

➤ **HIGH HOPES**  
Evaluating medical marijuana

➤ **BURNING QUESTIONS**  
Identifying what fuels fire risk

➤ **SUCCESS STORY**  
Halving undernutrition rates in infants

# FUTURE-MAKERS

## **SPEAKING OUT**

Tackling complex health topics in Australia



**WESTERN SYDNEY**  
UNIVERSITY

**ADMINISTRATION/  
EDITORIAL BOARD**

**Professor Deborah Sweeney**  
Deputy Vice-Chancellor & Vice-President  
(Research, Enterprise and International)  
T +61 2 9685 9822  
E d.sweeney@westernsydney.edu.au

**Professor Kevin Dunn**  
Pro Vice-Chancellor, Research  
T +61 2 9678 7417  
E k.dunn@westernsydney.edu.au

**Dr Shantala Mohan**  
Director, Research Impact and Integrity  
T +61 2 4736 0581  
E shantala.mohan@westernsydney.edu.au

**Mr Craig Bromley**  
Production Coordinator  
T +61 2 4736 0895  
E c.bromley@westernsydney.edu.au

**ABOUT THIS MAGAZINE**

Future-Makers is published for  
Western Sydney University by

**nature research**  
custom media

part of Springer Nature.  
Level 8, 227 Elizabeth Street, Sydney,  
NSW 2000 Australia

Copyright © 2021 Western Sydney University.  
All rights reserved. The information in this  
publication was correct at the time of going to  
press in October 2021.

Some of the research contained in this  
publication was supported by the Australian  
Government through the Australian Research  
Council (ARC) or the National Health and  
Medical Research Council (NHMRC).  
The views expressed herein are those of  
the authors and are not necessarily those of  
Western Sydney University, the Australian  
Government, the ARC or the NHMRC.

**ABOUT**

Western Sydney University is a large,  
student-centred, research-led university.  
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.

The University is now ranked in all major  
global university ranking systems, and is  
in the top 2% of universities worldwide.  
Through investment in its academic  
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.

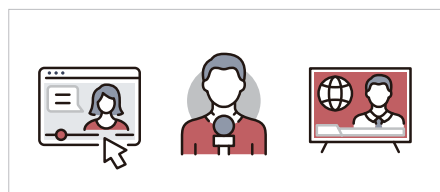
A guiding principle for the University  
is that there is no limit to potential success  
for those with drive, talent, confidence  
and ambition.

westernsydney.edu.au

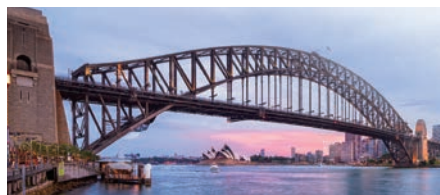
**CONTENTS**

- 4** Editorial  
**5** Infographic

- 11** HELPING YOUNG PEOPLE READ  
THE FINEST PRINT



- 16** SYDNEY'S BRIDGES OF FAITH



- 20** HERE'S WHY MENSTRUATION  
MATTERS



- 25** IMPROVING CHILDHOOD  
NUTRITION IN LAOS



COVER STORY

- 7** EARLY DETECTION OF TERROR



- 12** A CASE FOR JOB BOUNDARY  
GUIDES



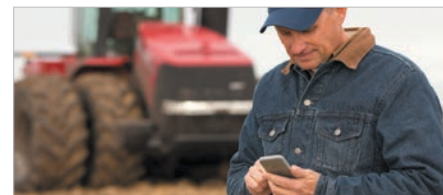
- 17** FORGING CULTURAL  
UNDERSTANDING



- 21** REDEFINING HOMELESSNESS  
IN GHANA



- 26** TECH READS DISTRESS BETWEEN  
THE LINES



- 37** FEATURE: GIVING PHOTOSYNTHESIS  
THE GREEN LIGHT



COVER STORY



**8** THE SECRET POWERS OF WONDER FUNGUS



**9** STRONGER TOGETHER: SINGLE WOMEN REVIVE SUSTAINABLE FARMING



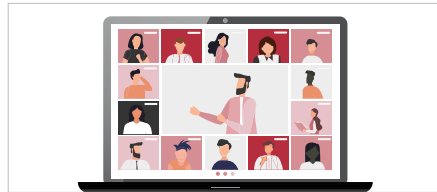
**10** SNAPSHOTS OF PANDEMIC RESILIENCE AND VULNERABILITY



**13** MEASURING AND MANAGING AN INVISIBLE RESOURCE



**14** TECH TOOLS OF THE TEACHING TRADE



**15** BUILDING A BETTER UNDERSTANDING OF SEXUAL HARASSMENT



**22** BIPOLAR DISORDER: FACTORING IN TRAUMA



**23** KICKING OFF A BONDING SESSION WITH IMPROVED HEALTH



**24** STRAIGHT TO THE SOURCE



**27** FEATURE: BURNING QUESTIONS



**31** FEATURE: GETTING INTO THE WEEDS ON CANNABIS



COVER STORY

**39** BIOLOGY-INSPIRED CAMERAS ON THE INTERNATIONAL SPACE STATION



**34** FEATURE: BEYOND MUTILATION



COVER STORY





# INDUSTRY CO-FUNDED PHD SCHOLARSHIPS

Western Sydney University is continuing our commitment to research excellence through the delivery of our Industry Co-funded Scholarships Program. This new program builds on Western's areas of existing and emerging strength by supporting future generations of research and industry leaders. In line with these ambitions, the University invites applications from prospective PhD students and industry partners.

## PhD Students

### Do you want to undertake a PhD with a key research industry partner?

Apply now to undertake a Doctor of Philosophy (PhD) program, supported by a scholarship that is co-funded by an industry partner and Western Sydney University. Opportunities are available in the following priority research areas:

- Urban transformation
- Bushfire research
- Mental health
- Healthy ageing
- Protected cropping
- Social equality.

### What do you receive?

Successful PhD scholarship recipients will:

- receive a stipend valued at up to \$30,000 (AUD) per annum for a period of three or four years;
- be supervised by an emerging or established researcher in your chosen discipline;
- gain access to world-leading research facilities and equipment;
- collaborate with leading researchers and industry partners; and be immersed in the research culture at Western Sydney University.

## Industry Partners

### Interested in a research collaboration to develop innovative solutions for your organisation?

We have researchers ready to collaborate with industry partners to establish co-funded scholarships that provide you with access to the expertise of an emerging researcher.

### What is a co-funded scholarship?

A co-funded scholarship has an industry partner enter into an agreement to fund 50% of a PhD scholarship, with the remaining 50% funded by Western Sydney University. Co-funded scholarships are valued at a total of \$30,000 (AUD) per annum for a period of three or four years.

### What are the benefits?

- Utilise the skills, knowledge and expertise of a PhD research candidate.
- Collaborate to investigate problems and develop solutions for your business.
- Gain access to specialist facilities and equipment.
- Support an emerging researcher to contribute to knowledge in your field.
- Establish an ongoing collaboration with Western Sydney University.

For more information contact:  
[grs.scholarships@westernsydney.edu.au](mailto:grs.scholarships@westernsydney.edu.au)

[westernsydney.edu.au/schools/grs/  
scholarships/current\\_scholarships](https://westernsydney.edu.au/schools/grs/scholarships/current_scholarships)



## ON THE COVER



➤ Western's Olayide Ogunsiji (standing) and spokesperson Fatu Sillah (seated) are a formidable united front working to collate data and raise awareness about the impact of female genital mutilation/cutting on an estimated 53,000 women and girls in Australia today.

Cover image:  
© Cybele Malinowski

# RESILIENT RESEARCH: SDG OUTCOMES DURING A PANDEMIC

The global impact of the COVID-19 pandemic on society has been colossal. Likewise, the pandemic has disrupted global research efforts. Research has been curtailed, extended, modified or, in some disciplines, redirected to research about the pandemic itself. Western Sydney University researchers have demonstrated incredible resilience and integrity during this challenging period and, importantly, have maintained their valuable relationships with international partners and our international student cohort. At the same time, they have delivered impactful research that has progressed the United Nations' sustainable development goals. The intention is to radically transform global economies and societies. Our projects are undertaken at the local level but have global relevance to societies and economies.

We are delighted to welcome you to the fifth edition of *Future-Makers* that brings attention to the fascinating research undertaken in a wide range of disciplines. The commitment of our researchers to excellence, quality and integrity are reflected in their collaborations with international partners and in the international work of our higher degree research students. From agriculture, food security, sustainable farming, and bushfire resilience to

health issues including men's health, child nutrition in developing countries, cannabis pain relief, gut health, barriers to healthcare for homeless people, supporting female genital mutilation survivors, and transforming mental health delivery in rural and remote areas, our research stories take you on an amazing journey of discoveries that help confront global problems.

Perhaps most notably, the stories provide insight into current global challenges related to resilience and vulnerability to the COVID-19 pandemic, effective use of technology in classrooms with the rise of remote learning, and building positive interfaith relations.

We not only encourage you to read these stories of success but persuade you to connect with us irrespective of the country or region you are located in, to work with Western to identify and co-create solutions to universal challenges. ■

**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.

## GLOBAL RANKINGS

### ➤ TIMES HIGHER EDUCATION WORLD UNIVERSITY RANKINGS



**6<sup>th</sup>**  
in Australia  
**34<sup>th</sup>**  
in the world

### ➤ THE UNIVERSITY IMPACT RANKINGS 2021



**6<sup>th</sup>**  
in Australia  
**17<sup>th</sup>**  
in the world

Ranking for individual sustainability development goals



**3<sup>rd</sup>**  
in the world



**4<sup>th</sup>**  
in the world



**5<sup>th</sup>**  
in the world



**10<sup>th</sup>**  
in the world

### ➤ ACADEMIC RANKING OF WORLD UNIVERSITIES (ARWU) 2021

Agricultural Sciences, Automation Control, Civil Engineering, and Nursing **TOP 75**

Ecology **1<sup>st</sup>** in Australia  
**13<sup>th</sup>** in the world

### ➤ QS WORLD UNIVERSITY RANKINGS BY SUBJECT

Nursing and Sociology **TOP 100**



## EXCELLENCE IN RESEARCH FOR AUSTRALIA 2018

85% of the University's research was identified as 'world standard or above'.

**WELL 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

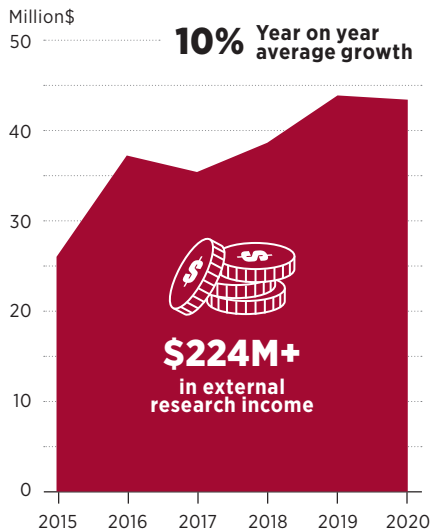
**ABOVE WORLD STANDARD** ★★★★★

- 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



## RESEARCH

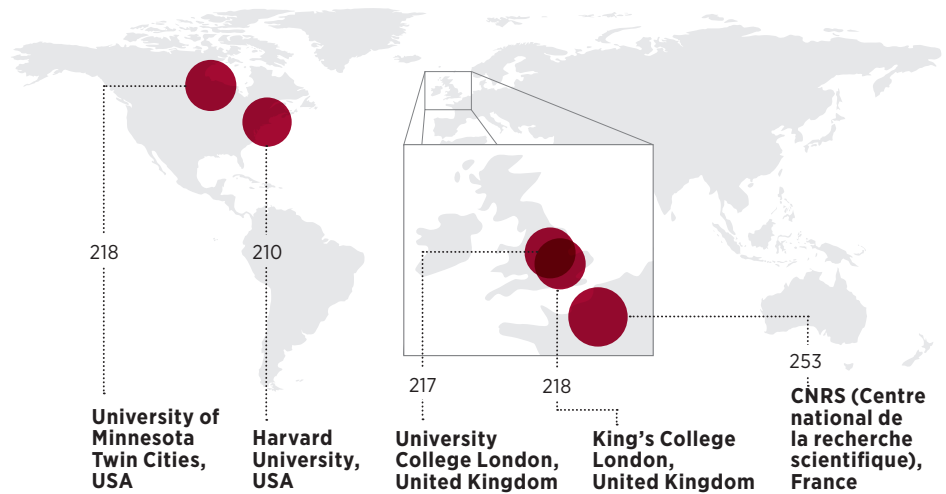
### RESEARCH INCOME



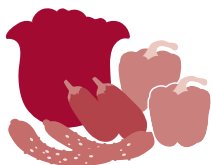
### TOP 5 INTERNATIONAL COLLABORATORS

based on co-authorship for 2015 to 2020 in SciVal Publication Collaboration

● = Number of co-authored publications



### PRODUCE DONATED TO FOODBANK IN 2020 FROM PROTECTED CROPPING RESEARCH



**15,970kg**

### HIGHER DEGREES COMPLETED IN PAST 5 YEARS (2016 - 2020)



**1,021**  
Completed degrees

### RESEARCH OUTPUT BY SUBJECT IN THE NATURE INDEX

(From 1 May 2020 - 1 April 2021)

Life Sciences

25

Earth & Environment Sciences

21

Physical Sciences

13

Chemistry

12

**42**  
Articles

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

## STUDENTS

### EDUCATIONAL ATTAINMENT IN FAMILY

**49,266**  
Total students



**65%**  
First in Family to obtain university degree

### ALUMNI



**200,000+**  
Graduates

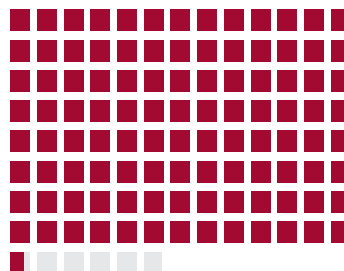


**20,000+**  
Working overseas in 128 countries

## STAFF

### ACADEMIC STAFF COMPOSITION

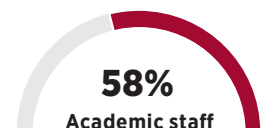
■ = 10 people



**1,047**

Academics involved in research

### GLOBAL PERSPECTIVE



**58%**  
Academic staff are from international backgrounds



# EARLY DETECTION OF TERROR

By analysing online interactions, research has revealed how to identify men at risk of becoming violent offenders.

5 GENDER EQUALITY



A report by Western's Associate Professor Lucy Nicholas and colleagues at Swinburne University of Technology has found that a significant overlap exists between a subset of aggrieved men and right-wing terrorists in Victoria. This finding suggests that government agencies may be able to identify emerging threats before it is too late.

The report, *Mapping right-wing extremism in Victoria* examined interactions that took place in online forums and social media, and conducted stakeholder surveys to investigate whether men who expressed anti-feminist sentiment, who believe that feminism has gone too far, are more likely to turn into right-wing extremists.

"What we were interested in was how men develop the sentiments that have been seen

## NEED TO KNOW

- There is overlap in the sentiments of anti-feminist men and right-wing extremists.
- Anti-feminist groups could be considered terrorist organisations.
- Better support for men could prevent violence.

to underpin violence," explains Nicholas, whose primary research area at Western's School of Social Sciences is gender and sexuality.

The links in language and sentiment were plain to see. "What we can say from the data is that men who are aggrieved about custody, for example, develop a coherent ideology that it is feminism's fault, and then link that to other progressive phenomena. They then develop a broad and extremely angry

discourse, and link to a community of like-minded men online."

Their work has developed a list of red flag language that can be used to identify individuals whose views risk taking them down a violent path. Referring to recent crimes by anti-feminists in the USA, Nicholas says: "There needs to be attention to a rise in those discourses before it gets to the point of a mass shooting."

The work formed the basis of a submission to the Parliamentary Joint Committee on Intelligence and Security Inquiry Into Extremist Movements and Radicalism In Australia. The team recommended both bottom-up approaches, such as providing an alternative community and information to men at risk of radicalisation, as

well as a top-down securitisation approach, including listing some anti-feminist groups as terrorist organisations.

The report suggested that violence against women needs to be considered a security issue and a threat to public order, in the same way that Muslims at risk of radicalisation have been targeted by intelligence agencies.

Claudia Fletcher, works for 'No to Violence', a male-focussed family violence referral service. She says the language highlighted by the report was "instantly recognisable through my own counselling experience." She says the report highlights the importance of linking disparate government groups towards the goal of better supporting at-risk men. "If combined with appropriate referral pathways, the service system could interrupt men at risk of radicalisation during trigger points and direct them toward safe social networks," she says. ■

A far right protest in Melbourne, 2019.





# THE SECRET POWERS OF WONDER FUNGUS

Promoting the symbiosis between fungus and tree roots could have big benefits for forestry.

15 LIFE ON LAND



## The appearance of fungi is not always cause for concern.

The mouldy growths you find at the back of the fridge are miles away from the helpful fungal species that can improve forest resilience and sustainability.

Married researchers Jonathan and Krista Plett, from Western's Hawkesbury Institute for the Environment, are studying how ectomycorrhizal fungi, a type of fungi that surrounds tree roots without penetrating them, establish and support tree health.

Foresters have been inoculating seedlings with fungi prior to reforestation to aid tree establishment for a long time, but as climate extremes worsen, researchers predict current inoculation strategies will be insufficient.

If the symbiotic relationship between trees and fungi is better understood in this time of great climate stress, the rewards could be significant. Studies estimate annual damage and control costs for plant pathogens are more than US\$20 billion (AU\$26.5 billion) in crop production and US\$7 billion in forestry.

"Imagine coating a seed with a probiotic that would naturally encourage beneficial microbes to flourish. It would be like a fungal welcome pack containing all that the seedling needs to establish

itself, avoid pathogens and make sustainable use of the soil resources," says Jonathan.

To create such a resource, Jonathan and Krista are examining the nutrient cycle between fungi and tree roots.

Ectomycorrhizal fungi donate a lot of nutrients to trees, increasing their productivity and reducing the amount of expensive fertilisers needed. But it's not for free – this is a symbiotic relationship. "Some people estimate up to 30% of the tree's photosynthesis is going to feed the fungi and other organisms in the soil," explains Krista.

One nutrient going into the soil is carbon, a process that could be key in fighting climate change. "There's a theory that ectomycorrhizal fungi not only eat carbon, but slow down soil respiration. It's debated, but there could be potential to direct a lot of carbon

## NEED TO KNOW

- Ectomycorrhizal fungi form symbiotic relationships with trees.
- They can help provide nutrients, protect trees against pathogens, and store carbon.
- Seedlings can be inoculated with fungi to help them flourish in adverse conditions.



*Pisolithus microcarpus*, pictured above, is a mycorrhizal fungus.

underground," Krista says.

In a recent paper, the team showed that genetics have a significant impact on how ectomycorrhizal individuals work with their tree partners and store carbon. "It isn't sufficient to see if the trees are colonised, we need to consider the genetics of what is found on the roots," says Krista. "There is a push to start thinking about tailor-made inoculum for plantation trees made up of fungi specifically adapted to the trees and the soil they will be planted out in."

In the Pletts' quest to understand these processes, they are conducting field trials in pine forest nurseries in Australia to improve inoculation strategies through a more fungal-centric understanding of symbiosis, including the importance of diversity.

"Our assessment of successful mycorrhiza in seedlings was to look for white fluffy growth on the roots. Jonathan showed us that's really underestimating what's

going on," says Angus Carnegie, a senior researcher in the NSW Department of Primary Industries.

There are up to 20 species of ectomycorrhizal fungi in pine plantations in Australia. "Just like every human has a different skill set, different mycorrhizal species have different ways that they help a plant," says Jonathan. "One species may give lots of nutrients, another species may help drought tolerance, another may protect against pathogens, and so forth."

"We're still testing this, but probably the seedlings with higher diversity of fungus — the reds, browns and yellows, as well as the white fungi — will do better when they get planted out."

Through field trials, the Pletts are increasing our understanding of fungal biology, so that foresters will be able to reduce nursery treatments that harm the environment, while improving profitability, producing trees that can flourish in adverse conditions and capture carbon. ♥

# STRONGER TOGETHER: SINGLE WOMEN REVIVE SUSTAINABLE FARMING

A collective in rural India is boosting the status of single women and fighting hunger by returning to traditional techniques.

2 ZERO HUNGER



## Female farmers in India

are widely expected to work as free labour on family farms. They rarely own the land and, in some cases, have no role in deciding how it is managed. Single women in rural communities must fend for themselves and will often work even when unwell just to make ends meet. A women's collective in India, supported by research from Western Sydney University,

is trying to change this.

In 2013, Bhavya Chitranshi, a PhD student at the Institute for Culture and Society at Western, moved to Emaliguda in eastern India to immerse herself in the community of a Kondh adivasi (Indigenous) tribe. The aim was to spend a year researching and designing a project to support sustainable development within the community. "As a young, single woman in an unfamiliar place, I felt most comfortable among women," she says. "We worked in the fields, spent time together cooking, bathing and completing chores, and as we shared our life stories, it became clear that being single here was a unique and challenging experience." Nearly a third of women in Emaliguda are unmarried, separated, or widowed, while others have husbands who do not provide much support. Chitranshi decided to explore what it was like to be a single adivasi woman and began holding open discussions with her new friends. "At first, everyone felt extremely vulnerable talking about the challenges of singleness," she says. "But slowly they began opening up as they saw value in and derived strength from sharing their lives with each other."

The group soon evolved into the *Eka Nari Sanghathan*, which means "single women's collective".



*Eka Nari Sanghathan members hard at work.*

## NEED TO KNOW

- Western's Bhavya Chitranshi, helped establish *Eka Nari Sanghathan*, a single women's collective in India.
- The collective practises sustainable farming, using traditional techniques.
- They produce enough food for themselves and are able to sell the remainder.

Together, the women rented some land and adopted a collaborative approach to agriculture, dividing labour by ability and sharing the produce equally. For Sanghathan member Mami Pedenti, it is a long-awaited opportunity for single women to be recognised and valued as farmers who are economically independent and self-sufficient. "We should not have to depend upon anyone for our basic needs," she says. "We deserve year-round food security and to live a healthy life. This is possible through eating healthily and farming sustainably. If we kill the planet today, what will our future generations live off?" she adds.

Chitranshi organised a trip to a demonstration farm so the women could see that sustainable farming

was viable. "We now cultivate our own seeds and make our own organic fertilisers, so we can grow healthy food while protecting the land, forests, soils and insects that keep the whole ecosystem alive," says Chitranshi. By adopting traditional, ecologically sensitive techniques, the Sanghathan is rejecting the industrialised, technology and profit-based systems introduced by the Green Revolution, where farmers were encouraged to use chemical fertilisers and to plant high-yielding and hybrid seed varieties and cash crops. "The adivasi farmland had been transformed from growing Indigenous pulses, millet and oilseeds, to growing major cash crops, like cotton and eucalyptus," explains Ashutosh Kumar from Ambedkar University in Delhi, who works with Chi-



transhi on the project. “But *Eka Nari Sanghathan* is taking back the art of cultivation to produce food for self-consumption. They have already revived several Indigenous crops by selecting seeds that work harmoniously with nature.” And this harmony defines the politics of the Sanghathan. “Many people doubted our approach, but now they are coming to us for advice,” adds Chitranshi.

The collective now produces enough food for its own sustenance and sells the surplus, keeping the profits in a communal bank account to be shared collectively. “Before, people didn’t even know who the single women in our community were, but now they are starting to recognise our struggle,” says Mami Penenti. “Whatever type of struggle people face, gender, class, or identity, we need different kinds of Sanghathans to transform these oppressions. Because together, people can work on any issue that’s important to them.”

Next, Chitranshi, who has been living and working with the collective during the COVID-19 pandemic would like to help Emalguda establish a decent healthcare system, though she also appreciates what they have already achieved, both spiritually and politically (including securing single women a pension as well as securing government financial aid for building houses). “It has been so inspiring to see how strong single women are when they come together,” she says. “Working in a collective, you experience the beauty of relationships, female friendships and the value of sharing joy and love even when life gets difficult.”

## SNAPSHOTS OF PANDEMIC RESILIENCE AND VULNERABILITY

COVID-19 response case studies assess the preparedness of states and the challenges faced by vulnerable populations.



**In 2020, a report on immigrants in detention** was able to highlight the varied responses to COVID-19 in 20 countries. The collaboration between Western’s Humanitarian and Development Research Initiative (HADRI) and the International Detention Coalition (IDC) was presented as case studies that “highlight the very high risk of contracting COVID-19 in detention,” says Nichole Georgeou, who is the director of HADRI.

In one example, Singaporean researchers looked at the largest refugee settlement in the world, Cox’s Bazar in Bangladesh, which houses roughly 900,000 Rohingya refugees from Myanmar, living at a density of approximately 40,000 people per square kilometre. While the potential for disease spread at the settlement has been outlined by epidemiologists, the authors noted that, as of June 2020, there was only one testing facility.

The HADRI/IDC report has been referenced in commentaries and submissions by Nobel Peace Prize winning NGO, Human Rights Watch, and IDC will use the case

studies to continue to advance urgent discussions on how to support people in immigration detention across more than 100 countries. The United Nations has called for a reduction of people in immigration detention worldwide to reduce the risks of pandemic deaths.

HADRI was launched in 2016 to highlight the complexity of international responses to conflicts and disasters, explains Georgeou. As early as June 2020, Georgeou and her collaborators had also

co-produced a report on state responses to COVID-19 in 43 countries and territories. These snapshots led to dozens of follow-ups, including the detainee report.

“The first report suggested that the decisiveness of Pacific Islands governments had helped them fare exceptionally well initially,” Georgeou points out. A recent experience with measles had devastated Samoa. “So the Solomon Islands had rigorous checks in place at airports as early as February 2020.”

Collaborators on this report, Sergio Moldes Anaya from the University of Granada and Harlan Koff of the University of Luxembourg, later extended their research to case studies that pointed to three key points of state vulnerability: exposure to external shocks, a state’s capacity to respond, and social divides. “Mexico, for example, struggled from all three — with heavy dependence on oil and exports, the government chose not to close borders and suffered widespread outbreaks as a result. Australia, on the other hand, was well-rounded on all three and fared quite well,” says Koff.

Georgeou says there will be many insights from the pandemic about disaster preparedness. “I hope that all these timely studies help us keep a record of the lessons.”



### NEED TO KNOW

- Decisiveness slowed immediate pandemic impacts.
- Immigrants in detention are at high risk of contracting COVID-19.
- Social divisions and reliance on external entities hamper state disaster mitigation.

# HELPING YOUNG PEOPLE READ THE FINEST PRINT

Media literacy strategies are in development after landmark studies find many young people don't know what news to trust.

4 QUALITY EDUCATION



## Speculation that young people drive 'fake news'

inspired a study into the news literacy of young Australians.

"Claims were being made that young people were somehow responsible for fake news because they don't use quality news services, and I wanted to find out if there was any truth in it," explains Tanya Notley, a senior lecturer at Western's School of Humanities and Communication Arts.

"There hadn't been any major studies in Australia focussed on exploring the news practices of people aged under 18, which was very surprising given all the changes taking place to the news environment."

In 2017 and 2020, Notley worked with a research team

on a national survey of young Australians about their media literacy and engagement.

Notley was surprised at the level of mistrust expressed by Australians aged eight to 16. "In our surveys in both 2017 and 2020, two-thirds of young people said news media organisations have no idea what their lives are like, so it's not surprising they don't really trust them." A separate 2019 study (see below) noted that very few news stories include young people or are about issues that most affect them.

The 2020 survey study also found that only 36% of young Australians believe they know how to identify fake news stories. "The complex news media landscape means critical news evaluation skills are essential, but it seems most young people are not developing these skills at school," Notley says.

The multi-institutional Australian Media Literacy Alliance (AMLA) was formed in response

## NEED TO KNOW

- 36% of young Australians believe they can't identify false news.
- The Australian Media Literacy Alliance was formed as a result of the findings.
- Western will be co-developing a wider national media literacy strategy.

ABC, was among those who partnered with Western to form the AMLA. "This high-impact research is paramount," Astbury points out. "For ABC Education, [the research] helps us evaluate the impact of the media literacy resources we develop."

Drawing on the findings, the AMLA has produced a *Media Literacy Framework* to guide education efforts. It's already been adopted nationally by institutions such as public libraries, media outlets and museums, as well as several non-government organisations.

A series of initiatives to advance young people's news media literacy has also been developed by AMLA members. One of these has supported 21 young 'news champions', who represent every Australian state and territory. "These news champions are driving conversations about the future of news to ensure young people's perspectives are heard," Notley points out. ■

to the survey findings, and throughout 2021 Western and the AMLA will be co-developing a wider national media literacy strategy with news outlets, government bodies, NGOs and civil society organisations.

Annabel Astbury, Head of Digital Education at the

## YOUTH IN THE MINORITY

A 2019 report called *The inclusion and representation of young people in the Australian news media* analysed one day of news coverage and found these figures.

### VOICE



1%

of news stories directly quoted a young person

### YOUTH ISSUES



2%

of news stories were about young people as a social category

### VISIBILITY



11%

of news stories included images of young people

### IMPACT



34%

of news stories were about issues likely to impact young people



# A CASE FOR JOB BOUNDARY GUIDES

Case law researchers seek to untangle how far employers can reach into their employees' personal lives via social media policies.

## 8 DECENT WORK AND ECONOMIC GROWTH



There is an increasingly blurred line between the public and private, says Sandy Noakes, a School of Law lecturer at Western. Her recent work suggests that many workers in Australia may be unaware that the social media policies of their employers don't always line up with case law.

Alongside fellow Western researcher, Sarah Hook, she is working with the Independent

Education Union, which represents more than 75,000 teachers in Australia, on a guide to social media policies to educate teachers about their rights and obligations.

Noakes says cases highlighted in the media in which teachers had been investigated for their associations outside working hours got them thinking. "Is there a blurred line between school teachers' professional and personal lives, because they are expected to be role models in the community?"

Hook and Noakes looked at the issue of an employer's legal right to control employee behaviour on social media outside work. The researchers pored over the more than 60 instances of existing case law, and found it fell into three categories. In the first two, case law is clear: you can't disparage your employer on social media, and you can't behave inappropriately towards other workers or clients.

The third category of case is "damage by association," explains Noakes. That is behaviour outside work that may cause damage to the employer if the employee's connection to the employer is known. There is no settled position on this type of case in Australia.

Noakes and Hook soon began working with teacher associations. "We found that social media policies relating to school teacher conduct about these policies sought to very tightly control teacher behaviour on social media



Employers and employees should learn more about what can be included in workplace social media policies.

outside work," says Noakes. "For example, they required teachers to control what their family and friends posted about them, and teachers were also expected to report anything negative that was said about their school on social media." In almost all cases, the policies stated that a breach could result in disciplinary action, including dismissal, which Noakes and Hook suggest has not been tested in case law.

The research sparked debate at the Australia & New Zealand Education Law Association forum, which is frequented by representa-

tives from education policy organisations in the Australian and New Zealand, as well as unions that represent teachers.

"In terms of future impact, the benefit of our model of analysis is that it can be applied to any employer's social media policy," says Noakes. Directions by employers must be lawful and reasonable. Noakes and Hook plan to work with other unions on guides to educate employees about their rights, and to encourage employers to review their social media policies when they reach too far into personal lives. ■

## NEED TO KNOW

- Researchers at Western are working with the Independent Education Union on a guide to social media policies.
- Some social media policies are not necessarily supported by case law.
- Causing damage by association is nonetheless often in social media policies.

# MEASURING AND MANAGING AN INVISIBLE RESOURCE

Putting research in the hands of village communities leads to coordinated and lasting improvements in groundwater management.

2 ZERO HUNGER



In many regions of India, groundwater is the main source of water for local communities, but years of overuse has critically depleted groundwater reserves, with dire implications for water and food security. There are no easy solutions, but as Professor Basant Maheshwari's team at Western's Smart Agriculture Research

Cluster and School of Science has shown, an alternative 'transdisciplinary' approach, bringing together different disciplines, and enrolling local villagers as participants in the research, has opened a new pathway for solving this complex problem.

"Groundwater overuse is a serious problem in India and nearby countries, and is becoming significant across South East Asia and Africa," explains Maheshwari. "Our project is about finding ways to improve the sustainability of groundwater use while improving

the livelihood of village communities by solving a complex, people-related problem from a range of perspectives, including technical, social, environmental, economic, agronomic and policy points of view."

Initiated in 2011 and working in 11 villages across two watersheds in western India, the Managing Aquifer Recharge and Sustaining Groundwater Use through Village-level Intervention (MARVI) project is funded by the Australian Centre for International Agricultural Research, and the Australian Water Partnership. The project is a broad collaboration with the CSIRO, and agricultural research institutions and NGOs in India. The MARVI team put the community at the centre of interventions.

"The way we saw it, we had two options to address this problem: a conventional approach where we collect data, perform some

## NEED TO KNOW

- Groundwater reserves are becoming critically depleted in India.
- The MARVI project is finding ways to use groundwater more sustainably.
- It empowers local farmers to monitor and manage usage.

modelling and develop recommendations, or a transdisciplinary approach where we bring people together to own the problem, enrolling water users to monitor groundwater, learn together and develop their own science and strategies for collective action," says Maheshwari.

As Maheshwari recounts, while the conventional approach might have been easier, the project would have ended a long time ago with a low probability of those strategies translating to meaningful action. The alternative approach that the team undertook was time-consuming and difficult, but it has led to real and ongoing action by communities and is already being replicated in other areas of India.

Through the MARVI project, members of the 11 communities taking part in the initiative were trained as 'groundwater informed' volunteers to help communicate how groundwater works, and to reliably collect groundwater level and rainfall data.

"Many doubted that villagers with limited formal education would be able to collect reliable groundwater data or understand the groundwater science," says



Villagers monitoring groundwater levels in Meghraj.



Maheshwari. “However, the villagers disproved that apprehension and were able to collect reliable data and work closely with researchers.”

Hari Ram, is one of the volunteer farmers from the Dharta watershed who participated in the MARVI project. “In the beginning, we did not know how measuring groundwater depth and rainfall would help us, but we knew that we needed to do something,” he recalls. “Within six months we started getting a feel for how groundwater levels were fluctuating in the wells and how rainfall and groundwater pumping influenced the groundwater levels. This eventually helped us to estimate groundwater availability and decide on how much area we could irrigate until the crop harvest.”

“The participatory, village-level monitoring approach empowers local communities to develop their own groundwater management dialogue and strategies,” says Maheshwari. “By learning that they are pumping from a common pool resource, the communities were able to find their own solutions. Through the newly formed Village Groundwater Cooperatives, farmers were encouraged to work together to tackle their common problems.”

The MARVI project is now being adopted by the Government of India, which is rolling out the programme in seven states covering more than 20,000 villages through a World Bank supported project, the Atal Bhujal Yojana – a National Groundwater Management Initiative. ♥

## TECH TOOLS OF THE TEACHING TRADE

Technology is now a cornerstone of classroom life, but how can teachers ensure they use it effectively?

4 QUALITY EDUCATION



**With the rise of remote learning**, educators and students need to navigate through a dizzying array of technological tools, from hardware such as laptops, tablets, and mobile phones, to online learning resources like GeoGebra and YouTube videos, and learning management systems such as Echo, Canvas or Google Classroom. And it's set to grow even more — the online education market is projected to reach US\$ 350 billion by 2025.

In response, Western Sydney University researchers have designed a framework to help educators ensure such tools are used to their maximum potential.

The Technology Integration Pyramid (TIP), designed by Professor Catherine Attard and Professor Kathryn Holmes from Western's Centre for Educational Research, is a comprehensive framework to assess the effectiveness of technology as a pedagogical tool. Attard believes it will help educators evaluate whether the latest technology will make their work more effective.

At the Pyramid's base are the contextual elements of technology use. These are the things that make each classroom

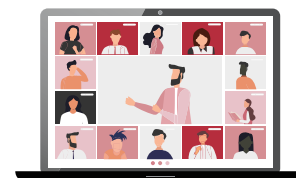
or tech use case unique, and what differentiates them in terms of how students would benefit from technology use.

The sides of the pyramid represent the four most important considerations to ensure effective technology use — pedagogy, the subject being taught, student engagement, and the technological tools themselves.

The research that produced the TIP was gathered in mathematics classrooms.

Attard and Holmes looked for teachers who were considered by their peers to be exemplary users of technology and studied the commonalities between their methods. This was complemented by interviews with students and parents.

Holmes says this research will help teachers understand that technology is just a tool, and that focusing on the teaching is



**THE ONLINE EDUCATION MARKET**  
is projected to reach  
**US\$350 billion**  
by 2025

the priority. In one example, a classroom that Holmes visited had children equipped with laptops who were all copying from a PowerPoint presentation on the board. “It was supposed to be a science lesson, but it was basically a typing lesson,” she recalls.

Conversely, in a different school where students were not provided with devices, a teacher whose only technology was her personal phone, an app called Plicker, and an interactive whiteboard was able to conduct a multiple choice quiz that captured real time information about how well her students understood a topic. “You don't need a lot of technology, it's about your teaching practice,” explains Attard.

Attard and Holmes are now turning the TIP into an accessible tool for teachers to ensure they use technology in the most effective and productive ways. ♥

### NEED TO KNOW

- Remote learning is an increasingly popular pedagogical method.
- There are lots of technological options to choose from.
- The TIP will help teachers evaluate which options are most effective.

# BUILDING A BETTER UNDERSTANDING OF SEXUAL HARASSMENT

Western Sydney University researchers are lifting the lid on women's experiences of sexual harassment on public transport in Bangladesh.

5 GENDER EQUALITY



Over 90% of women who use public transport in Dhaka, Bangladesh have experienced some form of sexual harassment during their commute. Despite this alarming figure, few studies have explored women's experiences of sexual harassment, the effectiveness of NGO initiatives, and how women are taking action.

At Western's School of Humanities and Communication Arts, PhD student, Arunima Kishore Das is taking a multifaceted approach to better understand sexual harassment of female commuters on public buses in the Bangladesh capital.

"In Bangladesh, there are

## NEED TO KNOW

- Sexual harassment is rife on public transport in Bangladesh.
- NGOs, the government, and women commuters are pursuing initiatives in parallel.
- Arunima Kishore Das hopes her research will help these groups work together.



Activists protesting rape block roads in Dhaka on October 21, 2020.

very limited spaces for women to freely share their experiences of harassment on buses," says Megha\*, a 20-year-old commuter. "If we do, we will be stigmatised."

By combining qualitative surveys and social media analysis, Das is investigating women's experiences of sexual harassment on public transport, their views on women's rights and gender relations, and how they are using social media to raise awareness.

"NGOs tend to portray women in Bangladesh as passive victims," says Das. "But many are using social media campaigns to try and change their situation. This isn't being acknowledged."

In 2019, for example, Bangladeshi entrepreneur, Jeenat Jahan Nisha, launched a line of T-shirts with the slogan

'Ga Gheshe Daraben Na,' or 'Don't Stand Too Close', to raise awareness of sexual harassment on crowded public transport. The T-shirts quickly became used in a social media campaign, attracting both praise and criticism. Other women have established Facebook groups to raise funds for launching women-only buses in Dhaka to reduce sexual harassment cases.

Das is also examining initiatives run by government organisations and NGOs to assess whether they are adequately addressing women's issues, and how donors in western countries are influencing these interventions. She has found that many of these initiatives do not take into account how class, religion, education, and ethnicity shape women's perceptions of

sexual harassment. Organisations leading projects to tackle this issue largely haven't consulted women commuters.

Das plans to share her research findings with women commuters, NGOs, and government departments to help the groups work together to develop solutions that tackle sexual harassment on public transport more effectively. She also hopes her research will contribute to the development of safer public transport systems for women. This is key to the Sustainable Development Goal for sustainable cities and communities.

"To have a sustainable city, you need to have a sustainable public transport system that is safe for women," she says. ♥

\*name changed for privacy



# SYDNEY'S BRIDGES OF FAITH

The Sydney Statement incorporates lessons from two decades of international interfaith dialogue.



A young team has produced *The Sydney Statement*, an evidence-based interfaith charter designed to build bridges between believers of different religions.

Over two years, around 200 young people met to propose and approve steps that would allow people of all faiths in Sydney, and the world, to flourish as part of a resilient and harmonious society. Supported by research from Western's Challenging Racism Project, the deliberations, organised by Youth PoWR (Parliament of the World's Religions), resulted in the drafting of *The Sydney Statement*, officially launched on 9 February 2021.

"I envision that *The Sydney Statement* will become a living document that presents

core values, principles and commitments that challenge and question its readers, regardless of the context or times, to make a better society for all," says Ryan Epondulan, youth coordinator of The Sydney Statement Executive Committee.

Western researchers analysed 21 interfaith declarations issued since 1990 from across the globe to provide guidelines for the drafting of *The Sydney Statement*. "Most of the declarations were developed by single-faith groups and written by faith leaders or executive committees," says sociologist, Rachel Sharples. There was little evidence of their impact or of best-practice examples that were effective in directing pro-social action. In comparison, *The Sydney Statement* was drafted using lessons gained from Western researchers' study of previous interfaith documents and their efficacy.

Sharples says, the pro-social action component of *The Sydney Statement* complements the team's

## NEED TO KNOW

- *The Sydney Statement* is an interfaith charter aimed at bettering society.
- The interfaith charter was youth driven.
- Western researchers provided guidelines to assist in the drafting of the statement.

work on bystander anti-racism, which looks at how people can make informed decisions about standing up against racism and discrimination.

*The Sydney Statement* stands out from previous interfaith declarations because youth were in the driving seat, adds Epondulan. He believes it has already had an impact. "At each consultation, young people were surprised by how much they had learned about other religious traditions," he says. "I think the process of discussion, collaboration and review for this new interfaith charter will make them more confident to engage in dialogue."

Importantly, *The Sydney Statement* provides suggestions

about how its commitments, related to human rights, social justice issues, and caring for the environment, can be implemented. These include ideas like identifying elements in one's own religion that are relevant to engaging with others, suggestions of interfaith events to get involved in, and resources about community organisations and activities.

The statement has so far been endorsed by nearly 200 people, including 25 leaders of seven faith groups and organisations. Other endorsers include 17 individuals from interfaith and educational organisations, and from government, including members of parliament.

"Wisdom. Compassion. Diligence. These are the qualities of our humanity that are powerfully represented by *The Sydney Statement*. My endorsement is a sign of support for the wonderful opportunities presented by our multi-religious world," says Sophie Vo, Buddhist representative on the Youth PoWR Committee.

Youth PoWR designated the 19th of March, the date the Sydney Harbour Bridge was opened, 'Bridge Day', a day for building interfaith bridges to promote a cohesive multicultural society. ♥

The Sydney Statement seeks to build bridges between believers of different religions.





# FORGING CULTURAL UNDERSTANDING

Exploring how Australian students develop intercultural understanding through study abroad programs in Indonesia.

4 QUALITY EDUCATION



**Studying abroad is more than just learning in a foreign context,** students also gain a working knowledge of another country's culture. Trying new foods, adjusting to different daily routines, and setting up a home away from home are just some of the factors that contribute to how well a person settles in and which elements of a culture they adopt.

Every year, the Australian Consortium for In-Country

Indonesian Studies (ACICIS) sends groups of students from Australia to spend a semester at a university in Indonesia. Kate Naidu, a PhD candidate in cultural studies at Western and a former teacher of Bahasa Indonesia, describes the process of intercultural learning gained from their in-country experiences, and how this improves their capacity to communicate and interact effectively with people from diverse cultural backgrounds.

"It is often assumed that study abroad schemes automatically produce intercultural capacities," says Naidu. "My research examines whether students

improve their intercultural capacities, and how this happens."

Naidu conducted in-depth interviews with students before, during and after their semester in Indonesia. She took the past experiences of students into account, including their educational backgrounds and



By 2019,  
approximately  
**40,000**  
Australians

had participated in the New Colombo Plan which encouraged exchanges in the Indo-Pacific region.

## NEED TO KNOW

- Study-abroad programmes can provide opportunities for intercultural development.
- Western's Kate Naidu is investigating how this happens.
- She hopes her findings will help improve student experiences in study-abroad programs.

previous travel experiences. She also held focus group discussions with pendamping (local Indonesian students recruited as 'buddies') and did interviews with ACICIS in-country staff.

Naidu looked at which factors help build intercultural capacity during an in-country



A group of students in Indonesia.

© Ika Hila/Shutterstock; © Seungyeon kim/Shutterstock/Getty Images Plus



experience including formal educational aspects, such as university classes and private language tutoring, as well as informal aspects, such as relationships with locals and other ACICIS students, individual personality differences, new routines, and navigating unfamiliar local built environments, transport, and even climate.

An example is the way students discussed attitudes to time. “The way that students engage with diverse temporal rhythms and different framings of ‘time’ itself is fascinating,” says Naidu. “Indonesians tend to have a relaxed approach and will refer to *jam karet*, or ‘rubber time’. They often walk more slowly, and punctuality is less important to them. Some Australian students struggle with this.”

While on the surface, such differences may seem just philosophical or cultural, Naidu notes they are at the heart of how a society runs, such as eating times, periods of waiting, and daily routines structured around prayer times.

“In this way, the experience of being in-country provides opportunities to inhabit alternative ways of being in the world which may ‘bump up’ against existing understandings and practices,” she explains.

The insights gathered from Naidu’s discussions with the ACICIS cohort will provide nuanced points to focus on, in student induction sessions at host universities. She hopes her research findings will guide future policy and practice for institutions that host and run study abroad programs, and that this will subsequently enrich student experiences. ♥

## CUTTING OFF ONLINE FRAUDSTERS

Impersonating vendors to hijack payments is increasingly common. Alana Maurushat is creating a guide to help protect business.

4 QUALITY EDUCATION



**Companies could avoid payment diversion fraud**, an increasingly common cyber-attack, using a guide being developed at Western’s School of Social Sciences.

Last year, Australian businesses reported more than \$14 million in losses to payment diversion fraud via the Australia Competition and Consumer Commission’s Scamwatch; between January and March 2021, the average losses were more than five times higher than the same period last year.

A team led by Alana Maurushat has spent the last two years identifying the most frequent features of payment diversion fraud via anonymous surveys with affected companies. This is now being further explored through a quantitative study in which they hope to canvass more than 100 victims.

“A typical target could be a supermarket, and the regular payments it makes to a supplier,” explains Maurushat. “The supermarket will receive an email with features, such as previous correspondence, and a request for payment to an updated bank account.”

The amount requested will usually correspond with previ-

ous payments, Maurushat says — which suggests surveillance of a victim’s computer system via malware for six months or more. “Today’s scammers seem to be able to understand when payments are made, to whom payments are made, and the company’s payments processes.”

Ken Gamble, head of Sydney-based international cybercrime investigation company IFW Global, where Maurushat acts as an advisor, is sometimes called upon to help recover assets, as authorities are hampered by jurisdictional barriers.

Gamble says that it’s important stakeholders are aware of evolving patterns in cybercrime. “Alana’s research has been



presented to law enforcement, regulators, corporates and the banking industry,” he points out. Payment diversion fraud is mostly handled by state authorities, adds Maurushat, but due to the global nature of the crime, she believes it would be better dealt with by the Australian Federal Police.

The guide, due to be released next year by Western, will include suggested protections such as verifying changes in bank details with suppliers. Maurushat says training staff to spot phishing emails and calls also helps reduce risk. In the future, Maurushat sees the use of multi-factor authentication, as well as advanced quantum encryption, as vital safeguards.

But there’s little room for complacency. Her team has already come across one example of AI mimicking a person’s voice. Maurushat’s research also found that victims who changed their payment processes, invariably believe they are no longer vulnerable. “Cybercriminals are quicker to adapt than companies are to defend,” she says. “Being secure on email has not stopped companies being attacked again via text messages or calls.” ♥

### NEED TO KNOW

- Digital surveillance enables cybercriminals to impersonate trusted suppliers.
- Verifying bank detail changes and training staff to spot phishing emails mitigates risk.
- Multi-factor authentication and quantum encryption could safeguard companies in future.

# THE GUT DOCTOR IS IN

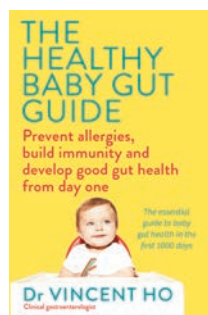
Dr Vincent Ho's passion for communicating changing wisdom on early gut health could have impact for generations to come.

## 3 GOOD HEALTH AND WELL-BEING



Vincent Ho, a gastroenterologist at Western's School of Medicine, is trying to save young people from preventable gut issues through a prolific one-man education campaign. Ho produces online videos and blog posts, does radio segments and has written a parenting book on how to strengthen the gut health of young children. His book, *The Healthy Baby Gut Guide* came out in September 2020 in Australia and New Zealand, with plans for global distribution in late 2021.

"I am passionate about good



## THE HEALTHY BABY GUT GUIDE came out in

**September 2020**

in Australia and New Zealand with plans for global distribution later this year.

gut health early in life, the first 1,000 days is crucial," explains Ho. "For a long time we thought allergenic foods should be introduced at about three years' old, once the child has a more mature immune system. But now we are finding that introducing these foods within the first 12 months can reduce the chance of the child developing allergies later on."

Calling himself the 'Gut Dr', Ho has created an educational portal to discuss all things gastrointestinal-related that has had more than 6 million views to date. "He has a way of distilling technical information in a way that people really relate to," says Anna Evangelini, deputy editor of health and medicine at *The Conversation*, a researcher-led



website with almost 19 million monthly readers, on which Ho has co-produced about 40 articles on gut health.

When Ho established the Translational Gastroenterology Laboratory at Western, in 2011, he was much more of a typical clinician-scientist. He saw patients. He taught classes. He studied colorectal cancer and gut motility disorders.

"But he goes above and beyond what I think any other GI doctor would do," says Sandra Solinas, one of Ho's patients and a leader of Gastroparesis Australia, a support and advocacy group that Ho works with for people with stomach emptying problems.

Then, in December 2015, Ho had an experience that would change his career. His daughter

Olivia, then just six months old, took her first bite of egg and went into severe anaphylactic shock. "I was the most scared I've ever been," recalls Ho.

After Olivia recovered, he dedicated himself to learning more about the causes of allergies in young children. Ho soon adapted his research lab to focus more on the role that intestinal microbes play in shaping the immune system broadly. He also set out to counter the misinformation that, as he discovered, was rife.

The birth of his second child, Brandon, then inspired Ho to write more about science-informed strategies for preventing and managing allergies in children, which culminated in his book. ♥

## NEED TO KNOW

- Ho's gastrointestinal educational portal has had more than 6 million views.
- His 2020 book seeks to disseminate new perceptions of children's gut health.
- The first 1,000 days of a child's life is crucial for introducing allergenic foods.



# HERE'S WHY MENSTRUATION MATTERS

Research to understand young women's knowledge of periods is being used to raise awareness and improve menstrual health literacy across Australia.

## 3 GOOD HEALTH AND WELL-BEING



By improving the menstrual literacy of young Australians, the health and wellbeing of more than 12 million women will be enhanced. Dr Mike Armour and a team at Western are trying to find a way to deliver information about menstruation in an easily accessible manner.

Menstrual issues, such as period pain or heavy menstrual bleeding, affect more than 90% of women under 25 in Australia, affecting young women's attendance rates and concentration at school and in higher education. In 2018, a team of researchers led by Armour, a senior research fellow at Western's NICM Health Research Institute, surveyed more than 4,000 Australian girls and young women to find out how much they understood about their periods.

"Young women in Australia, in theory, learn about menstruation in physical education classes, but very few found that information valuable," says Armour.

Using information from the survey, the research team developed *Menstruation Matters*, a web-based resource designed to improve young women's knowledge of menstrual health. The program delivers information about menstruation, evidence-based

## NEED TO KNOW

- Western researchers surveyed more than 4,000 young women about periods.
- They developed *Menstruation Matters*, a web-based resource in response.
- It provides information and screening.

self-managed methods to help reduce period pain such as practicing yoga and dietary advice, and how to approach their GP if they have further concerns.

One participant said: "[*Menstruation matters*] filled in some gaps I had from school. I don't remember learning much practical stuff in school, just what a period was. Now I understand why I get [period] cramps and things I can do to help manage it."

*Menstruation Matters* doesn't just provide information and self-care advice; a key part of the website is screening – all participants answer five questions via a tool called PIPPA (Period ImPact and Pain Assessment). "If they get a high PIPPA score they receive an email advising them to see a GP for further investigation," explains Armour, "we also provide them with a letter to take to the GP that explains the PIPPA score and why

it is important to follow up on this."

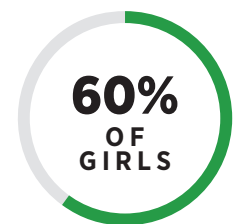
Since 2018, *Menstruation Matters* has been included in *Period Talk*, an educational programme that aims to inform boys and girls aged 9-13 through a series of videos about periods. Founder of *Period Talk*, Tasha Lawton, said *Menstruation Matters* provided some much-needed verification of the information in *Period Talk*. "It was very important to me to ensure I had as much proven data included in *Period Talk* [as possible], not only to give it more credibility but to make sure it really was a genuinely holistic and all-encompassing resource."

The impact is clear, with *Period Talk* being delivered in more than 100 schools across Australia. The Queensland State Government has now committed to rolling the programme out to all public schools during 2021 and 2022. *Menstruation Matters* has also been used in the development of an app that is designed to provide acupressure and self-care advice to reduce period pain. The app, Luna, is currently available in Australia, USA, Germany, Brazil and Taiwan.

Armour has high hopes for *Menstruation Matters* and hopes to secure a grant to grow the programme by developing it into an app itself. "The information is valuable, but we need to make sure we are delivering it in a format that is accessible and understandable for young women." ♥



## IMPACT OF MENSTRUAL PAIN



would not speak to a teacher about period-related problems



## 3 out of 10 GIRLS

skipped class at least once over a 3-month timescale.

# REDEFINING HOMELESSNESS IN GHANA

Study examines the barriers to healthcare for homeless people in the West African nation of Ghana.

## 3 GOOD HEALTH AND WELL-BEING



When Benedict Osei Asibey moved from a village in Ghana to the city, to attend university, he witnessed homelessness for the first time. A decade later, Asibey, now a PhD candidate with Western's Translational Health Research Institute, is working to improve health outcomes for the people who lived precariously on the streets while he gained a tertiary education.

"Homelessness in Ghana is purely an urban experience," Asibey says. "I was born and raised

in a rural community and when I moved to the city, seeing homeless people was a new experience".

"My university was right in the centre of the city and there were a lot of homeless people there. I would talk with them and ask them why are you sleeping here?"

"They face a lot of stigma because local people see them as criminals, but they're not, they have a lot of problems to overcome, including difficult backgrounds and trauma."

Asibey's most recent research examining healthcare engagement for Ghana's homeless people took him back to his home country in 2019 to survey almost 400 people about their experience of living without a permanent home.

A key finding from that survey was the reluctance of homeless people to seek help from health services such as outpatients, accident and emergency, and GP clinics because of the stigma and discrimination they faced.

"When I think of what hospital staff did to my friend when he was sick, I don't even try to go to the hospital. If a street boy like him is insulted that way, then there is no reason for me to go there, because it makes me feel worse," said one interview participant. "Nurses give priority to people who don't live on the street. My friend sat there for more than two hours even though we were among the first in the line," he recalled.

Asibey recommends that community-based homeless programmes be invited into medical clinics to provide a one-stop shop for social assistance and healthcare.

"Hospitals and clinics can be used as an opportunity to engage with homeless people, and help provide needs beyond

## NEED TO KNOW

- Homelessness in Ghana is more common in cities.
- Many homeless people do not access health services due to stigma, this needs to change.
- Hospitals and clinics are a way to engage with homeless people.

regular hospital care, such as food, clothing and other social support," Asibey suggests.

Among his other recommendations are the integration of some traditional medicine — which at 26%, was the most commonly used service by homeless adults among the six services studied — into mainstream health clinics, a focus on sourcing permanent



Slum dwellers are not considered homeless in Ghana.



housing, and more access for the homeless to drug and alcohol services.

The implications of Asibey's work, however, extend beyond re-imagining health systems. He says his research reveals a level of ignorance about the extent of homelessness in the country.

The homeless are not included in census counts, Asibey says, and Ghana Housing Policy's definition of homelessness only recognises rooflessness, not those living in the urban slums. The best estimate from the Ministry of Gender, Children and Social Protection is that the number of homeless is around 100,000, yet this ignores the vast number of people experiencing residential instability.

"We don't have any housing policy that clearly defines homelessness in Ghana. Slum dwellers are 40% of the country's urban population, and those people are [effectively] homeless."

Asibey is lobbying Ghanaian NGOs and government departments including the Ministry of Works and Housing, Department of Social Welfare, Metropolitan and Municipal Assemblies, to expand the definition of homelessness to include those living in precarious housing. This will help identify individuals and families in need of stable housing, and allow the government to better meet the health needs of this sector.

If he can also convince them to adopt his recommendations concerning healthcare, they could play a key role in helping Ghana meet its UN Sustainable Development Goal targets in promoting health equity and reducing premature mortality. ■

## BIPOLAR DISORDER: FACTORING IN TRAUMA

Understanding the impact of trauma in Australian patient populations will help improve screening and treatment.

3 GOOD HEALTH AND WELL-BEING



"Trauma screening isn't standard practice after a bipolar disorder diagnosis, nor is trauma-informed therapy," points out Amy-Leigh Rowe, a PhD candidate at Western's School of Psychology. But some research suggests up to 98% of people living with bipolar disorder will experience at least one trauma in their lifetime and 51% of people living with the disorder will have experienced childhood trauma.

Childhood trauma, adds Rowe, is linked to earlier onset

### BIPOLAR DISORDER



**51%**  
**OF PEOPLE**  
**WITH BIPOLAR**  
disorder  
have experienced  
childhood trauma

and more frequent and severe episodes of mania and depression — the key characteristics of bipolar disorder, a mental disease that affects roughly 1.3% of the global population.

Rowe recommends that trauma screening and therapeutic approaches are included in the Australian Psychological Society's evidence-based guidelines for the psychological treatment of bipolar disorders.

To support her case, she is leading a study on more than 150 people examining how different types of trauma influence their quality of life, and the frequency, severity, and management of their bipolar disorder. "Few have looked deeply into how cumulative trauma over a lifetime affects illness course," she explains.

Study participants who exhibit bipolar type 1 and type 2 were asked via online surveys and interviews about

their symptoms, stressful events in the previous six months and any lifetime traumas, including the frequency, duration and severity of such trauma. Any event that causes a person significant distress has the potential to be traumatic, says Rowe.

Follow-ups at three and six months covered symptoms, mood, traumatic and stressful events and social environment.

Interim findings suggest that just over half of her sample have experienced emotional or sexual abuse and almost a third have experienced physical abuse.

Participants are grouped according to their trauma history and analysed according to demographic, clinical, biological and psychological features, says Rowe.

"I will also be looking at factors that moderate trauma such as social support, which is a protective factor, and stressful events that lead to more severe illness," Rowe adds.

"The results of this study should inform new psychological interventions for cumulative trauma," says Tania Perich, a senior lecturer in the School of Psychology. Perich is founder of the Bipolar Hub at Western, which brings together resources, training and research for people living with bipolar disorder, and their families and clinicians.

Once complete, this research will provide data on the prevalence of different types of abuse experienced by those suffering from bipolar disorder, including emotional, sexual and physical abuse, as well as neglect. This will bolster the case for treating trauma and bipolar disease more holistically, says Rowe. ■

### NEED TO KNOW

- About 1.3% of the global population have bipolar disorder.
- Roughly 51% of people with bipolar disorder have experienced childhood trauma, which is associated with earlier onset and more severe symptoms.
- Trauma screenings could better inform management plans.

# KICKING OFF A BONDING SESSION WITH IMPROVED HEALTH

Community-based education programme uses the camaraderie of sport to keep Australian men engaged in their health.



A men's health education programme tied to social rugby has helped improve measures, such as waist circumference and daily activity.



Since her dad died prematurely of cancer at the age of 60, in 2007,

Emma George from Western's School of Health Sciences has dedicated her career to encouraging men to be proactive about their health.

Her latest endeavour is a community-based programme called Active Breed, which has the support of the Canterbury-Bankstown Bulldogs Rugby League Club. It began in western Sydney in 2018 as a 12-week pilot education programme to help

male football fans pursue healthy lifestyle behaviours, improve health literacy, and learn how to engage with health services. Sessions were followed by a 45-minute touch football game among participants. "Later focus groups found that the solidarity built during the games was one of the main motivators for ongoing participation," explains George. The hope is the programme will be rolled out nationwide.

A randomised controlled trial in 2019-20 showed reductions in weight, waist circumference, boosted physical activity, improved mental health, and reduced sugary drink consumption. Subsequent focus groups with men and their families found broader impacts,

including improvements in family relationships, increased discussion of mental health and domestic violence, and changes

## NEED TO KNOW

- Men are less likely to use health services than women.
- Playing sport is a powerful motivator for ongoing participation in health education.
- Men's engagement with their health had flow on effects for their families.

in the family's physical activity and diet. Active Breed is now ready to be set up as a community programme run through a range of sporting clubs and workplaces.

George explains that, compared to women, men generally are less likely to use health services and tend to seek help for illness at a later stage. These behavioural factors explain why Australian women tend to live five or six years longer on average than men.

The programme was originally designed for people like George's dad. "He was a typical Aussie bloke who probably didn't engage as much as he could have with health services and didn't always talk about how he was feeling," she says, explaining that it goes beyond offering physical health support. "We also used football as a platform to start conversations about men's mental health, health service engagement and domestic violence awareness."

Tom Phee, 60, was typical of the men who entered the Active Breed pilot program, planning to "get a bit fitter, lose a bit of weight", which he did. "I became motivated to start exercising again, shed 5kg and lost 5cm around the belly," he explains. While that didn't really surprise him, what did was how Active Breed helped improve his mental health.

When Tom began developing post-traumatic stress disorder symptoms related to his experiences during three decades as a firefighter, he was inspired by the programme's mental health sessions to seek help from a counsellor. "It really put my mind at ease," he says. He now returns to the programme as a mentor, notably during the mental health components, to share his experiences. ♥





## STRAIGHT TO THE SOURCE

A guide outlines how to support grassroots voices in United Nations food security policy discussions.



In May 2021, a guide to facilitating small-scale producer participation in global food policy was sent to hundreds of organisations affiliated with the United Nations Committee on World Food Security. The guide was co-authored by Anisah Madden, as part of her PhD research through Western's Institute for Culture and Society. *The Guide to Facilitation in the Civil Society and Indigenous People's Mechanism* gives insights into the methods of the Civil Society and Indigenous People Mechanism (CSM).

The CSM formed in the wake of a food crisis in 2008, when a series of economic and weather events caused the cereal price index to spike, reaching a peak 2.8

times higher than in 2000. Millions found themselves unable to meet their basic food needs. "After 2008, member nations of the United Nations recognised that many solutions to food insecurity and ecological challenges were already being practiced on the ground in communities," says Madden.

The CSM gathers organisations and people's movements composed of smallholder farmers, pastoralists, fishers, Indigenous peoples, agricultural and food workers, landless people, women, youth, consumers, urban food insecure and NGOs. It facilitates the participation of these producers and workers in political discussions with governments about food systems policy.

"Small-scale food producers provide about 70% of the world's food, yet are among the most affected by malnourishment and food insecurity," explains Madden. "Opening up policy debates to grassroots voices highlights the

### NEED TO KNOW

- A guide to grassroots involvement in UN food security policy was released in 2021.
- The guide was designed for the Civil Society and Indigenous People Mechanism.
- The CSM aims to amplify the voices of smallholder farmers, fishers and indigenous peoples, among others.

crucial role of local and traditional food systems in food security."

More than 380 million people globally are affiliated with the CSM through participating organisations. A transnational

peasant movement, La Vía Campesina, for example, is working to raise concerns about the degradation of natural resources essential to the traditional food systems in which they are involved. In the guide, a Romanian member of La Vía Campesina, Ramona Duminicioiu, says the United Nations Committee on World Food Security is a place where her group can observe "the flaws and benefits of politics [while] seated directly at the table with governments, not in limited spaces as voiceless observers".

Madden's guide was put together over two years through consultation with the CSM and interviews with 40 facilitators. In addition to outlining some of the CSM's facilitation principles and practices, the guide shows how the CSM channels working group contributions into text-based policy formats, while keeping its mission's spirit alive. ■

# IMPROVING CHILDHOOD NUTRITION IN LAOS

A co-developed pilot community intervention programme that decreased rates of wasting and stunting in children in western Laos could have significant regional implications.

2 ZERO HUNGER



**Ratsavong Kethmany**, has seen a lot of malnourished young children in her job as a technical officer with the Lao Tropical Public Health Institute. Like the tiny 18-month-old she recalls meeting in the country's capital Vientiane. On good days, the mother fed her fifth child, breast milk, baby cereal, or masticated sticky rice with meatballs. On bad days, just plain rice with salt.

The diet is typical of many

children in the Lao People's Democratic Republic, and a key reason why the southeast Asian nation has one of the world's highest undernutrition rates, a problem that also persists regionally. Roughly 33% and 9% of Laotian children under-five suffer from stunting (low height for age) and wasting (low weight for height) respectively — conditions that affect development and result in poor cognitive function and learning outcomes.

Teaming up with researchers at the Burnet Institute in Melbourne, Professor Andre Renzaho from Western's School of Medicine and his collaborators conducted a three-year pilot study between 2008 and 2011, involving 720 households in the highlands of Savannakhet province. The aim was to determine whether interventions such as teaching mothers about good prenatal and postpartum nutrition, and strengthening community health infrastructure, could help reduce acute malnutrition among children.

The pilot was a success: acute undernutrition rates plummeted by 50%, and for those mothers who began breastfeeding within two hours of giving birth it had decreased by 75%. "Strengthening existing assets was a very effective way to start," says Kethmany. Significant improvements were



also recorded in maternal care and child immunisation coverage in Savannakhet province.

Renzaho has wider ambitions. He points to 2019 estimates by *The Lancet's Global Burden of Disease* report that suggest that child and maternal undernutrition that is, low birthweight, short gestation, growth failure, non-optimal breastfeeding, and low intake of micronutrients, accounted for 11.6% of all disability-adjusted life-years. "The health and wellbeing of a nation will never improve so long as undernutrition is a threat to its people's health," he explains.

So, in 2017, his team launched an ongoing study to see if their efforts could work on a larger scale. The goal? To see if a "mixed nutrition intervention package" introduced to women six months

into pregnancy, can reduce stunting and wasting in children at 18 months of age.

The package, which half of the 224,000 participants receive on top of standard care, targets the immediate causes of malnutrition, such as inadequate food, poor maternal health and non-exclusive breastfeeding, as well as underlying causes, such as food security, care behaviour and vaccination coverage.

"We are focused on capacity building through co-development with communities and public-health policy makers and practitioners to address deficiencies in information system management, community infrastructure and social supports," says Renzaho. "If effective and scalable, the model could be implemented across the region." ■

## NEED TO KNOW

- Lao PDR has one of the highest rates of undernourished children in the world.
- Roughly 33% of Laotian children under five suffer from chronic malnutrition and stunting.
- Nutrition interventions co-developed with local institutions by a multidisciplinary team saw malnutrition rates drop by 50%.



# TECH READS DISTRESS BETWEEN THE LINES

Computer analysis of text-based counselling can flag rural patients whose mental health is deteriorating.

## 3 GOOD HEALTH AND WELL-BEING



### A computational tool

developed at Western to analyse text message counselling to identify those at risk of a dangerous decline in mental health could transform mental health service delivery to rural and remote communities.

The algorithm was developed by a team led by Associate Professor Mark Antoniou, who studies language, cognition and their interface with technology at the MARCS Institute for Brain, Behaviour and Development.

Antoniou's work was part of a federally-funded pilot of Virtual Psychologist, which provided SMS-based counselling with qualified psychologists to Australian farmers. "It's a service for people who find telephone or face counselling too confronting, too embarrassing, too inconvenient, or simply unavailable," explains Dervla Loughnane, CEO of Virtual Psychologist and a collaborator with Western.

"Fire, flood and drought are just some of the stressful factors that regularly disrupt the lives of Australians in rural and remote regions", says Antoniou. In addition, fewer mental health practitioners are in regional centres than in cities,

and the distance from a remote property to the nearest service can be vast.

"Farmers also face obstacles of entrenched stoicism and the stigma around mental health, so it's a perfect storm of increased need, fewer services, and cultural and behavioural barriers," Antoniou says.

"If the person is willing to engage, the evidence shows that text-based counselling is as effective as traditional forms of counselling," he adds. For him, the text-based nature of the service brings with it the possibility of developing smart tools. People who are anxious, stressed or

## NEED TO KNOW

- Distance, entrenched stoicism and mental health stigma can prevent farmers from seeking help.
- A Western tool is able to identify anxiety, stress and depression with about 80% accuracy from a text message-based counselling service.
- People who are anxious, stressed or depressed use more first-person pronouns, such as *I*, *me* and *my*.

depressed are known to display particular patterns of language use, such as using more first-person pronouns like *I*, *me* and *my*, he

explains. So his team developed a tool to detect these patterns in SMS counselling transcripts. "We used advanced computational linguistic analysis on the language use patterns, to glean patients' current mental health status and make predictions as to where they are headed," Antoniou says. "The goal is to be able to flag someone who is very distressed and may be having suicidal thoughts."

"So far, we are able to identify anxiety, stress and depression with about 80% accuracy," he says. "We are also able look at a person's language use and predict how they are going to feel weeks or even months away, with an accuracy of 80 to 90%."

The ability to rapidly diagnose treatable conditions by scanning SMS data is extremely powerful, says Loughnane. "Within Australia and globally there is a shortage of mental health practitioners. The data Mark and the team produced is ground-breaking." ■





# BURNING QUESTIONS

Drought detectives examine how Australian forests will cope with a hot, dry and fiery future.





Matthias Boer setting up a drone to take observations in Bilpin, NSW.

## 13 CLIMATE ACTION



### At the height of the last drought in late 2019, when

eastern Australia was suffering through its hottest and driest year on record, environmental scientist, Dr Rachael Nolan, and her colleagues at Western went to see how the eucalypt forests near Armidale in New South Wales were faring.

“As far as you could see, the forest had turned to brown,” recalls Nolan. “The leaves were crispy.” The researchers did what any good clinician would do when faced with such a sick patient: they took measurements and samples, and tried to work out what had gone wrong.

The ‘why’ was easy — the drought had pushed these trees to the brink. But the ‘how’ was harder to establish. Their research found that the trees’ circulatory systems had effectively collapsed: hydraulic failure. The fact that this knowledge was so late in coming, in a country as drought-prone as Australia, reveals the paucity of understanding of how native vegetation responds to extremes of heat, drought and fire.

This is one of many vital research projects underway at the Hawkesbury Institute for the Environment at Western, which aim to better understand how the Australian bush will cope with and recover from the heatwaves, droughts and bushfires that are likely to increasingly affect a warming world.

### A DRY AND ARID LAND

These projects became even more significant in the wake

of the devastating 2019/2020 bushfire season that affected vast swathes of the eastern Australian landscape, burning some 5.8 million hectares, mainly forests, including the habitat of many endangered and threatened flora and fauna species.

“It blew us all away,” says Western’s Associate Professor Matthias Boer, who leads the fire research group at the Hawkesbury Institute for the Environment. Since that terrible season, Boer and colleagues have been heavily involved in research to inform enquiries into the Black Summer fires and to help fire authorities prepare for future events. Boer, Nolan and PhD student, Kathryn Fuller, form one of four nodes of the NSW Bushfire Risk Management Research Hub, conducting a range of projects around bushfire risk and resilience.

One area of focus is the impact of the drought and how the dryness of the fuel load and combustible plant materials, might have contributed to its flammability and the severity of the fires.

An interesting finding of this project was that the amount of fuel in forested areas before the 2019/20 bushfires wasn’t actually higher than average, despite news headlines suggesting the opposite. The difference was the moisture content of those fuels. “We showed that fuels throughout eastern Australia’s forests were the driest they had ever been, they’d been dry for a very long time, and they’d dried out sooner,” Nolan says.

Historical data show that when fuel dryness reaches a critical point, fire danger rises dramatically. Research led by Nolan compared historical



data on fuel moisture across a section of eastern Australia with maps of areas that were burned between 2000 and 2013, and found clear evidence of a threshold for dryness beyond which fire becomes significantly more likely.

The challenge is how to apply this information in forecasts of future fuel dryness. “It’s useful to know historically that these fires happened when it was really dry, the next step is to use this knowledge to predict where forest fuels are going to get to those critical dryness levels in the next week or the next month,” Nolan says.

## FUEL DRYNESS FORECASTING FOR CONTROLLED BURNS

This is where Dr Anne Griebel’s geographical work on forecasting fuel moisture comes in. At Western, she’s leading a project that is trying to establish links between the eco-physiological properties that determine how different vegetation types respond to drought stress and how this affects the dryness of the fuels in that landscape.

“We’re trying to figure out when it is too dry and a wildfire is really a high risk, or if it’s too wet for the planned burns to

## NEED TO KNOW

- Drought conditions increase fuel availability.
- Fuel dryness contributes to fire risk.
- Fuel moisture forecasts could be helpful in fire risk management.

successfully go ahead,” Griebel says. The aim of this modelling, which is being done in

conjunction with the New South Wales Bushfire Risk Management Research Hub and colleagues from the Australian National University, is to forecast the level of fire risk in a particular area and vegetation type from meteorological forecasts and satellite remote sensing.

“That’s a huge step to identify the key parameters that influence fuel moisture dynamics and then to characterise their variability across the landscape,” Griebel says. The project combines ground-based measurements of moisture and vegetation characteristics with remotely sensed indicators, to build the



“DECIDING ON WHERE TO BURN IS NOT JUST ABOUT WEATHER.”

Damage from the 2019/2020 bushfires is still apparent in May 2021 at the Patterson Range Trail, in Bilpin NSW.

ARC Linkage Grant with the Rural Fire Service, ACT Parks and Conservation Service, and the NSW Department of Planning, Infrastructure and Environment.



first biophysical model of fuel moisture in these landscapes. It's information that fire authorities need when planning hazard reduction burns, but currently don't have at the desired resolution in space or time.

"Deciding on where to burn is not just about weather, you need to know if the fuels in a particular area are dry enough to burn but not too dry to risk an escape," Boer says. "So it is a great opportunity for us to provide information that helps make those management decisions."

Understanding fire in the Australian landscape is not just about predicting when and where a fire might occur. There's also a need to understand what happens after a fire event, and how the landscape recovers, particularly a landscape that is already stressed by drought.

"The impacts from the drought are potentially more important than what happened during the fires because they may affect the capacity of these forests to recover," Nolan says. "What's the recovery like, and how does that relate to fire severity and perhaps how does that relate to what the drought conditions were at that location beforehand?"

Part of the challenge with studying drought-related tree die-offs is that it's difficult to get records of when and where trees have been severely affected by drought. A citizen science project called 'The Dead Tree Detectives', initiated by Distinguished Professor Belinda Medlyn and Associate Professor. Brendan Choat at Western is one attempt to track these die-offs, with the hope that finding these



(top) Members of Western's Fire Research Group: Matthias Boer, Rachael Nolan, and Anne Griebel. (bottom) Rachael Nolan taking measurements of charred trees at Bilpin, NSW.

trees will enable researchers to study what happens to them over time: do they recover, and what does that recovery look like?

"When they lose their leaves because of drought, then they can become more vulnerable to other things like insects or fire, and so it's really complex to disentangle what's going on," Nolan says.

The research, which is supported by the Hermon Slade

Foundation, is also making use of satellites to monitor the recovery of burned and unburned areas of bush using sensing from satellites.

Extreme bushfire events such as the Black Summer fires of 2019/20 are likely to be more common in eastern Australia if drought conditions occur more often in a warmer world. Western's bushfire research will help understand the conditions that lead to fires and guide

management and responses to them.

"We're really interested in gaining a more quantitative understanding of fire regimes and how they emerge from environmental conditions, and socioeconomic conditions as well," Boer says. "We can use that understanding to support fire managers in their decision-making and achieve better outcomes." ■



# GETTING INTO THE WEEDS ON CANNABIS

Using data to unlock pain relief for women around the world.

## 3 GOOD HEALTH AND WELL-BEING



### Roughly 176 million women around the world have endometriosis,

an incurable condition where tissue similar to the uterine lining is found outside the uterus. It can trigger severe abdominal pain, especially during menstruation, with serious impacts on many women's daily life, work, relationships and well-being. Treatment options are available, but millions of sufferers are in countries without adequate healthcare. Justin Sinclair, a PhD candidate at the NICM Health Research Institute at Western Sydney University, has found that these women could benefit from active constituents found within the cannabis plant.

Australia legalised medicinal cannabis in 2016, but less than 5% of doctors prescribe it, and thousands of Australians still buy it illegally for therapeutic purposes. Manufactured

cannabis products can cost patients \$250 to \$350 per month. Illicit cannabis costs about a third of that, but is of varying standards and not tested for adulteration, pesticide residues or heavy metals. This highlights the importance of quality-assured products. "If we can prove the safety, tolerability and effectiveness of medicinal cannabis in relieving the pain and associated symptoms of endometriosis, we can use this information to educate doctors

and government, which is an important step in further reducing the stigma around this plant as a medicine," says Sinclair. "This may lead to cheaper products and possible government subsidy through the Pharmaceutical Benefits Scheme."

### IF THE DRUGS DON'T WORK


Sinclair was inspired by a family member's experience with endometriosis to look into the use of cannabis as a pain management strategy. In 2017, he was part of a team, led by NICM's Dr Mike Armour (see pg. 20), that used an online survey to investigate self-management strategies Australians with endometriosis were using to relieve their pain. These strategies ranged from heat packs to meditation, but more than one tenth of the 484 respondents also used illicit cannabis. When the women rated the pain reduction for each method they had tried, cannabis was ranked the most effective, scoring 7.6 out of 10. Many cannabis users had more than halved their prescription medicines and reported other

benefits including better sleep, reduced nausea, and less anxiety and depression.

A similar survey of New Zealand endometriosis patients strengthened these findings, but this time, Sinclair and a larger international team examined which prescribed drugs cannabis users were using less. Opioids, a highly addictive analgesic medicine, were the most common type of painkiller that approximately 40% of women stopped taking. There was also a 15% reduction in the use of benzodiazepines, a potentially addictive sedative, a 17% reduction in non-steroidal anti-inflammatory drugs, and a 16% reduction in antidepressants. "This substitution effect is appearing more often in the literature," explains Sinclair. "Women are replacing their normal medications with cannabis because they don't like the side effects of the prescribed drugs or are worried about becoming addicted or dependent." He adds a note of caution: "they may not be disclosing their therapeutic use

### NEED TO KNOW

- Endometriosis affects approximately 700,000 Australian women.
- Medicinal cannabis is a pain relief strategy.
- Western researchers are working to remove some of the barriers associated with its prescription.

A man with short, light brown hair and a light beard, wearing a white lab coat over a light blue shirt, is looking directly at the camera. He is in a laboratory setting, with various pieces of glassware in the foreground. To his left are several clear plastic bottles with blue caps. To his right are two large, round-bottom flasks containing a dark orange liquid. The background shows laboratory shelves and equipment.

“WE PRESENT  
THE EVIDENCE,  
ANSWER  
QUESTIONS, AND  
ALLOW PEOPLE  
TO MAKE UP THEIR  
OWN MIND.”

Justin Sinclair, a PhD  
candidate at Western.

of cannabis to their doctors, and as such, may not be aware that cannabis is not an appropriate medicine for everyone, or of the potential interactions cannabis has with other medicines, or that some medicines cannot be stopped abruptly. It really is crucial that this is done under the supervision and care of a medical doctor.”

Sinclair is now conducting an international survey on cannabis usage for endometriosis, in conjunction with endometriosis support groups worldwide. “Specific questions around effectiveness, side effects, the

types of cannabis products they use and how they take them will help us identify the most successful self-management trends. These will provide the basis for designing products for clinical trial,” Sinclair says.

### FORGING A PATH FOR MEDICINAL PLANTS

There are more than 140 cannabinoids across the *Cannabis* genus, but research has mainly focused on cannabidiol (CBD) and the intoxicating delta-9-tetrahydrocannabinol (THC). Further research could uncover new therapeutics, more

efficient cultivation techniques, and optimum dosing methods, which will make a critical difference to patients. “Cannabis products taken orally may not act for up to two hours,” says Sinclair, “but the effects can last between six to eight hours, meaning someone could get a full night’s pain-free sleep.” The rising interest in cannabis could also encourage innovative uses of other medicinal plants. “I believe researchers worldwide have looked into the medicinal properties of less than 10% of the 300,000-plus flowering plant species worldwide,” he adds. At the NICM Herbal Analysis and Pharmacology Lab, Sinclair has joined a team investigating how the anti-inflammatory effects of CBD change when combined with terpenes, the compounds behind the strong smell of herbs such as rosemary and lavender. Such lab work provides the molecular insights needed to design products for clinical trials.

### TEACHING WITHOUT PREACHING

For Sinclair, the most important thing in driving change is education. “People have preconceptions because of what they were taught,” he says. “Until we can teach them that new information has come to light, we’re going to be at a stalemate.” Since 2016, Sinclair has given more than 100 lectures to the public, doctors, nurses, other healthcare professionals and fellow academics. The talks, many in conjunction with the medicinal cannabis advocacy charity, ‘United in Compassion’, have been well received. “There is great interest from all manner of medical doctors, but particularly GPs, and pharmacists and

nurses who weren’t taught anything about the body’s endocannabinoid system during their training.” Many people are still sceptical, but Sinclair accepts that. “We present the evidence, answer questions, and allow people to make up their own mind.”

### CHANGING THE TUNE OF A NATION

In January 2020 in Melbourne, Sinclair presented evidence at the Senate inquiry into the current barriers to patient access to medicinal cannabis in Australia, highlighting the lack of unbiased education and the dearth of doctors willing to prescribe it, particularly in rural communities. The inquiry resulted in 20 recommendations to break down these barriers, including a safety review of cannabidiol that downgraded it from a prescription-only drug to one that, in certain forms and for certain conditions, can be bought from a pharmacist. But some legal hurdles still need to be overcome. “Unless the drug driving test detects for actual impairment rather than the mere presence of THC, patients will be too afraid of losing their licence to use a potentially life-changing and now legal medicine,” says Sinclair

Through his ongoing research and collaborations, Sinclair hopes to prove and promote the positive effects of medicinal cannabis. “Endometriosis is a horrible reality, and for many women the prescribed medicines do not work,” he says. “I would love to be part of the research team to provide such evidence, and allow doctors to have the evidence they need to give patients other options.”

### A DOSE FOR DEMENTIA

Another topic under the microscope at NICM is the use of medicinal cannabis for treating mild cognitive impairment, a transitional stage between healthy ageing and dementia when people start showing signs of memory loss. “This is a window of opportunity for interventions that could potentially delay the onset of Alzheimer’s disease,” says Genevieve Steiner, an associate professor of cognitive neuroscience at Western. “There have been almost 150 failed attempts at developing new drugs for Alzheimer’s disease in the past 20 years,” says Steiner, whose team is studying the effects of cannabis on memory loss. Previous preclinical studies show that CBD reverses memory impairment in animal models for Alzheimer’s disease, while CBD’s anti-inflammatory properties could help combat the underlying disease processes of Alzheimer’s in people. Steiner’s team is testing a cannabis-based treatment from licenced medicinal cannabis producers, Australian Natural Therapeutics Group (ANTG), for treating memory and thinking problems in people with mild cognitive impairment. This is now ready for the first human trial. “This research helps us fulfil our shared mission of using medicinal cannabis to alleviate suffering and improve quality of life,” says James Gaskell, ANTG’s Chief Operating Officer. “It could offer hope for millions of people worldwide and spur the development of the next-generation cannabis-based therapeutics for brain disease,” adds Steiner.





# BEYOND MUTILATION

Efforts are underway to educate the public and clinicians about female genital mutilation/cutting, which Olayide Ogunsiji has helped calculate affects roughly 53,000 girls and women in Australia today.

“FGM/C HAS  
MULTIFACETED  
IMPACTS ON  
A WOMAN’S LIFE.”

Olayide Ogunsiji is a senior lecturer at Western's School of Nursing and Midwifery.

3 GOOD HEALTH  
AND WELL-BEING

**Fatu Sillah will never forget what happened to her** when she was six years old. Her mother's friend came to their house near Freetown in Sierra Leone and invited her to a party next door. Excited by the thought of food and friends, Sillah quickly headed over, but her anticipation soon turned to alarm.

"There were young girls sitting in a line crying and I could sense straight away what was going on," recalls the 30-year-old, who now lives in Sydney. "But it was too late for me to escape."

Sillah is one of an estimated 53,000 women and girls in Australia who suffered female genital mutilation, also known as female genital cutting, or FGM/C, and one of 200 million women and girls globally. The World Health Organization defines FGM/C as "all procedures involving partial or total removal of the external female genitalia, or other injury to female genital organs for non-medical reasons."

Even estimating the number of survivors in Australia was a challenge involving careful collation of reliable international prevalence figures and analysis of ongoing immigration from countries where FGM/C takes place. Indeed, it was not until a 2017 report, that an official number was available in Australia.

The report, co-edited by Dr Olayide Ogunsiji, a senior lecturer at Western's School of

Olayide Ogunsiji (standing) works with spokesperson Fatu Sillah (seated) to increase the resources available to those living with the impacts of female genital mutilation/cutting in Australia.



©Cybele Malinowski



Nursing and Midwifery, has enabled a better understanding of the effects on Australian communities and helps drive funding for concerted efforts to help survivors in the community and in hospital settings.

## SURVIVORS FACE MENSTRUAL, SEXUAL, MENTAL AND CHILDBIRTH HEALTH PROBLEMS.

### THE SPECIALISED HEALTH IMPACTS

Healthcare services equipped to provide FGM/C survivors with the help they need are important, explains Ogunsiji.

Aside from the cruelty of cutting, survivors often struggle with lifelong complications. “FGM/C has multifaceted impacts on a woman’s life — physically, emotionally, psychologically, and socially,” explains Ogunsiji, who is also a registered nurse.

Short-term impacts include pain, bleeding, swelling in the genital area, and urinary tract infections. In the long term, survivors may face menstrual problems, sexual health and childbirth complications, and mental health issues.

Yet, Ogunsiji’s research has shown knowledge in this area is severely lacking. As a result, she is now working with women’s health clinics to raise awareness of the issue with pamphlets and training a select group of midwives to provide specialised care to

survivors. She is also exploring how to make awareness of the dangers of FGM/C part of the school curriculum.

“We need to work in partnership with the community, healthcare providers, and the government to get the job done,” she says. Earning the trust of immigrant communities where the culture of cutting is prevalent is also key, says Ogunsiji. “The aim is to connect them with services to support them, rather than to judge or attack them.”

### A LACK OF AWARENESS HAMPERS SUPPORT

The reasons for FGM/C are complex and involve a mix of social and cultural factors, such as the belief that it preserves a woman’s modesty or helps prepare her for marriage. In Sillah’s case, she and all her friends were cut because “mutilated girls were thought to be more humble, less promiscuous, or dirty,” she says.

Today, FGM/C is practised in more than 30 countries across Africa, Asia and the Middle East. But there are survivors

### LIVING WITH FGM/C



ESTIMATED  
**53,000**

women and girls  
in Australia

**200**  
MILLION

women and girls  
globally

worldwide. Awareness of the issue in Australia, however, is low. “When I speak about FGM/C, it’s jaw-dropping for many people,” says Sillah. “They say, ‘Wow, I didn’t know this happened to people who live in Australia or that it happened to women in general.’”

For example, in a 2019 survey of almost 20 Sydney-based primary healthcare providers (GPs, nurses, social workers, etc.), Ogunsiji and her team found while most respondents were aware that FGM/C is illegal in Australia, none knew the actual penalties. Many were also unsure of how to engage those affected who might need legal or crisis care support, with some saying they had only watched a 15-minute documentary on the topic during their training.

The key to tackling FGM/C prevention — and to help meet the United Nations’ goal of stamping out the practice by 2030 — is to do more than just criminalise the act, Ogunsiji says. Education and awareness must come into play too.

### OPENING UP TO OTHERS

Ogunsiji first began researching FGM/C more than 15 years ago, as a young PhD student at Western Sydney University. Before starting out, she, too, was unaware of the problem. In Nigeria where she grew up, they had “been taught it was no longer acceptable to circumcise girls,” says Ogunsiji.

“But then I came to Australia and it caught my attention as an important issue that impacts women and girls, and it needs to be known about,” she says.

For the first six months after she was mutilated, Sillah could barely walk. “Urinating was hard for me, urine equaled pain,” she recalls. Until today, she still suffers from long, painful periods with heavy bleeding, and nerve damage that causes her to sweat a lot, even in freezing temperatures. “It kind of screwed up my whole body system,” she says.

She also has to deal with talking about her past to potential sexual partners. “I answer questions truthfully so that they understand,” says Sillah. “But at the same time, it’s always a debate: ‘Should I? Shouldn’t I? Am I just wasting all my time and energy telling you when two months later, you don’t want to be in my life?’”

“The short-term and long-term trauma of FGM/C is always going to be there,” she says.

Since early this year, Sillah has joined forces with Ogunsiji to help raise awareness of the issue. “I share my story not because I want you to feel sad for me, but because I want you to learn about FGM/C,” says Sillah.

“I’m praying for the day when I can have regular conversations in which people already know what FGM/C is,” she says. “That is my goal.”

### NEED TO KNOW

- In Australia, there are an estimated 53,000 female genital mutilation/cutting (FGM/C) survivors.
- The United Nations hopes to eradicate the practice by 2030.
- Education about support systems for healthcare providers and survivors is key.

# GIVING PHOTOSYNTHESIS THE GREEN LIGHT

Taking the brakes off sugar production in crops could significantly boost food production.

2 ZERO HUNGER



## With a grain of luck,

Oula Ghannoum's recent work on releasing the natural brakes on photosynthesis systems could fuel the first big boom in crop productivity in 50 years.

Ghannoum, from Western's Hawkesbury Institute for the Environment, was born in Tripoli, Lebanon, an ancient city that she describes as containing barely "the shadow of a plant". It's perhaps surprising then that one of her specialties is C4 photosynthesis, which is a system only used by about 5% of green vegetation, most hailing from warmer climes; C3 photosynthesis plants comprise the remaining 95%.

Roughly 50% of grasses are C4 plants, which have a higher photosynthesis efficiency than typical C3 plants, explains Ghannoum. Several, including maize, sugar cane, sorghum, and millet already dominate agriculture due to their high productivity, low water use and stress tolerance.

But what if C4 plant photosynthesis efficiencies could improve the yields of C3 crops such as wheat and rice? Recently,

Ghannoum and her collaborators have been able to show that C4 crops are less sensitive to high sugar levels, which may explain their productivity. They are now pursuing whether manipulating C4-like sugar sensors based on millet can reduce the negative feedback regulation of photosynthesis in C3 crops, such as wheat, rice and potato.

## NEXT GREEN REVOLUTION

The last science-driven leap in plant yields occurred in the late 1960s, during what is now known as the Green Revolution. At that time, the world was on the

brink of a food crisis. To prevent millions of people from starving, scientists and governments worked hard to increase food production by introducing high-yielding grains, improving irrigation techniques, and implementing widespread use of chemical fertilisers and pesticides.

Their efforts paid off. A global food shortage was averted and "the gains from wheat and rice breeding were 20 or 30% every couple of years," says Professor Robert Furbank, director of the ARC Centre of Excellence for Translational Photosynthesis, through which Ghannoum leads a programme at Western. But now, that gain has fallen to roughly 1% annually — a rate that will not provide enough food for the projected growth in population by 2050. According to estimates by the United Nations (UN), the world's population

## NEED TO KNOW

- Gains in wheat and rice from breeding has fallen to roughly 1% annually.
- Oula Ghannoum is investigating how to increase plant biomass.
- She is trying to control sugar regulation during photosynthesis for staple crops.



Wheat is a plant that uses C3 photosynthesis.

is expected to swell to nearly 10 billion by mid-century. "To feed that many mouths, we will need to almost double our food production, which requires a quantum leap in productivity," says Furbank.

To calculate crop yield, farmers and plant scientists use an equation comprising two parts: plant biomass (how many grams you can grow) and the proportion of the plant that is growing. During the 1960s, all of the breeding efforts were focused on the latter. "But now we've reached some sort of a plateau, so we have to work on the other part of the equation," says Furbank.

The total biomass of a plant is closely linked with photosynthesis, the process by which plants use sunlight to convert carbon dioxide and water into oxygen and sugars. This sugar production fuels plant



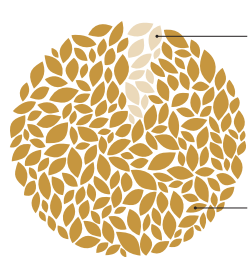
Oula Ghannoum.

© Sally Tsoutas





## PHOTOSYNTHESIS PLANTS



C4



Photosynthesis efficiency **HIGH**  
Productivity **HIGH**  
Water use **LOW**  
Stress **TOLERANCE**

C3



**95% CROPS**

growth, which in turn translates into crop yield.

“The main remaining avenue for us to try is to convince photosynthesis to work harder,” explains Ghannoum.

### BOOSTING BIOMASS

There are two ways to boost photosynthesis. One is to alter the efficiency of the main photosynthetic enzyme Rubisco, the other is to tweak the feedback mechanism governing the entire process.

To imagine the feedback mechanism within a plant, think of a house with solar panels on its roof, explains Furbank. When sunlight hits the panels and produces electricity, switches in the house control where the electricity goes. Something similar happens when sunlight strikes a plant — except that when some of the switches are flicked, “they send a signal back to the solar panel saying: ‘We won’t work as hard now because we don’t need

you anymore.”

“Now, we are trying to understand and manipulate the genes associated with this brake and see how we can relieve it,” explains Ghannoum. Doing so will enable plants to make more sugars in the leaves (called the source), which they can send to the fruits or grains (called the sink). “We also want to better understand this crosstalk between the source and sink so that we can encourage sugar investment in the sink,” she adds.

“But it isn’t as easy as just modifying sugar sensors. Photosynthesis is governed by multiple genes. Improvements must integrate whole plant feedback and requires a better exploitation of source-sink coordination,” explains Ghannoum.

“We really didn’t understand

very much about this braking process until recently,” says Furbank. “Despite the fact that we’ve been working on photosynthesis in Australia, and probably leading the world in that area, for the past 60-odd years.”

But thanks to new synthetic biology and genetic editing tools, Ghannoum and her team have been better able to identify some of the genes responsible for sending signals to different parts of a plant, telling them to speed up or slow down photosynthesis.

“So we can go in and change a gene and ask: does it make a difference?” says Furbank. “That’s what Oula’s programme is all about — making those sorts of changes and seeing what it does to the plant.”

Ghannoum and her collaborators are testing a new photosynthesis boosting technique on a grass called setaria, which scientists often use as a model plant. And in addition to working on rice, wheat and millet, they have also begun experimenting with sorghum. Eventually, the team hope to be able to boost photosynthesis in fruits and vegetables too — tomato is a priority target. “So the productivity and stress tolerance of staple cereals, and maybe even some of our main vegetables, will hopefully increase in the near future,” says Ghannoum. “This should help promote more sustainable agriculture by improving crop yield with less water and nutrient input.”

If Ghannoum and her team succeed, they will play a part in helping to achieve the UN’s goal to “end hunger, achieve food security and improved nutrition, and promote sustainable agriculture.” They also might just help spark a new Green Revolution of the 21st century. ♥

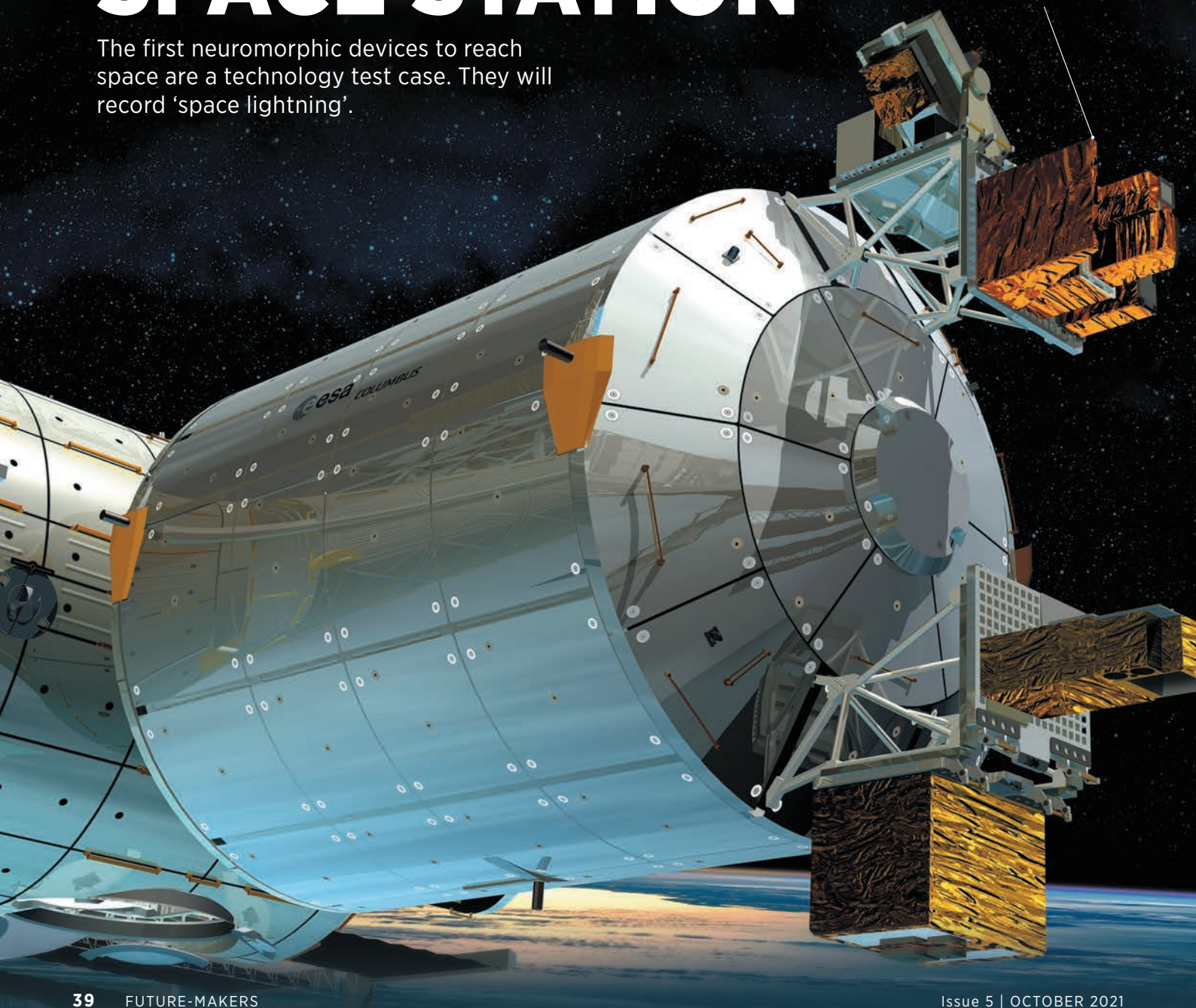




# BIOLOGY-INSPIRED CAMERAS ON THE INTERNATIONAL SPACE STATION

The first neuromorphic devices to reach space are a technology test case. They will record 'space lightning'.

Western's neuromorphic cameras will be installed on the International Space Station's Columbus research module for at least a year from late 2021.





In late 2021, the International Space Station (ISS) will receive a pair of 'neuromorphic' cameras designed by Western's Falcon Neuro project to document upper-atmosphere sprites and keep an eye out for space debris.

A bit like lightning, sprites are spectacular electric discharges. But these streak out of the top of storms towards the edge of the atmosphere. "Modelling of their electron interactions has shown they might be generating greenhouse gases and disrupting satellite communication systems," says Associate Professor Greg Cohen from Western's International Centre for Neuromorphic Systems (ICNS). "Yet they live such brief lives that they are extremely difficult to study, and poorly understood."

Due to be launched in November, Falcon Neuro's cameras will be part of a larger palette of experiments that will be fixed to the outside of the ISS Columbus module (see left) by the station's robotic arm. There, a year-long observation will address a fundamental lack of data on sprites and keep an eye out for space junk. But perhaps as importantly, it will mark the first use in space of neuromorphic engineering — designs that seek to replicate the efficiencies of biology.

### THE EYES HAVE IT

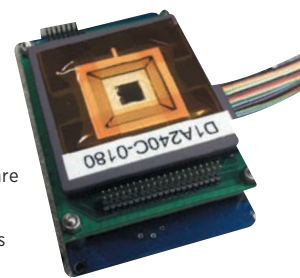
Western's neuromorphic cameras mimic the way that photoreceptors in our eyes only send signals to the brain when activated by light, cutting out vast quantities of non-essential information. The hope is that they will bring much needed cost,

power and data efficiencies to space research.

For space-based applications, where power and data transmission are at a premium, "the amount of data conventional cameras produced is just way more than you could ever stand to bring down from the space station," explains Matthew McHarg, a research director at the United States Air Force Academy (USAFA) in Colorado Springs, who has been working with Neuro Falcon to ensure the cameras can reach and survive space conditions.

Researchers have previously studied sprites using high-speed digital cameras on satellites or aeroplanes. These cameras contain an array of semiconductor chips that convert light into electrical signals, which are periodically gathered together to create a single image frame. "But if you're looking at the sky and nothing's happening,

Neuromorphic sensor pixels are wired to take readings only when light falls on them.



a normal camera produces whole frames of information that tell you nothing," says Cohen. High-speed, high resolution cameras can produce up to 100,000 frames per second and a vast quantity of useless data.

An array of pixels have been fitted to Neuro Falcon's cameras, with each pixel wired to operate like an individual camera, only delivering data when there is a change in light intensity falling upon it. "If something moves or suddenly gets brighter or darker — like a lightning strike, for example — those pixels tell you that something's changed," Cohen explains.

Falcon Neuro's cameras are each about the size of a conventional single lens reflex camera and feature far fewer pixels than a smartphone camera, but they are sufficient to capture sprites. Their primary task is to map exactly where sprites occur, how often they are formed, and what might trigger them. This may also help us to understand more about the origins of conventional lightning, which could feed into weather and climate models.

Each pixel in Cohen's neuromorphic camera has dedicated circuitry to process its signals, so that it can immediately report changes in light and time-stamp them with microsecond precision.

"And if you reduce the amount of data, you don't just

### NEED TO KNOW

- In late 2021 two cameras designed by Western's Falcon Neuro team will become the first neuromorphic technology in space.
- Neuro Falcon's cameras mimic the way that photoreceptors in our eyes only send signals to the brain when activated by light.
- Neuromorphic technology can reduce the amount of empty data captured.

reduce the power draw of the camera, you reduce the amount of power in the processing and the transmission of data back to Earth,” explains Cohen.

Elsewhere, neurons are also the inspiration behind highly efficient, low power processors, which are attracting significant early innovation investment from NASA, Boeing, Intel, IBM, General Motors and others.

### SPACE TO GROW

McHarg runs a research team of cadets at USAFA’s Space Physics and Atmospheric Research Centre who build science

payloads destined for space. “We didn’t really know much about neuromorphic cameras,” explains McHarg “So, I was very excited to team up with Greg on this.” One goal, he says, is simply to find out how the cameras operate in the harsh space environment. “We hope that this is the start of a whole bunch of uses of these cameras in space,” he adds.

“It’s a ludicrously expensive business, launching and installing equipment on the ISS,” Cohen points out, recalling that he offered to travel to the ISS himself to fit the cameras. But NASA “very kindly rejected

my offer,” he says, laughing. “I said to them once, ‘What if I installed a thumbprint reader, so that you needed me to activate them?’ And they said, ‘We’ll absolutely send your thumb up for you.’”

Western’s neuromorphic first has been made possible through a \$5.4 million contract from Australia’s Defence Innovation Hub, awarded in 2019, to develop neuromorphic cameras for use beyond Earth’s atmosphere, the largest ever contract awarded by the funder.

### EYE OUT FOR SPACE CLUTTER

One of Western’s neuromorphic cameras will also keep watch for satellites and fragments of space junk. This is part of a wider ‘space situational awareness’ campaign to track the positions of thousands of objects that increasingly congest the edge of space.

When satellites reach the end of their lives, some are simply abandoned. This growing cloud of space junk risks colliding with operational satellites, potentially posing a threat to communication networks, global positioning systems and weather satellites. Travelling in orbit at 28,000 km/h, a direct hit from a fragment of debris no bigger than a CD could destroy a satellite.

“All satellites are just inherently fragile,” says Stacie Williams, Space Science Architect at the Air Force Office of Scientific Research in Arlington, Virginia. “A small piece of debris can cause a lot of problems up there. And there’s a lot. It’s kind of like trying to monitor mosquitoes in my backyard here in Virginia in summer.”

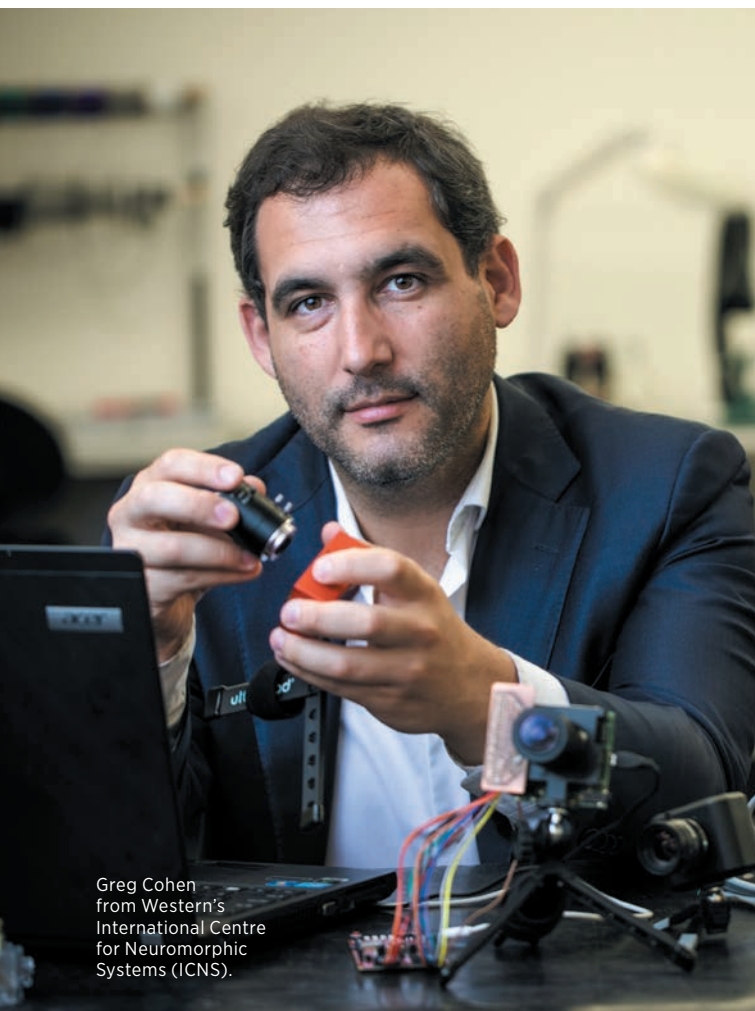
While one of Western’s cameras will look down at the Earth, the other will stare at the Earth’s horizon. “The one looking at the horizon will be able to see the upper edge of space, and we should be able to see low Earth-orbit satellites,” says Cohen. That will allow them to gather space situational data that is vital to protect more than 4,000 satellites in orbit around the Earth.

“We need new, creative sensors to effectively, and at a reasonable cost, track the debris that we’re concerned about,” explains Williams.

Most monitoring of debris relies on either expensive radar facilities, or optical telescopes that only function at night, and Cohen says that neuromorphic cameras could help to provide much more affordable and accurate tracking data.

The Western team has already tested neuromorphic cameras for this in a mobile observatory called Astrosite. Developed in collaboration with the Royal Australian Air Force, the Astrosite neuromorphic telescope has been able to track objects in low Earth orbit, and all the way up to the most distant geostationary orbits.

One advantage on the ground is that while normal telescopes have to remain as still as possible, to avoid blurry images, neuromorphic cameras are so fast that they don’t have that problem. Since the cameras rely on changes in light intensity, they can also function during the day, allowing them to monitor the sky continuously. “There are just so many benefits, because they are so different from traditional cameras,” Williams points out. ■



Greg Cohen from Western’s International Centre for Neuromorphic Systems (ICNS).





## 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)

**WESTERN SYDNEY**  
UNIVERSITY



[westernsydney.edu.au](http://westernsydney.edu.au)