubator preserves the slices in a tank filled with a liquid that mimics spinal fluid. Simply adding antibiotics to try to stop the bacteria growing will not work because the drugs would damage the brain cells. So Buskila’s team tried some other tricks. They found that cooling the slices to 15 or 16°C slowed the spread of bacteria.

Another way to destroy bacteria is to shine UV light on to the tank, but that also kills neurons. In the Braincubator, brain slices are kept in one cooled chamber, while in a second

chamber, UV light shines on to the artificial spinal fluid which circulates between the two. This successfully slows bacterial growth in the liquid, dramatically increasing the slices’ life.

“NOW WE CAN LOOK AT WHAT HAPPENS NOT JUST IN 4 HOURS, BUT IN 20 HOURS.”

The Braincubator is already on sale and has proved useful for researchers. Dario Protti, a physiologist at the University of Sydney, uses the Braincubator in his lab, and says “it has had a very positive impact on my research”. He says the equipment helps reduce the number of animals used in experiments and could potentially be used to monitor changes in how proteins and genes are expressed in brain tissue over much longer periods.

“Now we can look at what happens not just in four hours, but in 20 hours, and study the difference between short-term and long-term synaptic processes,” says Buskila. “If the Braincubator can have a real impact on our understanding of how the brain works, that will make me happy.”

## NEED TO KNOW

- Brain slices typically last 6 hours.
- The Braincubator, developed by Western researchers, has extended slice longevity by a factor of 6.
- It is now commercially available.

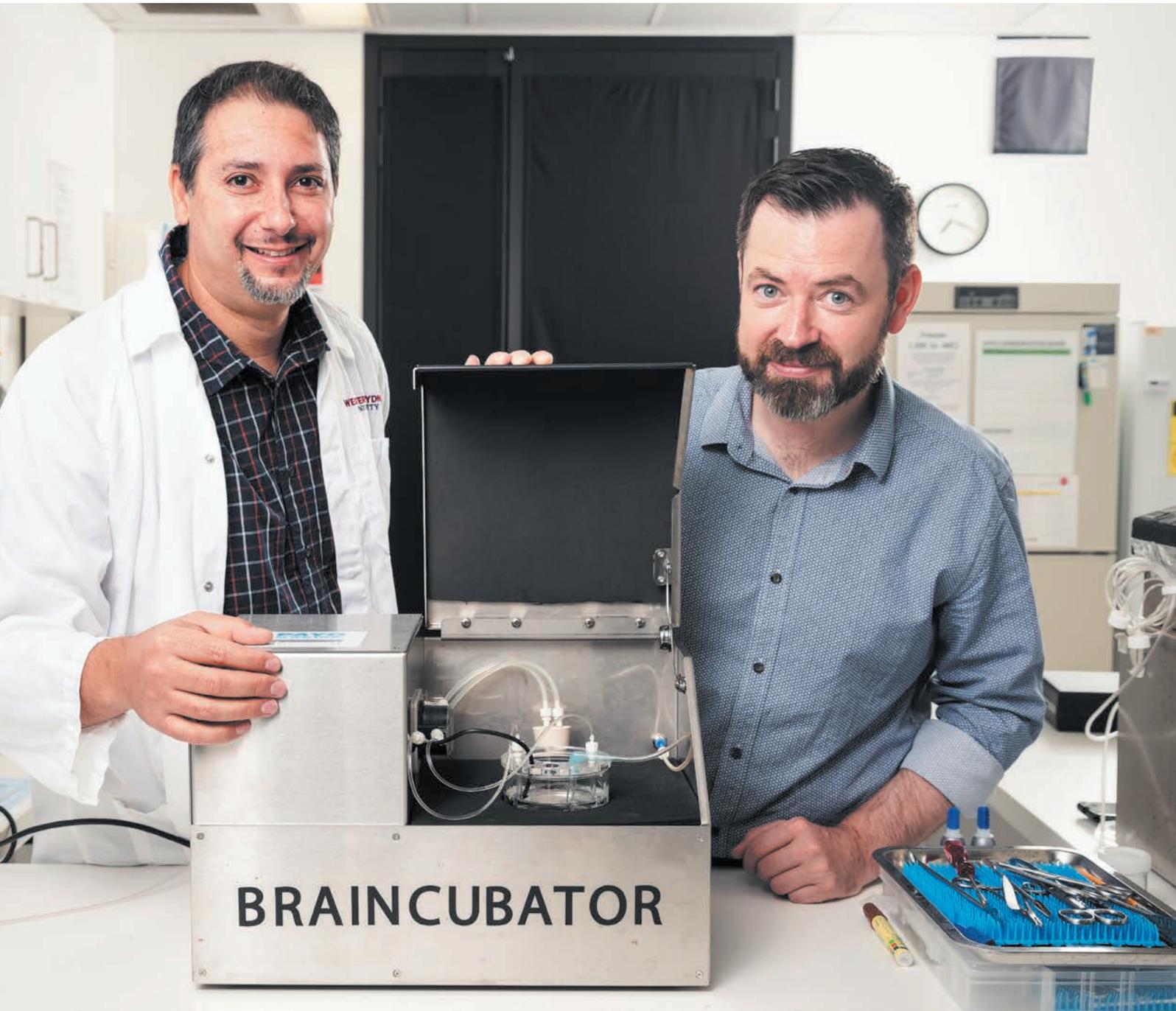


This research was funded by MND Australia. © Daniel Boud

Dr Yossi Buskila (left) and A/Prof. Paul Breen (right) with the Braincubator.

# WAVES

Technology developed by Western researchers can extend the viability of brain slices up to 36 hours.

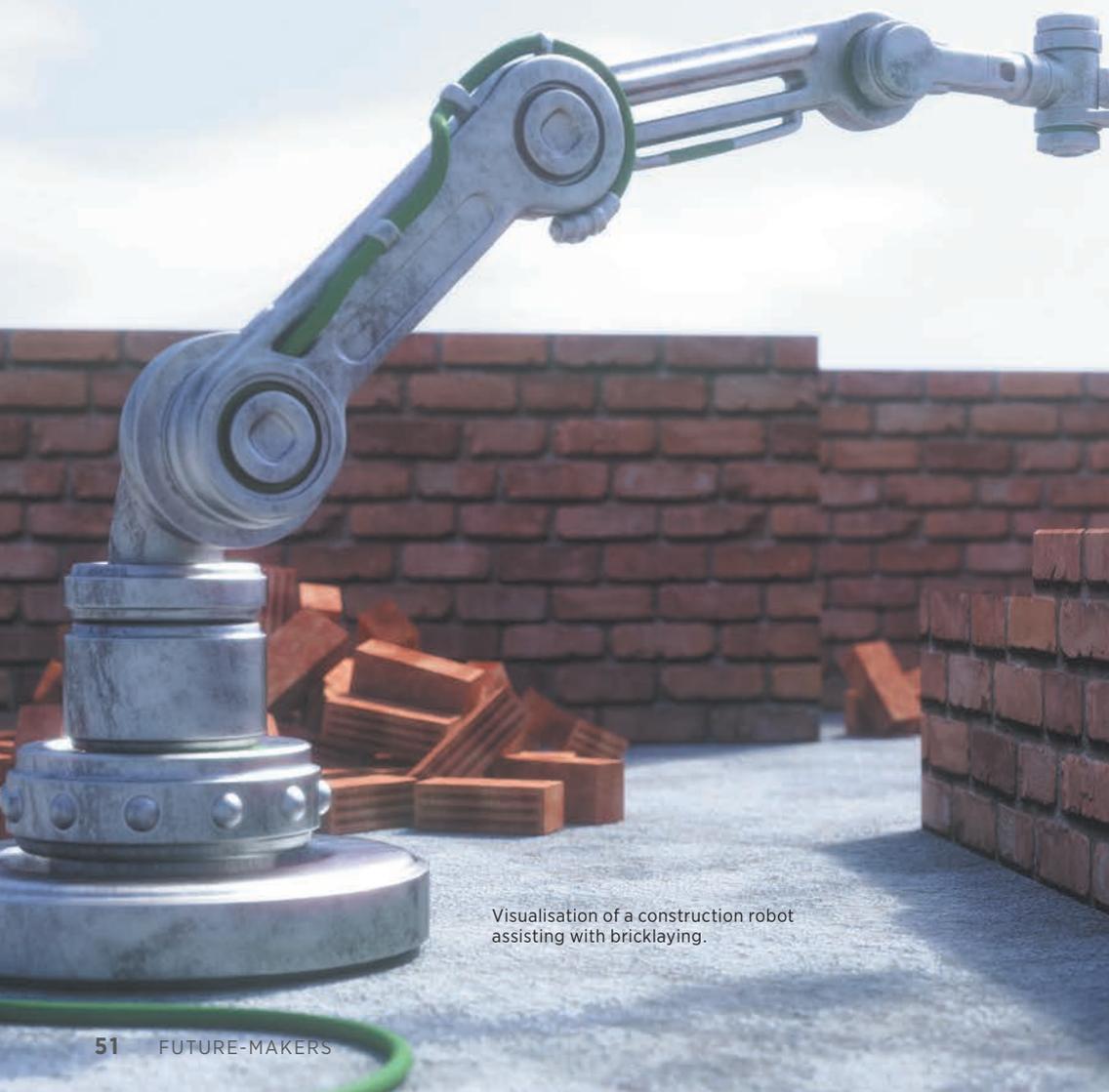


11 SUSTAINABLE CITIES AND COMMUNITIES



# CONSTRUCTIVE CONVERSATIONS

Robots working alongside builders could be the key to meeting Australia's housing construction challenges, if the industry can be persuaded to embrace the new technology.



Visualisation of a construction robot assisting with bricklaying.

## The growth spurt of Australia's largest cities

shows no sign of slowing. By 2036, the NSW state government predicts that almost 1.75 million new residents will call Greater Sydney home — an unprecedented expansion rate for the city.

Housing all these people is a daunting challenge, but the construction industry could make use of new methods that might help. Although it may be a while off, there are early signs that tradespeople could soon be joined on site by robot assistants, able to take on some of the heavy lifting of

building new homes.

Allocating robots some of the more mundane and repetitive tasks of house building, as well as some of the more dangerous roles, would boost

safety and productivity.

To help facilitate the adoption of robots as the latest tool on building sites, the New South Wales Government's land and property development organisation, Landcom, sponsored CoBuilt 4.0, a project to bring together researchers from across Sydney to develop collaborative robots to work with tradespeople to help meet the state's housing goals.

"Sometimes when you bring universities together, it's just a really good fit," says Professor Kerry London, Dean of the School of Built Environment, who is leading Western Sydney University's contribution to the project. The University of Sydney and UNSW Sydney researchers are developing

This research was funded by Landcom. © Maciej Frolow/Photodisc/Getty Images

the robot technology. “Our role is to mobilise the connection to industry and to investigate adoption barriers and enablers,” London says.

London and her Western colleagues, including Dr Yingbin Feng and Dr Karyne Ang, investigated the human side of the equation. “I have expertise in adoption of new technologies in the construction industry and have completed nationally funded research studies over the past 15 years on all manner of innovations,” London says. “One of the greatest challenges, and the biggest opportunities, revolves around people embracing the change”, she says. “For me, it has always been about the people.”

London began her career as an architect before moving into capital works project management with the Northern Territory government. There, she experienced first-hand the interactions between government organisations and the construction industry, which are especially nuanced at times of change — whether it be new ways to fund major projects, such as the development of public-private partnerships; or new technologies, such as the move toward off-site manufacturing as a method of building construction. “Government can play a role as a major client, as a regulator, and also as an influencer,” London says.

Understanding of the way government could encourage positive change in the industry was limited, which, in 2002, led London to another career shift. “I went into academia, to do my PhD at Melbourne University, to investigate the underlying structure and behaviour of the construction industry, specifically

to enact transformative change.”

London made case studies of six major projects ongoing at the time, including Melbourne’s Federation Square, to map the supply chains and to establish what the power structure of each chain looked like. Power might lie in the hands of major multinationals through their sheer volume of purchase, or with small or medium companies that are one of a few suppliers of a particular aspect of the build or who are extremely skilled in their particular field, London explains. Understanding construction industry supply chains by mapping power structures has informed everything she has done since. “How do we understand the power structure to mobilise the introduction of something like collaborative robotics?”

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**“WHEN PEOPLE  
ADAPT THE  
INNOVATION  
TO THEIR OWN  
SITUATION -  
THAT’S WHEN  
REALLY  
EXCITING  
THINGS HAPPEN.”**

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First, the team looked at any research already carried out into the potential of construction robotics. “The most interesting trend, which shaped our work, was that the old idea of robots coming on site and replacing most or all the people, and the whole site being highly automated, although enticing for safety reasons, has never taken off”

## NEED TO KNOW

- Sydney’s expansion shows no sign of slowing.
- Robots could help the construction industry keep up with demand for housing.
- Western researchers are investigating the industry’s adoption of this technology.

A far more realistic picture, she says, involves collaborative robots taking over specific tasks that people don’t want to do. Mundane and repetitive tasks such as laying a straight row of bricks at ground floor level, or high-risk tasks such as constructing a roof, would be particularly suited to robotics, leaving people to do the more interesting, problem-solving, creative tasks in a safer environment.

Starting the discussion with the construction industry was the next step. “We did two really significant workshops, primarily with contractors, just trying to identify what they thought would be the challenges, and areas where they thought this might be a great idea.”

The team then conducted the second focus group interview with sub-contractors. Some tradespeople could immediately see potential benefits. “You could have it set up with voice recognition, so you could yell out a number and it would be able to cut this timber for you,” said one carpenter from a major construction company. “It would be useful for timber pre-cutting,

and for passing timber for someone in the roof, so that you don’t need the ladder. In the session the ideas really began to flow.”

As with any disruptive new technology, there were legitimate concerns, including the costs and complexities of training people to use the new machines, and worry over needing to be ‘computer smart’ to operate them. Discussing potential training modes was a key part of the workshops.

Ultimately, says London, there will be a whole range of mindsets, and understanding how to navigate that to help drive the change is where the supply chain structure comes in. Contractors in comfortable ‘power positions’ are probably not going to move until the technology becomes an industry norm. The early adopters are likely to be contractors in highly competitive parts of the supply chain seeking a commercial advantage over rivals, who see the market opportunity and invest in the technology.

“As researchers, when we look at innovative technologies we imagine possible scenarios - and then we open up discussion,” London says. “Sometimes”, she says, “people take the innovation in a direction you never foresaw.”

“One contractor, who builds high-rise residential apartments, said one repetitive task that really takes up time is doing inspections in each room,” London says. “He got pretty excited trying to work out how he could use robots to do these inspections to free up people for many other tasks,” she says.

“When people adapt the innovation to their own situation - that’s when really exciting things happen.” ♥



# LEAVES OF GRASS

A study into why grass turns brown and what it means for grassland productivity is vital to Australian ecosystems and industry.

**The prickly crunch of dry,** brown grass is a familiar sensation in the Australian summer. But despite its ubiquity, little is known about when and why grass turns brown, and what it means for Australia’s extensive grasslands in a changing climate.

ARC Georgina Sweet Australian Laureate Fellow, Distinguished Professor Belinda Medlyn and colleagues at Western Sydney University are embarking on an Australian Research Council Discovery Project to answer key questions about how grasslands respond to changes in temperature and rainfall, and what implications that has for the carbon they store in the soil.

Grasslands make up around 40% of the planet’s terrestrial surface; from the vast prairies of North America, and the wind-swept steppes of Eurasia, to the pampas of South America and savannahs of northern Australia.

They’re also vital for cattle farming. “There’s a lot of interest around how to maintain pasture grasses during hot and dry periods, what kinds of pasture grasses, what will be

able to survive and continue to perform when we have hotter and drier conditions,” Medlyn says. “The grasslands are really interesting ecosystems, valuable in their own right, but they also support a huge industry.”

The project was inspired by research conducted in the North American grasslands of Wyoming, which looked at the effect of increasing carbon dioxide levels and heating on

the grass. Several vegetation models were applied to try and predict the responses in this experiment, but Medlyn says the models didn’t adequately capture the impact of the grasses browning-off as the soil started to dry out. The probable reason was that a lot of models of the effects of carbon dioxide levels, temperature increases, and rainfall decreases, were originally developed for forests, which don’t brown-off in the same way that grass does.

Browning of grass in dry conditions means that the grass isn’t photosynthesising and therefore won’t be capturing carbon or producing new grass. “If you’re trying to predict how much productivity you have in a grassland, you need to be able to predict that browning process,” Medlyn says.

Medlyn and her group are deploying devices known as ‘phenocams’, which are essentially time-lapse cameras that record changes in the grass colour over time. “By looking at those images, we get much more information about what’s going on with the grasses than if we would just go



Belinda Medlyn at Western’s Hawkesbury Institute for the Environment.

## NEED TO KNOW

- Grasslands are important components of Australia’s ecosystem,
- Belinda Medlyn and colleagues are studying why and how grass browns.
- Researchers are collecting targeted data sets to develop and test model representations of key processes.

and measure what had happened once a year.”

The project also involves field and glasshouse experiments using technologies that enable researchers to subject grasses to different concentrations of carbon dioxide, and levels of heat and water to see how they respond over time.

## WHAT LIES BENEATH

One key challenge with grasslands is that so much happens below the surface, says Professor Elise Pendall, a soil ecologist and one of the four Western researchers leading the project.

This research was supported by the Australian Government through the Australian Research Council.



“In grasslands, roots make up around 75% of the biomass,” Pendall says. Grass growth crowns sit right at the soil surface, with the leaves growing upwards from them, and the roots extending down. Study often involves digging pits to extract the entire plant and root systems. If that isn’t possible, researchers take soil cores so they can extract the roots and measure factors such as biomass, respiration rates, carbon content and nutrient content.

Roots are vital for grass’s survival during hotter, drier conditions, Pendall says. “They can get thicker when it gets

warmer, and that might be to reduce water loss, but we want to know if that compromises their ability to absorb water.”

One of Medlyn’s post-doctoral researchers, Dr Jinyan Yang, is developing a model that will pull together all the information gathered in the project, and which can be used to predict grassland productivity, greening and browning under different climatic conditions.

“Then, you can start exploring different species and figure out what kinds of species might be able to cope best with different climatic conditions,” Medlyn says.

She points out that many Australian grasslands, particularly in the country’s interior are already well adapted to hot, dry conditions.

“Part of our work is really looking at how those grasses managed to survive during those hot dry conditions, what traits enable them to keep going during those dry periods,” she says.

Pendall gives the example of a project in Tasmania, which compared soil carbon storage underneath kangaroo grass and wallaby grass. Kangaroo grass sequestered much more carbon, and this sequestration

was shown to be fairly resilient to modelled climate change conditions.

In addition to storing carbon, grasslands also play an important role in stabilising Australia’s fragile soils and preventing erosion. The deepening drought in central Australia is contributing to a loss of grasslands that is, in turn, enabling larger and more regular dust storms.

In all, the work is feeding into a bigger research project; Medlyn’s ARC Laureate Fellowship-supported efforts to model Australian vegetation as a whole, from forests to woodlands to grasslands. ■

# RESEARCH FOR A BETTER FUTURE

**KYLIE BUDGE** >>  
Research Theme Fellow  
- Urban Living Futures  
and Society

**SEBASTIAN PFAUTSCH**  
Research Theme Fellow -  
Environment and Sustainability

>>  
**LYN TIEU**  
Research Theme Fellow  
- Education and Work

>>  
**JENNIFER  
MACRITCHIE**  
Research Theme Fellow  
- Health and Wellbeing

## Western Sydney University Research Theme Fellows discuss their work's impact.

Dr Kylie Budge, a creative arts researcher, Dr Lyn Tieu, a linguist, Dr Jennifer MacRitchie, a cognitive scientist, and Dr Sebastian Pfautsch, a tree physiologist, are among Western Sydney University's best and brightest academics. Their work is helping to shape a greener, smarter, healthier, inclusive, and creative future. These researchers recently came together to share their thoughts on their work's potential for creating impact in the world.

### FUTURE COMMUNICATORS

Linguistics wasn't at the front of Lyn Tieu's mind when she began her university studies, but she quickly became fascinated by what the scientific study of language could reveal about society. Her work focuses on how children acquire meaning, and how they interpret a particular feature of language called linguistic inferences — the messages we sometimes don't even realise we're conveying through our choice of words and phrasing.

For example, the sentence 'girls are as good as boys at maths' seems to be an equitable statement. But Tieu, Research Theme Fellow in Education and Work, says some studies have shown that the implicit inference that comes from the way that statement is ordered is that girls are not as naturally gifted as boys are at maths. "So if teachers are saying things that convey additional messages

beyond what they're attempting to convey, that could have an impact on how children are interpreting the content that we're delivering," she says.

In seeking to understand how children interpret these linguistic inferences, Tieu is hoping her research can help "bridge that gap between our scientific understanding and children's actual educational experiences."

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She also believes that linguistics has much to offer in terms of moving society towards greater equality, because it recognises that all languages are equal. "Prescriptive authorities will have you believe that there is some standard version of a language that you must attain, but the danger with that is that people then use that to create prejudices, to marginalise," she says. "In linguistics we learn that that's not true — different languages and dialects are equally important and valid, and can offer rich

insights into the mind. If linguistics could actually be taught earlier in the curriculum, not only would you get the scientific benefit of learning about scientific inquiry and hypothesis testing through linguistic studies, it could actually change attitudes."

### FUTURE SPACES

Changing attitudes is something that Kylie Budge is working hard to do in the creative arts field; in particular, antagonism towards selfies and Instagram culture in museums.

"People like myself are arguing there is some kind of benefit to this Instagram culture because it's a platform where people can creatively express their experience, their engagement with the space, and with the artefacts that are on display," says Budge, Research Theme Fellow in Urban Living Futures and Society. "It's a way to upend the power balance that has perhaps existed for too long, where museums have told people what they should think, what they should look at and how they should think about certain exhibits or space."

"There are still a lot of people who won't go to a museum or gallery, and feel like that's not a place for them," says Budge. But she argues that allowing digital expression in these traditionally non-digital spaces can open these spaces up to new audiences who might otherwise not experience them.

(Left) © Anna Kucer; Photo of Jennifer MacRitchie taken by Monica Pronk. (Background) © oxygen/moment/Getty Images

Another area where attitudes are changing, but not always for the better, is around the concept of maker spaces. These communal spaces with shared equipment are popping up in cities around the world – and particularly in China, where they are viewed as hothouses of creativity and innovation.

There is growing awareness of the importance that these spaces have in encouraging innovation. “These are about participating, making, and contributing to society, rather than just consuming.”

“I think policy-makers and governments sometimes presume that somehow innovation occurs in an abstract vacuum,” Budge says. “Different support mechanisms and spaces need to be provided and created to allow innovation to flourish. It doesn’t just happen.”

Creativity and divergent thinking are nourished in maker spaces, but the spaces themselves need protection and support. Australia has a few maker spaces — one of the most well-known in Sydney is in light industrial estate land in Marrickville — but, many are under threat from development pressure. Budge hopes that her work will contribute towards greater understanding and appreciation of and access to these spaces in Australian cities, particularly outside metropolitan regions.

### FUTURE CREATIVITY

Music is a familiar expression of creativity, but Dr Jennifer MacRitchie, Research Theme Fellow in Health and Wellbeing, believes it also could have significant health and wellbeing benefits, particularly in the elderly. Having studied electrical

engineering and music, she was working on motion capture technology to study the movement of pianists’ fingers when she became interested in the processes by which we acquire musical skills.

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“Your brain has to process symbols on a page if you’re reading music notation, decide on an action, a set of fine-motor commands that you use to manipulate the musical instrument, listen to the sound being produced, and then refine the next set of actions accordingly and you’re doing that at such minute time scales,” she says. “Playing a musical instrument is such a beneficial task for your brain, so we started wondering, why is it not something more people can have access to and benefit from.”

It has long been established that these skills have to be acquired early in life, but MacRitchie and her colleagues have recently published research results that show that the elderly

are just as capable of taking up music for the first time, and there are significant benefits in doing that.

But some older people can face additional challenges in learning music; for example, having restricted movement due to stroke or arthritis, or cognitive decline experienced as part of dementia. Practical and economic concerns to accessing a musical instrument may be enough to put off potential learners. This is another area where technology is breaking down barriers; MacRitchie gives the example of new musical interfaces that can be used on an iPad.

“A lot of my research is trying to devise ways to reduce some of those cognitive and physical barriers in learning to play a musical instrument so that we’ve got more people having access to musical activities and getting the optimal benefits for their wellbeing.”

Researchers are still getting to grips with the extent of these benefits, because until now much of the work has focused on people with a lifetime of musical experience, not on those who are taking it up later in life. While there are likely to be

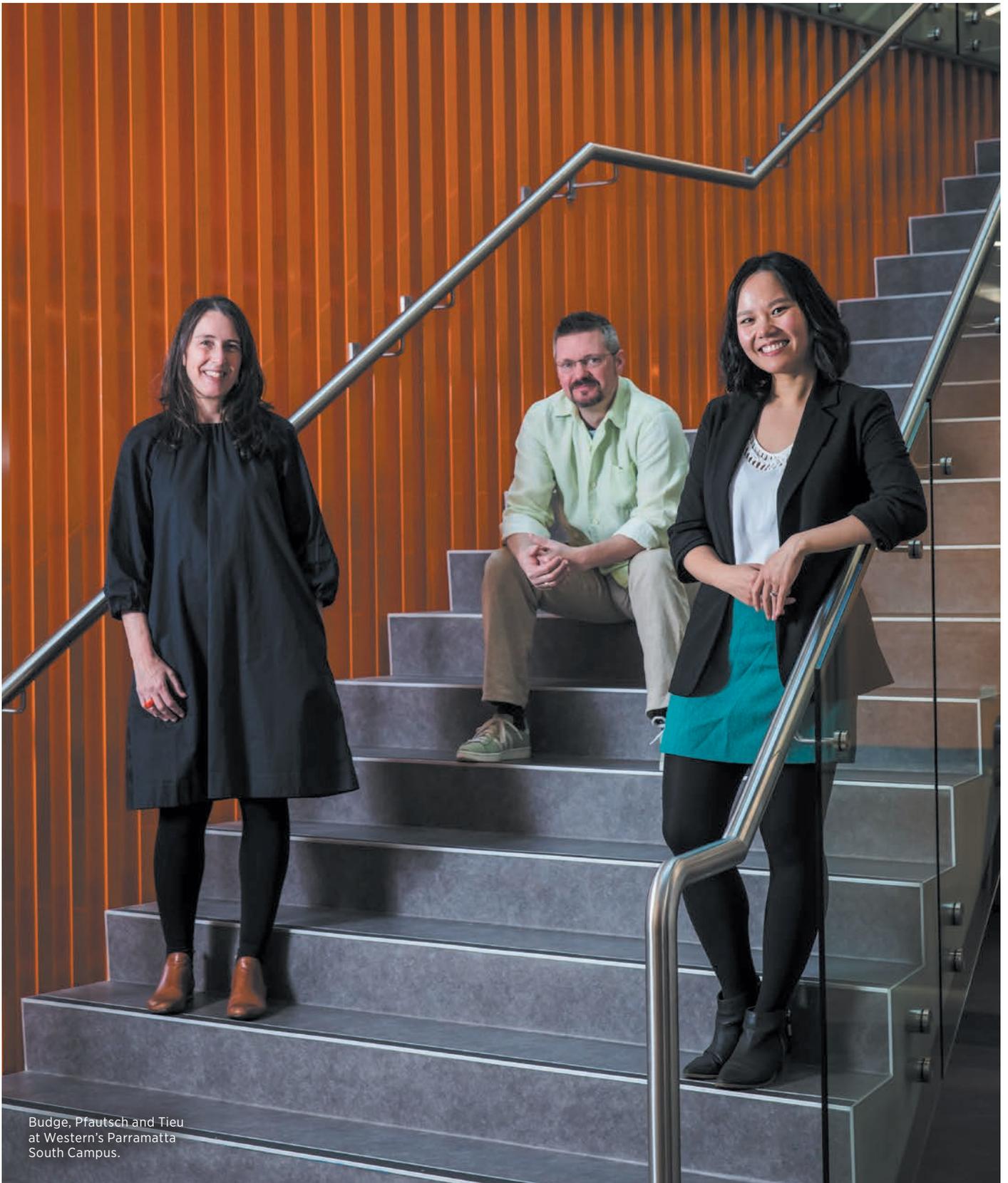
physical and cognitive benefits, MacRitchie is also interested in the emotional and social benefits. “By doing a lot of group musical activities, you’re giving people avenues to share something together and identify as part of a group,” she says. “That helps reduce loneliness, for which older adults tend to be at risk.”

### FUTURE CITIES

The elderly, immobile and very young are more vulnerable than most to the effects of heat, and that’s where Dr Sebastian Pfautsch’s research comes in. As Research Theme Fellow in Environment and Sustainability, he’s looking at how urban green



Music could have positive cognitive benefits in the elderly.



(Left) yacobchuk/Stock /Getty Images Plus; (Right) © Anna Kucera

Budge, Pfautsch and Tieu  
at Western's Parramatta  
South Campus.



(left to right) Kylie Budge, Sebastian Pfautsch, Lyn Tieu, and panel moderator Bianca Nogrady at the Research Theme Fellow Panel.

infrastructure could help address the growing issue of urban heat.

Urban green infrastructure describes anything green in an urban space; from the grass, shrubs and trees along roads and in parks, to living walls and rooftop gardens. It's increasingly recognised that urban green infrastructure plays a vital role in cooling the urban environment.

Pfautsch and colleagues deployed temperature data loggers across several western

Sydney councils, and found that a street with just 10% canopy cover experienced 12 days above 40°C in summer, while a street with 30% canopy cover had fewer than half that — experiencing just five days of summer above 40 degrees. “It’s a huge difference that not only impacts the wellbeing of people living in tree-lined streets but also impacts power consumption for air conditioning in their houses,” he says. “You have

add-on effects once you start increasing urban canopy, where you reduce heat and energy bills in households.”

But there are other benefits to increasing urban green infrastructure, Pfautsch says. “While green infrastructure helps make cities liveable, it also has benefits in biodiversity, liveability, public health, and even helps with reducing crime, and increasing property values,” he says.

The challenge is how, where and what to plant to best combat the urban heat island effect combined with the climate crisis that is already seeing temperatures in Australia’s major cities approach dangerous levels during summer months. But there’s only so much that urban green infrastructure can do.

“If western Sydney gets hit by a heatwave, trees won’t help cooling these very hot air masses, especially if they have no access to water that supports transpiration,” he says. “We have to look at other ways to cope with these new conditions of repeated heat waves and low rainfalls. We’re exploring how thermal benefits can be generated by different surface materials and colours used in urban design.”

Pfautsch hopes his work can help guide local and state governments towards creating more liveable cities in the face of a heating climate. “We urgently need to expand green infrastructure, but we have to be smart about it if we want maximum cooling benefits in times of rapid urbanisation and a heating climate.”

(Top) © Anna Kucera; (Bottom) © zetter/stock/Getty Images Plus





## CENTRES OF DISCOVERY

Western Sydney University campuses are situated in locations throughout Greater Western Sydney.

Further information can be found here:  
[westernsydney.edu.au/future/our-campuses.html](https://westernsydney.edu.au/future/our-campuses.html)



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