

The Royal Society of Victoria

Promoting science since 1854

SCIENCE VICTORIA

NEWS FROM THE ROYAL SOCIETY OF VICTORIA

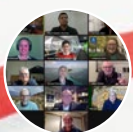
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New RSV Members

Mr Jack Ottaway
STUDENT - DEAKIN UNIVERSITY

Mr Vaughn Monger
STUDENT - RMIT

Mr Richard Harris
LIBRARIAN - CHARLES STURT UNIVERSITY

Dr Michael Spencer
TEACHER - MONASH UNIVERSITY / RMIT

Mr Christian McCaffrey
STUDENT - UNIVERSITY OF MELBOURNE

Unless Members request a ballot, these will be considered by Council and, if elected, will be confirmed at the next Ordinary Meeting of the Royal Society of Victoria.



SCIENCE VICTORIA

Monthly newsletter of the RSV

THE ROYAL SOCIETY OF VICTORIA INC.
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Melbourne, Victoria 3000

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COVER IMAGE: Acclimatise



Yield to the Dingo

Australian pastoralist David Pollock demonstrates that much needs to be learned about how to transition Australia's vast, arid rangelands pastures from their present, significantly degraded condition to become truly sustainable farming operations.

Overgrazing has been the overwhelming cause of the declining condition of our rangelands, yet domestic stock have contributed to less than half the total impact. Unmanaged animals such as rabbits, wild goats and kangaroos ramp up the grazing pressure, leading to a "set stocking" approach to pastoralism, a constant competition over scarce resources at the expense of plant and animal biodiversity.

Any responsible grazing system must allow the most palatable plants time to recover through a rotational grazing system, which is unworkable when so many unmanaged animals continue to graze pastures vacated by

stock. Pastoralist David Pollock recommends that hardest of all things – a cultural shift.

"By far the cheapest, most guaranteed to be effective thing we can do as Australians to recover our rangeland resources, whether it be for production or conservation, is to stop killing the dingoes," he argues.

In an article published in the Proceedings of the Royal Society of Victoria, David illustrates how the large properties involved in the infertile, dry soils of the rangelands make animal-proof fencing economically unviable. "The most viable option on larger properties is to make use of the dingo to control unmanaged grazers, with one important caveat – cattle must be run instead of sheep."

"As a nation, we need to start the conversation about how to transition from our current practices, which have proven to be immensely destructive, towards those that restore and sustainably utilize our

resources. And there is a lot at stake, as pastoralism in semi-arid and arid regions is the predominant land use in Australia, covering around 40% of Australia's land mass."

David believes the change must start at the top. "The fiction of the wild dog has been created over the past twenty years to enable the Australian Government to continue to fund dingo culling." He points to "a sustained campaign of misinformation that is directly contrary to the available science."



At a glance

- Pastoralism in semi-arid and arid regions covers about 40% of Australia's land mass.
- Significant overgrazing has been occurring for many decades due to competition between stock and unmanaged animals like rabbits, wild goats and kangaroo, who consume more than 60% of pasture plants.
- The dingo is Australia's top-order predator and must be conserved to further manage both feral and native species, preventing their overbreeding and overgrazing. This will allow pastoralists to transition to a rotational grazing system that allows pasture plants to recover.
- Sheep are incompatible with the presence of dingoes and must be phased out in the rangelands to favour larger grazing stock such as cattle.

Australia's maligned apex predator

Throughout Australia dingoes are maligned by primary producers, through adherence to the long-established cultural norm of believing that the dingo is their enemy, and by the public, through a sustained campaign of misinformation that is directly contrary to the available science.

David considers the substitution of the term 'wild dog' for the term 'dingo' conjures up very different mental images and is a deliberate fiction that enables the Australian Government to continue to fund dingo culling.

"The single most influential move towards restoring the dingo to its rightful level of immense ecological and productive worth would be for all government departments to discontinue the use of the term 'wild dogs' to describe dingoes," David claims.

"This move could easily be justified by the recent, current and ongoing genetic research, which overwhelmingly shows that public funds are not currently being used



The RSV's Proceedings are published online, open access with *CSIRO Publishing*



David and Frances Pollock at Wooleen Station

to kill wild dogs, because they are so few in number that it is arguable they don't even exist in Australia's wild places."

Currently, the definition of the term 'wild dog,' as described by government agencies, includes pure-bred dingoes.

Transitioning from sheep farming

David is resolute: "Sheep and dingoes cannot co-exist and without the dingoes on large properties to manage the total grazing pressure, there is almost no likelihood that the landscape will be managed sustainably. If we continue to degrade our soil and pasture, then sheep will not survive there for much longer anyway."

So, is this the end of sheep farming in the rangelands? Not necessarily. If the land becomes more productive, with the sheep gone and dingoes "managing the unmanageable," then it's likely pastoralists can transition to owning smaller, more productive properties

– a much cheaper proposition on which to maintain effective exclusion fencing. "It is also the point at which management becomes intensive enough that those properties have the capacity to control their unmanaged grazers themselves."

Good news all round

David points out that dingoes are not just essential for good grazing management, but also the survival of native flora and fauna in rangeland areas. "Wherever dingoes have gained a foothold they have completely removed the fox in the southern rangelands. They have also affected cat numbers."

• "Australia has the largest extinction rate of mammals in the world, and that will continue for as long as we deny the dingo its ecological role." •

About David Pollock and Wooleen Station

With wife Frances Pollock, David is the co-owner of Wooleen Station in the Murchison district of Western Australia, dedicated to the rehabilitation of the outback for the purpose of sustainable production and healthy vibrant ecosystems into the future. He is the author of *The Wooleen Way: Renewing an Australian Resource*. [📺](#)

[Watch video presentation here >>](#)



PHD OPPORTUNITIES AT DEAKIN UNIVERSITY

Determining the resilience of Australian alpine plants and communities in a future climate

The Australian Alps are among the most vulnerable to climate change worldwide. Alpine plant communities are already showing signs of climate stress, are under threat from exotic pest plants and animals, and are recovering from a legacy of stock grazing.

There is urgent need for progressive management strategies to maximise restoration success through consideration of future soil water availability, plant thermal tolerances, and the adaptability of functionally important species. To bolster the resilience of alpine landscapes under climate change we must understand the interactions between the physical and biological processes underpinning the health of alpine environments and adaptability of alpine plant communities.

The *Australian Mountain Research Facility* brings together leading institutions and researchers across four states and territories to produce world-leading ecosystem, evolutionary and biophysical science to guide adaptive management of High Mountains across

Australia. It supports research to assess the extent and effects of changing climate, water and fire regimes on ecosystem processes and their feedbacks and provide a structure for integrated research, management, and governance of Australia's mountains.

Excellent PhD candidates with a background in ecological science, population genetics and/or botany/zoology are sought to join our highly collaborative AMRF-aligned project team to explore the climate resilience of alpine plant and invertebrate communities through field and laboratory experimentation. Projects are based at Deakin University Burwood or Warrnambool campus, co-funded by the Australian Research Council and our industry partners Parks Victoria, Royal Botanic Gardens Victoria, Mount Hotham Alpine Resort, and Southern Alpine Resort Management Board.

Within the **eXtreme Plant Ecology Research Team** and the **EcoGenetics Lab** both in the *Centre for Integrative Ecology* with Susanna Venn, Adam Miller, Virginia Williamson, and Adrienne Nicotra (ANU), we seek 3 PhD candidates to work on the following projects:

- 1) Heat and frost tolerance of regenerating alpine plants and interactions with drought (Deakin Burwood)
- 2) Adaptive genomics, plasticity and regeneration strategies of alpine plants (Deakin Warrnambool or Burwood)
- 3) Alpine plant water relations with drought (Deakin Burwood)

Applicants are expected to have an excellent grade (e.g., H1 or HD) in an Honours or MSc research program and proven skills in scientific writing. Successful candidates will be awarded a 3-year PhD scholarship (~AU\$28,000 p.a. tax free), commencing Spring

2021 or by negotiation. Australian and New Zealand residents will be prioritised due to Australia's current border restrictions.

Interested candidates should contact us via email:

Susanna Venn

(Susanna.venn@deakin.edu.au) or

Adam Miller

(a.miller@deakin.edu.au)

Australian and NZ students:
22 Oct at Deakin




 Events for the month


UPCOMING LECTURES:



From Dump to Paradise: Saving the Eastern Barred Bandicoot from Extinction

Thursday 16 September, 2021

6:30 PM - 8:00 PM AEST

1 x General Registration A\$6.36

incl. A\$1.36 Fee & Tax

Sales end on 23 Sep 2021 General Admission for non-members

As of early 2021, around 100 endemic Australian species are listed as extinct by the federal government or the International Union for the Conservation of Nature – and that doesn't count our invertebrates, which could bring the number closer to 1,000. With entire ecosystems at risk and Australia standing out as the continent with the highest rate of mammalian extinctions in the world since the colonisation by Europeans in 1788, there is much work to be done to save our species.

In 1988, the Eastern Barred Bandicoot Recovery Team was formed here in Victoria to respond to a continued population decline of the mainland population, sending this species dangerously close to extinction. One of the last places this bandicoot could be found in the wild was at the Hamilton tip; 33 years later, Eastern Barred Bandicoot populations now persist in several safe havens, including fenced sites and islands free of foxes, their biggest threat.

While much work remains to be done, the Eastern Barred Bandicoot is now well on the way to recovery, giving hope that, with persistence and dedication, government and non-government organisations working together, and effective community engagement, we can save these and other threatened species from extinction.

Join Threatened Species Biologist Dr Amy Coetsee, who will explore this long-term campaign to establish populations of the Eastern Barred Bandicoot in discrete locations across Victoria, and the important relationships that must be sustained with local communities to enable the success of this species' recovery.



About the Speaker

Dr Amy Coetsee is a Threatened Species

Biologist at Zoos Victoria,

fighting the extinction of some of Victoria's most endangered species. Amy has a strong background in conservation, research, government policy and science communication.

Amy currently leads several projects, specialising in Eastern Barred Bandicoot recovery, where she has more than 16 years of experience.

Amy is involved in all aspects of Eastern Barred Bandicoot conservation including planning, monitoring, research, threat mitigation and community engagement. In 2019, Amy was selected as an Australian Superstar of STEM and is a role model to many aspiring young scientists and conservation enthusiasts.

Dr Coetsee completed her PhD at the University of Melbourne on the reintroduction biology of Eastern Barred Bandicoots. 🐾

Tickets are available below to participate in the webinar via Zoom and/or Eventbrite. RSV Members are prompted to enter their promotional code to access a member's ticket. Alternatively, you can watch along via Facebook Live at the appointed time without buying a ticket.





FOODPRINT MELBOURNE: Building The Resilience Of Melbourne's Food System

Thursday 23 September, 2021

6:30 PM - 8:00 PM

1 x General Registration A\$6.36

incl. A\$1.36 Fee & Tax

Sales end on 23 Sep 2021 General Admission for non-members

Dr Rachel Carey

We tend to think of Melbourne and other cities in Australia as places that are food secure; nationally, we produce enough food to support 60,000,000 people, more than twice our population, in service of our role as a major exporter of primary goods and food products. Supermarket shelves are usually filled with food, all year around. But in the last 18 months we've seen images of sparsely-occupied shelves, crops being dug back into their fields and students queuing for food vouchers. The compounding crises of bushfire and pandemic have revealed some of the cracks in our food supply system, flaws that make our population vulnerable to scarcity.

Join Dr Rachel Carey, who will be exploring what we need to do to strengthen the resilience of Melbourne's food system to future shocks and stresses, particularly those related to climate change and pandemic, seeking a more nuanced conversation about matching up available resources with the healthy, sustainable diets we want our population to be maintaining.

We can leverage the lessons from

the pandemic to transform the way we manage our food system, through strengthening local and regional food supply chains; sustaining the productivity of fertile land on the urban fringe; building efficient, circular food economies to minimise waste; promoting resilient, sustainable production systems adapted to a changing climate, such as regenerative or agri-ecological approaches; building livelihoods through addressing insecure employment, low wages and poor working conditions in the food industry; and redesigning systems of food relief to ensure equitable, dignified access to healthy, sustainable, culturally-appropriate food during times of system stress.



About the Speaker

Dr Rachel Carey is a Lecturer in Food

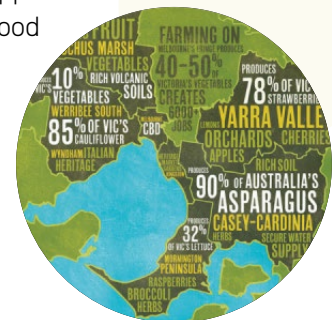
Systems at the University of Melbourne's Faculty of Veterinary and Agricultural Sciences, where her teaching and research focuses particularly on the governance of resilient and sustainable food systems.

Rachel leads the Foodprint Melbourne project, which is investigating the resilience of Melbourne's food system to shocks and stresses and the role of Melbourne's foodbowl in increasing the resilience of the city's food supply. The project team is working with a wide range of stakeholders to plan interventions to increase the resilience and sustainability of the city's food system. Project partners include the City of Melbourne, Resilient Melbourne, Port Phillip and Westernport Catchment Management Authority, the Interface Councils and the Peri-Urban Group of Rural Councils. The project is funded by the Lord Mayor's Charitable Foundation.



One of Rachel's key research interests is the resilience and sustainability of city food systems in the face of growing challenges from climate change, pandemic, population growth, urban sprawl and from declining supplies of natural resources, such as land, water and fossil fuels. Rachel's research has also focused on analysis and development of food policies and the governance of 'free range' and other higher animal welfare labelling. She has a particular interest in integrated food policies and in cross-sector and collaborative approaches to developing food policy.

Rachel has worked on food policies for the City of Melbourne and the City of Greater Geelong, and she is a member of the Melbourne Food Alliance. Rachel is a member of the Editorial Board of the journal *Agriculture and Human Values*. She has a PhD from the University of Manchester (UK) and a Masters degree in Food Policy from City University (UK).



Tickets are available below to participate in the webinar via Zoom and/or Eventbrite. RSV Members are prompted to enter their promotional code to access a member's ticket. Alternatively, you can watch along via Facebook Live at the appointed time without buying a ticket.


 Advance Notice


LECTURE

Thursday 14 October, 2021

6:30 PM - 8:00 PM

General Registration

A\$6.36

incl. A\$1.36 Fee & Tax

Sales end on 14 Oct 2021

General Admission for non-members

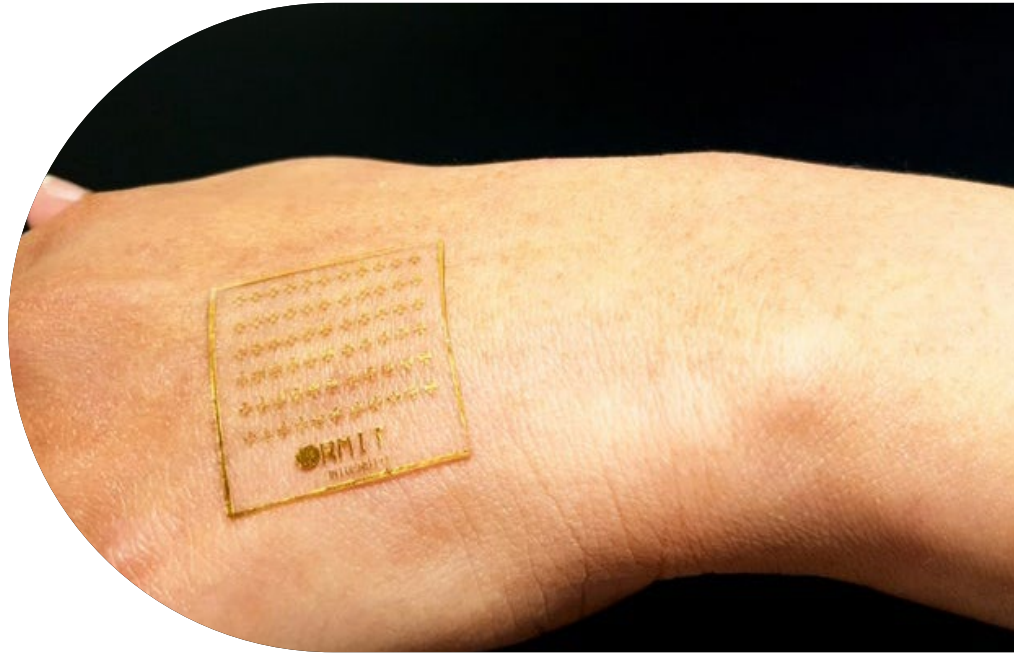


Electronic Skin: Sensing the world around and within us

Dr Madhu Bhaskaran

Stretchable and wearable electronics represent a new wave in devices which can bend, flex, and stretch with the human body. Researchers from Melbourne's RMIT University have developed a prototype to mimic real human skin, with the aim to create a viable alternative to invasive skin grafts and conventional prosthetics.

Join Professor Madhu Bhaskaran, who leads the team working to transform conventional, hard electronics into soft, unbreakable products, thin enough to create "electronic skin." These ground-breaking, electronic, prosthetic patches can adhere to the skin to mimic, measure and diagnose body functionality, and monitor the environment around, on, and within us. Their potential extends beyond improving the lives of people with




prosthetic limbs and skin grafts to offer new tools for surgeons, astronauts and other professions requiring a precise "feel" without direct contact.

**About the Speaker**

Professor Madhu Bhaskaran is a multi-award winning electronics engineer and innovator. She was the 2014 recipient of the RSV's Phillip Law Postdoctoral Award, and has since been recognised for her outstanding achievements with a slew of awards, including the 2018 Batterham Medal from the Australian Academy of Technology and Engineering and the 2020 Frederick White Medal from the Australian Academy of Science.

Professor Bhaskaran co-leads the Functional Materials and Microsystems Research Group at RMIT University, which she established at the outset of an ARC postdoctoral fellowship in 2010, and acts as Node Director and Chief Investigator for the ARC Centre of Excellence for Transformative Meta-Optical Systems. Her work on electronic skin and wearable

sensors has been patented, and her group now works collaboratively with multiple industry and design partners to commercialise the technology for healthcare and aged care.

Madhu attained her Bachelor of Engineering at the PSG College of Technology in Coimbatore, India, before completing first her Master of Engineering then Doctor of Philosophy at RMIT University, Melbourne. 

Tickets are available below to participate in the webinar via Zoom and/or Eventbrite. RSV Members are prompted to enter their promotional code to access a member's ticket. Alternatively, you can watch along via Facebook Live at the appointed time without buying a ticket.

ACCLIMATISE

The Science of Sustainability & Adaptation

ACCLIMATISE

The average global temperature continues to climb

The environment changes in very little time

Ecosystems are altered, animals lose habitat

We have an increasing sense of dread as we watch the thermostat

Less rain, more heat, and weather events are more extreme

Looking at the IPCC report, doom & gloomy it will seem

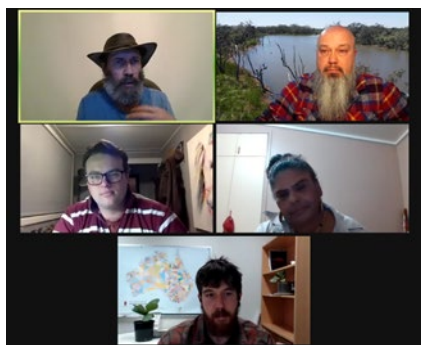
But the ACCLIMATISE events have given us hope

With the great work people are doing, Earth just might cope

More droughts and bushfires, temperatures rise

To protect the planet, we need to ACCLIMATISE

During National Science Week, a suite of events supported by the Inspiring Victoria Program explored climate challenges and the search for creative, innovative solutions as we work towards a sustainable future for all life on Earth.



ACCLIMATISE began with a yarn from the first scientists and custodians of this Country, hosted by Inspiring Victoria and Inspiring the ACT. First Nations people have long lived in balance with nature, having taken care of this land for over 65,000 years. Bushfood grows naturally on this land and survives the tough Australian climate without the same resources needed by introduced crops, and Indigenous landowners, like Uncle Dave Wandin, are farming native bush foods. It's delicious, nutritious, and sustainable.

Aunty Kerrie Saunders shares bush tucker in her area, while Luke Williams formally studies its safety because, despite thousands of years of consumption, current food regulations do not recognise traditional knowledge as documented evidence of safe consumption. He is working to bridge this gap. Farmer and academic, Joshua Gilbert, however, warns that only 1-2% of revenue from bush foods returns to Indigenous communities. With over 6,500 native foods, we should be supporting their production in agriculture and fostering Indigenous farming practices.

Museums Victoria then invited households to consider what they can do for a thriving future in a changing climate. The average global temperature has risen by 1°C in the past century. While this might not seem like much given that weather fluctuates every day,

just like our bodies, which remain at around 36-7°C, the planet's temperature should remain stable, and it is now sick with a fever. Victoria is already experiencing symptoms: less rain and snow, warmer temperatures, and more days of extreme heat. We can all be doctors, helping to patch up the Earth. Museums Victoria asked participants to rethink how they travel, use electricity, and contribute to waste production because every bit counts.



We should also listen to First Nations people who are at the forefront of climate change solutions. Young, Indigenous voices are growing louder, calling for people to protect *Our Treasured Earth*. Country underpins their culture, sustains their livelihood, and entwined in their future. 'It's impacting my people right now,' said Tish King, Community Organiser at Seed Mob. 'Climate change is the environmental response to our behaviour', added Djarra Delaney. 'It is the planet communicating that we are impacting it negatively.' Djarra and Tish are continuing to care for Country and inspiring action and leadership critical to address our climate crisis.



Messages around the climate crisis and other global challenges can be shared through stories. Dr Angela Savage, CEO of Public Libraries Victoria, led a discussion with scientists and writers about how story and science can be woven together to convey powerful messages. While people might not necessarily be receptive to being bombarded with facts and figures, fiction opens new possibilities and removes the "scariness" of tackling science.



Something that often accompanies stories are illustrations. Nature illustrations are ancient – from Indigenous rock art and cave paintings to medieval manuscripts and sketches. While we can now snap photos of wildlife, illustrations were once the only way to depict visual information species. A panel hosted by State Library Victoria discussed natural history illustrations, with a particular focus on the work of Elizabeth Gould, who often went unrecognised given that her work was often attributed to her naturalist husband in his books – a thorny issue for women in science.



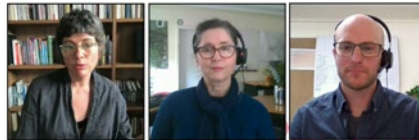


It is all very well to represent biodiversity in pictures, but what biodiversity we have is decreasing as we push animals to the brink of extinction. Zoos Victoria warns that we are in the sixth mass extinction, one caused by humans. Amphibians are in the thick of it with over 3,700 species threatened with extinction due to invasive species, infectious disease and an increase in intensity and frequency of bushfires. One of the species the team at Zoos Victoria is working hard to protect is the Baw Baw Frog; now with an estimated wild population of fewer than 500, they are relying on the help of monitoring programs and citizen scientists to prevent their extinction.



Meanwhile, marine scientists at Phillip Island Nature Parks are creating a safe habitat for Little Penguins and Australian Fur Seals that call Phillip Island their home. Land-based problems trickle into rivers and oceans, influencing temperatures, wind and currents. 'The whole warming of our planet starts with the oceans,' says Associate Professor Andre Chiaradia, as 90% of global warming is absorbed by the ocean. The ocean off the corner of Victoria has

risen by 2.6°C, negatively impacting breeding and feeding behaviours of penguins as fish move away to find colder water, leading to a population decline, and forcing seals to move further south to survive.

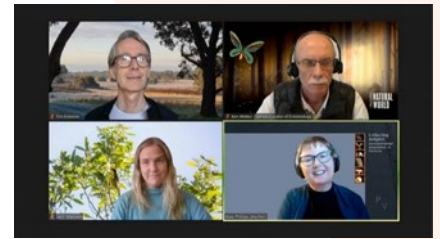


The 'zoo of trees' at Royal Botanic Gardens, that was established in 1845, also needs to adapt to still bloom in 2070 or 2090. Whatever was planted over 100 years ago influences the microclimate, architecture and plants in the gardens today, and so tree species now are carefully considered. Some plants will not survive the future climate while others will thrive. Horticulturalists like Clare Hart are adapting the landscape to be resilient. She and others at the Royal Botanic Gardens are founding members of the Climate Change Alliance that works across the globe to exchange ideas (and plant seeds) to ensure that botanic gardens are climate-adapted.



Author and climate activist, Sophie Cunningham, led a discussion with Royal Botanic Gardens staff, highlighting the importance of plants and fungi. Charlie Carrol, Manager of Arboriculture, described the benefits of trees – creating attractive landscapes for recreation, and providing habitats for wildlife and shade for us. Mycologist Tom May also shared the importance of fungi to the "wood wide web", forming

partnerships with plant roots to exchange nutrients and breaking down dead organisms to return elements back to the environment. Fungi can also be used to build bricks, provide fire-resistance to building interiors, as food packaging (instead of plastic) and as clothing fabric in addition to food and medicine – they are very versatile and sustainable.



Finally, *ACCLIMATISE* drew to a close with a panel hosted by Parliament of Victoria. Dr Ken Walker (Museums Victoria), Dr Sally Sherwen (Zoos Victoria) and Professor Tim Entwisle (Royal Botanic Gardens) spoke about what their respective organisations are doing behind the scenes to protect Victorian flora and fauna in the face of climate change. The 2019-2020 bushfires pushed many species over the edge: many animals and insects died immediately or in the aftermath, and many plants were reduced to char. But the Royal Botanic Gardens replanted trees that they had grown in their nursery to quickly restore habitats, Zoos Victoria rescued and bred animals, and Museums Victoria is carefully monitoring insect populations to ensure they return.

While climate change is a great cause for concern, there are many organisations here in Victoria working tirelessly to protect the environment. They call on us to help as citizen scientists, so that we can track the distribution of native flora and fauna, grow plants that aid pollinators, and think about how our actions impact the land and seas.

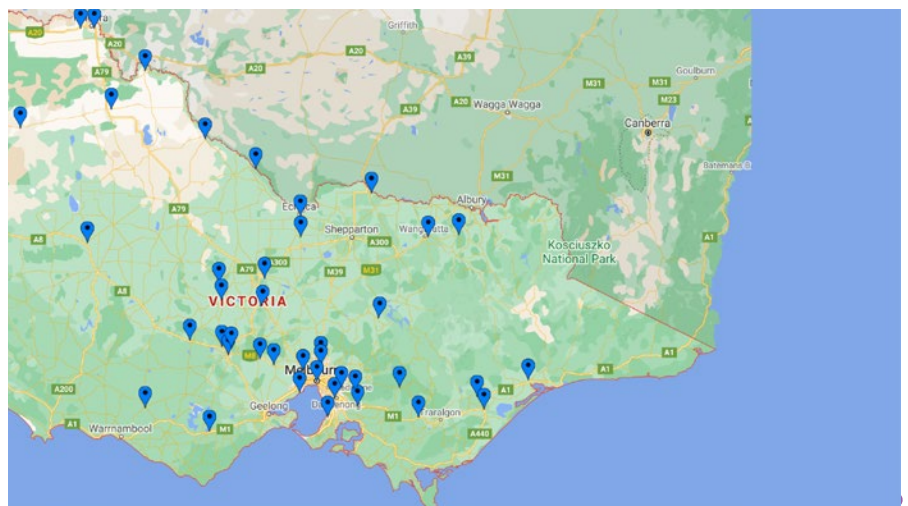


Regional Science Champions: a wave of STEM across Victoria

Victorian libraries provide us with a place to learn, create, and explore. Last year, the Regional Science Champions program sowed seeds of ideas for science outreach activities across the state. Since then, the program has grown, and the effects have rippled as more and more librarians share science and foster STEM skills within their communities.

A partnership network between Public Libraries Victoria, Museums Victoria and the Royal Society of Victoria, supported by Inspiring Victoria, aims to support areas with limited access to resources for STEM education. Since the program's inception, forty-three librarians have become Science Champions in their local communities. They were guided by Kate Barnard, Science Programs Manager at Scienceworks, to channel their enthusiasm for science into developing engaging STEM programs for their libraries and communities.

'Inspiring Victoria loves working with libraries and their communities,' says Rena Singh, Inspiring Victoria Manager. 'We try to deliver science engagement in a diversity of places and this project has enabled us to invest in building the capacity of regional areas to increase their skills and knowledge and continue to build this into local communities.'



In a series of training workshops, Kate emphasised the importance of fostering STEM skills in children. Kate's focus was on empowering librarians to facilitate activities that engage and build skills rather than those that convey many scientific facts. Science and STEM are not the same – and STEM is not simply the addition of science, technology, engineering and mathematics. Rather, STEM is an integrated exploration using problem-solving, investigation, experimentation, learning-by-doing, and most importantly, play.

The skill sets and geographical spread of the Regional Science Champions was diverse, and they established a community forum in which they could share ideas and experiences. Some were already delivering STEM-based activities at their libraries prior to the program while others faced various barriers, such as a lack of confidence in scientific knowledge. But Kate reassured them that you don't need to be an expert to share STEM.

Below: Jane - East Gippsland Libraries



Kate Barnard

Building on Storytime sessions is an excellent example of how STEM learning can be seamlessly integrated into library activities. Pamela Allen's book, *Alexander's Outing*, is the story of a duckling that falls down a deep hole. He was rescued by characters filling up the hole with water for him to float to the top.

This story introduces the idea of buoyancy and children can investigate other possible ways to save the duckling. Similarly, *Rosie's Walk* is a story about a chicken who is being chased by a fox – how might children build something to keep Rosie safe? There are STEM concepts in more stories than we might realise.

Scienceworks has also developed lending kits packed full of resources to assist librarians in delivering hands-on activities. *'These kits are low floor, high ceiling, and wide walls,'*

says Kate. *'Low barrier to entry, you can take them a really long way – the sky is the limit – and there is a great breadth in the way they can be used.'*

One kit that librarians can borrow has an engineering focus. Workshop participants are challenged to build a fun (yet safe) rollercoaster track, to construct with blocks, cardboard and screws, and to work a piston. These can each be tailored to different ages and audiences, whether it's about watching how a ball might roll along a rollercoaster track or building intricate twists and turns by factoring momentum.

There are plenty of bots to unbox in the robotics and coding kits. Specifically aimed at children ranging from 3-15 years old, workshops with three different robots involve free-play and a series of games. Participants can try their hand at coding to instruct their robots to play soccer or navigate obstacle courses.

Children can reach for the stars with the third kit focused on astronomy and space science. It includes

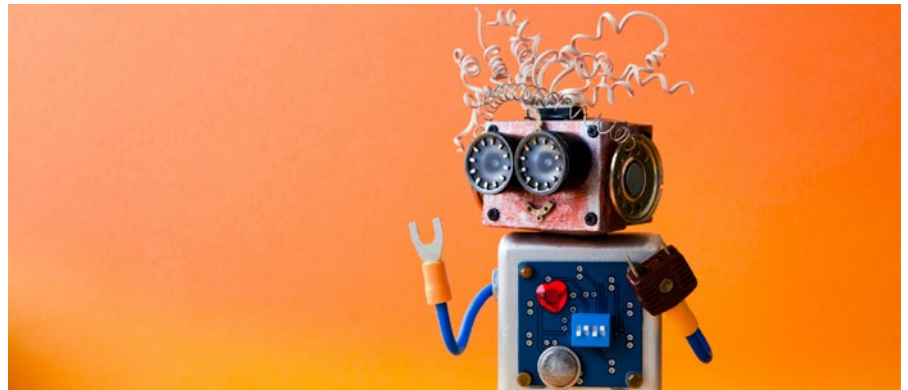


telescopes and a planetarium software to travel around the Universe, a *Merge Cube* to explore the galaxy in the palm of their hands using augmented reality, and robots to program just like a Mars Rover.

'The Loan Kits we have funded provide designated resources so that regional Victoria has the same opportunity to engage in the wonder of Science and Technology as their metropolitan friends,' says Rena.

Armed with these resource kits and full of new ideas, the Regional Science Champions are preparing exciting activities for National Science Week. But this is only a taste of what is to come. The partnership network aims to foster a love of science and help build STEM skills in Victorian communities all year round.

'It was a really inspiring and motivating course,' says Davida McDonald, Library Officer at Colac Community Library & Learning Centre. 'Kate Barnard was a fantastic convenor and made me



realise it didn't have to be hard to introduce STEM to my preschool program...I'm overflowing with ideas & ways to expand STEM to all ages at our library.'

The Regional Science Champions are brimming with ideas to foster STEM exploration, design and problem-solving skills in their communities. While the librarians took different things away from Kate's lessons and the program, it is clear they all gained ideas for facilitating programs, resources, and greatly benefited from their connection to one another. All three organising bodies are very proud of initiating such a successful program, and after four iterations, we hope

to see it continue and bloom as it expands in 2022.

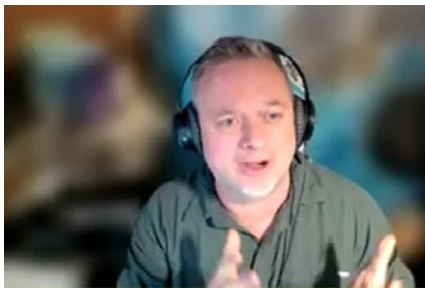
'[This] project has harnessed creativity, curiosity and passion for learning among library staff to deliver exciting and engaging STEM activities in their communities,' says Angela Savage, CEO of Public Libraries Victoria. 'The impact of PLV's partnership with Museums Victoria and Inspiring Victoria is ongoing, with library staff sharing their experiences and ideas for delivering STEM programs across the state.'

Kinetic Connection Challenge, Ballarat Libraries



Weaving Indigenous Knowledge into Agriculture

This article follows a panel discussion delivered to the Royal Society of Victoria (co-hosted by Inspiring Victoria and Inspiring the ACT) during National Science Week on 13th August 2021 titled “Indigenous Food and Agriculture”. Panel featured Uncle Dave Wandin (Wandooon Estate Aboriginal Corporation), Luke Williams (RMIT University), Auntie Kerrie Saunders (Yinarr-ma), and Joshua Gilbert (Chares Sturt University), and was hosted by Associate Professor Bradley Moggridge (University of Canberra).



We have a responsibility to care for land

With bush foods growing and backburns planned

First Nations People know Country best

We should listen to them because it now is stressed

A sustainable way forward is to eat bush food

Plants that happily grow at this latitude

They are tasty and wholesome, quite a good treat

Working together, climate change we can beat

In a Welcome to Country, Uncle Dave Wandin introduced us to Bunjil the Creator’s First Law of Country: that our mothers look after and nurture us early in life, and that we should take care of them later in life as they grow older and weary. Not only does this apply to our biological mothers, but also the spirit of mother. Here, that is Naarm. The spirit of Naarm is older than humans and it is getting tired.

‘The only way we’ll heal Country is by walking together,’ he says.



Uncle Dave is a Wurundjeri Fire Elder, using fire on the landscape to sustain and maintain Country. He has brought cultural burning back to Coranderrk Station near Healesville, after the Wurundjeri people were forced off the land for nearly a century. Following much neglect, the property was covered in weeds, and native seeds had struggled to germinate because of introduced pasture grasses for cattle. Uncle Dave used a series of carefully controlled burns to promote the growth of native seeds and clear away the pervasive weeds. It took eight weeks to clear the 800m driveway alone, but now the land is bouncing back.

Trees are growing at their own pace and are being helped by the Indigenous students Uncle Dave teaches. Birdsong now fills the air, and wombats, wallabies, echidnas, and other animals have returned. Native plants require little work and fewer resources compared to introduced crop species, making them more sustainable as a food source in agriculture. In addition to teaching students to care for Country, Coranderrk will also be producing food over the next two years. Landowners should be learning from cultural knowledge holders so that Victoria’s native plants and wildlife are conserved for future generations – just like they are on these 200 acres.



To get more bush foods on the market, however, they first need to be approved by the national food regulatory body. Food Standards Australia and New Zealand (FSANZ) currently does not recognise thousands of years of Indigenous knowledge and song lines as evidence of safe consumption. Luke Williams, a proud Gumbaynggirr descendant, is working with FSANZ alongside Aboriginal businesses and organisations to change this. He studies the bioactivity (effect in our bodies) and toxicity of bush foods and is helping to develop new regulatory frameworks to assess the dietary safety of traditional foods that better consider the unique history, knowledge and culture held by First Nations people.

‘These foods might be new for the Western ways, but it’s old Knowledge for the Mob,’ commented Associate Professor Bradley Moggridge.



Kamillaroi/Gomeri woman Auntie Kerrie Saunders showcases bush tucker found around Moree in northern NSW. What started out as a hobby for both gardening and bushwalking became a business conducting bush tucker tours (Yinarr-ma). Auntie Kerrie takes people on walks, pointing out medicinal and food plants, and prepares meals for guests with them. One of her favourite foods to serve is bush pizza; with a ganalay seed flour base and a topping of galan galaan (native spinach) and buuy buuy (river mint) ricotta.

While the tiny ganalay seed grains work well in damper and pizza, Auntie Kerrie has found it more challenging to produce bread with them. Similarly, weeping grass is a native rice grain that is too small to be commercially viable. However, Uncle Dave pointed out that the first-known leavened bread was made by the Ancient Egyptians who worked with grains just as small – it was over time that they became larger and more productive. Furthermore, these native seeds were larger 200 years ago, when they were still being looked after by Traditional Custodians of the land prior to the interruption of European invasion. Uncle Dave and Auntie Kerry hope that with careful agricultural husbandry, native seeds will hit the market. (After all, quinoa is tiny but has been branded as a superfood!)



But when they do, it is important that Traditional Knowledge holders are properly acknowledged. Farmer, academic and Worimi man, Joshua Gilbert, warns that they currently only receive 1-2% of revenue from the commercial bush food space. He believes that despite being the first farmers in the world, Indigenous knowledge and wisdom of our agricultural landscape is often ignored. There are 6,500 types of native foods, but there are many barriers to First Nations people commercialising them. Joshua is therefore an advocate for boosting their representation in the agricultural sector. The good news is that 40% of the land mass has been returned to Traditional Custodians, and now with a formalised commercialisation and export strategy for native foods, the opportunities for Indigenous producers are endless.

The Australian population is continuing to grow, demanding more food and resources, but climate change is already taking a toll on the agricultural industry. We need to listen to traditional knowledge and revitalise cultural ways of taking care of the land if we are to maintain another 65,000+ years of sustainable agriculture. 🌱

Chytrid and the future of the Baw Baw frog

WHILE THE IMPACT OF CLIMATE CHANGE AND INTRODUCED SPECIES HAS ALREADY CREATED HAVOC WITH VICTORIA'S NATIVE SPECIES SUCH AS THE BAW BAW FROG, THEY ALSO FACE ANOTHER CHALLENGE, IN THE FORM OF A DISEASE CALLED CHYTRIDIOMYCOSIS - ALSO KNOWN AS AMPHIBIAN CHYTRID FUNGUS DISEASE. JUST AS COVID-19 IS DISRUPTING HUMAN LIVES, THIS DISEASE AFFECTS BIODIVERSITY ON A GLOBAL SCALE AND IS ALSO CLASSIFIED AS A PANDEMIC.

Chytrid fungi (*Batrachochytrium dendrobatidis*) is a problematic cause of amphibian fatality. These fungi are microscopic and waterborne, with the infectious 'zoospore' able to 'swim' in water. When the species that affects frogs comes in contact with their skin, it targets the outer keratin layers that are used for the purpose of self-regulation. When this starts to happen, electrolytes such as sodium and potassium drop, leading to heart failure and, in most circumstances, death.

In aqueous sites, amphibians can be susceptible when they commune in ponds or catchments or through direct contact. In addition, spores found in the environment in traces of water or damp soil are easily diffused through birds, livestock and other invertebrates. Finally, humans

could also spread the disease if the chytrid fungi contaminates their boots or items such as pond nets and bottle traps.

So far, 43 frog species in Australia are in decline, with seven of them extinct and six at high risk. At present, the Baw Baw frog, only found in the Central Highlands of Victoria, is also under threat with an estimated 500 or less left in their natural habitat. While conservation efforts and recovery programs are being initiated to keep the species from further loss, we too, need to be aware of diseases such as Chytridiomycosis and how they can swiftly devastate these remaining, threatened populations.

Priya Mohandoss

This article is based on the 'Amphibians, situation critical: Insights from the leaders in the field saving Victoria's frogs @ Zoos Victoria' webinar as a part of Inspiring Victoria's ACCLIMATE series for National Science Week 2021. 📺

Further reference

Scheele B. C., et al. (2019) Amphibian fungal panzootic causes catastrophic and ongoing loss of biodiversity. *Science* 363, 1459-63.

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Victoria's Baw Baw Frog



Let's Torque STEM Grand Final

THIS ARTICLE RECAPS THE LET'S TORQUE UNDERGRADUATE SCIENCE COMMUNICATION COMPETITION, HELD ONLINE VIA THE ROYAL SOCIETY FACEBOOK LIVE PAGE ON 21 AUGUST 2021.

Effective communication of science is necessary to influence policy, health, the environment, and increasingly, tackle misinformation. *Let's Torque* is an organisation run by undergraduate students, for undergraduate students, to showcase the real-world potential of STEM solutions and foster communication and leadership skills.

This year, four undergraduate students presented STEM solutions to global challenges for the Let's Torque Grand Final. Their aim was to bridge the gap between researchers and society by communicating innovative STEM developments to the general public.

This year the initiative was led by **Jack O'Connor** as Head and **Mitchell de Nardis** as Deputy Head. Following a sparkling program of communication workshops and semi-finals with participants delivered by the Let's Torque team, the Grand Final was conducted online, during yet another Melbourne lockdown for National Science Week, hosted by the Royal Society of Victoria.

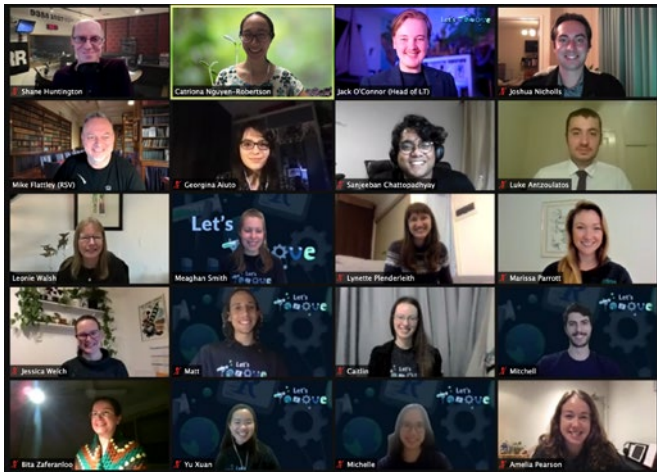
Joining the team and competitors were judges **Catriona Nguyen-Robertson** (RSV Science Communications), **Dr Shane Huntington** (Einstein a Go Go, 3RRR) and **Dr Leonie Walsh** (Chair of C4NET and Victoria's inaugural Lead Scientist).



Keynote:

Dr Marissa Parrott,
ZOOS VICTORIA

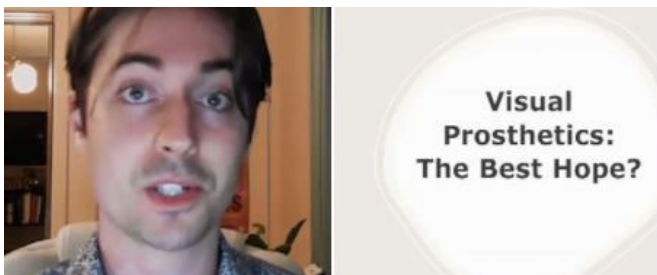
This year's keynote address was delivered by someone who conveys important science messages in her everyday life, reproductive biologist Dr Marissa Parrott. Since joining Zoos Victoria's Wildlife Conservation and Science department, she has led many conservation efforts to protect endangered native animals that are based on scientific research. Their successful campaigns "When Balloons Fly, Seabirds Die", "Lights off for the Moths", and "Safe Cat, Safe Wildlife", demonstrate the power of conveying science well. They encouraged people to use bubbles rather than balloons to avoid creating deadly litter, to minimise light pollution for Bogong Moth migration, and to keep cats indoors so that they do not prey on native wildlife. Marissa's presentation was an inspirational demonstration of clear, effective science communication.



Finalists for the Let's Torque Grand Final with Judges, the 2021 Let's Torque team and RSV staff.

The Competition

Our thanks to all participants for stepping up for this year's competition! These are tricky times to get involved in *anything*, so your enthusiasm and commitment is warmly appreciated. The four finalists presented on the following topics, and were awarded Prizes as follow:



First Prize

Joshua Nicholls,
 SWINBURNE UNIVERSITY OF TECHNOLOGY: "BIONICS: SEEING INTO THE FUTURE."

What would life be like without your vision?
 Joshua Nicholls (Swinburne University) gazed into the future of visual prosthetics. Developments in bionic eye technology provide hope to the 13 million Australians who live with some form of vision loss. Electrodes are implanted in the visual cortex, or on or below the retina of the eye that receive electrical signals from a camera. The image resolution is still quite low as only a set number of electrodes contribute to forming an image, resulting in a very pixelated image, but as the technology advances and more electrodes are included, the detail of the images will get better and better. Joshua hopes that the cost will come down while the resolution of this technology will increase in the future.

Watch Joshua's presentation [here >>](#)



Second Prize

Sanjeeban Chattopadhyay,
 SWINBURNE UNIVERSITY OF TECHNOLOGY: "PERMEABLE PAVEMENTS: A KEY DESIGN FOR A WATER-SENSITIVE FUTURE."

Urban areas are currently not optimally designed when it comes to heavy rainfall and flooding. Infrastructure decreases the natural filtration of water through the ground, as areas once covered by vegetation have been replaced with buildings, concrete paths, and asphalt roads. Not only are floods inconvenient, stormwater also overloads drains and becomes contaminated with rubbish.

To avoid severe floods after heavy rainfall, Sanjeeban Chattopadhyay (Swinburne University) is excited to see permeable pavements rolled out. Permeable pavements are comprised of a porous surface to absorb more water, mitigate potential flood events and direct moisture into the soil below.

Watch Sanjeeban's presentation [here >>](#)



It's only a second

One nanosecond can be 30cm of error, meaning one second off can result in 300,000 kilometres of error.

People's Choice Prize

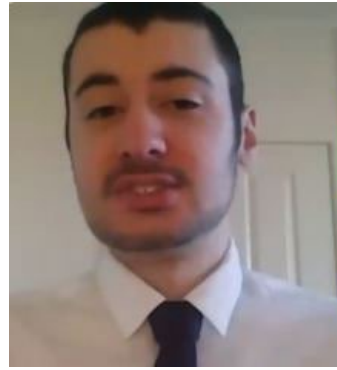
Georgina Aiuto,

SWINBURNE UNIVERSITY OF TECHNOLOGY: "TAKE A SECOND FOR THE FUTURE."

Georgina Aiuto (Swinburne University) spoke about the importance of accurate monitoring populations of koala and other native animals with GPS data. Following the 2019-2020 Australian bushfires, the distribution of animal populations in affected regions in the aftermath was assessed using this global system.

Satellites use atomic clocks to link their position and time. The timekeeping mechanism of an atomic clock is based on the excitation of atoms such as caesium – essentially, electrons in the atom vibrate when excited by light of a certain wavelength, and a second is defined by a set number of electron vibrations. Atomic clocks are more stable than regular clocks but, as the Earth's rotation slows and falls out of sync with satellites orbiting the Earth, "the second" needs to be updated so that our GPS data remains accurate. Australian animals that are monitored from space rely on how we define time, as a misalignment of a few milliseconds can mean kilometres of inaccuracy at the ground level.

Watch Georgina's presentation [here >>](#)



Finalist

Luke Antzoulatos,

RMIT UNIVERSITY: "NANO-TERMINATORS"

Scaling down from the vastness of space, Luke Antzoulatos (RMIT University) drilled down to the nanoscale. When bacteria form aggregates (biofilms) during an infection, those within the biofilm are shielded from antibiotics. If this occurs, the only way forward is to increase dosage, which in turn, contributes to future antibiotic resistance. Luke described a new solution: Nano-Terminators, a mix-n-match of nanoparticles composed of materials with antimicrobial properties. Galinstan, a liquid metal alloy used in thermometers, can pierce biofilms and bacterial cell walls; silver interferes with bacteria metabolism; and curcumin, used in curry powder, disrupts bacteria communication. Each only work for specific bacteria types, but together, they may be able to combat infections when antibiotics fail.

The RSV extends congratulations to the finalists, our thanks to the judges and commend the 2021 Let's Torque team for another excellent competition! 🎉

Watch Anton's presentation [here >>](#)

[Video \(Facebook Live\) here >>](#)



Young Scientist Research Prizes

THIS ARTICLE RECAPS THE YOUNG SCIENTIST RESEARCH PRIZES COMPETITION, WHICH WAS HELD ONLINE VIA THE ROYAL SOCIETY FACEBOOK LIVE PAGE ON 19 AUGUST 2021.

Every year, final year PhD candidates present their doctoral studies to the Royal Society of Victoria, competing for four Prizes that recognise excellence in Victoria's early career scientists. Eight finalists present under the four categories: Biological Sciences, Biomedical & Health Sciences, Earth Sciences, and Physical Sciences. While the format of delivery was different this year, participants rose to the challenge to deliver engaging and informative videos for National Science Week. A particular congratulations to Mark Vidallon, Kimberley Reid, Lauren Bleakley and Sarah McDonald, the first prize winners of their respective categories.

Biological Sciences



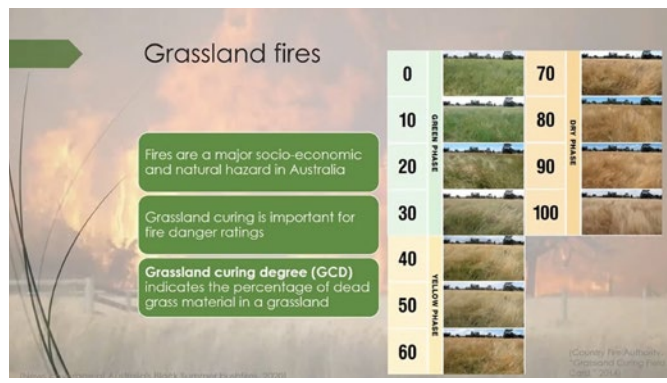
Sarah McDonald,
SCHOOL OF BIOSCIENCES, THE UNIVERSITY OF MELBOURNE

During and after the rain, as storm water flows down the drain, pollutants are picked up for the ride and are delivered to receiving waterways via stormwater runoff. Among the variety of pollutants present in stormwater, metals continue to be identified

as a priority due to their ubiquity, legacy, and ability to bioaccumulate and cause effects in organisms. Monitoring of urban stormwater runoff has revealed that discharges into receiving waterbodies tend to occur over short-term 'pulses'. As a consequence, organisms that access these environments are subjected to intermittent, short term metal exposures rather than a continuous exposure. The water quality guidelines currently set by regulatory bodies to protect these ecosystems are typically derived from chronic toxicity tests. This is an issue, as these guidelines may not be protective of episodic exposures typical of stormwater runoff.

Sarah McDonald has monitored metal contaminants in stormwater runoff in Moonee Ponds Creek to determine their risk to aquatic animals. She found that only 2% of the metals in the water were available to be taken up by organisms (bioavailable), and that they only entered the receiving waterbodies intermittently. This short-term exposure to metal therefore appears to pose little risk, but she has yet to study the impacts of repeated exposure. In the meantime, her studies will help inform water quality guidelines.

Watch Sarah's presentation [here >>](#)



Sike (Lydia) Li,
SCHOOL OF EARTH, ATMOSPHERE & ENVIRONMENT,
MONASH UNIVERSITY

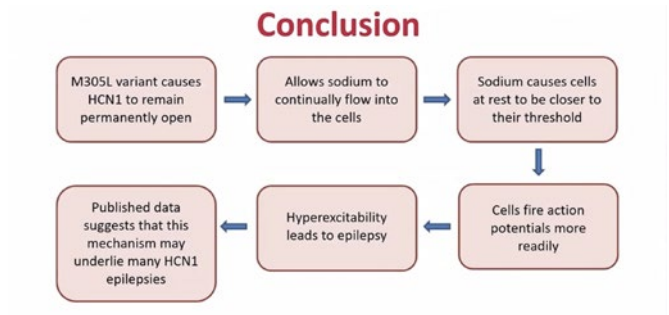
Bushfires in Australia can be absolutely devastating. One of the factors that determines their ferocity is how much fuel they have to burn. Most grasses have a life cycle where they annually dry out and die or become dormant, a process referred to as curing. Curing affects fire behaviour by gradually increasing the amount of dead material in grasslands while decreasing moisture levels, thereby increasing the chance of fire ignition, intensity and spread. Sike (Lydia) Li has been tracking grasslands in Australia using remote satellite data and works to improve estimates of curing using data from multiple satellites so that we can

accurately monitor how much dry fuel is around come bushfire season.

Grassland curing degree (GCD) has been traditionally determined using three approaches – a visual estimate, a point intercept method also known as the 'Levy Rod' method, and destructive sampling. However, these methods are either costly and inefficient, or lack accuracy, and they are impractical for large areas. Hence, the need for estimation of curing degree on large scale has become increasingly important for grassland fire monitoring. However, current satellite products have low spatial resolution that are unable to distinguish grasslands from other nearby land types. Melbourne would need a much higher resolution due to its large area and complex land types in the peri-urban area. This research establishes the use of higher spatial resolution satellite imageries for generating Grassland Curing Maps (GCMs) as an effective method for grassland curing observations. It also finds and analyse the ISV between GCMs created by various spatial resolution and builds a decision support system.

Watch Sike's presentation [here >>](#)

Biomedical and Health Sciences



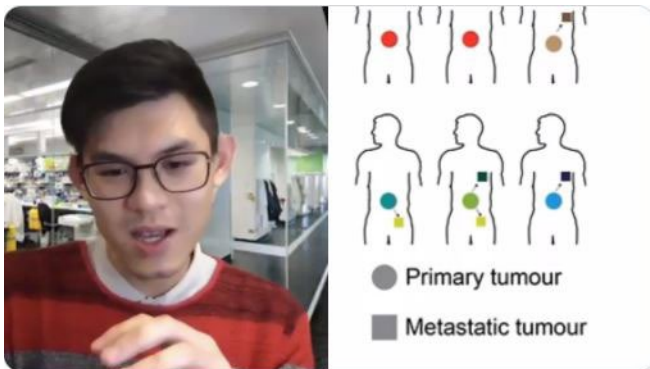
Lauren Bleakley,
FLOREY INSTITUTE OF NEUROSCIENCE AND MENTAL HEALTH, THE UNIVERSITY OF MELBOURNE

Ebony, a young girl with a rare and severe form of epilepsy, was the inspiration for Lauren's PhD studies. Ebony's case is caused by a mutation in her HCN1 gene, which provides cells instructions to make a channel to let ions in and out. This alteration of the HCN1 channel caused by the mutation is associated with severe developmental impairment and drug-resistant epilepsy. When altered, the channel is permanently in

an open state, allowing sodium ions to constantly flow into neurons in the brain, which causes them to be hyperexcited, triggering seizures. Lauren has developed a mouse model of the disease to test antiepileptic drugs so that she can find and test effective treatments.

The HCN1 gene encodes the HCN1 ion channel, which plays a key role in setting and stabilizing the resting membrane potential of neurons. Pathogenic variants in HCN1 are known to cause epilepsy, including severe, early-onset epilepsy syndromes such as Developmental and Epileptic Encephalopathy (DEE). To date, 29 confirmed pathogenic variants in HCN1 have been identified to cause epilepsy, with 14 of these variants, including the recurrent de novo HCN1 M305L variant, associated with DEE. Although preliminary functional analysis has been conducted on some HCN1 variants, the mechanisms through which changes in HCN1 channel function lead to neuronal hyperexcitability are yet to be examined in detail. This research involved engineering the HCN1 M294L heterozygous knock-in (Hcn1M294L) mouse, which carries the mouse homologue of the human HCN1 M305L variant and is the first mouse model of HCN1 epilepsy, in order to explore the disease mechanism underlying HCN1 DEE.

Watch Lauren's presentation [here >>](#)



Ronnie Low,
WALTER & ELIZA HALL INSTITUTE OF MEDICAL RESEARCH, THE UNIVERSITY OF MELBOURNE

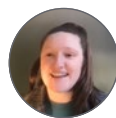
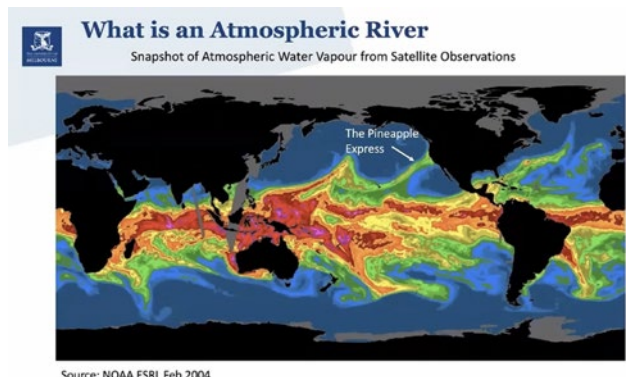
Pancreatic cancer is the 4th most common cause of cancer related death in Australia, with less than 10% of patients alive 5 years after their diagnoses. Most patients die within 6 months. Chemotherapy, being the only treatment, has not improved patient survival and new treatments are desperately needed. Pancreatic cancer can differentiate into low grade tumours or high grade tumours, where high grade tumours are associated with poor prognosis. Due to the limited

treatment options available for pancreatic cancer, it is crucial to understand what causes the cancer to grow into different grades, which may involve better ways to select treatments for patients, in addition to identification of new treatment options.

One of the barriers to developing new treatments is that genomic analyses have so far failed to identify good therapy targets. Ronnie's solution is organoids: 3D multicellular structures grown in a lab that are derived from patient cells. He has generated Australia's first pancreatic cancer organoid biobank and used these tools to better understand factors that drive disease progression. He is also trying to identify new opportunities for treatment, and screening different drugs on patient-derived organoids allows researchers to see how the patients will respond so that they can receive treatments that actually work.

Watch Ronnie's presentation [here >>](#)

Earth Sciences



Kimberley Reid,
SCHOOL OF GEOGRAPHY, EARTH & ATMOSPHERIC SCIENCE, THE UNIVERSITY OF MELBOURNE

Atmospheric Rivers (ARs) are narrow regions of enhanced water vapour transport in the lower troposphere. Globally, ARs are associated with natural hazards such as extreme rainfall and floods, extreme winds and landslides. They are responsible for 90% of water transport from the tropics to poles, carrying more water than the Amazon River through the atmosphere. They occur regularly over Australia, associated with natural hazards such as extreme rainfall and floods.

Australasia, regional ARs are particularly understudied. Extreme rainfall is notoriously difficult to forecast

more than three weeks in advance yet, when correct, forecasts of extreme rainfall are incredibly useful to a variety of stakeholders, including farmers and emergency managers. A recent area of research is sub-seasonal forecasting, which means making forecasts out to 3-6 weeks. Due to the chaotic nature of the atmosphere, forecasting an individual thunderstorm out to 3 weeks is essentially impossible. However, large-scale features, like Atmospheric Rivers, can be predicted further in advance. Kimberly Reid studies the relationship between ARs and extreme rainfall to inform new tools and processes for forecasting hazardous rainfall 3 to 5 weeks in advance.

Watch Kimberley's presentation
[here >>](#)

Critical metals will help us solve the problems of the future!



It's our responsibility to ensure that they don't create more problems than they solve!



26



Owen Missen,

SCHOOL OF EARTH, ATMOSPHERE & ENVIRONMENT,
MONASH UNIVERSITY

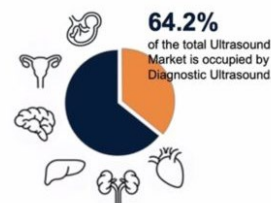
Rarer than gold but less well known, tellurium (Te) is one of the least common elements on Earth. It is the bright future of solar energy as it is primarily used to manufacture films for solar cells. When combined with other elements, it has enhanced electrical conductivity and can efficiently absorb sunlight and convert it to electricity. Due to its low abundance, little is known about its toxic effect on humans and ecosystems; however increased use of Te in applications is leading to greater input of anthropogenic Te into the environment. A greater understanding of the sources and mobility of Te is important to ensure it does not become a significant pollutant. Yet, compared to other semi-metals such as arsenic and selenium, the environmental (bio) geochemistry of Te has thus far received very little attention.

So, while critical metals like tellurium will help us meet important needs such as low emissions energy production, we also need to ensure that they do not become an environmental contaminant, thereby creating

more problems than they solve. So Owen Missen travelled to nature's richest tellurium site in Moctezuma, Mexico, where he found evidence of diverse communities of bacteria breaking down the toxic form into non-toxic nanoparticles. These ore deposits provided a unique natural experiment regarding the dispersion of Te in the environment, which has been used in his research to further develop a model of the biogeochemical cycling of Te.

Physical Sciences

Ultrasound imaging



Important in prenatal care
...and in diagnosis of other types of diseases

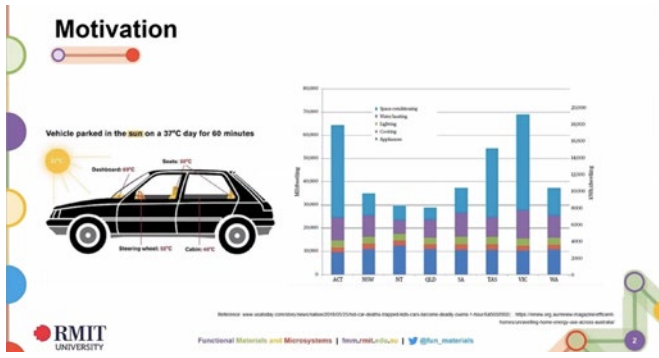


Mark Vidallon,

SCHOOL OF CHEMISTRY, MONASH UNIVERSITY

Ultrasounds are widely used for medical imaging, but a great challenge is the inability to distinguish between organs with similar acoustic responses, such as blood vessels and soft tissues. Contrast agents, typically "microbubbles", are injected into the bloodstream to give better contrast of blood vessels against other tissues.

Recently, new types of gas-containing and gas-generating colloids are being developed for this purpose and for other applications, such as drug delivery and theranostics, due to the acoustic properties of bubbles and associated mechanical effects during bubble formation. Mark's work is revolutionising these microbubbles with bio-inspired, red blood cell membrane bubbles that are biocompatible, so escape destruction by the body's immune system. He can take a patient's (or compatible donor's) blood cells, from which he creates microbubbles, and can even add modifications such that they act as sensors or can be remotely activated to transduce infrared light into heat on demand using polydopamine – a new way to personalise medicine. These features provide key properties for more effective and safer ultrasound contrast agents.



Sumaiya Kabir,
SCHOOL OF ENGINEERING, RMIT UNIVERSITY

When you sit near a window on a hot day – say, in a parked car – you’re reminded of how easily heat travels through glass. Ironically, we overwhelmingly address this problem with air conditioning systems, the use of which is a major contribution to global warming, accounting for up to 50% of the total electricity used in Australia alone. While we can use curtains and blinds to keep heat in or out of our internal spaces, a more permanent, efficient and sustainable solution for temperature regulation through glazing is needed.

The high use of AC is driven by inefficient construction solutions and material choices of windows for the exchange of natural sunlight. Some solutions to regulate the amount of heat that penetrates our windows are already available, yet also require electricity to thermally regulate or block out the sunlight. Sumaiya is developing a self-regulating glaze for glass windows. Her thin film, made with a novel material (vanadium dioxide), lets light through while blocking heat coming in – only on hotter days – without the need to use any electricity.

ASSESSORS AND JUDGES

The RSV extend grateful thanks to our assessors: Dr Viktor Perunicic (Q-CTRL), Dr Sophia Frentz (Eliiza), Dr Jane Canestra (ARPANSA) – including those who journeyed the further several billion micrometers to join us as judges on the night – Professor Andy Gleadow (University of Melbourne), Dr Bill Birch (Museums Victoria), Dr Catherine de Burgh-Day (Bureau of Meteorology), Professor David Walker (RMIT University), Professor Richard Reina (Monash University), Dr Gavin Smith (Ambulance Victoria), Professor Sandra Rees (University of Melbourne), and Associate Professor Rob Day (University of Melbourne), along with our Science Program Chair – Dr Kevin Orrman-Rossiter, CEO – Mike Flattley and Science Communication Officer – Catriona Nguyen-Robertson. 🇺🇸

[Watch Video \(Facebook Live\) here >>](#)



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