The Royal Society OF VICTORIA
Promoting science since 1854

Inspiring AUSTRALIA Victoria

SCIENCE VICTORIA

OCTOBER 2023

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Precision farming techniques, driven by data analytics and remote sensing technologies, optimize resource allocation, ensuring minimal wastage of water and fertilizers.

(Photograph: Gary D Chapman/Shutterstock)

SCIENCE VICTORIA

This Edition: Science and Food

Science is embedded in the production, preparation, and consumption of food. Agriculture is a collaboration between farmers and the Earth's systems, and faces immense disruption from extreme weather events like floods, droughts, and fires, exacerbated by our warming climate. This month we take a look at the resilience of Victoria's food system, from growing crops to distributing food during social disruptions such as pandemics, and canvass some future-focused solutions to anticipated challenges.

On the Cover: Canola fields near Creswick, in west-central Victoria. Grains like wheat, barley, and canola, account for 20% of the value of Victoria's agricultural sector. Photograph: Chris Putnam/FiledIMAGE via Shutterstock


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Please note the submission deadline for content to be included in upcoming editions:

- For the November 2023 "Victoria and Space" edition of *Science Victoria* is **5pm, Friday 20th of October 2023.**
- For the December 2023 "The Future of Drug Discovery" edition of *Science Victoria* is **5pm, Friday 17th of November 2023.**

FROM THE EDITOR

Scott Reddiex
Editor, *Science Victoria*

This year has already seen the hottest month on Earth in 120,000 years,[1] leaving many of us in Australia looking nervously towards our upcoming summer. It further supports the slow realisation that the idea of 'business as usual' in many areas of our life is becoming increasingly unrealistic with the changing climate.

As modern agricultural and processing practices keep most of us quite removed from the sources of our food, we will first feel the 'downstream' effects of extreme weather events on our food supplies - less choice at the supermarket, higher prices. However, agriculture in Victoria is a $17.5 billion industry, utilising half of the state's land and employing almost 70,000 people, meaning that food production and food security is intertwined with the livelihoods of those connected to the various industries and the state's economic viability.[2] Everything is connected, and so everything must adapt.

In this month's edition of *Science Victoria*, we take a look at the science relating to food. Gordon Noble looks at some of the impacts of a 50°C day on agriculture, and Dr Catriona Nguyen-Robertson revisits work by Dr Rachel Carey on the source and security of food in Victoria. We also look at how the agricultural practices of First Nations, refined over 60,000+ years, are being interwoven with contemporary farming.

October sees some big events at the RSV, and all can be joined either in-person or online. There is a two-day symposium on 'The Future of Victoria's Native Forests', which will see scientists, land managers, and First Nations' knowledge holders explore options and issues for securing the future of these forests following the end of their commercial logging. We are also excited to welcome Dr Muneera Bano (CSIRO/Data61) for a presentation on human-centred artificial intelligence (AI) – where innovation and empathy meet to shape the future of our world. For more information on these and other events, have a look through the **Events and Opportunities** section.

Over in the **Engage Victoria** section, we take some time each month to curate a list of projects of relevance to STEMM that are currently open for consultation. This month, the EPA is seeking feedback on the expansion of a slag grinding/concrete facility in Yarraville, which would produce 1.5 million tonnes of concrete per year. Feedback is also sought for the ministerial review into the staffing of Victoria's public hospitals, which will look at the recruitment, retention, and supply of doctors (among other topics).

If you'd ever like to contribute to an edition of *Science Victoria*, have a read through the **Guidelines for Authors** and send through your pitch. As readers will note, we feature pieces addressing a monthly theme, as well as submissions on past themes or different STEMM subjects. Upcoming editions are themed around Space (November), the Future of Drug Discovery (December), Artificial Intelligence (February), and Victoria's Fauna (March).

We hope you enjoy this month's edition of *Science Victoria*!

References:
1. July 2023 confirmed as hottest month on record. (2023, August 8). World Meteorological Organization. public.wmo.int/en/media/news/july-2023-confirmed-hottest-month-record
2. Karanja, F. (2023). Victorian Agriculture Industry Overview. Agriculture Victoria. agriculture.vic.gov.au/__data/assets/pdf_file/0008/921158/Food-and-Fibre-Economic-Factsheet-Agriculture-Overview_Jan2023.pdf

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Acknowledgement of Country:
The Royal Society of Victoria acknowledges the many First Peoples of our continent, their vast history and connection to the lands and waters within and beyond the State of Victoria, and the valuable cultural and scientific knowledge held by the Elders to care for Country. We acknowledge our headquarters are located on Wurundjeri land, never ceded, and convey our respect to Elders past and present. The RSV welcomes all First Nations people, and seeks to support and celebrate their continued contributions to scientific knowledge.

REMEMBERING DR ERIC BIRD

Rob Gell AM MRSV
President, The Royal Society of Victoria

I mentioned in our July edition that I was encouraged in 1978 to join the RSV by Dr Eric Bird. Eric was my thesis supervisor and an important figure in my genesis as a geographer. Please indulge me again.

Eric passed away in June and although his passing was marked briefly in *Science Victoria* at the time, I wish to take this opportunity to say more about him, particularly on behalf of others who, like me, have understood his great contribution to a little publicised but increasingly important scientific discipline, coastal geomorphology.

So, with permission, I will take words sent to me by colleagues in recognition of his contribution to science, and people.

Eric's 1960 ANU PhD on the evolution of the Gippsland Lakes barrier system is referred to this day, indeed it was the cornerstone of our recent roundtable at the Royal Society of Victoria 'The Future of the Gippsland Lakes'.

Emeritus Prof. Bruce Thom of the University of Sydney met Eric in the UK in 1964. Bruce's honours research was on the geomorphology of the Port Stephens-Myall Lakes area. Bruce recently wrote:

Dr Eric Bird rowing through a tidal channel in Western Port Bay, 1974. Photograph courtesy of Rob Gell.

> "There is so much to say about Eric's work on Gippsland Lakes. At a meeting three weeks ago in the Victorian Royal Society on environmental problems confronting the Lakes, several of those present recognised how much we owed to Eric. Neville Rosengren, a long-time associate, was able to expand on my thoughts as we discussed Eric's insights on the salinisation of this estuary complex following the artificial opening of the Outer Barrier at Lakes Entrance in 1889. The dieback of Phragmites and associated shoreline erosion was noted by Eric as tidal flows extended into the lakes. Continued degradation of this system would have appalled him."
>
> — Vale Eric Bird – International Coastal Geomorphologist
> Bruce Thom's Blog - No 242, Australian Coastal Society, 26 June 2023[1]

Like Bruce, I treasure my copy of "Geomorphological Study of the Gippsland Lakes", published in 1965 as a monograph of the Research School of Pacific Studies ANU. Brilliant maps of the evolution of the barrier complexes, and examination of the changes to the Ninety-mile beach and foredunes, which continue to provide the building blocks for current work being done by Bruce and Eric's successor at the University of Melbourne, David Kennedy. With Neville Rosengren there will be a paper in the Proceedings of the Royal Society of Victoria later this year from the roundtable entitled, The Coastal Geomorphology and Geology of the Gippsland Lakes Region: A Review and Future Directions.

Former students frequently refer to Eric Bird's field trips. He would stride out ahead of a group through saltmarsh or mangrove fringe, shore platform or clifftop. John Enright notes: "Eric, as always tanned and fit, dressed in shorts and sandals, working his way between the groups. When I told him we had to relocate a base station because of a six foot red-bellied black snake sunning itself on the delta, he was completely unfazed and continued to sweep through the heath and grassland for the day".

My own mentor, Dr Ken Boston AO, was a student of Eric and also a student of him. As a matter of fact, Ken once purchased a sulphur-crested cockatoo he named 'Eric'. An international education professional Ken went on to become Chief Executive of the Qualifications and Curriculum Authority in the UK in the days of the Blair Government. Ken's comments about the inimitable scientist that was Eric Charles Frederick Bird are worth considering and I am certain would be endorsed by many, certainly by myself:

"Eric had a major impact on my life and career. I regret that I never made that fully clear to him. It was not in the field of coastal geomorphology, which I vacated forty years ago. It was in the affective rather than the cognitive domain of learning that he left an imprint that has carried me through a career far removed from the substance of my Ph D.

It was from Eric that I learned independence of thought, the excitement of breaking new ground, the importance of identifying and focusing relentlessly on priorities, and the need for rigorous attention to quality. In my experience in the rather stuffy University of Melbourne in the 1960s and 70s he was a breath of fresh air, with immense appeal to undergraduate and postgraduate students. Unlike so many other University teachers I had encountered, who relied so much on their knowledge and critique of secondary sources, his every lecture or interaction as a thesis supervisor was driven by his personal research experience. His commitment and enthusiasm were infectious.

He also taught me how to write: set aside the flowery style acquired through an early 1960s English/History major; avoid adverbs and adjectives where possible; pick precisely the right noun and verb, and leave them unadorned. His pencilled comments on drafts of chapters were scrupulously thorough, immensely helpful, and always supportive. In speeches, articles and policy documents, his lessons have stayed with me to this day.

If the fundamental role of education is to grow minds and imaginations, to 'exercise the learning muscle in the skull', and to equip a person to shape and adapt to the future scurriculum itself, I owe an enormous debt of gratitude to Eric. He was a wonderful man, an inspiring mentor, and a great friend. I mourn him deeply."

As always, I welcome your letters and thoughts at **president@rsv.org.au**.

In memory of Dr Eric Charles Frederick Bird
2 September 1930 - 8 June 2023.

References:

1. Thom, B. (2023, June 26). Vale: Eric Bird—International Coastal Geomorphologist. Australian Coastal Society. australiancoastalsociety.org.au/acs-blog/2023/06/vale-eric-bird-international-coastal-geomorphologist/

Dr Eric Bird (Right) with a group of students on French Island, 1983. Photograph courtesy of Rob Gell.

SMALL DIETARY CHANGES SUPPORT GREENHOUSE GAS REDUCTIONS

By Professor Karen Campbell
Professor of Population Nutrition at Deakin University

The energy transition occupies hearts and minds, with awareness of the need to urgently reduce greenhouse gas (GHG) emissions at the personal, commercial, and political levels now universal. There's simply no escaping the impact our energy investments have on the rapid warming of our planet, and that fossil fuel emissions are the major contributor to climate warming. Running a very close second however, are GHG emissions associated with the production, distribution, and waste of food. Animal products, particularly meat and milk, are a very important part of the global emissions story.

At a personal level, evidence tells us that moving progressively away from a meat-based diet has manifest benefits for our wallet, our health, and our environment. Compared to meat-based diets, vegan diets, at the other end of the animal-product continuum, are estimated to cost up to one third less and produce just a quarter of emissions.[1,2] In addition, vegan diets, when compared to meat-rich diets, reduce land and water use, waterways pollution (eutrophication), and biodiversity loss by 50 to 75 percent.[2]

In considering personal choice, this is not a call for population veganism – something many might baulk at, regardless of concerns for the environment. This is about increasing the contribution of plant-based foods to your diet across a week. Of upping vegetable intakes and subbing out some animal products with high nutrient staples like tofu and tempeh, legumes, nuts, and seeds. The benefits are gained incrementally as we move from animal-based to plant-based diets. For example, changing from a high to a low meat diet can result in at least 30% differences in emissions, resource utilisation and biodiversity loss.[2] Any shift along that continuum will be a move in the right direction.

When we consider our global climate, biodiversity, land, and waterways, business as usual is no longer an option. Decarbonising the world requires concerted efforts across multiple domains. With the food system the second major player in our GHG emissions profiles, we must urgently prioritise options that will shift the food-related emissions dial, nurturing the planet and its populations.

References:
1. Kahleova, H., et al. (2023). Vegan Diet and Food Costs Among Adults With Overweight: A Secondary Analysis of a Randomized Clinical Trial. JAMA Network Open, 6(9), e2332106. doi.org/10.1001/jamanetworkopen.2023.32106
2. 2. Scarborough, P., et al. (2023). Vegans, vegetarians, fish-eaters and meat-eaters in the UK show discrepant environmental impacts. Nature Food, 4(7), 565–574. doi.org/10.1038/s43016-023-00795-w

NATIONAL SCIENCE WEEK FIELD TRIP WITH GEOGRAPHY VICTORIA

By Garry Moore, on behalf of Geography Victoria

On Saturday, 19 August 2023, around 40 geography enthusiasts gathered near to the corner of Glen Huntly Road and New Street in Brighton for a Geography Victoria National Science Week field trip. The morning was spent with a tour of the Yalukit Willam Nature Reserve under the expert guidance of urban ecologist and conservationist, Gio Fitzpatrick. Gio more than ably described the ongoing work of converting the former golf course into a refuge for indigenous plants, invertebrates, fish, reptiles, birds, and mammals. He impressed all those present with his deep knowledge of the intricate ecological web linking all these life forms in the Reserve, and with the power and cogency of his presentation.

Following this tour, those involved walked the short distance along Hotham Street to the National Trust's Rippon Lea Estate. The Estate consists of a beautiful and heritage-listed Victorian mansion set in a magnificent 14-acre garden. Following a lunch on the mansion's terrace, the Geography Victoria party members were addressed by Matt Chester, the National Trust's Estate Property Manager, on the property and its history. They were then led by Matt on an extensive tour of the garden, taking in the lawns, the lake, the observation tower, the fernery, the 1930s-era swimming pool, the windmill, and the orchard. During the tour, Matt described the elaborate underground watering system designed by the Estate's founder, Sir Frederick Sargood. This system, resurrected during the drought years of the 1980s, harvests spring and storm water from surrounding suburbs and reticulates it throughout the large garden. Mains water is used in only a small area of the garden – vegetable and herb gardens – where it is deemed more suitable than the lake water.

A unifying feature of the tours of the Yalukit Willam Nature Reserve and the Rippon Lea Estate was the imaginative use of water in both. Water derived from the Elster Creek sustains the web of life associated with a chain of pools central to that portion of the Reserve. The extensive underground system which harvests surrounding water for Rippon Lea sees that water used throughout the garden, with the residue ultimately being discharged into the Elster Canal and then Port Phillip Bay.

All in all, the day proved to be both highly instructive and thoroughly enjoyable for all those involved in the field trip – a worthy contribution by Geography Victoria to National Science Week.

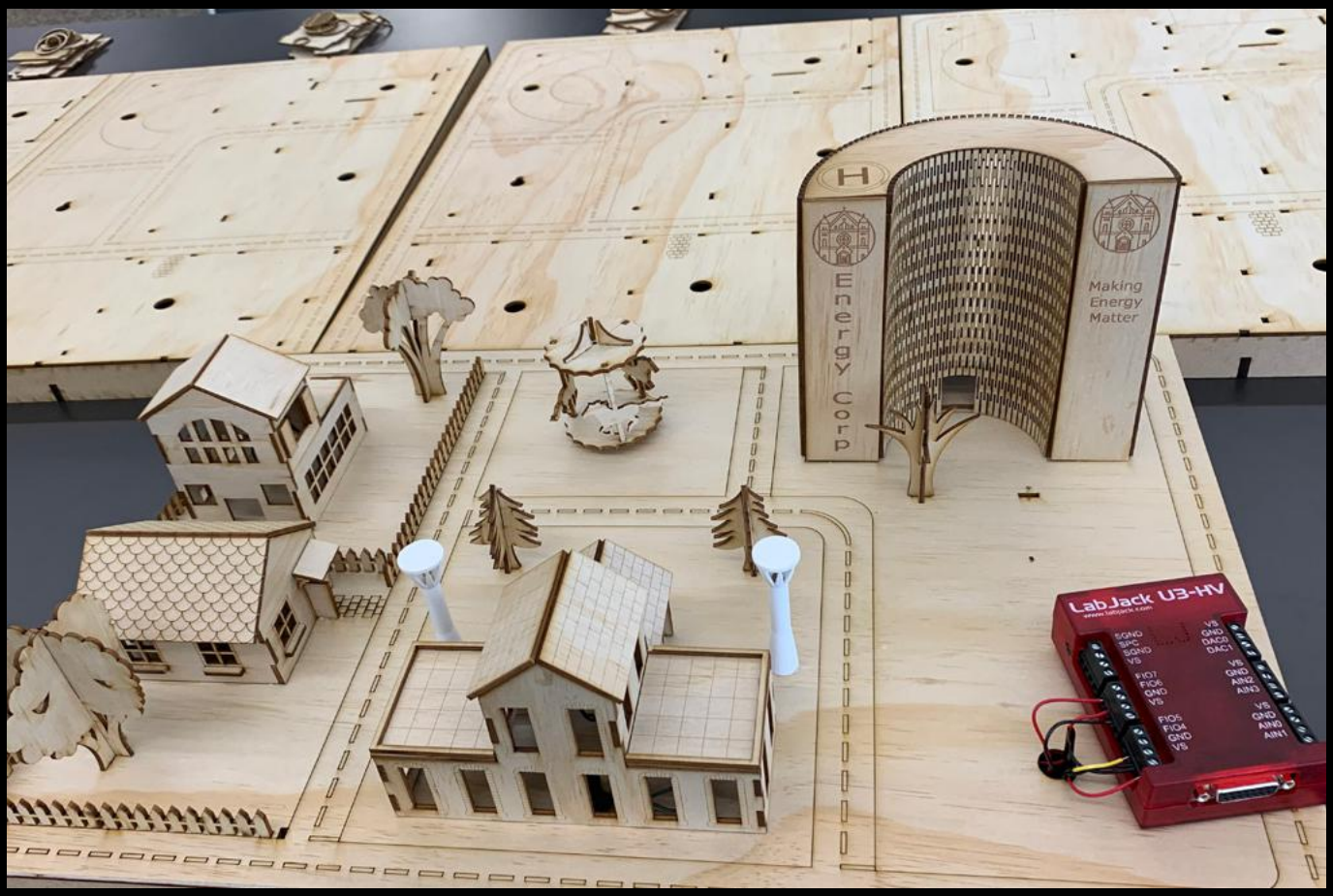
SNAPSHOTS OF STEMM

Images from everyday science.

Nee Edirisinghe shares her research on inflammation with passers-by in front of State Library Victoria as part of Soapbox Science, organised by STEM Sisters.

Photograph: STEM Sisters.

SNAPSHOTS OF STEMM



Students build and test model cities that run on renewable energy as part of the A Renewable Future program at Gippsland Tech School.

Photograph: Gippsland Tech School.

SNAPSHOTS OF STEMM

People playing with Turbulent Encounters, a wind and snow simulator in the Beyond Perception exhibition at Scienceworks.

Photograph: Benjamin Healley/Museums Victoria

NEW RSV MEMBERS

INDIVIDUAL MEMBERS

Miss Artemis Siourthas
Environmental Science Student, The University of Melbourne

Miss Mia Fynney
Student, Monash University

Mr Rickey John
Research Assistant, RMIT University

Associate Professor Noel Cranswick
Paediatrician, Royal Children's Hospital Melbourne

Dr Dave Kendal
Director, Future in Nature

Mrs Angelina Ross
Retired Psychologist & Mathematics Teacher

AFFILIATES

Members of the Royal Society of Victoria are advised of our governing Council's intention to accept the following organisations as Affiliates of the Royal Society of Victoria, in accordance with Rule 8 (4) of our governing rules (**rsv.org.au/rules-bylaws/**).

THE SCIENCE TEACHERS ASSOCIATION OF VICTORIA (STAV)
stav.org.au

STAV provides leadership, support, services, programs and resources for all levels of science education. STAV represents the collective voice of all teachers of science in all matters relating to the teaching of science in Victoria and, through ASTA (the Australian Science Teachers Association), it represents these teachers at a national level.

THE CLEAN OCEAN FOUNDATION
cleanocean.org

Clean Ocean Foundation is an Australian environmental charity aiming to preserve marine environments by stopping all forms of ocean pollution. It works with communities, other NGOs, governments, and businesses to reduce marine and coastal pollution. This includes working for the closure (or upgrade to world's best practice) of all coastal sewage outfalls.

THE MELBOURNE MARITIME HERITAGE NETWORK
mmhn.org.au

MMHN is a non-political, not-for-profit, member-based 'umbrella' organisation that brings together individuals and stakeholder groups from marine, maritime heritage, education, tourism, corporate, and community sectors, committed to greater recognition of, and knowledge about, Melbourne's maritime heritage and maritime industry sector. MMHN is a catalyst to advocate for the better management of maritime matters

BECOME A MEMBER OF THE RSV

The Royal Society of Victoria is the State's oldest scientific society, a part of Australia's intellectual life since 1854. We bring together an independent community of science practitioners, educators, industrialists, and enthusiasts to promote an understanding and utilisation of scientific knowledge for the benefit of the state of Victoria.

$40/YEAR

Student Membership

For students enrolled full-time at a recognised Victorian education and/or research institution (proof of current, full-time enrolment required for Student Membership commencement/renewal)

$120/YEAR

Full Membership

Open to all adults (18+) with an interest in science! A current membership of the Royal Society of Victorian entitles the use of the professional postnominal 'MRSV.' Those elected as Fellows of the Society are entitled to the postnominal 'FRSV.'

$1000/YEAR

Organisational Membership

For organisations to claim membership of the RSV. Provides a method for general sponsorship of the RSV's programs, along with discounted rates for access to RSV facilities throughout the year.

The Royal Society OF VICTORIA
Promoting science since 1854

To join the Royal Society of Victoria please go to **rsv.org.au/how-to-join**. You can also choose to support science in Victoria by completing the donation form in this edition or visiting **donorbox.org/royal-society-victoria**

REIMAGINING HUMANITY IN THE AGE OF GENERATIVE AI

Presented by Dr Muneera Bano, Senior Research Scientist at CSIRO's Data61

How long will it be until AI can pass captcha tests and convincingly prove it is not a robot? How long will it take for AI to accurately imitate human emotions, curiosity, the desire to question, and the joy of love? Or will these qualities always remain intrinsic to being human?

Generative AI technologies have captured the attention and imagination of everyone, but their development and use pose complex challenges and risks that must be addressed to ensure their benefits are truly realised. In this talk, we will take a deep dive into the exciting and rapidly evolving field of generative AI, exploring its potential social benefits and the challenges it poses for our society.

Join us on this journey to the frontier of human-centred AI, where innovation and empathy meet to shape the future of our world.

ABOUT THE SPEAKER

Dr Muneera Bano serves as a Senior Research Scientist at CSIRO's Data61, focusing on projects related to responsible AI and promoting diversity and inclusion within the AI field. Her focus is on the intersection of computers and humans, specifically exploring ways to engineer technology to better serve people's needs.

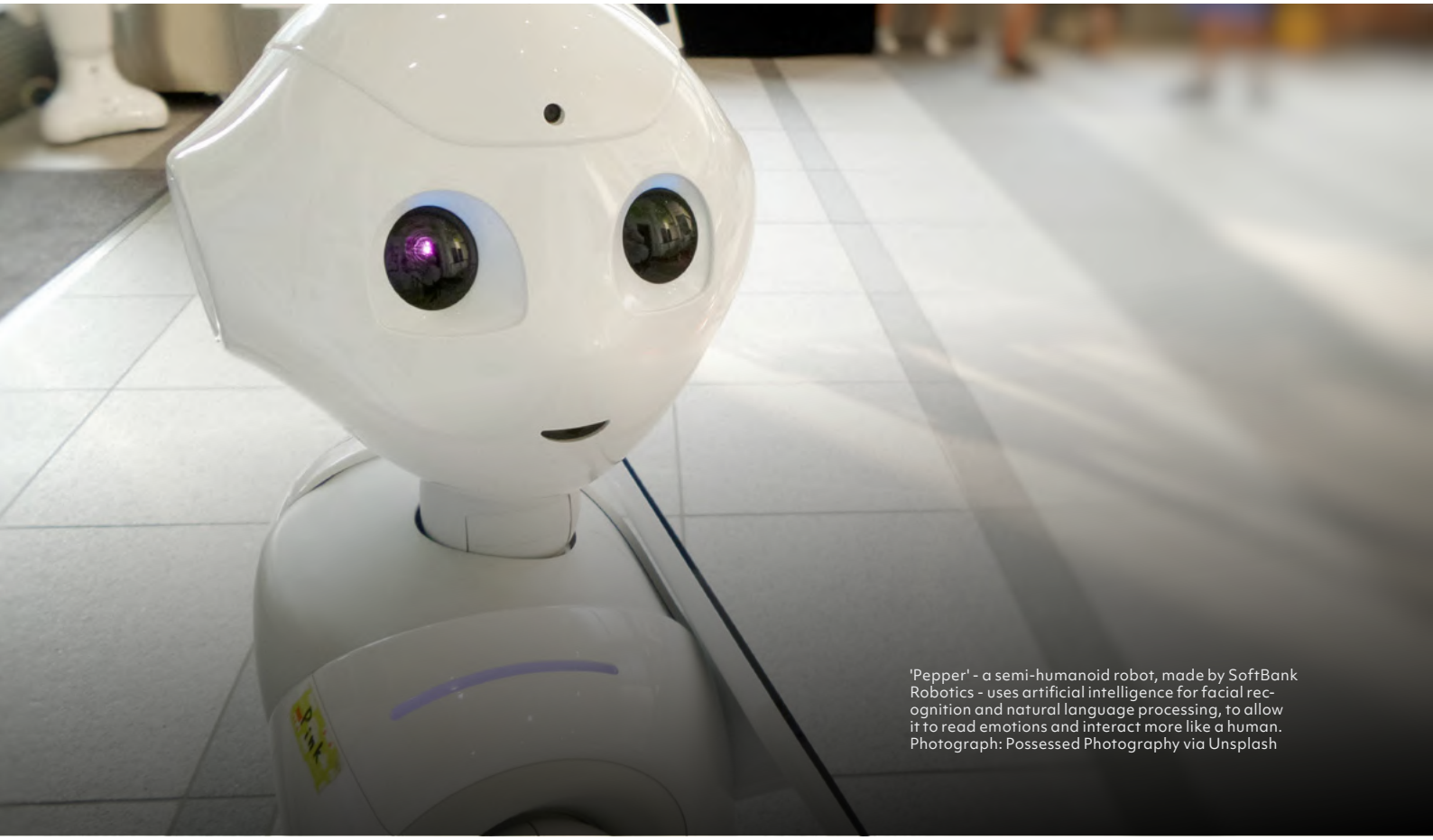
REIMAGINING HUMANITY IN THE AGE OF GENERATIVE AI

Date/Time:
Thursday, 19 October 2023, 6 pm-7.15 pm

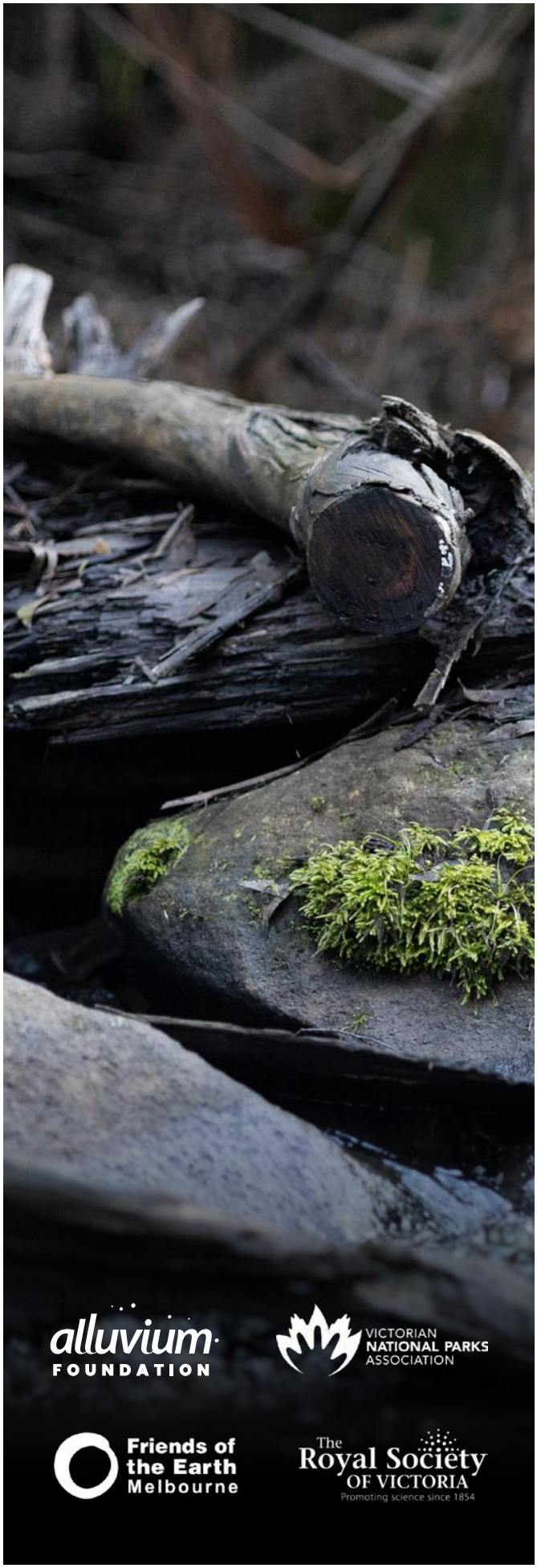
Price:
In-Person: $10 (non-RSV members)/$5 (RSV members)
Online: $5 (non-RSV members)/Free (RSV members)

Location:
The Royal Society of Victoria
Wurundjeri Country
8 La Trobe Street, Melbourne
(Simulcast on Zoom and Youtube)

Reserve your spot for in-person or online attendance at:
rsv.org.au/events/generative-ai



'Pepper' - a semi-humanoid robot, made by SoftBank Robotics - uses artificial intelligence for facial recognition and natural language processing, to allow it to read emotions and interact more like a human. Photograph: Possessed Photography via Unsplash



THE FUTURE OF VICTORIA'S NATIVE FORESTS A PUBLIC SYMPOSIUM

On the 23rd of May this year, the Victorian Government announced that commercial logging of native forests would cease in Victoria at the end of 2023 – six years ahead of the scheduled close. The native forest areas that will no longer be available for logging cover 1.8 million hectares (18,000 km2) confined to the eastern regions of Victoria, roughly equivalent to the entire Goulburn River catchment, or twice the area of metropolitan Melbourne.

This public symposium will explore options and issues for securing the future of these forests. We will convene scientists, land managers and First Nations expertise to explore and discuss perspectives informed by scholarship, cultural practices and ecological values. These scholars, policy makers and knowledge holders will address bushfire prevention, recovering threatened species, sustaining human health and wellbeing, and adapting to the regional impacts of climate change. We seek to understand how the end of logging operations will change the way native forests are managed, the challenges of future management, and the opportunities that this land-use change provides.

The program will be conducted over two days: from 8:30am to 5pm on Thursday 26th October, and from 8:30 to 1pm on Friday 27th October. The speakers and full program, with short abstracts, will be posted closer to the dates. Meanwhile, please register now to secure your place in the room. You can also register to attend via Zoom webinar, and we will livestream proceedings via YouTube.

THE FUTURE OF VICTORIA'S NATIVE FORESTS - A PUBLIC SYMPOSIUM

Date/Time:
Thursday, 26 October 2023, 8:30am-5:00pm
Friday, 27 October 2023, 8:30am-1:00pm

Price:
Free

Location:
The Royal Society of Victoria
Wurundjeri Country
8 La Trobe Street, Melbourne
(Simulcast on Zoom and Youtube)

Reserve your spot for in-person or online attendance at:
rsv.org.au/events/the-future-of-victorias-native-forests/

AIMING HIGHER: IMPROVING SCIENCE EDUCATION IN VICTORIAN SCHOOLS

With the Victorian Government recently announcing free places for prospective teachers in tertiary education and training courses, it's clear there's a crisis in this essential profession that warrants special measures.

Certainly, participation and completion rates in secondary schooling for students in science subjects have been declining for many years, along with numbers of science-trained teachers. The social malaise reported by a generation of young scholars emerging from the pandemic years certainly isn't helping.

We can all imagine the professional pressures that come with being a teacher, and that asking a young graduate – or a mature-aged worker changing careers – to 'step up' is a big ask. Our science teachers must balance delivery of the Victorian Curriculum with the spontaneity and spark of student-led modes of inquiry to maintain their engagement, questioning and persistence. It's a tough gig, particularly if stretching to teach science "out of field", and even more so when engaging students who are experiencing any form of socioeconomic disadvantage or poor mental health.

But are we truly addressing the full picture? What do teachers need to feel supported and valued in sustaining their practice, and what do our primary and secondary students need from teachers to feel engaged and inspired by the challenges of the science curriculum? Join leaders in pedagogical research, program delivery and professional development to explore opportunities to improve both student outcomes and the status of science teaching in Victoria.

ABOUT THE SPEAKERS

Amanda Berry is a professor of STEM Education, and Associate Dean Research & Innovation in the School of Education at RMIT University. Amanda's research focuses on how science teachers develop and refine their professional knowledge and how that knowledge can be communicated in ways that build a strong future science teaching workforce and inspire students' interest, engagement and success in science. Amanda has led numerous projects at state, national and international levels focusing on innovations in science teaching and learning and the development of teacher knowledge and practice.

Jan van Driel is a professor of Science Education in the Faculty of Education at the University of Melbourne. He is co-leading the Mathematics, Science & Technology Education Group (MSTEG). His research is on the intersection of science education and teacher education. Based on the notion that teachers have a strong influence on students' performance and aspirations, he aims to understand how science teachers' practices are shaped by their professional knowledge and beliefs, and how these practices impact on students. Specifically, he is interested in how science teachers adapt their teaching to address different learning needs and interests among their students.

Ms **Alexandra Abela** has been the President of the Science Teachers' Association of Victoria since 2019, and a continuous member of STAV since joining as a pre-service teacher in 1993. Alex first joined STAV Council in 2001 and has held a number of Executive governance roles. She is currently STAV's representative on the board of the Australian Science Teachers Association. Throughout her teaching life, Alex has held a variety of leadership positions in education, and she is currently Assistant Principal and Head of Staff Development at Marian College Ararat. She is passionate about organisational culture, innovation and change management; and is driven to create cultures of support, wellbeing and inclusion in all facets of education. Alex is a Director of the Centre for Strategic Education (CSE) and Deputy President of the Independent Education Union of Victoria Tasmania (IEUVT).

Dr **Brendan Rigby** is the Director of Tech Schools and Performing Arts at the Department of Education. Previously he worked as the Project Director responsible for the redesign of the Framework for Improving Student Outcomes (FISO). Dr Rigby previously worked in international education policy and programs for UNICEF Ghana and Plan International, while also co-founding and managing a non-profit, WhyDev, focused on improving support for international development and foreign aid workers. He's a trained secondary school teacher and passionate about embedding student voice and perspectives in education policy.

AIMING HIGHER: IMPROVING SCIENCE EDUCATION IN VICTORIAN SCHOOLS

Date/Time:
Thursday, 2 November 2023, 6pm-8pm

Price:
In-Person: $10 (non-RSV members)/$5 (RSV members)
Online: $5 (non-RSV members)/Free (RSV members)

Location:
The Royal Society of Victoria
Wurundjeri Country
8 La Trobe Street, Melbourne
(Simulcast on Zoom and Youtube)

Reserve your spot for in-person or online attendance at:
rsv.org.au/events/improving-science-education/

A joint presentation by the Royal Society of Victoria, the Australian Academy of Technology and Engineering, and the Science Teachers Association of Victoria, with the support of the Inspiring Victoria program.

UPCOMING RSV EVENTS

The RSV hosts many STEMM-related events, public lectures, and meetings throughout the year. These are predominantly held at the RSV Building at 8 Latrobe St, Melbourne (unless otherwise indicated), and simulcast online via YouTube. Our public lectures comprise the "Scientists in Focus" component of the Inspiring Victoria program in 2023.

19 OCTOBER

REIMAGINING HUMANITY IN THE AGE OF GENERATIVE AI

Join us as we hear from Dr Muneera Bano (CSIRO/Data61) on human-centred AI, where innovation and empathy meet to shape the future of our world.

For more information, visit **rsv.org.au/events/generative-ai**

26 + 27 OCTOBER

THE FUTURE OF VICTORIA'S NATIVE FORESTS - A PUBLIC SYMPOSIUM

With the end of commercial logging of native forests, the future of 1.8 million hectares of Victorian forests needs to be addressed. Over two days, the RSV will convene scientists, land managers, and First Nations expertise to explore options and issues for securing the future of these forests. We seek to understand how the end of logging operations will change the way native forests are managed, the challenges of future management, and the opportunities that this land-use change provides.

For more information, visit
rsv.org.au/events/the-future-of-victorias-native-forests/

2 NOVEMBER

AIMING HIGHER: IMPROVING SCIENCE EDUCATION IN VICTORIAN SCHOOLS

Join leaders in pedagogical research, program delivery and professional development to explore opportunities to improve both student outcomes and the status of science teaching in Victoria. Presented in partnership with the Australian Academy of Technology and Engineering, and the Science Teachers Association of Victoria, with the support of the Inspiring Victoria program.

For more information, visit **rsv.org.au/events/improving-science-education/**

23 NOVEMBER

RSV PHILLIP LAW POSTDOCTORAL AWARD LECTURE

The winner of the RSV's Phillip Law Postdoctoral Award will present their work to a special meeting of the RSV at a public lecture scheduled for the evening of **Thursday, 23 November 2023**. This will be professionally filmed and shared online.

For more information, visit
rsv.org.au/awards-and-prizes/phillip-law-award/

7 DECEMBER

RSV RESEARCH MEDALLIST LECTURE

The winner of the annual RSV Medal for Excellence in Scientific Research will present a lecture to RSV members and guests on the evening of **Thursday, 7 December 2023**, at which the Medal will be presented.

For more information see:
rsv.org.au/awards-and-prizes/research-medal/

As part of the *Bushfood Chocolate* program at Ballarat Tech School, students work in teams to design and produce their own sustainable and ethical chocolate product. They are introduced to indigenous Australian bush plants to choose the flavours of their chocolate, and are encouraged to consider the importance of buying ethically produced chocolate and the sustainability of all food packaging. They then pitch their new product to their classmates at the end of the day.

Photograph: Ballarat Tech School

AUSTRALIAN LAUREATE FELLOWSHIPS

Applications are now open for the Australian Laureate Fellowships scheme, for commencement in 2024.

Up to 17 five-year Australian Laureate Fellowships may be awarded each year, providing funding for Australian Laureate Fellow salary towards a Professional Level E (or equivalent) salary, funding for 2 Postdoctoral Research Associates (5 years), 2 Postgraduate Researchers (4 years), and up to $300,000 per year project funding.

Two named Australian Laureate Fellowships may be awarded to successful female Australian Laureate Fellows. A Kathleen Fitzpatrick Australian Laureate Fellowship will be available to a highly ranked female candidate from the humanities, arts and social science disciplines, and a Georgina Sweet Australian Laureate Fellowship will be available to a highly ranked female candidate from the science and technology disciplines.

Dr Georgina Sweet O.B.E., MRSV, DSc., was the first female author in the RSV's academic journal, the *Proceedings of the Royal Society of Victoria*, in 1896.

Applications close **5pm, 10 October 2023.**

For more information, visit:
arc.gov.au/funding-research/funding-schemes/discovery-program/australian-laureate-fellowships

Applications can be made at:
grants.gov.au/Go/Show?GoUuid=253dd471-c963-44db-80bb-79f1ef2368ab

EARLY CAREER INDUSTRY FELLOWSHIPS

Applications are now open for the Early Career Industry Fellowships scheme, for commencement in 2024.

The Early Career Industry Fellowships scheme creates a pathway to support academic researchers in establishing careers in industry, and industry-based researchers to work in university settings, with the aim of increased two-way mobility and skill-building in research collaboration, translation and commercialisation.

Up to 50 Early Career Industry Fellowships may be awarded each year providing salary contribution for up to 3 years and project costs up to $150,000.

This scheme is intended to support researchers from industry as well as university settings, for example postdocs seeking to build industry experience and expertise or career researchers from industry looking to return to the university system to work on industry problems.

Fellows must spend time undertaking research in both the university and industry setting.

Applications close **1 November 2023**.

For more information, visit: **arc.gov.au/funding-research/funding-schemes/linkage-program/early-career-industry-fellowships**

NATURE FUND 2023

Expressions of Interest are now being sought for Nature Fund 2023 project grants.

The purpose of the Nature Fund is to drive non-government investment into projects that benefit biodiversity.

The Nature Fund will encourage collaboration and partnerships between government, business, philanthropy and the community to deliver high impact projects that contribute to improving Victoria's biodiversity.
In 2023, the Victorian Government has invested a further $3.5 million in the Nature Fund, adding to the $10 million of funding to 22 projects in 2022.

Projects supported through the Nature Fund need to demonstrate their ability to make a high impact contribution to improving Victoria's biodiversity through either habitat restoration or actions to improve the outlook for specific threatened species.

The minimum funding a project can request from the Nature Fund is $20,000. There is no maximum funding, however projects seeking funding will need to demonstrate good value for money, providing at least matched funding from non-government sources.

Funded projects will need to be delivered within a maximum of two years.

An online information session will be held 12 October 2023 (registration is required).

EOI period closes **6 November 2023**.
For more information, visit: **environment.vic.gov.au/nature-fund**

PREPARING FOR THE INEVITABLE: WHAT A 50°C DAY MEANS FOR VICTORIA'S FOOD SYSTEM

Damaged and dead grape vines in a Mildura vineyard. Photograph: Hypertension Creative (via Shutterstock

PREPARING FOR THE INEVITABLE: WHAT A 50°C DAY MEANS FOR VICTORIA'S FOOD SYSTEM

By Gordon Noble MRSV

The northern hemisphere summer has reminded us that extreme heat events may be just around the corner. A 50°C day, which climate scenarios may have thought was still some time off, could happen any time. How well prepared is Victoria's food system?

You have to hand it to the Europeans for creativity. As Europe's long heatwave brought scorching temperatures, the Italian Meteorological Society gave their heatwave a name: Cerberus, after the three-headed monster featured in Dante's Inferno.[1] Just as we name cyclones, it may be that future heatwaves are given names to communicate their severity from ordinary heatwaves.

This year has been an extraordinary year for extreme heat. On the 3rd of July, the record for the average global air temperature was broken. The record only lasted a day, being broken again on the 4th of July.[2,3] Graphic images of the impacts of extreme heat – from Canadian fires that blanketed New York in smoke, through to the fires that ripped through Maui in Hawaii with tragic consequences – provide a timely warning that Australia is a land of droughts and flooding rains.

Extreme heat is unfortunately not a surprise to climate scientists, who have detailed the fact that the frequency and intensity of hot extremes (including heatwaves) have increased on the global scale since 1950.[4] The Intergovernmental Panel on Climate Change's (IPCC) Sixth Assessment Report states that the frequency and intensity of hot extremes will continue to increase at global and continental scales even if global warming is stabilised at 1.5°C. The intensity of extremes would be at least double at 2°C, and quadruple at 3°C of global warming, compared to changes at 1.5°C of global warming.[4]

What would a 50°C day mean for Victoria's food system, and, perhaps most importantly, what can we do to make our system and society more resilient?

What we know is that a 50°C day is plausible. On average, between 1980 and 2009, temperatures passed 50°C about 14 days a year, somewhere in the world. The number rose to 26 days a year between 2010 and 2019.[5] The east coast of Australia has already come close to a 50°C day: in February 2009 Melbourne reached 46.4°C, whilst Sydney (Penrith) reached 48.9°C in January 2020. Both occasions are associated with catastrophic events.

IMPACTS ON FARMED ANIMALS

The impact of extreme heat on humans has been well studied. A recent Lancet meta-analysis reviewed 7,360 studies and found that a 1°C increase in temperature is positively associated with increased mortality and morbidity.[6] We can expect that a 50°C day would impact on the productivity of cattle, sheep, chickens, and other farmed animals with impacts including mortality, reduced growth, and reduced fertility.

Heatwaves are known to impact dairy production and lead to mortality amongst herds.[7] Heat stress is known to reduce egg production for chickens.[8] For sheep, heat stress has been shown to influence feed conversion efficiency, appetite, reproduction, wool growth, and susceptibility to disease.[9]

Warming of oceans associated with prolonged heatwaves is likely to impact sea-caged Atlantic salmon, who cannot escape warmer surface waters by diving deeply.[10] Research demonstrates that summer warming negatively impacts salmon growth rates, leading to increased fish disease and even death.[11] There are broader implications than just salmon, with research projecting that, on average, when an annual high temperature extreme occurs in an exclusive economic zone, 77% of exploited fish and invertebrates will decrease in biomass.[12]

IMPACTS ON HORTICULTURE

The impact of extreme heat events does not end with animal productivity. Of all the potential impacts of a 50°C day the impact on honeybees, and pollinators, is of concern. Extreme heat events can lead to a collapse of a colony.[13] Researchers have found that with six hours at 42°C, 50 percent of male honeybees die.[13]

If a male bee survives a heat event, his fertility is likely impaired. The impact of an event which led to mass mortality of honeybees would be compounded by the impact on heat-stressed crop plants with floral outputs impacted by extreme heat. Researchers have identified the need to understand how extreme heat affects bee–crop interactions in this era of climate change.[14]

Another impact of extreme heat are bushfires, which produce smoke that is already associated with what the wine industry terms 'undesirable sensory characters' (smoky, burnt, ashy, or medicinal) that is described as 'smoke tainted'.[15] Research is examining the impact of smoke on potatoes, with McCain Foods noticing that potatoes don't seem to store well after intense wildfire years.[16]

We can imagine a scenario where Victoria experiences a 50°C day that may have been preceded by a heatwave. The cumulative impacts on honeybees would then impact pollination. Impacts on chickens, sheep, cattle, and other farmed animals would be to reduce productivity with likely shortages. This will ultimately translate to higher prices for consumers.

What, then, can we do at a local level to mitigate against extreme heat events?

THE ACTIONS NEEDED. NOW.

Victoria is fortunate to have levers at our disposal.

The urgent action is to green Victoria. Shaded surfaces in urban areas are known to be 11–25°C cooler than the peak temperatures of unshaded areas.[17] In urban areas, research from Western Sydney University has revealed the temperatures at ground level could vary by more than 10°C due to tree coverage.[18] In the United States, research has found that an increase of tree canopy shading of roadways to an average of 50% across all streets is found to reduce the estimated rate of heat mortality in 27% in Phoenix.[19]

The same issues apply to agriculture. There is extensive research on the benefits of shade trees for agriculture.[20] To create shade in the right areas there is a need for water. The challenge with water is that its value changes according to the weather. The value of an extra litre of water during extreme rainfall is negative, whilst in a drought it is exponentially high.

As identified in previous issues of *Science Victoria*, Victoria is in the fortunate position of producing excess water, but it is literally poured down the drain. Currently around 140 billion litres of Class C recycled water are discharged into Port Phillip Bay each year.[21] The Eastern Treatment Plant in Carrum discharges around 123 billion litres into Bass Strait.[22] The volume of recycled water is linked to the size of the city, due to Melbourne's desalination plant, and we can expect this volume to grow. Population growth in Melbourne's north, west, and inner city will translate into increased flows of Class C recycled water into Port Phillip Bay. It is projected that the population of the north and west of the city alone will grow by 1 million in coming years.[23]

The challenge is that the recycled water we have is not where we need it. In the Victorian era, engineers solved this problem by establishing the dams that supply our water today, investing in the pipes across our urban networks and building a sewage treatment facility that meant that Melburnians could forget that we were once called 'Smell-Bourne'.

Today, the science informs us of the risk. The actions we take are up to us.

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After 6 hours at 42°C, 50% of male honeybees in a hive will die.[13]

Photograph: Photografiero (via Shutterstock)

OCKHAM'S RAZOR AT THE ROYAL SOCIETY OF VICTORIA

By Dr Catriona Nguyen-Robertson MRSV

The simplest explanation is often the best. ABC Radio National's *Ockham's Razor* has returned to the Royal Society of Victoria. Eight incredible tales of science and endeavour were presented at the podcast and recorded for the podcast live. Hosted by Tegan Taylor, Ockham's Razor is a soapbox for all things scientific.

Episodes featuring these eight Victorian speakers will be published online in late 2023 at **abc.net.au/radionational/programs/ockhamsrazor/**

PROF BRENDAN WINTLE

Nature can surprise us – even surprising conservation biologists. In fragmented, tiny pockets of land, critically endangered species are clinging onto their existence.

Australia is a global asset for its biodiversity and rich array of unique flora and fauna. But we have officially recorded 110 extinctions – which is likely an underestimate, given that this figure does not include invertebrates nor species that were not described by Western science – and there is no sign of stopping our trajectory of species loss. 'It's time to restore our reputation,' says Prof Brendan Wintle.

For over 200 years, the Australian landscape has become fragmented. Expansive developments for urbanisation, agriculture, and resource extraction have eaten into ecosystems and vegetation. Small, isolated patches of vegetation have traditionally been regarded as having little ecological value when it comes to conservation, however, Brendan and his team have found that they often hold the greatest value as they can be home to species found nowhere else.

If we gave up on these small patches of vegetation, we would stand to lose many species that are confined to them. For example, the critically endangered western ringtail possum or ngwayir (Pseudocheirus occidentalis) now remains in fragments scattered along the southwest coast. We should rethink the way we prioritise conservation to recognise the critical role that small, isolated patches play in conserving the world's biodiversity – it's not all just about big, national parks and forests. Restoring and reconnecting small, isolated vegetation patches should be an immediate conservation priority.

DR FLORA HUI

Glaucoma is a leading cause of blindness. For the one in fifty Australians who will develop it, their vision is lost due to damage to the optic nerve. It is a "silent" blindness that sneaks up on people, and early detection is critical as there is no cure or way to restore vision once it is lost.

While there is no cure, there are treatments to manage the condition. The purpose of all glaucoma treatments is to lower pressure within the eye, especially around the optic nerve, to prevent nerve deterioration. However, this is merely a treatment for a symptom, not a treatment for the root cause of the problem. Optometrist Dr Flora Hui researches new ways to diagnose and treat glaucoma.

As we age, our nerve cells struggle to produce as much energy as they need. Mitochondria are the powerhouses of the cell, producing energy, but if they do not produce enough, this leads to cell injury and death. Nicotinamide, known as vitamin B3, could be the solution: it is a key molecule for mitochondrial health. Nicotinamide levels at the retina, in the back of the eye, decline with age, which could be a driver of vision loss. Diet supplementation could be like adding oil to a car engine for it to run more smoothly, helping mitochondria within nerve cells of the retina to churn out enough energy to survive.

Flora led a world-first clinical trial of high-dose nicotinamide that found nicotinamide could indeed improve vision for glaucoma patients, and she is now scaling up the trial. Her findings provide hope for a treatment that could protect nerve cells and help those that have already been damaged to function better.

DR JARROD MCKENNA

Half the population has a female reproductive tract, but research into women's reproductive health has historically been lacking. The reasons mostly come down to two hurdles: women have largely been excluded from science and scientific research, and researchers lacked a suitable animal model to study the female reproductive tract. Dr Jarrod McKenna "mansplains" periods and the discovery of a menstruating mouse.

Males have typically been the default subjects in biomedical research – for humans, animals, and even cells. The main reasoning for this continuing is that females are a more "complicated" model organism. The physiological changes associated with the menstrual cycle add complexity, especially when you add variability in contraception use into the mix. Ironically, this has led to the complex female reproductive system remaining largely an enigma.

But the accidental discovery of a menstruating mouse has propelled studies of this important area of healthcare. Of all mammals, only around 80 have a menstrual cycle – menstrual cycles are exceptionally rare in the animal kingdom. Dr Nadia Bellofiore stumbled across the first known menstruating rodent, the Egyptian Spiny Mouse, quite by accident. As she routinely flushed the mice's vaginas with a saline solution, on some days, the syringe would come out a little bloody. Initially worried that she was doing something wrong, she realised that there was a pattern - the mice were bleeding for a few days and then would stop, challenging the long-standing belief that rodents do not menstruate.

Researchers from Monash University, including Jarrod, have since characterised the Egyptian Spiny Mouse's menstrual cycle, identified PMS-like behaviour and, most recently, studied

the early stages of pregnancy. The mice have human-like menstruation and appear to prepare the uterus for pregnancy in a similar way to humans. This little mouse could change how we monitor pregnancy and treat women's reproductive health conditions, such as endometriosis and infertility.

KRYSTAL DE NAPOLI

Earth is tiny within the universe. We are on a miniscule planet orbiting one star. But there are more stars scattered throughout the cosmos than grains of sand on planet Earth. We are a curious species, eager to understand our place amongst it all.

In the early 1900s, physicists thought of the universe as a cosmic fabric, with the three dimensions of space woven together with time - now known as spacetime. The bending of spacetime is what we experience as gravity. Objects with mass create gravitational fields - bending and warping the spacetime fabric like a heavy ball will curve and stretch a trampoline when dropped in the middle. The greater the object, the more this happens.

The most violent and energetic processes in the universe, such as colliding black holes or neutron stars, disrupt spacetime. Cosmic waves propagate in all directions away from the source at the speed of light, like ripples in a pond when a pebble drops in. These gravitational waves carry with them information about their origins, as well as clues to the nature of gravity itself.

A gravitational wave passing through the Earth would distort the shape of the planet as it passed through - but on an imperceptible scale. We would need a telescope or detector the size of a galaxy to detect their presence. Physicists therefore needed to get creative: they use 'celestial lighthouses'.

Gravitational waves can be detected indirectly via their effect on other things. Pulsar stars rapidly rotate, blasting out strong beams of light at regular intervals. The beat of these cosmic metronomes is steady, unless a gravitational wave alters it. As we look towards pulsar stars, if their light arrives a fraction of a second late, it is because of a gravitational wave. Given that there are thousands of pulsar stars, physicists look for the deviations in their pulses to map gravitational waves. They are using the universe itself to detect these invisible things.

A/PROF RASHINA HODA

Earlier this year, A/Prof. Rashina Hoda got a surprise: a research student from another university asked her about a paper she had written – only, she hadn't written it. The title sounded like something she could have written. The authors listed were people she had collaborated with. But she had never written that specific paper. This was an example of artificial intelligence (AI) hallucination.

Generative AI tools create content in whatever form we ask; ChatGPT generates text, DALL-E produces artistic images, and others create other media. When ChatGPT was launched in November 2022, it took off faster than any other software before it, and by January 2023, there were over 100 million active users. It churns out text by predicting the best next word to follow the pattern of words. It is confident in its answers. But it is also prone to confident false claims, known as hallucinations.

Rashina is a researcher addressing the question: how will we coexist with generative AI in the future? While it can do wonderful things to help boost our productivity, what if it gets things wrong? And what ethical considerations have been considered during the development of this technology? When Rashina surveyed software engineers and other workers behind the technology, she realised that most were not aware of all of the principles that need to be taken into account when it comes to releasing these tools into the world: reliability, safety, privacy, etc.

'We're on the verge of an identity crisis for humanity,' Rashina says. AI is here to stay. We therefore need to consider how we will use AI while also considering ethics and our wellbeing.

DR SUSI SEIBT

Organs-on-a-chip is the future of biomedical research, according to Dr Susi Seibt. They rely on microfluidics: labyrinths of tiny channels in which fluids mix on a micro- and nanometre scale.

Microfluidic chips have moulded and engraved channels with several holes through which scientists can direct, mix, separate, or manipulate fluids. Susi provided the example of milk and lemon curdling – you may be familiar with the transformation of smooth, creamy milk to something chunky, lumpy, and completely unappetising. In microfluidics, you could have two streams of milk and lemon juice constantly mixing and watch how it starts to curdle, freezing the reaction in time. It essentially allows scientists to perform all sorts of experiments on a tiny scale.

This technology may soon become an important part of efforts to improve global health, particularly through the development of point-of-care testing devices. Microfluidics are already widely used for monitoring blood glucose and detecting pathogens such as the SARS-CoV-2 virus. Microfluidic channels can also be lined with human cells to mimic human tissues - "organs-on-a-chip", as it were. Although they are much simpler than tissues and organs, these systems can serve as effective mimics of human physiology and disease. They can be sealed and sterile, and made of an optically transparent material that allows real-time monitoring and analysis of the cells. Additionally, they can be personalised with patient samples, enabling experimentation with cells and tissues outside the body. For example, a heart-on-a-chip can connect to a liver-on-a-chip for cardiotoxicity testing of new drugs. Susi believes that microfluidic technology may soon replace animal models in the future and revolutionise the pharmaceutical and biomedical industries.

TILLY BOLEYN

Tilly Boleyn, Head of Curatorial at Science Gallery Melbourne, is all about blurring the boundaries between STEM, art, design, and anything else. She is a self-proclaimed massive nerd, who is curious about the world and everything in it. She smashes all sorts of sciences and art together to create spaces for people to think and question.

Interdisciplinary science is not a new thing - First Peoples have done it for millennia - but it is not always done. It seems to have been lost in the education system. As a school student, Tilly had to choose to pursue either science or art. She could not study both. Early in her microbiology career, Tilly discovered her natural talent as a 'science gossip' – meaning that she is better at

talking about other people's science rather than doing her own. She went into science communication and education, and then moved into the museums and galleries industry.

Tilly sees Science Gallery Melbourne as 'the Tinder of research', creating spaces for people from different disciplines to get together. For example, as part of the Disposable exhibition, a large-scale installation plonked in the middle of the University of Melbourne campus transformed human urine into electricity as a phone charging station. Sandra and Gaspard Bébié-Valérian, artists based in France, wanted to create a sculpture that highlighted the valuable resource that is urine. Tilly connected them with Professor Peter Scales, a chemical engineer who could help them convert their idea into a usable battery. The result, Urinotron, combined scientific equipment, engineering skills, and metres of electronic wires in an artistic equivalent of an alchemist's workshop, with a different kind of gold.

Science Gallery provides fertile ground to change perspectives and thinking. Art and science are not separate. 'Sparks fly when there is collaboration between the two,' Tilly says.

TRISH KERIN

People have a fundamental right to stay safe at work. There may be many subtle warning signs that not everything is quite right. These weak warning signals occur all around us every day, but we often either fail to notice them or realise their significance.

Trish Kerin lives by "The Platypus Philosophy". The platypus is a unique and unlikely creature: a monotreme (egg-laying mammal) with the bill of a duck, the claws of an otter, and the tail of a beaver, and one of the few mammals that produces venom. If you're out walking one evening and see a glimpse of the bill, you might mistake it for a duck. If you do not investigate further, you could happily make that assumption without realising that you have actually seen a poisonous platypus. This is like a weak signal in a facility. If you don't investigate further, you may think you have a meaningless piece of data, but it may be something far more serious, which is why Trish works with company leaders to improve safety in their organisations.

She uses the platypus framework:

Platypus appears - sight and record a warning signal

Link the data - where was it spotted and what else was around?

Assess the data

Tasks and timing - what else was happening simultaneously?

Yesterday and yonder - has something similar happened before?

Perceive the potential scenarios and consequences of a hazard

Understand the controls you can put in place

Secure the platypus

The next time you see something strange that you can't quite explain, look deeper, run through the platypus steps and ask yourself "where is the platypus hiding?" Trish encourages everyone to identify these signs in their personal and work lives, and act on them - because if you do, you stop them from hurting you tomorrow.

Below: Dr Jarrod McKenna and other researchers at Monash University hope to use the Egyptian Spiny Mouse (*Acomys cahirinus*) as a model organism for studying female reproductive health.

Bacchus Marsh is one of Victoria's 'foodbowl' regions, growing a substantial amount of grains, legumes, fruits, and vegetables.

Photograph: Josh Withers (via Unsplash)

FRUITS AGAINST MELANOMA: THE SCIENCE BEHIND MEDICINAL PLANTS

Dr Catriona Nguyen-Robertson MRSV, with Dr Tien Huynh

Plants have been used as traditional medicines around the world for centuries – even millennia. With technology that we have now, Dr Tien Huynh can uncover the science behind how they work. Drawing from her Vietnamese heritage, she is particularly interested in studying medicinal plants from tropical Asia.

GAC COULD BE WHAT WE ~~NEED~~ SEED TO FIGHT MELANOMA

The plant that is closest to Tien's heart is the gac fruit (*Momordica cochinchinensis*). Gac is a large, red, prickly fruit grown throughout Southeast Asia, belonging to the cucumber family. Several years ago, she encouraged a Vietnamese student to investigate whether the fruit may have any health benefits. The student was initially doubtful – to her, gac was just a weed and common fruit eaten back at home. The results, however, were astounding.

Gac has a distinctive orange-reddish colour resulting from its rich carotenoid content, with especially high levels of lycopene and beta-carotene. Lycopene gives tomatoes their red colour, and beta-carotene gives carrots their orange. In comparison, gac contains 200 times as much lycopene as tomatoes, and over 50 times as much beta-carotene as carrots.[1] It is therefore well-suited for natural food-colouring as an alternative to petroleum-based artificial colours. It may also be protective for eye health, as carotenoids can reduce the risk of developing certain eye diseases, such as age-related macular degeneration, and gac has the highest levels of carotenoids of any known plant in the world. Vietnamese people knew it was linked to eye health intuitively, and documentation on Vietnamese traditional medicine lists gac as a treatment for dry eyes and night-blindness.[2]

Most recently, Tien has been interested in the ability of gac to fight melanoma. The idea of using compounds from plants against cancer is not new. Various chemotherapy drugs have already been developed from plant products, including bark and roots, such as vincristine and vinblastine from the Madagascar periwinkle (*Catharanthus roseus*), paclitaxel from the Pacific yew (*Taxus brevifolia*), and camptothecin from the Chinese happy tree (*Camptotheca acuminata Decne*). Tien investigated seeds from the gac fruit as they had already been shown to kill cancer cells from breast, colon, gastric, liver and lung cancer, plus they may otherwise go to waste.

To test the ability of gac seed extract to kill cancer cells, Tien's student added it to melanoma cells in the lab – and the cells died.[3] Importantly, non-melanoma cells did not, indicating that the anti-cancer activity was specific against melanoma cells. Once they knew that gac seed extract can kill melanoma cells, they wanted to know how.

It came down to specific proteins that are unique to the gac plant. Three of the gac seed proteins that had anti-melanoma activity have equivalent proteins in human cells, which have roles in driving melanoma. Tien therefore believes that these three gac proteins may compete with the human protein counterparts, thereby interfering with their function and disrupting melanoma growth. Given that cancer originates from changes to the cell's DNA resulting in uncontrolled growth, inducing a cascade of signals within the melanoma cell to ultimately lead to its death is most welcome. Since Tien's team's gac seed extracts have similar activity as anti-cancer drugs that are already available, with up to 95-98% effectiveness,[3] but were not as damaging to normal cells, their work offers an exciting possibility for an alternative or a way to complement current cancer treatments.

Dr Tien Huynh has established industry and community transformative projects for medicinal plants, environmental sustainability and agricultural upcycling. Photograph: Dr Tien Huynh.

FROM FOOD SCRAPS TO MEDICINE

Tien's enthusiasm and eagerness to seek ways to improve both human health and environmental sustainability has led her to investigate methods of upcycling plant waste for medicinal purposes. With many fruits, we do not eat the whole fruit, and much of it is discarded. Tien therefore decided to investigate the potential benefits of the achachairú fruit from the Garcinia humilis tree. Achachairú is a small fruit, related to mangosteen

Gác fruit (*Momordica cochinchinensis*). Photograph: williamnyk via flickr (CC BY-NC 2.0).

(*Garcinia mangostana*), that is usually consumed as pulp in juice, jams, and ice creams. The peel is often discarded as waste. Like with gac, Tien saw an opportunity to upcycle the waste as an alternative, sustainable and low-cost source of anti-cancer compounds. In similar experiments, another of Tien's students evaluated achachairú peel for its anti-melanoma activity and found that it also triggered melanoma cell death, albeit it was 10-fold less effective compared to the anti-cancer drug controls.[4] Nonetheless, the moderate anti-cancer activity of achachairú peel provides future opportunities for upcycling of this discarded waste as a functional food ingredient.

Tien's studies into the activity of fruit extracts against melanoma provides evidence for further studies into their use in medicine. Using scientific techniques and technology, she can confirm and understand the underlying mechanisms of the health benefits of fruit – especially components of fruit that are often wasted – that have been used as part of traditional medicine for centuries because people discovered what worked through trial and error. 'There is a bit of truth in a lot of traditional medicine,' Tien says. 'Where we come in, is to follow up and find out specifically why a plant does certain things and ways we can improve on it, so that people can benefit from these amazing plants.'

Dr Tien Huynh is an Associate Professor at RMIT University, and last presented to the RSV on this subject in 2019. You can watch the full lecture free on Youtube at ***youtube.com/watch?v=TnIfx1I4ZkI****, or the 10-minute summary video at* ***youtube.com/watch?v=6zuH_51WHaI***

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WHERE DOES YOUR FOOD COME FROM? WILL IT ALWAYS BE THERE?

By Dr Catriona Nguyen-Robertson MRSV

This article revisits a presentation to the Royal Society of Victoria on 23rd of September 2021 titled "Foodprint Melbourne: building the resilience of Melbourne's food system", delivered by Dr Rachel Carey (The University of Melbourne).[1]

Have you noticed that food prices have gone up? Food supply chains are being affected by a combination of local and global shocks, which are contributing to rising food prices.

We have had many wake-up calls in recent times. Bushfires, floods, war, and the COVID-19 pandemic all exposed the cracks in our food supply systems. More Australians have experienced food insecurity in the past few years than ever. Crops, livestock, and produce were lost – or simply could not get to us. Dr Rachel Carey wants to make our food supply chains much more resilient to future shocks and stresses.

We tend to think of Australian cities as food secure. Across the nation, we produce enough food to support 60,000,000 people – more than double the population (albeit a large portion is exported). But during the COVID-19 pandemic, we saw supermarket shelves barely stocked, farmers leaving their produce rotting in fields or dumped, and students queuing for food vouchers and parcels.

The COVID-19 pandemic disrupted food supply chains in several ways. It shut down major cities, and state and international borders, caused labour shortages on farms and processing centres, increased waste of farm produce with the shutdown of the hospitality sector, and created surges of consumer demand.

Rachel leads the Foodprint Melbourne project,[2] which investigates the resilience of Melbourne's food system. The pandemic exacerbated weaknesses that were already there due to a changing climate: more frequent and severe fire, drought, and floods. She now wants to leverage lessons learned over the past few years to transform our food systems.

All Australian state capitals have city foodbowls – city-fringe farmland – that are a vital source of fresh food. But as our cities rapidly grow, their food bowls are under threat as farmland is cleared to make room for more houses. Urban sprawl encroaching into the fields that supply our food will mean that we might struggle to feed the growing population. Melbourne's dwindling foodbowl currently grows enough food to meet around 41% of the Greater Melbourne population's overall food needs – but how do we get that 60% more?

Urban farming is one solution. There are many green spaces in the city, including parks, median strips, golf courses, and rooftops, that we could be utilising to grow edible produce. CERES, a non-for-profit community-run environment park and farm, saw a high demand for its food boxes as lockdowns forced people to shop more locally than ever before. On a 250 m^2 patch in the inner city, urban farmers grew a multitude of fruit and vegetables for nearby residents.

Rachel advocates for cities to increase their urban farming capacity as an "insurance policy" in the event of natural disasters or pandemics. Local food production, while not sufficient to be our only food source, can be a buffer against future shocks that disrupt supply chains to fill the gaps.

We can also rethink how we deal with waste to create circular economies. Cities have access to waste streams that can be reused within the system. Food waste, for example, could be converted into compost so that nutrients in organic waste are returned to the soil. City wastewater can provide a relatively secure source of water for food production in a drying climate.

There is also a financial benefit to the closed loop: keeping money circulating within our own economy when we purchase food from local farmers and suppliers and give resources back to them.

We similarly need greater diversity within the system. In addition to a variation of scale – from urban plots and small community gardens to large enterprises – we also need geographic diversity in the locations of our food source in the case of rerouting like with bushfires. Farmers should also vary their types of crops and livestock so that there is also a backup if one is impacted.

If your pantry and fridge stocks remained unscathed during the COVID-19 pandemic, then perhaps you are among the more fortunate. One of the biggest victims of supply shocks is not the food quantity, but the equity of food distribution. A combination of local and global shocks, and additional pressures of the cost-of-living crisis, can lead to spikes in food prices. When this happens, people on low incomes and those already food insecure are most affected, and households with children are being hit harder than others.[3] Only 55% of Australian households had high food security in the last 12 months (i.e. they had no anxiety about sourcing adequate food), while over 2 million households

On the banks of the Merri Creek in Brunswick, Victoria, CERES is a great example of how we can use our green spaces for urban farming. Photograph: CERES

Top: Infographic about the Food Security Problem. Source: Univery of Melbourne.

(21%) sometimes had to skip meals or go days without eating because they did not have money to buy food.[3]

Importantly, an increasing number of people are unable to afford enough nutritious food – it is not merely about sourcing something to eat, we need adequate nutrition too. As it is, fewer than 7% of Australian adults eat the recommended number of fruit and vegetable servings daily.[4] If everyone did, we would not have enough to go around. Foodprint Melbourne therefore aims to increase equitable access to fresh, healthy foods and promote sustainable production for current and future generations of Australians.

Based at the University of Melbourne's School of Agriculture, Food and Ecosystem Sciences, Rachel's team works with a range of stakeholders to ensure that their research has great impact. The team is planning interventions and collaborating with local councils and management bodies to enact cross-sector and collaborative approaches to food policy.

An equitable, food secure future is possible. By strengthening local and regional food supply chains, maintaining city-fringe farming lands and developing urban farming approaches, creating circular food economies to minimise waste, and adopting greater flexibility, we can build a resilient system. Rachel is paving the way forward now to ensure access to food for generations to come.

You can watch Dr Rachel Carey's presentation for free on Youtube at ***youtu.be/pxaGhEL0Eow***

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Dr Tien Huynh led a forum on the Future of Work Powered by AI, run by the Vietnamese Australian Professional Network with speakers Professor Dinh Phung (Monash University), String Nguyen (Chubbiverse), Quan Pham (PI.EXCHANGE). Photograph: Vietnamese Australian Professional Network

THE FUTURE OF AI IN THE WORKPLACE

Dr Catriona Nguyen-Robertson MRSV

Artificial intelligence (AI) has been woven into the fabric of our lives. 'It's a revolution,' says Dr Tien Huynh, an academic at RMIT University. 'We can't really stop it, but we can improve it'.

AI comes in different forms that have already become integrated into everyday life. You may ask it to navigate the best route through traffic, to ask if it will rain today, to filter spam out of your email inbox, or to select films and music that you might like. The ability of AI to perform these tasks is the result of machine-learning algorithms, trained on copious amounts of data and examples.

OpenAI's ChatGPT and Google's Bard use large language models that digest huge quantities of data scraped off the web and infer relationships between words to generate their own text. Professor Dinh Nguyen, Research Director of the Department of Data Science and AI at Monash University, points out that, even though they are trained on trillions of words, they still 'don't understand anything" – they simply recognise patterns. The most basic language model training involves predicting a word in a sequence of words: most commonly either next-token-prediction (guessing the next word) and masked-language-modelling (guessing a word within a phrase). The model learns to fill in the blank with the most statistically probable word given the context. In doing so, they learn to compose sentences on the fly as if they were human, which potentially makes them more versatile than their AI "smart assistant" predecessors as assistants.

Next-token-prediction

The model is given a string of words and it needs to predict the next word.

Catriona is a _____

Catriona is a woman
Catriona is a daughter
Catriona is a scientist

Masked-language-modelling

The model is given a string of words with one word that is masked. It needs to find a suitable word to fill the blank.

Scott ___ music

Scott plays music
Scott loves music
Scott hates music

With a suite of generative AI tools at our disposal, the question of how it will impact the way we work arises.

WHAT CAN WE USE GENERATIVE AI TO DO?

Generative AI is a type of AI that can create new material in whatever medium we ask for: text, images, video, audio, and 3D models. It sounds like the way of the future – and people have been scurrying to jump on the generative AI bandwagon. Since its launch last November, ChatGPT has become one of the fastest growing apps in history, only taking three months to reach over 100 million active users.

Multiple industries are using generative AI to their advantage. Most people have played with ChatGPT – even if simply to test it out. People use it to generate cover letters, speeches and emails, to provide advice, to assess code, and to analyse vast quantities of data, among other things. Creatives looking for inspiration for their books or poems have also asked ChatGPT to produce rough drafts to get them started. Ultimately, people are using ChatGPT and other generative AI bots to save time and help share their cognitive load.

Many people liken this AI to having a 24/7 personal assistant to do some of the heavy lifting and streamline routine tasks. Entrepreneur, String Nguyen, uses ChatGPT and similar programs every day as someone who generates enormous amounts of social media content. It proof-reads her work and she asks it to provide her with marketing strategies. Essentially, it acts as her virtual assistant and copy editor. Indeed, String is not the only business-owner who has tested ChatGPT's capacity as an assistant to reduce costs, and free up time and brain space for strategic thinking and high-level decision-making.[1,2]

Could chatbots eventually automate the roles of human executive assistants, especially their more repetitious work, as well as other jobs that involve administrative work? We do not have an answer. However, Dinh believes in a future where,

instead of simply divvying up tasks with other people, we also use AI to help share the load.

WHAT IF WE RELY ON GENERATIVE AI TOO MUCH – ESPECIALLY SCHOOL STUDENTS?

As many students who write essay assignments have realised, ChatGPT can be quite a useful writing tool. Ask it to write an 800-word essay on Rosalind Franklin in the style of a year 10 student, and it will do it. Perhaps not perfectly, but it will put words on a page.

While some teachers are trying to crack down on the use of AI in education, concerned that these tools will eliminate critical thinking and writing skills, others encourage it. With the right guard rails in place to prevent cheating - and honestly, students haven't needed AI to cheat in the past – generative AI could empower both students and educators.

These tools can provide access to vast amounts of information in a short timeframe, remove accessibility barriers by providing the option of interacting through text or speech, and can provide personalised educational content based on student needs. Sal Khan, CEO of Khan Academy, sees it as an opportunity to provide a personal tutor to every student or teaching assistant to every teacher.[3]

The average class sizes in Victoria are over 21 students at both primary and secondary levels,[4] but students and educators could collaborate with AI tools to even out the student:teacher ratio. Khan Academy has developed Khamingo, a "friendly AI-powered learning guide" that identifies mistakes in students' work, answers questions, quizzes students, and, importantly, asks students to justify and share their reasoning to ensure that they have a solid understanding of concepts.

A survey from The University of Melbourne conducted across Semester 1 of this year (March-June) found that tertiary students use generative AI to brainstorm and refine ideas, summarise information, and provide language support, especially for students with English as an additional language.[5] Fewer than one in ten student respondents had used generative AI to produce content that was submitted as all or part of an assignment, but many use it to at least get started and feel more supported in their learning. It can thus be used responsibly as a support tool, rather than something to be frowned upon.

Just as the education system has adopted calculators and computers as learning tools in the past, AI is the next tool. These tools aren't going away and by banning them, educators would be failing to prepare their students for the world they will graduate into. We need to learn how to use them best. The same way that academics before me had to learn how to find information in books and journals in libraries, I had to learn how to best use search engines to enable me to better find what I was looking for. Students today need to learn how to work with generative AI tools to be a part of this modern world.

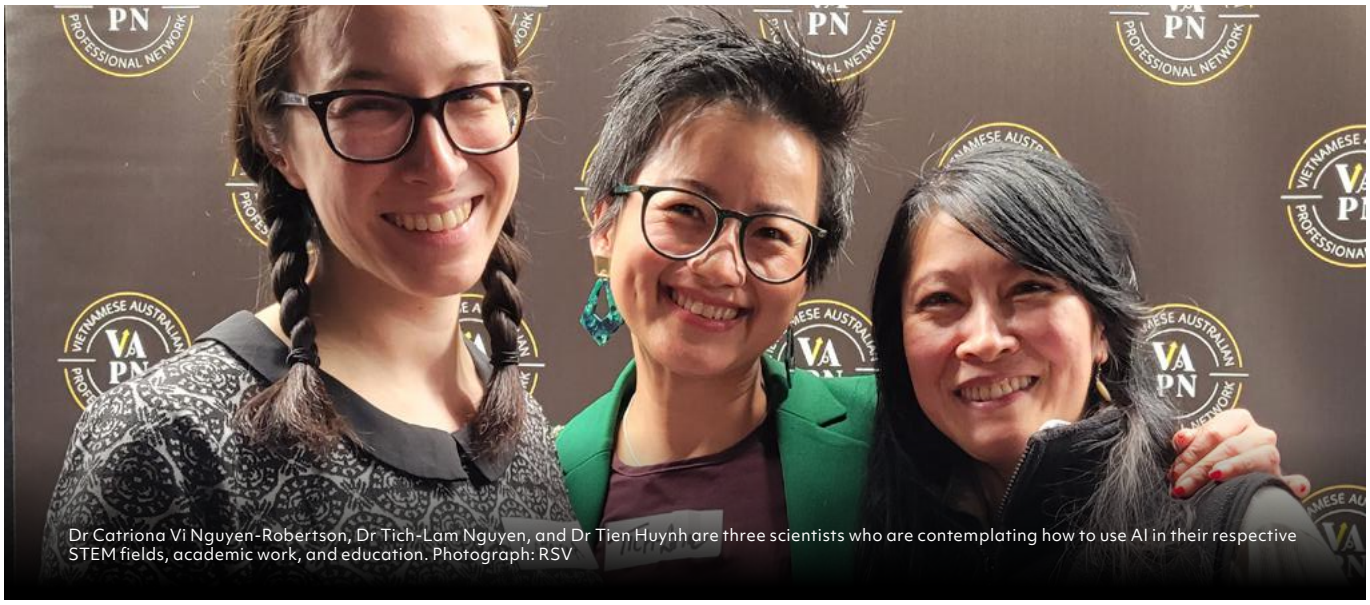
WHAT ARE THE DOWNSIDES OF A RELIANCE ON GENERATIVE AI?

I may have painted a picture of profound ways that generative AI will impact work and education, however there are certainly very valid concerns around this technology. We need to understand its limitations and consider how to balance the risks with the rewards.

Inaccurate or biased information.

When Tien asked her PhD students to try using ChatGPT to write an academic literature review, the result was intriguing: ChatGPT wrote something plausible about the field, except many of the references had been completely made up. A more well-known example is a New York-based lawyer who is now facing a court hearing after relying on ChatGPT for research in a legal brief, which he did not verify before submitting fake citations in a court filing.[6] These are the result of AI hallucinations: confident responses from AI that are, in fact, false information. AI tools like ChatGPT are trained to predict strings of words that best match your query. They lack the reasoning, however, to apply logic or to consider any factual inconsistencies they may be spitting out.

Moreover, machine-learning algorithms are only as good at the data they are trained on. There is a risk that they may provide inaccurate or biased information. ChatGPT's database has a limited knowledge of the world after 2021 – what it knows after that is merely based on users' input. As we use it more, it will learn more, but it can still make mistakes, especially because it is essentially trained by people, and people make mistakes and can be biased.



Dr Catriona Vi Nguyen-Robertson, Dr Tich-Lam Nguyen, and Dr Tien Huynh are three scientists who are contemplating how to use AI in their respective STEM fields, academic work, and education. Photograph: RSV

Privacy and ethical concerns.

The technology that has been unleashed into society is - according to A/Prof. Sarah Roberts - an 'unfettered experiment' that not even the tech companies that created it can properly control.[7] Associate Professor of Information Studies at UCLA, Sarah Roberts, is concerned about the lack of ethical considerations before ChatGPT and other generative AI tools were released. To conduct research in laboratories, research scientists must apply for ethics approvals and adhere to strict ethics guidelines – but are tech companies doing this for their products that are directly going out into the world?

AI applications are revolutionising the way we create. But ultimately, these creations rely on ideas conceived by humans – humans who are not always given appropriate credit. Some professional artists, writers, musicians, and programmers fiercely object to the use of their creations as training data for generative AI tools that generate outputs that compete with or make their work redundant.[8] These systems have often been trained on data ripped off the internet without attribution or compensation. Copyright lawsuits that are now underway in the US, including challenges of OpenAI's Codex, and GitHub and OpenAI's Copilot, both of which are large language models trained upon billions of lines of open-source code, have substantial implications for the future of generative AI systems.[9] If the lawsuits prevail, then generative AI systems will only be allowed to be trained on work in the public domain or under licences, which will affect everyone who integrates generative AI into their work – including those who use it for scientific research and education.

Generative AI also introduces several privacy concerns due to its ability to process personal data and generate potentially sensitive information, even though this information is supposedly anonymised. There are also people whose job it is to screen the content AI algorithms are trained on - even the horrific content that represents the worst of humanity. Richard Mathenge, a worker for OpenAI based in Nairobi, and his team taught the GPT model about explicit content.[10] The goal was to train it to keep such content away from users - but they had to repeatedly view, read and categorise explicit text so that the model learned to recognise and avoid it. This type of work has been crucial for AI tools like ChatGPT and Bard, but it horrified the people who had to do it. We rarely discuss this human toll behind the "quality assurance" of these AI models.

A CHANGING TIDE: WHERE TO FROM HERE?

'We need to reinvent the way we're going to work,' says engineer Quan Pham. AI can do mundane tasks for us and process information much faster than our brains are capable of, freeing up our time to do more "human" things. Some jobs may disappear, but many will adapt, and new ones will be created as the workforce adopts the new technology.

A 2017 report estimated that there has been a gradual net gain of 15.8 million jobs as a direct result of the introduction of personal computing technologies.[11] Consider the entire ICT industry that did not exist several decades ago – we are simply at the forefront of another wave.

ChatGPT and other generative AI tools could be used to create a baseline for our work, to which we then add our own voice. They may boost our productivity, but as Dinh says, 'at the end of the day, you are still responsible for what you produce'. We shouldn't be afraid of the technology, but we do need to learn about its limitations, and train people to use it appropriately before completely embracing it.

Keen to learn more about AI? Join us in person or online on the 19th of October as Dr Muneera Bano (CSIRO/Data61) presents "Reimagining Humanity in the Age of Generative AI".

For more information, visit ***rsv.org.au/events/generative-ai***

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We assigned ChatGPT (chat.openai.com) a task to create a prompt for Midjourney (midjourney.com) to create a portrait of itself. After teaching ChatGPT some specific variables, it delivered the prompt for Midjourney. Inputting the prompt into Midjourney and recycling the prompt several times, Midjourney continued to create depictions of itself as a woman, despite the prompt being gender-neutral. Is this AI manipulation, or has it been taught it's a woman through its users?

Source: Rosie Everett, Brand Warrior Communications, utilising ChatGPT and Midjourney.

Rabbit Island (top left), seen from a beach on Wilsons Promontory, taken during a study on muttonbird rookeries by Dr Mary Gilham/CSIRO in 1958.

Photograph: Dr Mary Gilham MBE (CC BY 2.0)

1970

RABBIT REMOVAL AND ISLAND REHABILITATION

By Scott Reddiex MRSV

In the long history of this land, a man named Mr Thomas Austin could be considered an introduced pest. Born in England, he arrived in Victoria via Tasmania in 1837, claiming 29,000 acres of land near Winchelsea on the south-west coast.[1]

On Christmas Day of 1859, the gift that Austin had requested arrived in Melbourne: 24 wild European rabbits (*Oryctolagus cuniculus*), sent by his brother in England. The number of rabbits grew exponentially, and by 1865 more than 20,000 had been reportedly hunted for sport by Austin.[2,3]

While this was one of many introductions of the European rabbit, genomic and historical data point to this small group as being the predominant source of invasive rabbits on this continent.[3]

A case study of the environmental impact of rabbits comes from another location where they were directly introduced: the appropriately named Rabbit Island, located off the coast of Wilsons Promontory. Lieutenant John Lort Stokes aboard the HMS Beagle (yes, *that* HMS Beagle, during its third voyage, to survey the coasts and rivers of Australia) wrote in 1846, "*the ship lay near a small islet close to the Promontory about seven miles from the entrance, which, from the abundance of rabbits, we called Rabbit Island; I have since learnt that these animals had multiplied from a single pair turned loose by a praiseworthy sealer six years before*".[4]

For over a century, rabbits dominated the small island, decimating local flora and damaging the nesting ground used by seabirds. The rabbit population was mostly eliminated by the mid-1960s, first with myxomatosis and then with 1080 poison (sodium fluoroacetate).[5] Without it, the island could begin to heal.

The 1970 Proceedings of the Royal Society of Victoria featured a study on this healing, "*Ecological Effects of Rabbit Reduction on Rabbit Island, Wilsons Promontory, Victoria*", by Frederick 'Ian' Norman.[5] Visiting the island nine times between 1965 and 1968, the survey team observed any remaining rabbit activity, changes in the island's vegetation, and changes in the distribution of muttonbird rookeries. They observed decreasing signs of rabbit activity over this period, leading to a complete absence of rabbits by September of 1968. This observation was inversely related to an increase in vegetation returning to the heavily eroded landscape, to the point that "*the 1.5 acres of bare sand present in August 1966 had become vegetated*".

The return of vegetation to Rabbit Island "*had a noticeable effect on the distribution of muttonbird burrows*". After summarising the results of the study, Norman concludes that "*in destroying the vegetation the rabbits contributed largely to a situation where birds were unable to maintain nesting burrows in the sandy soil. Progressive decrease in the rabbit population has initiated a regeneration process which has reversed the degeneration of habitat to the extent that birds are recolonizing old breeding areas.*"

After more than 130 years, the small island could begin its recovery.

From:
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Mary Ellinor Lucy Archer (left) and Jean Hagger (right) in 1965. Hagger had been encouraged by Archer to pursue librarianship, and later became the Head of RMIT's Department of Librarianship - the first female head of department at RMIT.

Photograph: Leone Mills. Source: State Library of Victoria (All Rights Reserved)

1920

FLORAL WOUND CARE

By Scott Reddiex MRSV

Around the world and throughout recorded history, people have been collecting, studying, arranging, and gifting flowers. Whether it be the lotus offerings depicted in ancient Egyptian artwork,[1] the flowers used for ikebana in Japan, the cuttings of plants transported for horticulture, or the roses for Valentine's Day, all of these have something in common: they start to wither and die as soon as they are cut.

On the 11th of December 1919 – a year after completion of her Master of Science – Mary Ellinor Lucy Archer's paper "*The Longevity of Cut Flowers*" was read to the RSV. In it, she records her different treatments of fresh cuttings, and the solutions that these cuttings were placed in, to determine what combination would keep the plant looking healthy for the longest time.

Archer starts with a fundamental consideration: "*the reason or reasons which cause cut flowers to die, or to lose their characters as flowers by passing into the fruiting condition.*" She hypothesised two reasons: that cutting the flower stem blocks vessels within the stem, preventing the rise of sap, and/or "self-poisoning" in response to compounds released by cells around the cut surface. After testing the latter, she concluded it must be the former, leading her to question what blocks these vessels and how to prevent such blockages.

Archer classified the factors contributing to blockages as either external or internal to the plant. The most common external factor was bacterial growth in the water surrounding the stem, while internal factors were harder to discover and define, but can be thought of as similar to blood clotting in humans.

On how to prevent blockages, whatever their cause, Archer stated that "*it will have to be done by placing the stem in some solution which will perform the required action without, at the same time, having any harmful effect on the living tissues of the plant.*"

The solution (pun intended) identified by Archer was "*a dilute solution of the non-poisonous heavy metals", which seemed to eliminate the blockages, "and the flowers remain nearly perfect for a considerable period*".

However, perhaps consistent with the era of using radium to paint clock dials and mercury to make hats, Archer selected a heavy metal that is definitely toxic for both plants and animals. Using solutions of lead nitrate, she found that different acacia samples could remain fresh for up to 14 days. While her solution may have worked, what you'll most commonly find in sachets of flower food that accompany a bouquet from the florist nowadays is a combination of sugar, acid (often citric acid), and sometimes a small amount of bleach.

Mary Ellinor Lucy Archer MBE – professionally known as Ellinor Archer – was a ground-breaking female scientist in Australia.[2] She was the first female scientist at the CSIRO, starting as investigator and secretary of the Seed Improvement Committee, and later becoming Chief Librarian of the organisation from 1923 - 1954. It was her role as a librarian through which she had the greatest impact, and she was president of both the Australian Institute of Librarians and its successor, the Library Association of Australia. Archer was awarded an MBE (an order of the British Empire) for her work in 1956.

From:
Proceedings of the Royal Society of Victoria, Vol XXXII. (New Series), 1920. Art. XVII - The Longevity of Cut Flowers, by Ellinor Archer, M.Sc.

References:

1. *Florists and Flower Arranging in Ancient Egypt*. (2018, August 3). At the Mummies Ball. atthemummiesball.com/florists-flower-arranging-ancient-egypt/
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"Fearful earthquake and tidal wave at Arica South America". Mr. C.T. Winter.
Wood engraving, November 9, 1868.

Source: State Library of Victoria, ID. 1653418 (Public Domain)

1868

THE SPEED OF A TSUNAMI

By Scott Reddiex MRSV

On the 29th of October 1868, RSV President Robert L. J. Ellery presented his collected observations "*of the unusual waves which were experienced on the shores of some of the Pacific islands, New Zealand, and Australia, on the 15th of August last, which he stated were undoubtedly the result of the frightful earthquakes which occurred along the west coast of South America on the 13th August.*"

These 'frightful earthquakes' were the 1868 Arica earthquakes, which occurred near the Chilean city of Arica. Estimated to have been between 8.5 and 9.3 in magnitude, it completely destroyed many cities in southern Peru and northern Chile, with an estimated death toll exceeding 25,000. Similar to the 2011 earthquake off the coast of Japan, it subsequently triggered large tsunami waves in all directions, devastating the coast of South America and spreading across the Pacific Ocean.

The waves struck many coastal locations throughout the Pacific over the course of the following day, with impacts being recorded by locals. In Newcastle, NSW, "it swung the ships at anchor around, and washed boats on shore." In Savai'i, Samoa, the water had risen fifteen feet on the east side of the island, while in New Zealand and the Chatham Islands the waves had risen "*from four to eight feet, doing considerable damage on the low-lying coasts*".

To calculate the speed that these waves had travelled, Ellery collected observations of the times that they had hit Apia/Abaiang in Kiribati, Lyttleton in New Zealand, Sydney, Adelaide, and even Albany in WA – around 14,000 km from the epicentre. But while the tsunami waves had been observed along coastlines throughout the Pacific, Ellery "*had not got the times with sufficient precision to make any use of them to obtain the rate at which the sea disturbances must have travelled.*"

Using the time that the tsunami was recorded in Callao (in the Peruvian capital of Lima) as his starting time, and the local times and distances of the locations the waves subsequently hit, Ellery calculated the average rate of wave transit to have been 381 miles per hour (613 km/h). However, he acknowledged that this estimation was likely inaccurate, due to factors like retardation of the wave before it reached Adelaide especially, and the (incorrect) assumption that the epicentre had been in Callao/Lima, when it had actually been thousands of kilometres to the south-west.

From:
Transactions and Proceedings of the Royal Society of Victoria, Volume IX, 1868. Article XIX. – On the Earthquake Wave of the 15th August, 1868. By R. L. J. Ellery

References:
Okal, E. A., et al. (2006). Evaluation of Tsunami Risk from Regional Earthquakes at Pisco, Peru. *Bulletin of the Seismological Society of America*, 96(5), 1634–1648. doi.org/10.1785/0120050158

Coranderrk. Photograph: Yarra Ranges Council

The **Inspiring Australia strategy** was developed by the Australian Government to increase engagement and interest in the sciences. The **Inspiring Victoria** program is jointly funded by the Australian and Victorian governments with the Royal Society of Victoria.

Inspiring Victoria encourages involvement in STEM through initiatives (such as **National Science Week Victoria**) that are delivered by the RSV's program partners:

- **Public Libraries Victoria**
- **Neighbourhood Houses Victoria**
- **Parliament of Victoria**
- **Museums Victoria**
- **Royal Botanic Gardens Victoria**
- The **Commissioner for Environmental Sustainability**
- **Questacon**
- The **Arthur Rylah Institute for Environmental Research**
- **Zoos Victoria**

WEAVING INDIGENOUS KNOWLEDGE INTO AGRICULTURE

By Dr Catriona Nguyen-Robertson, Kate Bongiovanni, and Mike Flattley

This updated article follows a panel discussion convened by 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". The panel featured Uncle David Wandin (Wandoon Estate Aboriginal Corporation), Luke Williams (RMIT University), Aunty Kerrie Saunders (Yinarr-ma), and Joshua Gilbert (Charles Sturt University), and was Chaired by Associate Professor Bradley Moggridge (University of Canberra).

"The Indigenous population of Victoria was estimated to be at least 11,500 before the founding of Melbourne in 1835. Less than 30 years later frontier violence and the introduction of European diseases had decimated the population and only about 2,000 Aboriginal people survived." [1]

In the early 1860s, an Aboriginal reserve was established and held by a surviving collective of Kulin people and other Indigenous groups displaced by the invasion and colonisation of Victoria. This farming community sustained itself in the face of British imperial and Victorian Government control of ancestral lands and interference in the lives of First Peoplesbetween 1863 and 1924, finding new ways to persist and survive in a transformed world that had devastated a legacy of tens of thousands of years of human cultural practice in Australia's southeast.

Located around 50 kilometres north-east of Melbourne, the residents were mainly of the Woiwurrung, Bunurong and Taungurung peoples, who had selected and successfully petitioned for the land to be reserved for the purpose of producing crops and sustaining themselves. They named the property for a plant indigenous to the area that produces effusive white flowers in the summer months – Coranderrk, known in English as the 'Victorian Christmas Bush,' and to Western botany as *Prostanthera lasianthos*.[2]

Coranderrk ran successfully for many years as an essentially autonomous Aboriginal enterprise, producing and selling wheat, hops and crafts to the burgeoning Melbourne market. Produce from the farm won first prize at the Melbourne International Exhibition in 1881.[3] Yet further controls were imposed on Aboriginal Victorians' lives, culminating in the passing of the Aborigines Protection Act 1886, which required "half-castes under the age of 35" to leave the reserve, among other requirements and restrictions. This politically literate group sent a petition to the Victorian colonial government in 1886 to protest these oppressive measures, which became known as the Coranderrk Petition.[4]

In 1920, Sir Colin MacKenzie, a leading medical researcher, leased 78 acres of the Coranderrk reserve from the Aboriginal Protection Board to begin his work in the comparative anatomy of Australian fauna. This was the catalyst for the creation of the Healesville Sanctuary, now a popular conservation zoo for Australian native animal species.

The Coranderrk reserve was formally closed in 1924, with most residents removed to the Lake Tyers Mission in East Gippsland. The land was handed to the Soldier Settlement Scheme, which denied all but two returning Aboriginal soldiers from World War 1 an allocation anywhere in Victoria.[5] It was not until 1991 that the Wurundjeri people were able to reclaim the cemetery at Coranderrk, and an additional 119 hectares were purchased by the Indigenous Lands and Sea Corporation soon afterwards. Coranderrk was added to the Australian National Heritage List in 2011, and the property is now managed by Wandoon Estate Aboriginal Corporation.[6]

Uncle David Wandin is a Fire Elder of the Wurundjeri, an expert recognised by his people, trained in traditional methods for using fire on the landscape to sustain and maintain Country. He has led the return of cultural burning and food production at Coranderrk Station almost a century after his ancestors were removed from their land.

Uncle David Wandin.
Photograph: Federation of Victorian Traditional Owner Corporations

Following many years of neglect, the property was covered in weeds, and native seeds struggled to germinate amid introduced pasture grasses for cattle. Over the past decade, Uncle Dave used a series of carefully controlled burns to clear away the pervasive weeds and promote the growth of native seeds. It took eight weeks to clear the 800m driveway alone, but now the land is bouncing back.

The trees there are now growing at their own pace and are being helped by First Peoples under Uncle Dave's tutelage. Birdsong now fills the air, and wombats, wallabies, echidnas, and other animals have returned. Further, native plants require less work and fewer resources to grow 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 aiming to produce food over the next few 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 cared for by Uncle Dave.

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 and toxicity of bush foods - essentially their effects in our bodies - 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.

Once cleared for general consumption, bush foods need to become familiar to the mass market to drive commercial uptake and success.

SOME OF THE FOODS UNDER CONSIDERATION WITH FOOD STANDARDS AUSTRALIA AND NEW ZEALAND.

- Currently being developed for, or being sold in, commerical markets.
- Safety concerns due to toxicity, contamination, or bioactivity.
- A lack of data that accomdates their safe consum

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Kamillaroi/Gomeroi woman Aunty Kerrie Saunders showcases bush tucker found around Moree in northern NSW. What started out as hobbies, gardening, and bushwalking, became a business conducting bush tucker tours (Yinarr-ma). Aunty Kerrie takes people on walks on Country, 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 (dhaamba) and pizza, Aunty 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, it may just be that they are too small for now. 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 the seeds 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 Aunty Kerry hope that with careful agricultural husbandry, native seeds will eventually become bigger again, and even hit the market. (After all, quinoa is tiny but has been branded as a superfood!)

If and when these grains become commercially successful, it is important that traditional knowledge holders are properly acknowledged, along with the associated intellectual property. Farmer, academic and Worimi man, Joshua Gilbert, warns that First Peoples currently only receive between 1-2% of revenue from the commercial bush food space. He believes that despite being the first farmers in the world, the knowledge and wisdom of our agricultural landscape held by First Peoples is often ignored.

There are 6,500 types of native foods that we could all be eating, but there are many barriers to First Nations people commercialising them. Joshua therefore advocates greater First Peoples representation in the agricultural sector.

Joshua Gilbert is a farmer on his native Worimi Country in Gloucester, NSW, and a co-chair of Reconciliation NSW. Photograph: Joshua Gilbert

Above: Guli and lilly pilly jam drops with dhamu seeds served with ganalay and binamayaa dhaamba. Photograph: Yinarr-Ma

Below: Aunty Kerrie Saunders running a Yinaar-Ma tour, with her warm ganalay and rye sourdough. The ganalay grain is 25% protein. Photograph: Yinarr-Ma

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 Aboriginal and Torres Strait Islander 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.

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1. National Museum Australia, "Defining Moments: Coranderrk." Retrieved September 2023: https://www.nma.gov.au/defining-moments/resources/coranderrk
2. Nanni, Giordano; James, Andrea (October 2013). Coranderrk: We will show the country. Aboriginal Studies Press (AIATSIS). ISBN 9781922059406. Retrieved 19 July 2020. Chapter 1: A brief history of Coranderrk, 1835–81
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4. Entity - Coranderrk Station (Vic) (n.d.) Obituaries Australia. Retrieved September 2023: oa.anu.edu.au/entity/14880/text35596
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6. Wandoon Estate Aboriginal Corporation, "Our History: Pre- and Post-Colonisation". Retrieved September 2023: https://www.coranderrk.com/our-history

A Mountain Pygmy Possum and (below) a Bogong Moth. Photographs: Zoos Victoria.

ZOOS VICTORIA Fighting Extinction | MOTH TRACKER

MOTH TRACKER

A CITIZEN SCIENCE PROJECT WITH ZOOS VICTORIA

Help scientists at Zoos Victoria track the migration of Bogong Moths to help them and the Critically Endangered Mountain Pygmy-possum!

Beginning in spring each year, Bogong Moths make an epic migration towards alpine regions in Victoria and New South Wales, where Critically Endangered Mountain Pygmy-possums are waking from their hibernation. Bogong Moths are a crucial spring food source for Mountain Pygmy-possums and declines in Bogong Moth numbers are an urgent threat to the possums' survival. After Bogong Moth numbers crashed by an estimated 99.5% in 2017-18, these small but mighty moths were sadly listed as Endangered by the IUCN in 2021.

Moth Tracker is a citizen science initiative which aims to gather open-source real time data on the dates, locations and numbers of Bogong Moths travelling during the annual migration period. If you see a Bogong Moth, or a moth you think could be a Bogong Moth, take a photo and upload it to Moth Tracker. It's quick and easy, and will help scientists better understand how to help the moths and if they will make it to the mountains this year.

Learn more about the moths, the possums who eat them, and the Moth Tracker project at ***zoo.org.au/possums/***

CALL FOR SCIENTIFIC PAPERS

The *Proceedings of the Royal Society of Victoria* is our refereed journal, published twice annually by CSIRO Publishing. Current and recent editions are available online in open access format from **publish.csiro.au/rs.**

The Society invites contributions for the *Proceedings* from authors across the various disciplines of biological, physical and earth sciences, including multidisciplinary research, and on issues concerning technology and the applied sciences.

Contributions on topics that are relevant to Victoria and the south-eastern Australian region are encouraged. The journal also publishes Special Issues and themed collections of papers commissioned by the Council of the Royal Society of Victoria. It is published online in May and November, with two issues constituting a volume.

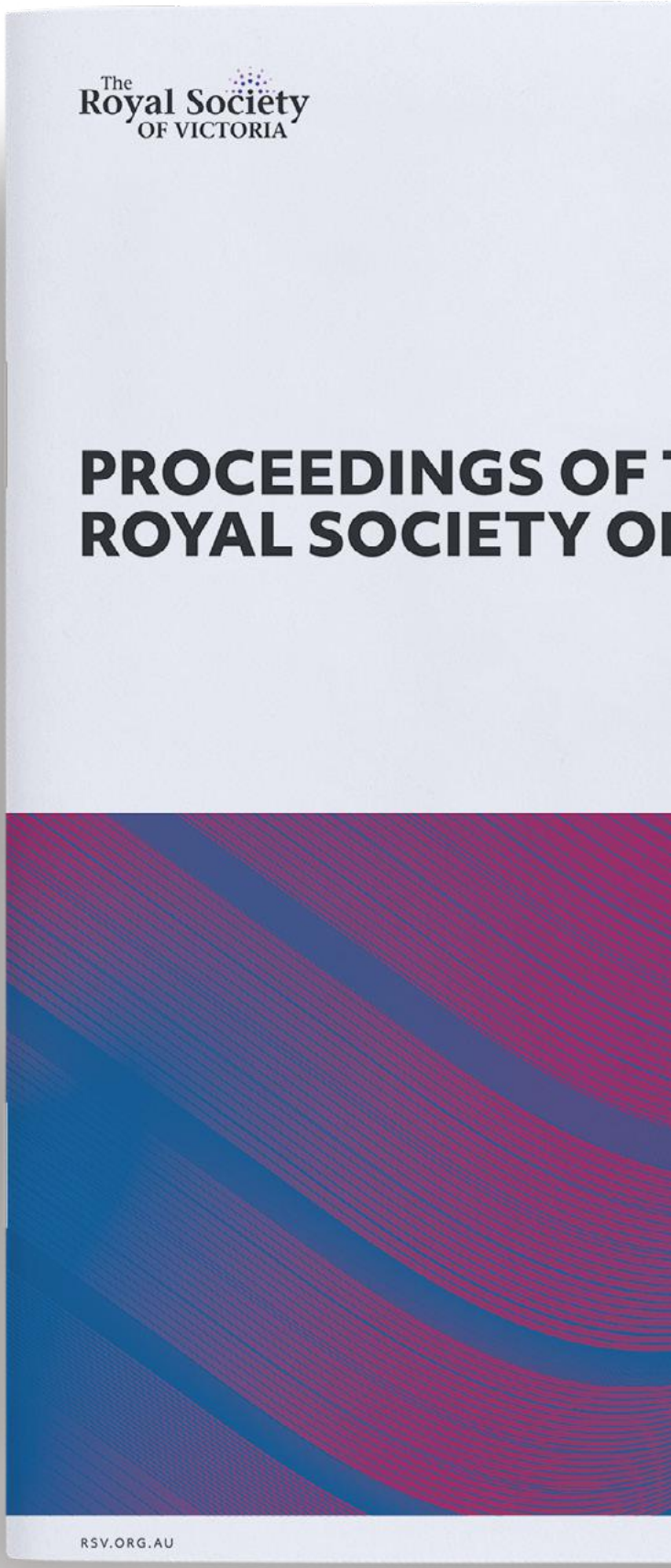
The *Proceedings* is one of Australia's oldest and longest-running science journals, a terrific platform for establishing an individual research presence, grouping papers derived from symposia on specific subjects, or simply joining a distinguished tradition of science published in or about our region that stretches back to the 1850s.

The journal began in 1855 as an irregular publication under the title *Transactions of the Philosophical Society of Victoria*, the present name being adopted in 1889. Since then, the journal has appeared on a regular basis, at first annually but varying from one, two or four parts per year. Since 1889, the parts issued each year were deemed to make up a volume. The online content extends back to Volume 118, Number 1, 2006.

Those interested in submitting papers should review the **Guidelines for Authors**. All enquiries and manuscript submissions should be forwarded via email to **editor@rsv.org.au**.

Please note copies of the *Proceedings* 1854 to 2006 are freely available online at the State Library of Victoria website in their 'Digitised Collections.'

SOCIAL MEDIA
Follow the journal on social media using the hashtag *#ProceedingsRSV*



CURRENT GOVERNMENT CONSULTATIONS OF INTEREST TO VICTORIA'S SCIENCE COMMUNITY

*Projects open for consultation from **engage.vic.gov.au/project***

Victorian Murray Floodplain Restoration Inquiry and Advisory Committee

Learn about the Standing Inquiry and Advisory Committee appointed to advise on the proposed Victorian Murray Floodplain Restoration Projects and their potential effects

Ongoing:
engage.vic.gov.au/VMFRP-SIAC

Victoria's Renewable Gas Consultation Paper

Provide your input to help design policy that could best support the efficient and effective use of renewable gas in Victoria.

Consultation closes 6 October 2023:
engage.vic.gov.au/victorias-renewable-gas-consultation-paper

Seadragon Offshore Wind Project

Public comment is invited on the draft Scoping Requirements for the Seadragon Offshore Wind Project EES, off the coast of Ninety Mile Beach in western Victoria.

Consultation closes 11 October 2023:
engage.vic.gov.au/seadragon-offshore-windfarm-project-environment-effects-statement-ees-draft-scoping-requirements

Slag Grinding Facility in Yarraville

The EPA has received a development licence application, and now seeks comments from members of the community who may be affected by the proposal.

Consultation closes 12 October 2023:
engage.vic.gov.au/steel-cement-pty-ltd-app018889

Processing of Fill Material and Construction Waste for Reuse

The EPA has received a development licence application for a facility in Bulla VIC, 3428. It seeks comment from anyone who may be affected by the proposal.

Consultation closes 19 October 2023:
engage.vic.gov.au/hi-quality-quarry-products-pty-ltd-app018022

Ministerial Review: Victorian Public Sector Medical Staff

Have your say about workplace systems and employment arrangements impacting public hospital medical staff and delivery of health services.

Consultation closes 15 December 2023:
engage.vic.gov.au/min-review-vic-pub-sector-med-staff

PITCHING AND WRITING FOR SCIENCE VICTORIA

Science Victoria seeks the discussion and promotion of scientific topics of relevance to people living in the State of Victoria. We are particularly interested in new research, in-depth articles, or exploration of subjects where scientific work and thinking can directly address or deepen our understanding of environmental and socioeconomic challenges.

We welcome your pitches and pieces for news, features, opinion, and analysis articles on current scientific research in Victoria, recent scientific discoveries, related social and policy issues, technical innovations, and overviews of impactful research. We cover a broad range of topics around Science, Technology, Engineering, Mathematics, Medicine/health (STEMM) under an overarching theme of "science and society."

Science Victoria's articles are written in plain, non-academic language, pitched at an intelligent and naturally curious audience that does not necessarily hold subject-matter expertise. This is not a platform for scientific journal articles nor media pieces. For more information on what we're looking for, please read our article submission guidelines below.

HAVE AN IDEA FOR AN ARTICLE?
PITCH YOUR IDEA TO US!
Send your idea to **editor@sciencevictoria.org.au,** along with any questions you have regarding your pitch.

In your email, please outline:
- In one sentence, what is your key message? (No more than 50 words)
- Why should this key message be shared with the readers of *Science Victoria*? (No more than 100 words)
- Which style of article are you proposing to write? (See below for a guide to article types)

Article pitches can be submitted at any time, but please keep in mind the article submission deadlines for the next month's issue. Note that we may accept your pitch, but suggest it is more suitable for another style of article.

ARTICLE SUBMISSION
Once your pitch has been accepted, you can submit completed pieces that comply with the style guide below. Completed articles to be published in the next issue of *Science Victoria* must typically be submitted 2 weeks prior to the beginning of the next month.

All pieces will be reviewed prior to publishing and may be edited for length and clarity (although we will be sure not to alter the message or context of your work). We will also endeavour to fact-check and confirm any grey areas with you ahead of publishing in the interests of accuracy.

All published pieces will be accompanied by a by-line, and a short (<50 word) biography of the author (title, institution, qualifications, current projects, contact email) to be submitted with your piece.

Images and figures to accompany your piece are strongly encouraged, however please ensure that you only provide original images produced by yourself or those that already exist in the Public Domain. Images must include details of the source and any relevant descriptions. If you do not provide any images, we may include Public Domain or stock images that we deem suitable for visual communication of your content.

REFERENCES
References for all articles should use a modified APA 7th edition format: reference list in author-year format, with numbered in-text citations. Refer to articles in previous editions for examples, or contact **editor@ScienceVictoria.org.au**.

WRITING FOR SCIENCE VICTORIA: ARTICLE FORMATS

STYLE GUIDE
To successfully engage the largest audience, all pieces should have readability in mind.

Readability can be determined using a Flesch-Kincaid readability test, aiming for a score between 50-60. This score means that your piece should be easily understood by an educated 16-year-old (a year 10 student).

If drafting your piece in Microsoft Word, **you can easily view your document's readability statistics** at Home>Editor>Document Stats. Alternatively, you can use one of the many free online calculators.

FEATURE ARTICLES
Recommended word count (600 - 1,800)
Feature articles are more in-depth pieces on a specific topic related to STEMM. A key aspect of feature articles is the narrative – this isn't a journal article, so think about the story that your article is trying to tell.

Your audience is intelligent members of the general public, who share an enthusiasm for scientific topics, or who are members of the scientific community outside of your particular field.

Avoid using jargon, as it will quickly alienate anyone who isn't an expert in that field. Explaining one or two otherwise irreplaceable terms is fine.

Please reference primary sources/journal articles for any non-trivial scientific claims, or for publications that prompted your writing of the article.

Feature articles typically run between 600 and 1,800 words (including references). Use of sub-headings and figures to break up longer pieces is strongly encouraged.

Not quite sure about the tone for your piece? Have a look at articles published in previous editions of *Science Victoria*, or in other scientific magazines for a general audience, like *The Conversation, Cosmos, New Scientist* or *Scientific American*. A good litmus test is knowing that most of us have read a piece or been to a presentation that managed to make the most interesting topics incredibly boring. This is what you want to avoid.

LETTERS
Recommended word count (400 - 1,000)
Letters have minimal restrictions on style, structure, or subject matter. You are encouraged to submit your thoughts/questions/comments that broadly relate to STEMM in Victoria and/or the Royal Society of Victoria. Potential subject areas include responses to articles in previous editions of *Science Victoria*, seminars at scientific events, science-related issues and policies, or topics you'd like to see in future editions.

Where a specific question is asked, we will endeavour to have the appropriate person respond to your letter.

WHAT I'VE BEEN READING
Recommended word count (400 - 1,000)
This is a column for you to tell us about a book broadly relating to science that you've read. These pieces are typically between 400 – 1,000 words and include a summary of the book and its ideas, as well as your interpretations or conclusions.

Possible questions to consider when writing this column:
- Do you think the author was correct in any assumptions?
- Was the author's style of writing approachable?
- Did they do the subject matter justice?
- Who would you recommend this particular book to?
- What did it mean to you?
- What did you learn?

OPINION ARTICLES
Recommended word count (600 - 1,000)
In contrast to an unbiased news or feature article, an opinion piece conveys your informed opinion on, or experiences with a particular topic. This is where your expertise on a subject can shine. Clearly state your argument, outlining the details of the problem you are addressing, and build to a strong conclusion.

For greatest impact, your choice of topic should be one that is broadly relevant to STEMM-related fields in Victoria. Examples of possible topics include:
- how to address a climate-change related problem in Victoria, successes and failures common to STEMM engagement initiatives,
- changes in your particular field of expertise
- your experiences of a career in STEMM and thoughts on how to better support the next generation of researchers,
- existing STEMM-related studies or approaches that you believe could be applied in Victoria,
- ethical problems related to scientific projects or careers in STEMM.

Please reference primary sources/journal articles for any non-trivial scientific claims, or for publications that prompted your writing of the article.

Opinion pieces should aim to be 600-1000 words. For anything shorter, consider submitting it as a Letter instead. We welcome well-informed opinion articles from all authors, particularly from those with significant expertise in a given area. Articles may reference your own work; however these are not promotional fluff pieces.

NEWS ARTICLES
Recommended word count (400 - 1,000)
News Articles are for the discussion of current or recent news relating to science, with an emphasis on science in Victoria or news that impacts Victoria's scientific community.

These articles should be concise, avoid use of jargon and personal opinion, and be referenced as appropriate. News pieces should be between 400-1,000 words in length.

Reports could relate to funding announcements/grant outcomes, new STEMM-related projects, high-impact publications relevant to Victoria, successes of Victorian scientists, or relevant STEMM-related policy news.


THE ROYAL SOCIETY OF VICTORIA
Promotion and Advancement of Science

HOLD YOUR NEXT EVENT AT THE ROYAL SOCIETY OF VICTORIA

The RSV engages communities with scientific knowledge through aligned partnerships, special events, festivals, conferences, and education programs. Email **rsv@rsv.org.au** to discuss your needs and ideas!

FACILITIES FOR HIRE

The Royal Society of Victoria's facilities are available for hire to organisations, companies, or private groups. This heritage-listed building opposite the Carlton Gardens is suitable for a wide range of events, including conferences, seminars, meetings, and private functions.

Limited parking is available on-site and a commercial parking operator is adjacent on La Trobe Street.

The RSV has audio visual and seminar equipment available for use, including videoconferencing facilities. There is a commercial kitchen on the ground floor, suitable for your own use or by a caterer.

SERVICES AVAILABLE

We provide a number of services to ensure your event is a success. Some of the services we provide are:

- Event management
- Meeting venues
- Grants and awards administration
- Social media campaign management
- Broadcasting and video production
- Campaign management
- Recruitment of scientific panels
- Convening community engagement and deliberation processes where scientific work contributes to social, environmental, and economic impacts and benefits.

The Burke and Wills Room

Multi-functional space with adjoining kitchen.

Capacity:

Workshops	≤30 people
Dinners	≤60 people
Seminars, functions, catering, etc	≤80 people

The Von Mueller Room

Seminar room great for smaller meetings and seminars.

Capacity:

Meetings, seminars, etc	≤15 people

The Ellery Lecture Theatre

Raked seating great for lectures, presentations, and conferences.

Capacity:

Raked seating	≤110 people.

The Cudmore Library

A picturesque room great for larger meetings and seminars.

Capacity:

Meetings, seminars, etc	≤24 people

We are registered as a Certified Social Trader working for the benefit of Victorian communities, which makes our services eligible under the Victorian Government's Social Procurement Framework, as well as the social procurement guidelines of the governments of New South Wales and Queensland. Our certification also assures industries of our authenticity in building social procurement into services and supply chains. For more information and bookings please contact our Business Manager at **james@rsv.org.au** or on +61 3 9663 5259

SUPPORT VICTORIA'S SCIENCE SOCIETY

Founded in 1854, the Royal Society of Victoria (RSV) is our state's science society. We are a membership based, non-government organisation, advocating for the importance of science, technology, innovation, and building the skills for Victoria's future industries, governments, community leaders, and research superstars.

We manage the Inspiring Australia program in Victoria, meaningfully engaging communities with science. We encourage, profile, and celebrate the achievements of Victorian scientists through public lectures, awards, and prizes, which are supported by the donations and bequests to the RSV Science Foundation. Your donations allow us to continue the work we have been doing for Victoria for more than 160 years.

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