The Royal Society of Victoria
Promoting science since 1854

SCIENCE VICTORIA

NEWS FROM THE ROYAL SOCIETY OF VICTORIA | RSV.ORG.AU | NOVEMBER 2022

Too Late to Save: The Extinct Australian Species 26

THE OFFICIAL NEWSLETTER OF RSV

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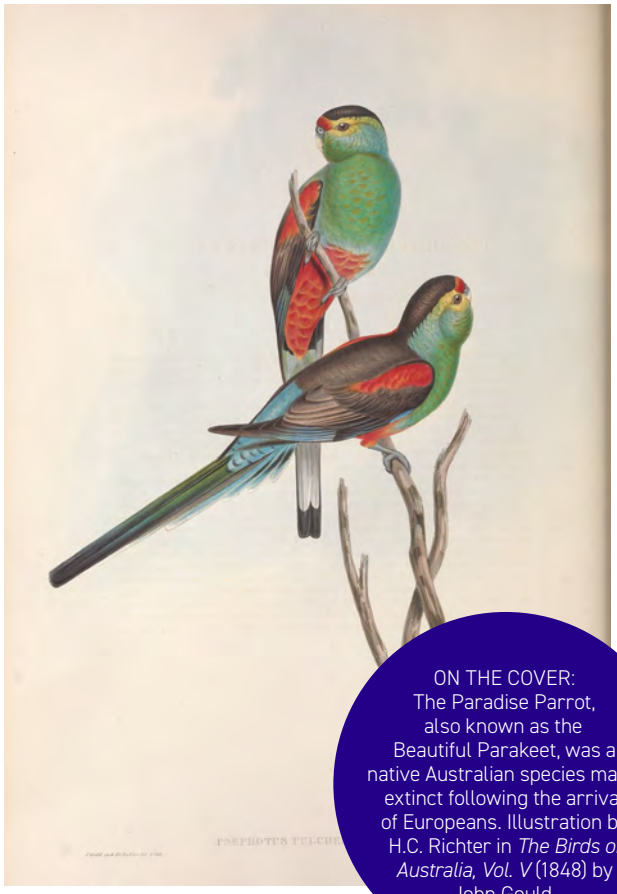

ON THE COVER:
The Paradise Parrot, also known as the Beautiful Parakeet, was a native Australian species made extinct following the arrival of Europeans. Illustration by H.C. Richter in *The Birds of Australia, Vol. V* (1848) by John Gould.

INTERESTED IN SCIENCE? ENJOY WRITING? WE WELCOME LETTERS, ARTICLES AND IDEAS.

Please note that the submission deadline for content to be included in the December 2022 edition of *Science Victoria* is **25th of November 2022**
Email **editor@sciencevictoria.org.au**.

FROM THE CEO

Prizes, Prizes, Prizes!

With so much to pack into 2022, we've ended up with our entire Awards season packed into November-December! It's a lively time at the RSV as we celebrate the achievements of Professor Rachelle Buchbinder AO (RSV Research Medallist), Dr Ashleigh Hood (Phillip Law Postdoctoral Awardee) and the eight finalists for the Young Scientist Research Prizes. I hope you can join us to hear about the fascinating work of these high achievers from across the research career spectrum, and across the many disciplines of scientific endeavour; details are in this month's edition of *Science Victoria*.

Caretaker mode is upon us for the Victorian State Election, and we should have a new State Government to work with come December. Whether returning or freshly minted, any new government will have a "first 100 days" agenda to clarify and deliver, so the RSV will be working hard to gain traction from our position *Towards Biodiversity Conservation and Recovery* with decision makers. We will have announcements to make following the election on Saturday, 26 November and welcome your influence in gaining support for the measures we've identified for action across all sectors of society.

As always, we seek your contributions to future editions of both *Science Victoria* and the *Proceedings*. There are guidelines for submission published in this edition, thanks to the outstanding work of Scott Reddiex. We'd love to hear from you at **editor@sciencevictoria.org.au**.

Have a great month!

Mike Flattley
CEO, The Royal Society of Victoria

SCIENCE VICTORIA, VOLUME 2, NUMBER 10, NOVEMBER 2022

The Monthly Publication of the Royal Society of Victoria – established 1854 for the promotion and advancement of science.

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Vice-President Dr Catherine de Burgh-Day
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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 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 seeks to support and celebrate the continued contributions of First Nations people to scientific knowledge.

FROM THE PRESIDENT

A Presidential Tree Frog

Recently on Radio National *Science Show* Robyn Williams interviewed Samantha Wallace, who is completing a PhD at The University of Newcastle in the School of Environmental and Life Sciences. Samantha is studying the impact of the 2019 bushfires on tree frog habitats. The fires destroyed a lot of prime tree frog habitat[1]. The frogs are also susceptible to chytrid fungus - a worldwide problem for frogs.

Two species that Samantha is investigating are endangered, Littlejohn's Tree Frog and Watson's Tree Frog, or *Litoria littlejohni* and *Litoria watsoni*.

Murray Littlejohn and Graeme Watson were the frog 'gurus' in the Department of Zoology at the University of Melbourne in the early seventies when I was an undergraduate. Graeme was also the President of the Royal Society of Victoria in 1991 and 1992. Dr Murray Littlejohn is a Fellow of the RSV.

There's been a split though and now he's had a frog named after him too!

A taxonomic revision has divided *Litoria littlejohni* into two species so Graeme now has his own frog.

Watson's Tree Frog (*Litoria watsoni*)
Image © Copyright, Professor Michael Mahony, School of Environmental and Life Sciences (Environmental Science and Management), University of Newcastle. Reproduced with permission.

It seems that the two frogs are closely related and very similar in appearance, indeed difficult to distinguish. The Watson's version has red or orange armpits (which sounds nasty), but it's good to know that these two doyens of biological science are now inextricably and perpetually linked, and recognised.

The good news is that our colleagues at Zoos Victoria are continuing their critical biodiversity work and with both Federal and Victorian government support have opened a world-leading frog breeding facility at Melbourne Zoo[2].

Importantly for this story, Graeme Watson's tree frogs will be accommodated with made-to-measure breeding habitats at the Amphibian Bushfire Recovery Centre, together with Spotted Tree Frogs and Southern Giant Burrowing Frogs. These species range from being listed as vulnerable to critically endangered under national environment law. The new centre is the first dedicated disease-controlled amphibian facility in Australia.

1 A range of threats for tree frogs: **https://www.abc.net.au/radionational/programs/scienceshow/a-range-of-threats-for-tree-frogs/101563480**
2 Australian First Centre Bringing Frogs Back from The Brink: **https://www.premier.vic.gov.au/australian-first-centre-bringing-frogs-back-brink**

The second part of my recent speech, 'What's in the Water?', appears in this edition of *Science Victoria*. I'm interested to raise again what are essentially old questions about the condition and future management of our aquatic systems. Water by its nature distributes pollutants far and wide and in Australia we still utilise a range of chemicals as insecticides and herbicides that are banned in other countries[3].

One wonders how we can spend millions of dollars on frog recovery when we continue to use these chemicals in waterways. For example, Goulburn-Murray Water has recently tendered for 42,000 litres of glyphosate herbicide as a specific brand that can be sprayed directly into our waterways that are used to irrigate our crops and sustain aquatic biodiversity.

A new RSV member has drawn attention to this issue in a recent LinkedIn post:

> ***To be clear, GMW, a publicly owned water body, had outsourced its statutory responsibility to supply us with clean water to a chemical company whose solution to the environmental management of the water resource is to spray a cancer-causing synthetic agrochemical directly into our water to kill all unwanted life in the water[4].***

In the same area, with the recent high rainfall and floods taking storm and floodwater into Port Phillip Bay, Victoria's Environment Protection Authority (EPA) has brought forward its Beach Report on the quality of water in the bay which usually begins on December 1st. EPA forecasts the water quality for 36 beaches in Port Phillip Bay and four sites along the Yarra River[5]. Many recent assessments have indicated that conditions for swimming are 'poor' - not suitable for swimming.

Water quality is clearly an important and current issue for our EPA:

> ***Update: The heavy rain and floods are having an ongoing impact on our water quality. We are pausing our POOR water quality SMS alerts until conditions improve. We will send you another SMS when our service resumes.***
> (EPA SMS, received 3 November 2022)
>
> ***Further update: Apologies for the technical glitch that sent out a message re: stopping Beach Report notifications. Routine notifications will continue as part of our commitment to keep you informed.***
> (EPA SMS, received 3 November 2022)

I was recently asked by a member "why doesn't Victoria have this kind of beach monitoring?", in reference to New South Wales's Beachwatch monitoring programme, which reports that 94% of monitored ocean beaches and 80 % of all monitored swimming spots are graded as good or very good. The NSW Minister for Environment James Griffin recently said[6], "despite the wettest summer in a decade, and Sydney's wettest year on record, there's been only a slight decline on last year's results."

I suspect the better water quality at Sydney beaches is mostly because they're either open ocean or because both Port Jackson and Botany Bay beaches are close to open ocean entrances. In comparison, Port Phillip Bay beaches are enclosed within a bay with much less circulation and with a sewage outfall at Werribee.

As usual I invite your comments, criticisms, thoughts, and ideas on how the Royal Society of Victoria can contribute to discussion about important matters of science. We are endeavouring to engage more strongly with the science industry sector and inviting Organisational Memberships. We invite you to complete the online membership application **here** and look forward to welcoming your organisation to the Royal Society of Victoria.

Rob Gell AM MRSV
President, The Royal Society of Victoria

3 The dirty dozen: 12 pesticides that are banned elsewhere but still used in Australia: **https://www.theguardian.com/australia-news/ng-interactive/2022/sep/27/12-pesticides-banned-elsewhere-but-still-used-legal-in-australia-what-is-paraquat-atrazine-fiprinol-pesticide-chemicals-food-crops-animals**
4 David Low's LinkedIn post: **https://www.linkedin.com/posts/activity-6993423530176512000-ntSK**
5 Summer water quality: **https://www.epa.vic.gov.au/for-community/summer-water-quality**
6 Latest water quality report released for NSW swimming spots: **https://www.environment.nsw.gov.au/news/latest-water-quality-report-released-for-nsw-swimming-spots**

LETTERS

Psoriasis: More Than a Minor Irritation

Skin (La piel)
by Sergio del Molino, translated from Spanish by Thomas Bunstead
First published in Spanish, 2020 (Alfaguara). English edition published 2021 (Polity).
ISBN: 9781509547876 922

October 29 each year marks World Psoriasis Day, which serves to raise awareness of the condition and advocate for those who live with it.

Psoriatic disease is more common, complex, and debilitating than you might realise. In Australia alone, it is estimated that 2.3%-6.6% of the population - 592,000-1.7 million people - suffer from psoriatic disease[1], however this number is not reflective of a single, uniform condition.

The disease is not confined to the characteristic skin lesions we most commonly associate with psoriasis. Instead, it is a chronic, multi-system, inflammatory disease with many associated disorders, such as psoriatic arthritis, cardio-vascular disease, inflammatory bowel disease, some cancers, liver and kidney disorders, and multiple mental illnesses.[1,2,3] Psoriasis and psoriatic arthritis in particular are closely linked; one study estimates that 41% of patients with psoriatic skin lesions also develop psoriatic arthritis.[4]

Furthermore, there is increasing recognition and understanding of an even closer link between psoriatic disease and mental health. Some studies suggest that almost 50% of those with psoriasis also suffer from mental illnesses like depression and anxiety. The link between psoriatic disease and mental health formed the theme of World Psoriasis Day 2022, with the **International Federation of Psoriatic disease Associations (IFPA)** highlighting current research in the area and amplifying the stories of patients.

Historically treated like lepers, stigmatised sufferers have been reluctant to speak about it. In 1985 author John Updike wrote about his life with the disease in a piece for the New Yorker titled, **At War with My Skin**. More recently, pop singer and fellow sufferer Cindi Lauper has become a spokesperson for the disease. In his 2020 book *Skin*, Spanish author Sergio del Molino explores both his experience with the condition and how it has shaped his self-identity, but also how it has impacted many notable figures in history.

Del Molino takes issue with Lauper's particular approach to sharing of her experiences, as he believes it suggests that psoriasis 'must be caused by stress, therefore lots of self-care is the answer'. Her approach conflicts with the well-established understanding that psoriatic disease is a collection of auto-immune disorders, which present complex treatment dilemmas. As del Molino says,

> ***"Cindi Lauper can disseminate all the hope she likes with sultry verses, and give any amount of advice to meditate and regulate one's breathing, but what has really saved her have been Cosentyx shots ['biologics'], a medication of great biological complexity developed in the most cutting-edge, jealously guarded laboratories in the world."***

Storytelling is essential to reduce suffering and stigma. Science is essential to deliver long term relief. Our work at the Society should support both.

Sergio del Molino is one of Spain's leading writers of fiction and nonfiction. Through his exploration of psoriasis, he traverses historical, scientific, and political history to arrive at a complex view of human imperfection and the human condition. His book is a thoughtful and highly recommended read.

Helen van de Pol MRSV
Science Communicator
Past RSV Councillor

1 Parisi R, Symmons DP, Griffiths CE, Ashcroft DM. (2013) Global epidemiology of psoriasis: a systematic review of incidence and prevalence. *J Invest Dermatol*, 133, 377-385
2 Wu JJ, Nguyen TU, Poon KY, Herrinton LJ. (2012) The association of psoriasis with autoimmune diseases. *J Am Acad Dermatol*, 67, 924-930
3 Kovitwanichkanont, T., Chong, A. H., & Foley, P. (2020). Beyond skin deep: addressing comorbidities in psoriasis. *The Medical journal of Australia*, 212(11), 528–534.
4 Ogdie A, Weiss P. (2015) The epidemiology of psoriatic arthritis. *Rheum Dis Clin North Am*, 41, 545-568

RSV NEWS AND NOTICES

New RSV Members

INDIVIDUAL MEMBERS

Mr Harry Gielewski,
Retired

Professor Sharath Sriram,
Functional Materials & Microsystems Engineer, RMIT University

Mr Michael Toby, Director,
ECTO Consulting

Mr Andrew McLean,
Chief Executive Officer, Landcare Victoria

Dr Patrick Cook,
Consultant Forensic Engineer, Minton Treharne & Davies Australia Pty Ltd

Call for Nominations:

RSV COUNCIL ELECTION FOR 2023-2024

Nominations are hereby called for the election of the following positions for the Royal Society of Victoria's 2023-24 Council:

Four Officers of the Society
Five Ordinary Councillors

Nominations for four Officers of the Society and up to five Ordinary Members of Council for 2023 and 2024 are sought. If required, these will be elected by postal ballot closing at 3.30pm on **1st March 2023**. The newly elected Officers and Councillors of the Society will take up office from the Annual General Meeting to be held in May 2023 - all current 2021-22 Officers and Councillors of the Society will continue until that date. All current 2022-23 Councillors continue until the AGM to be held in May 2024.

Note: *the following Officers of the Society are eligible and required to re-nominate to continue on Council:* Mr Rob Gell AM, Dr Catherine de Burgh-Day, Mr Jeffrey Luckins, Mr Siddharth Verma.

Note: *the following Councillors of the Society are eligible and required to re-nominate to continue on Council:* Dr Viktor Perunicic, Professor David Walker, Mr Richard Blundell. Associate Professor Robert Day completes eight contiguous years on Council in 2022-3 so will not be eligible to renominate until late 2023 for the 2024-25 Council.

Note: *Rule 23 (3) states that Council shall consist of the Officers of the Society and no more than ten ordinary members of Council, five of whom shall be elected to take office in odd-numbered and five in even-numbered years, from whose number Council shall appoint persons to such Special Positions as shall be determined by Council from time to time to be necessary for the proper conduct of the Society's business.*

Note: *The Returning Officer for the 2023-24 RSV Council Election will be Dr William Birch AM (Deputy: Dr Thomas Darragh FRSV),*

The Nomination Form is distributed with this Notice. It must be returned, attention to the Returning Officer, along with the nominee's 200-word statement by **3.30 pm, Monday, 19th December 2022**.

Nomination criteria & guidelines:

1. Nominees for Officer or Councillor Positions must be Financial Members of the Royal Society of Victoria at the closing date of nominations and, in accepting nomination, undertake to maintain their RSV membership status throughout the election process and any subsequent tenure on the RSV Council.
2. Nominations may only be made and seconded by Members of the Society who are financial at the closing date of nominations.
3. A Member may be nominated for only one Officer or Councillor position in each case.
4. The nomination, including the consent of the candidate, must be accompanied by a statement of not more than 200 words in length prepared by the candidate or the nominator. Any statement exceeding 200 words will render the nomination invalid.
5. Each statement must be submitted on plain paper; company or business letterhead will not be accepted. **An electronic copy as a Word document must also be lodged with the Returning Officer via: rsv@rsv.org.au**
6. All nomination forms and statements must reach the Returning Officer, c/o The Royal Society of Victoria, 8 La Trobe Street, Melbourne 3000 by **3.30 pm on 19th December 2022**, this being the closing time and date for nominations. These can be received via email to **rsv@rsv.org.au**.
7. A candidate may withdraw from the election for any of the positions for which he or she has been nominated.
8. In the event of uncontested positions, the Returning Officer will declare the results for those positions immediately; and state that an election for these positions is not required. Results will be published on the Society website and in the Newsletter (Science Victoria) distributed for February 2023.
9. If more than one nomination is received for any Officer, the Returning Officer must conduct an election for that position.
10. If there are more nominations than the number of vacant Ordinary positions of Council, the Returning Officer must conduct an election for all of the vacant positions.
11. A notice of the calling of an election and ballot papers will be circulated to financial members with the Newsletter (Science Victoria) distributed for February 2023. The Notice will be placed on the Society's website and on the notice board in the Society's premises displaying the nomination forms.
12. The notice of the election and Ballot Paper sent to members will be accompanied by the nominee's 200-word statement. These will be the only election materials authorised by the Society.

Nomination Form

FOR ELECTION TO RSV COUNCIL 2023-2024

We hereby nominate _____

of (address) _____

who is a member of the Society, for the position of:

President
Vice-President
Honorary Secretary
Honorary Treasurer
Ordinary Councillor

I consent to the above nomination.

Signature of Candidate: _____ Date: _____

I submit with this nomination form a Statement not exceeding 200 words in length to be displayed on the Notice Board in the Society's premises and website and if a ballot is necessary, circulated to the members. This Statement is a mandatory part of the nomination requirement.

NOMINATED BY:

Name: _____ Signature: _____ Date: _____

Address: _____

SECONDED BY:

Name: _____ Signature: _____ Date: _____

Address: _____

This nomination must reach the Returning Officer by 3.30pm on the third Monday of December, care of the Royal Society of Victoria, 8 La Trobe Street, Melbourne, Victoria 3000. **Please check the nomination criteria and guidelines to ensure your submission complies with all requirements.**

Please use a separate form if nominating more than one member for a position. Only one nomination per officer position and five nominations for the ordinary councillor positions will be accepted per nominating member. Further forms are available online from https://rsv.org.au/rsv-council-nomination-form-2023-24/.

Federal Budget Funding to Strengthen Australian Scientific Leadership in Asia-Pacific

First published by the Australian Academy of Science

The Australian Academy of Science will lead a new regional presence coordinating scientific engagement in the Asia-Pacific thanks to a $10.3 million investment from the Australian Government over the next six years.

The Minister for Industry and Science, the Hon Ed Husic MP, announced the funding in last month's Federal Budget.

The Academy welcomes and thanks the Australian Government's strategic commitment to establish the **International Science Council (ISC)** Asia-Pacific regional presence at the Academy.

This investment enables Australia to leverage its standing as a science and research leader and engage in strategic science diplomacy in our region and globally.

Australian Academy of Science President, Professor Chennupati Jagadish AC said hosting the International Science Council's Asia-Pacific Regional Presence in Australia would significantly boost Australia's scientific leadership in the Asia-Pacific region, deepen engagement across our region, and enable greater science outcomes that benefit all.

"It will also allow Australia to have greater input into global policy issues, extend its international influence through science diplomacy and provide access to a high-level network of global science leaders," Professor Jagadish said.

"Changes to the regional geopolitical landscape, climate change, global security and technology are among the issues currently shaping Australia's economy and society.

"An opportunity to enable meaningful regional engagement and to align activities with international science efforts will help us navigate these issues strategically and with impact."

President of the International Science Council **Sir Peter Gluckman** said the Academy had a long track record of successfully managing international engagements and in representing Australia's interests at the ISC since the Academy's inception in 1954.

"The Asia-Pacific focal point is central to translating the ISC's global vision into actions tailored to meet the unique needs of the Asia–Pacific region," Sir Peter said, who was also the former Chief Science Advisor to the Prime Minister of New Zealand.

"The Australian Academy of Science is a very active and engaged member of the ISC. As host of this new branch, the Academy is well placed to strengthen partnerships across the region and to advance science as a global public good.

"The ISC is grateful for the Australian Government's leadership and investment in building scientific cooperation in the region."

Professor Jagadish said the Asia-Pacific region is a key focal point of the Academy's international engagements and Australian diplomatic efforts.

"I wish to warmly thank the Academy of Sciences Malaysia for the valuable work undertaken in maintaining the Asia-Pacific regional office over previous years.

"We look forward to fostering engagement with the diverse nations across the Asia-Pacific region and working on our shared goal of championing science as a global public good," he said.

The ISC Asia-Pacific regional presence will begin operation in 2023.

*Full version of this article was originally published 25th October 2022 by the **Australian Academy of Science at https://www.science.org.au/news-and-events/news-and-media-releases/federal-budget-funding-to-strengthen-australian-scientific-leadership-in-asia-pacific***

EVENTS

Young Scientist Research Prizes Competition: Presentations, Judging and Prize Ceremony

Dr Shruti Nirantar, 2019 finalist

Thursday, 10th November 2022 (from 6:00pm)

To foster and recognise excellence in Victoria's early career scientists, the Royal Society of Victoria has established four prestigious competitive prizes open to Victorian students in their final year of doctoral candidature, in all areas of the Biomedical & Health Sciences, Biological Sciences (Non-human), Earth Sciences and Physical Sciences.

Inspiring Australia Victoria

Following assessment of applications across the four categories, we will select **eight PhD finalists** to present their work to us during **National Science Week**. Join us to hear about the latest science from our emerging scientists, and to support and celebrate the achievements of Victoria's upcoming high achievers.

Congratulations to our 2022 Finalists:

BIOLOGICAL SCIENCES

Ms Michelle Xu – RMIT University

Protective cultures as natural antimicrobials for fresh meat shelf-life extension: their application and consumer acceptance

Ms Linda Riquelme – The University of Melbourne

Estimating understorey biomass using remote sensing in semi-arid woodlands of south-eastern Australia

BIOMEDICAL & HEALTH SCIENCES

Mr Aung Zaw Zaw Phyo – Monash University

Health-Related Quality of Life in Later Life: Predictors, Trajectories, and Health Outcomes

Mr Daniel Urrutia Cabrera – The University of Melbourne

Using Cellular Reprogramming and CRISPR Technologies to Regenerate the Retina and Treat Vision Loss

EARTH SCIENCES

Mr Pui Kwan Cheung – The University of Melbourne

Measuring the micro-climactic impacts of turf irrigation in a temperate summer season

Mr Hoseong Lim – Monash University

Timescales of granite infancy: Advances in granite geochronology

PHYSICAL SCIENCES

Miss Mahshid Sadeghpour – RMIT University

Developing a Privacy-preserving Retinal Biometric Recognition System

Mr Yongqiang Wang – The University of Melbourne

Solar-driven CO2 capture and production from the air

Registration is available from **https://rsv.org.au/events/ysrp-2022/** to join us for the competition and awards ceremony at the Royal Society of Victoria's historic Hall in the Melbourne CBD. Alternatively, you can watch along via our **YouTube channel** at the appointed time without needing to register.

Explore Melbourne's Dynamic Coastline

Saturday, 12th November 2022 (10:00am–3:00pm), Rickett's Point, Beaumaris

A field trip organised by Geography Victoria in collaboration with the **Association of Bayside Municipalities**.

Port Phillip is a wonderland of coastal geomorphology, right on Melbourne's doorstep!

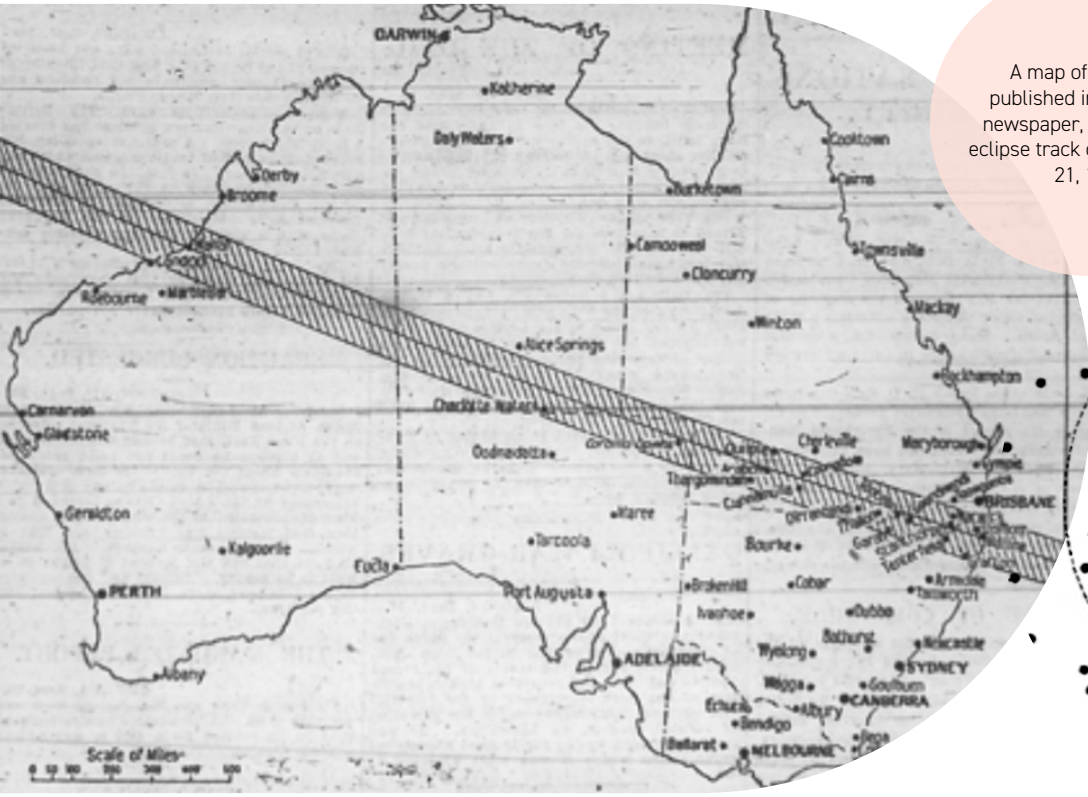
Join RSV President and coastal geomorphologist Rob Gell AM, fellow coastal geomorphologist Professor David Kennedy (Office for Environmental Programs, University of Melbourne), marine scientist Dr Rebecca Morris (National Centre for Coasts and Climate, University of Melbourne) and geologist Dr James Driscoll (Assistant Lecturer, Monash University) to explore the dynamic nature of the coast and marine environment – looking at evidence of historical changes on the coast, the geological landscapes that shape our foreshores and the bay, the impacts of climate change, storms and sea level rise on the marine and coastal environment, and more...

Our presenters will share the emerging science and practices changing the way the Bay is monitored and managed. This includes the use of cutting-edge technology, engaging citizen science and the use of nature-based methods of coastal protection.

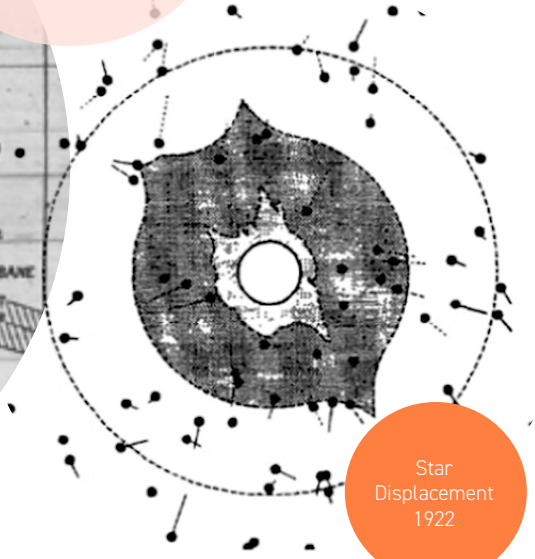
- There will be some walking (approximately 2 km).
- Street parking is available at Rickett's Point (fees apply).
- Lunch will be at the picnic tables at Rickett's Point – BYO or feel free to purchase from the Rickett's Point Beachside Café.
- The afternoon will be spent at the beach/cliffs opposite Edward St, Sandringham (street parking available).

Maps, specific information for the day and fieldtrip notes will be provided following registration. Places are strictly limited – suitable for ages 12 and up.

Registrations: **https://rsv.org.au/events/melbourne-coastline/**



A map of Australia published in The Argus newspaper, showing the eclipse track on September 21, 1922



Star Displacement 1922

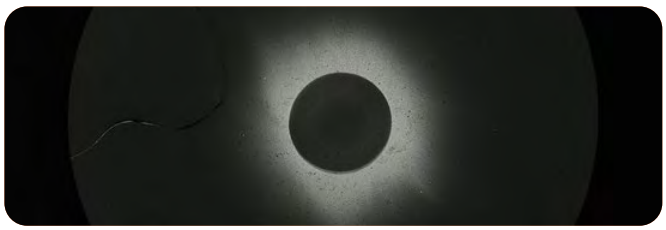
Validation of Einstein's General Relativity

Thursday, 17th November 2022 (5:30am–7:30pm) — Malaysian Theatre, Glyn Davis Building, The University of Melbourne

Celebrating the Centennial of an Australian Scientific Achievement

In 1922, the path of a total solar eclipse crossed the central part of Australia, presenting the first opportunity to validate Eddington's claims that Einstein's Theory of General Relativity was a 'representation of nature'. Expeditions were sent from different states in Australia to observe the eclipse, involving both Australian and international scientists. The scientific results were a resounding confirmation of Einstein's theory.

A distinguished panel will present details of the events surrounding the eclipse in 1922: the expeditions, the scientific data and the implications. Some of the most recent scientific results that directly reflect this new understanding of the nature of gravity will also be presented.

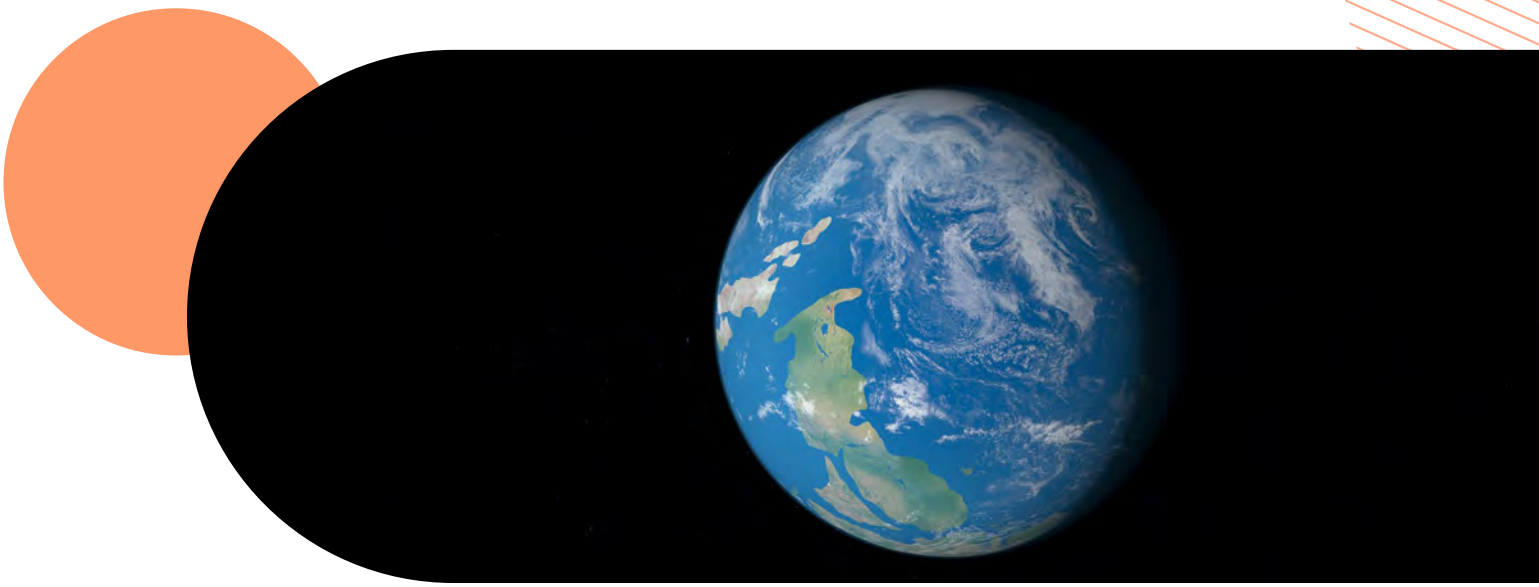


Solar Corona Australian Eclipse 1922

The panel will include Professors David Jamieson and Rachel Webster, and Emeritus Professor Brian Finlayson.

5.30PM refreshments at foyer outside B117 Glyn Davis Building (133 - Melbourne School of Design), followed by a panel presentation and discussion at 6PM.

Registrations: **https://rsv.org.au/events/1922-eclipse/**



Reefs, Revolutions & Redox at the Dawn of Animal Life

Inspiring AUSTRALIA Victoria

Thursday, 1st December 2022 (6:00pm) — Ellery Theatre, The Royal Society of Victoria

The light created at the Australian Synchrotron is about a million times brighter than the Sun. This brilliant light can be used to assemble tiny machines that would fit into the eye of a needle, improve cancer detection, and develop new drugs to fight malaria.

Clockwise, from top left: Otavia, a multicellular organism from the Tonian period, Snowball Earth glaciations from the Cryogenian period, Ediacaran biota from the Ediacaran period. By Jack Jackie Pomi - Own work, CC BY-SA 4.0, **https://commons.wikimedia.org/w/index.php?curid=114669161**

Earth's oceans have hosted the evolution of complex life throughout much of the planet's history. However, the link between evolving marine organisms and their physical habitats is often not well understood, especially on the early Earth. The "Cambrian explosion" of animal life around 540 million years ago has traditionally defined the boundary between the strange environments of the early Earth and the recognisable animal ecosystems of our current Era.

More recently, the evolution of animals and other complex life has been understood to have originated much earlier, in the preceding Neoproterozoic Era (~1000-540 million years ago). From enigmatic reef systems to sandy seabeds rich with jellyfish-like 'Ediacaran biota'; these Neoproterozoic marine environments were unusual but diverse habitats. Sedimentary rocks which were deposited in ocean basins during and after this 'dawn of animal life' record the complex links between ancient environments, climate, seawater conditions and biological evolution. In particular, the oxygenation of Earth's surface during this time had profound effects on almost every aspect of biogeochemical cycling on Earth and is thought to play a major role in shaping the biosphere of our modern world.

However, the timing of the oxygenation of Earth's surface environments and its link to biological evolution remains contentious. This talk will chart the tumultuous history of reefs and redox (from "oxygen reduction," indicating a biochemical reaction involving changes to the oxidation states of organisms and their supporting substrates) through this time, presenting a series of studies showcasing exciting new perspectives on marine environmental conditions and their link to ecosystem complexity. In particular, a suite of well-preserved marine carbonates has revealed new details about oxygenation of the Earth's oceans in the Neoproterozoic and Palaeozoic that challenge the traditional view of a unidirectional rise of oxygen through Earth's history. This perspective abandons the oceans, and instead implicates the importance of the greening of the continents around 400 million years ago, suggesting that land plants are the true engineers of our modern, oxygen-rich planet.

The Vulkathuna-Gammon Ranges in South Australia – a part of the Ikara-Flinders Ranges National Park – hold the geological record of some of the earliest known barrier reefs on Earth. The Flinders Ranges are currently under consideration for UNESCO **World Heritage** status, recognising the region's rich geological record of early animal life on our planet; Ediacaran biota and their eponymous geological period take their name from the Ediacara Hills in the Ranges. This is ancient Adnyamathanha Country, co-managed with the South Australian Government since 2011.

ABOUT THE SPEAKER

Dr Ashleigh Hood is a Senior Lecturer in the School of Geography, Earth and Atmospheric Sciences at the University of Melbourne. Prior to this she was a NASA Astrobiology Institute postdoctoral scholar at Yale University in the United States.

Her research seeks to improve our understanding of Precambrian marine environments and the evolution of the early Earth's surface environments through the Neoproterozoic Era to more recent times, using multidisciplinary techniques on marine carbonates from ancient reef complexes. To do this she integrates sedimentology, stratigraphy and geochemistry in both field and lab work.

Dr Hood is the inaugural winner of the Phillip Law Postdoctoral Award in Category III: Earth Sciences, recognising excellence in scientific research by an early career researcher in the years following attainment of their doctorate from a Victorian research institution. Her Award will be conferred following her lecture by Mr Rob Gell AM, President of the Royal Society of Victoria.

This will be a hybrid event. Please register at **https://rsv.org.au/events/reefs-revolutions-redox/** to attend in person at the Royal Society of Victoria in Melbourne or via Zoom webinar anywhere. All are welcome. RSV members are prompted to enter their "promo code" to access a members' ticket.

This live presentation will be streamed online via **YouTube** with the support of the *Inspiring Victoria* program.

Optimising Healthcare for People with Musculoskeletal Conditions

Inspiring Australia Victoria

Thursday, 8th December 2022 (6:00pm–7:30pm) — In-Person and Online

While medical care brings benefits for many, there is accumulating evidence that unnecessary care is a growing problem.

Not only does it fail to provide benefit and sometimes causes harm to the recipients of that care, it also diverts scarce resources away from those that need it most.

Join Professor Rachelle Buchbinder, whose research has focused on ways of optimising care for people with arthritis and other common musculoskeletal conditions such as low back pain; landmark trials examining treatments accepted into practice before their proper evaluation; and ways of more rapidly translating new evidence into practice as soon as it emerges.

ABOUT THE SPEAKER

Professor Rachelle Buchbinder AO, FAHMS is an Australian NHMRC Investigator Fellow. She has been the Director of the Monash-Cabrini Department of Musculoskeletal Health and Clinical Epidemiology since its inception in 2001 and a Professor in the Monash University Department of Epidemiology and Preventive Medicine since 2007. She is a rheumatologist and clinical epidemiologist who combines clinical practice with research in a wide range of multidisciplinary projects relating to arthritis and musculoskeletal conditions.

Professor Buchbinder recently chaired the steering group for The Lancet Low Back Pain Series, a series of three papers published in March 2018 that drew attention to the urgent need for action to reduce the current and projected disease burden from low back pain. In particular it outlined the epidemic of low value care for low back pain across the world and identified promising solutions.

Her current broad program of work, funded through various NHMRC schemes including a program grant, partnership centre, CRE and project grants include:

- reducing inappropriate overdiagnosis and over-testing across musculoskeletal conditions
- reducing waste in the health care system and identifying more efficient alternative service delivery models
- strengthening the recently established ANZMUSC clinical trial network
- living reviews and living guidelines
- implementation of the Australian Clinical Care Standard for osteoarthritis of the knee
- Development of a decision aid for knee arthroscopy
- Investigating ways of improving imaging reports to reduce overtesting, overdiagnosis and overtreatment
- Development of a core set of outcome measures for trials of shoulder disorders
- Development of the Back Pain Burden Questionnaire and the Back Pain Misconceptions Questionnaire
- Identifying ways of supporting people with suboptimal health literacy
- Long term outcome of inflammatory arthritis in Australia

Professor Rachelle Buchbinder AO is the **2022 recipient** of the Royal Society of Victoria's Medal for Excellence in Scientific Research. She will be awarded the Medal following her lecture by Laureate Professor Peter Doherty AC, a Fellow of the Royal Society of Victoria.

This is a hybrid event. Please register at **https://rsv.org.au/events/optimising-healthcare/** to attend in person at the Royal Society of Victoria in Melbourne or via Zoom webinar from anywhere. All are welcome. RSV members are prompted to enter their "promo code" to access a members' ticket.

This live presentation will be streamed online via **YouTube** with the support of the *Inspiring Victoria* program.

AWARDS, PRIZES AND FELLOWSHIPS

RSV Research Medal Awarded to Professor Rachelle Buchbinder AO

The Council of the Royal Society of Victoria is delighted to congratulate Professor Rachelle Buchbinder AO on her selection to receive the RSV's 2022 Medal for Excellence in Scientific Research. The Research Medal recognises peak research career achievements and outstanding leadership in research by scientists working in the State of Victoria. This year the Medal is awarded in Category II – the Biomedical and Health Sciences.

A senior practicing rheumatologist and clinical epidemiologist, Professor Buchbinder conducts a broad range of multidisciplinary research projects relating to the treatment of arthritis and musculoskeletal conditions, as well as improving communication with patients and general health literacy. Her objectives include reducing over testing, over-diagnosis and waste in health care, identifying more efficient service delivery models and studying the long-term outcome of inflammatory arthritis in Australia.

She has made outstanding contributions to her field through consistent excellence and developing methodologies of great value to other researchers. Professor Buchbinder is frequently consulted as a spokesperson for evidence-based healthcare and the reduction of wasteful practices in medicine, particularly in her specialist fields. She has inspired many clinicians and scientists.

Demonstrating a vigorous commitment to building health literacy in the global community to counter the burden of disease from uninformed health behaviours, she conceptualised and co-led creation of the **Health Literacy Questionnaire** (HLQ), which has been translated into 30+ languages and has been included in national health surveys in Australia, New Zealand & Denmark. The HLQ is now one of the most widely used measures of health literacy in the world, providing a reliable and valid measurement to inform targeted interventions by clinicians and improve patient health outcomes.

Rachelle is first author (with Professor **Ian Harris**) of ***Hippocrasy: How doctors are betraying their oath***, published in October 2021, addressing waste in medicine from overdiagnosis, over treatment and low value medical care. The book is a non-fiction bestseller.

She has led or co-led 23 influential, high impact randomised controlled clinical trials published in high impact journals that have changed practice and policy, resulting in improved outcomes for patients with arthritis and other musculoskeletal conditions. A potent example is her trial and subsequent Cochrane review synthesising the results of all trials of **vertebroplasty**, definitively establishing its lack of efficacy and potential for harm, which led to the removal of public funding for vertebroplasty in Australia and a decline in use of the procedure internationally.

Her invited editorials and opinion pieces in major journals such as the New England Journal of Medicine, Lancet and BMJ have also influenced public opinion and reduced use of low-value treatments such as knee arthroscopy to treat osteoarthritis in the knee. Her trials have been cited in over 100 systematic reviews and cited to support over 60 recommendations across many musculoskeletal conditions, including gout, rheumatoid

arthritis, osteoporosis, osteoarthritis, shoulder and back pain in national and international clinical guidelines.

Professor Buchbinder's research publication track record is exemplary. Between January 2011 and December 2021, she published over 336 papers, along with editorials, commentaries and letters. Her H-index since 2017 is 95, with 95,163 citations. Her leadership of an international group of authors in 2018 led to publication of a series of papers in **The Lancet**, addressing the 50% increase in global rates of disability from low back pain since 1990, drawing attention to the sheer complexity of the condition, recommendations for treatment and further research, and a **call to action** to recognise the level of disability associated with the condition along with the social, economic, psychological and cultural factors contributing to its global prevalence. Through the group's carefully crafted engagement strategy, the series received unprecedented media coverage with all 3 articles achieving Altmetric scores in the 99th percentile. There was media coverage in at least 17 countries, particularly vigorous in the United Kingdom, Australia, and Denmark.

Lead assessors and RSV Councillors, **Dr Jane Canestra** and **Professor David Walker**, were delighted to endorse Professor Buchbinder's nomination by her colleagues **Professor Michael Abramson** and **Professor Christopher Maher**.

"Professor Buchbinder's work has been one of global leadership in medicine, identifying changes that benefit patients by reducing harms to individuals, and redirecting the health economy to more efficient treatments and areas of previously unaddressed need," said Dr Canestra. "Her impact has been extraordinary, inspirational to all researchers. She's an exceptional physician, a leader in her field and very highly regarded."

"Someone once said that a bad idea in medicine takes nearly 100 years to overturn," said Professor Walker. "Perhaps we need more Rachelle Buchbinders!"

"She has a stellar national and international reputation as a clinician who has brought a bright light to examining the worth of many clinical practices in the area of arthritis, musculoskeletal health, and management of back pain. She has initiated and managed many international trials that have provided much needed data on what is worth doing, and what is not."

RSV President Rob Gell AM was particularly impressed with the many different ways in which this year's Medallist has translated her work into real beneficial change.

"Professor Buchbinder is without question a high-performing researcher. However, we must recognise that any scholar's personal output of journal articles and hoard of related citations, while a significant indicator of prowess, is a narrow measure of the actual medical, social, environmental or economic impact of their work; which is the social compact that all public research must find some way to fulfil."

"I think it's really valuable for scholars and experts from other disciplines and sectors to take a deep dive into the work of medical researchers like Rachelle Buchbinder and apply her methods to their own domains. In Rachelle's work, we really start to understand how to translate research into practice. She has extended from her own excellent medical practice and discovery research to synthesise the complex work of other scholars, conclusively demonstrating where clinical practices are conducted without recourse to an evidence base, even causing more harm to patients than good."

RSV CEO Mike Flattley is effusive in his praise for Professor Buchbinder's "crusading" approach to healthcare optimisation. "I can think of no field of endeavour that doesn't come up hard against its own resource constraints, and we all know the medical workforce has been under remarkable pressure to sustain its response to the pandemic," he says.

"While we rightly celebrate the hot action of discoveries, cures and breakthroughs, the value of clearly demonstrating what doesn't work through robust scientific methodology is simply not given enough oxygen. She knows we have to stop wasting time, money, and years of patients' lives by continuing to support ineffectual or harmful practices, and found a way to cut through."

"This is particularly important when addressing the overall quality of life for millions of people living with musculoskeletal conditions, and the cost to societies around the globe of this burden of disease. Professor Rachelle Buchbinder's efforts are an example to all researchers because they have had genuine, global impact for patients, clinicians, other researchers, and the healthcare systems that support us all."

ABOUT THE MEDALLIST: PROFESSOR RACHELLE BUCHBINDER AO, FAHMS

Professor Rachelle Buchbinder is an Australian NHMRC Investigator Fellow. She has been the Director of the Monash-Cabrini Department of Musculoskeletal Health and Clinical Epidemiology since its inception in 2001 and a Professor in the Monash University Department of Epidemiology and Preventive Medicine since 2007. She is a rheumatologist and clinical epidemiologist who combines clinical practice with research in a wide range of multidisciplinary projects relating to arthritis and musculoskeletal conditions.

Professor Buchbinder will be presented with the 2022 RSV Medal for Excellence in Scientific Research by Laureate Professor Peter Doherty AC FRS FMedSci FRSV, following a presentation on her work to the Royal Society of Victoria on the evening of Thursday, 8th December, 2022. Full details and registrations are available at **https://rsv.org.au/events/optimising-healthcare/**.

ABOUT THE RSV MEDAL FOR EXCELLENCE IN SCIENTIFIC RESEARCH

In its Centenary year (1959), the Royal Society of Victoria instituted a Medal for Excellence in Scientific Research. It is awarded annually for research in a field that rotates through the disciplines of Biological Sciences (Non-human), Earth Sciences, Human Health or Medical Sciences and the Physical Sciences.

More details about the prize, including the criteria and the nomination process, is available at **rsv.org.au/awards-and-prizes/research-medal/**

Past winners of the RSV Medal for Excellence in Scientific Research can be viewed at **rsv.org.au/awards-and-prizes/rsv-medal-winners/**

Winners of the Bruce Piasecki and Andrea Masters Award for Writing on Social Change

This new annual award recognises dynamic non-fiction writers between 18 and 40 years of age in the Australasia/ Oceania Region who aim to ignite positive social change through published work on any theme exploring key business and society issues. Themes include, but are not limited to, climate change, racial/gender equality, sustainability, innovation, and new approaches to lessen war and social stresses.

This year's winners come from diverse backgrounds, but each brings a passion for getting their message out to as wide an audience as possible.

Dr Anika Molesworth is a farmer, scientist and storyteller. She is widely recognised for her work in agriculture and food systems and generating climate change awareness. She is passionate about the effects of climate change on food production and hence the need for food producers to think differently about their processes. The prize is awarded for her book **Our Sunburnt Country** and her program of future work in this area. On receiving news of her award Anika said:

> **I am thrilled to be recognised by The Royal Societies of Australia and New Zealand in the Bruce Piasecki and Andrea Masters Writing Prize for my writing on climate change, food security and farming systems. With the world facing a multiplicity of challenges, it is critical that we communicate and engage with these issues so that they may be addressed and overcome quickly. It is a great honour to win this Award and it has given me a boost of confidence and encouragement for future writing endeavours. This Prize will go towards the creation of more books and communications to connect people with how climate change is impacting farmers and the food they produce, and the role we all play in implementing climate change solutions.**

Dr Niraj Lal is a physicist and science communicator who delights in explaining natural phenomena to everyone, including our youngest. He is both an academic and popular writer and a presenter on TV, radio and other media. The prize is awarded for his comprehensive science communication work and his program of social engagement for the future. He says:

> **It's a real honour to be a joint recipient of this prize. I'm thankful for my teachers, supervisors, and mentors for teaching me to write, and for the generosity of Bruce Piasecki and Andrea Masters in establishing the award. Social change is a challenging goal – to target, achieve and measure, and recognition like this is wonderful and encouraging.**
>
> **For me, the real value of awards like this is in their ability to support work to continue; which is my intent – with the energy transition, communicating the wonders of nature, and supporting social change through freedom of information. My particular focus remains communicating beyond those already in the know and those on the same page. I'm donating 10% of the prize money to the Freedom of the Press Foundation and Digital Rights Watch Australia to support writing for social change with freedom from surveillance.**

Each wins a half share of the AU$10,000 prize money generously sponsored by Dr Bruce Piasecki, the President and founder of the AHC Group Inc and founder of the Creative Force Foundation Inc (US), and a New York Times best-selling author of multiple titles, and Sebastian Vanderzeil, a Brisbane investor specialising in deep decarbonisation, climate resilient infrastructure and sustainable agriculture.

The award is offered with the kind support of the **Royal Society of New Zealand Te Apārangi**.

Phillip Law Postdoctoral Award 2022: Dr Ashleigh Hood - 'Proof of Life'

"The origin and evolution of life on Earth is intimately tied to environmental conditions on the Earth's surface. I am interested in the impact of large changes in the Earth system, including climate change and the oxygenation of the atmosphere-ocean system in driving the radiation and extinction of life."

The Royal Society of Victoria is delighted to congratulate **Dr Ashleigh Hood**, the 2022 recipient of the Phillip Law Postdoctoral Award, and the first to be awarded in the new category of Earth Sciences. Her research focuses on the co-evolution of life and planetary surface conditions over the last several billion years of Earth's history.

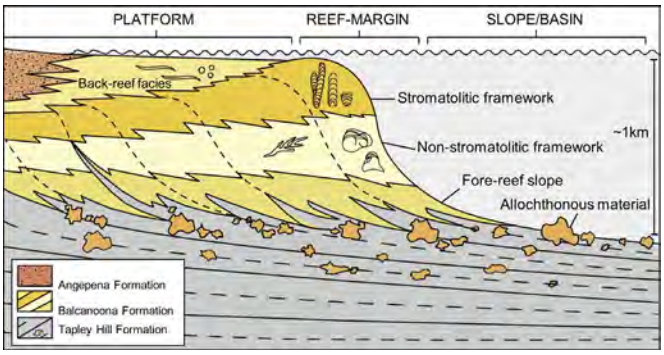
Assessment panel member Professor Andy Gleadow was impressed by Ashleigh's "outstanding science of major international importance and high impact, providing deep insights into the evolution of the Precambrian Earth and its life."

Ashleigh attained her PhD in geology from the University of Melbourne in 2014, working in the (then) School of Earth Sciences under the supervision of Associate Professor Malcolm Wallace to understand the ocean chemistry and marine carbonate mineralogy of seas in the Neoproterozoic Era.

Her first postdoctoral placement was with the NASA Astrobiology Institute at Yale University as an American Australian Association Postdoctoral Fellow and NASA Astrobiology Institute Postdoctoral Fellow. Here she developed a practical course in Sedimentary Petrography, organised and co-led an 18-day undergraduate field geology course at Great Slave Lake in Canada, and continued her research into one of the most fundamental questions in science – how did the Earth become habitable for life?

This question requires an interdisciplinary response, and Ashleigh has developed excellent collaborative networks while at Yale University, which she has since deepened and extended. Her research collaborations encompass analysis of metal isotopes, geochronology, geochemistry, astrobiology, sedimentology, computer modelling and fieldwork on the continents of Australia, Africa and North America.

"One obstacle in developing this history is the reliance on large, bulk-rock geochemical databases with minimal geological context, and a lack of research on shallow marine systems, the principal environments where complex life evolved. My work addresses this critical gap in our understanding of how these marine settings remained habitable to life throughout Earth's history using new, interdisciplinary work. I use marine sediments, including reef systems, preserved in the geological record as windows into ancient ecosystems and seawater conditions."



Schematic diagram of a carbonate platform of the Oodnaminta Reef Complex (Flinders Ranges), showing reef facies distribution.[1]

1 van Smeerdijk Hood, A., & Wallace, M. W. (2012). Synsedimentary diagenesis in a Cryogenian reef complex: Ubiquitous marine dolomite precipitation. Sedimentary Geology, 255-256, 56–71. https://doi.org/10.1016/J.SEDGEO.2012.02.004

Ashleigh returned to Australia and her alma mater the University of Melbourne in 2017, where she continues her work with Victorian colleagues while maintaining global collaborations at Yale University, Texas A&M University, The University of Chicago, the University of Edinburgh, Harvard University, Pennsylvania State University, the University of Nevada, McGill University and the Geological Surveys of South Australia, the Northern Territory and Namibia. Now based at Melbourne's reconstituted School of Geography, Earth and Atmospheric Sciences as an ARC DECRA Fellow, she was appointed under the University's Driving Research Momentum strategy and recently promoted to Senior Lecturer in Sedimentology. In balance with her research work, she undertakes a significant teaching load, in addition to PhD and Honours student supervision.

Assessment panellist Professor Peter Betts described Ashleigh's work as "outstanding."

"She has lots of awards, locally and internationally, displays leadership through conference and symposium organisation, editorial roles in significant journals and committee work at the institutional and national level. Her h-index is 19 from 36 papers. This is excellent!"

Beyond research impact, the Award recognises Ashleigh's commitment to science outreach, and understanding the conservation significance of some of Australia's most remarkable geological and ecological areas. Led by Ashleigh and Malcolm Wallace, the Sedimentology group's research on the Cryogenian Balcanoona Reef in the Northern Flinders Ranges has led to increased community interest and conservation efforts for the Vulkathunha-Gammon Ranges National Park and the Arkaroola Conservation Area. The discovery and documentation of these ancient reefs – among the oldest in the world – has been fundamental to the area's nomination for UNESCO World Heritage listing.

Vulkathunha-Gammon Ranges in the Ikara-Flinders Ranges National Park, South Australia

Her group's work also has industrial application. Through uncovering new insights to how oxygen levels in seawater through different eras have powerfully influenced the distribution of base metals like iron and zinc in sedimentary systems, their efforts are of direct benefit to the efficiency of Australian minerals exploration.

Finally, Ashleigh's research into the behaviours of past climates, and the changes wrought on these by changing atmospheric chemistry, helpfully maps out changes in dissolved oxygen levels in seawater over geological time. Periods of increased atmospheric CO_2 and a warming climate correlate with the dramatic shifts in the Earth system to effect widespread ocean acidification, hypoxia – low oxygen – and anoxia – totally depleted oxygen – linked to major extinction events. The lessons of this history are critical to addressing current and future changes to our environment and their impacts on our ecosystems.

Please join us in congratulating Dr Ashleigh Hood on her achievements. We also convey our gratitude to our assessment panellists for their challenging work in weighing the merits of a very competitive field of entries this year: **Emeritus Professor Andrew Gleadow, Professor Peter Betts, Dr Bill Birch AM** and **Mr Rob Gell AM**. Our thanks to you all.

Dr Hood will be presenting a public lecture on her work to the Royal Society of Victoria on Thursday, 1 December at 6:00pm titled "**Reefs, Revolutions & Redox at the Dawn of Animal Life**," where she will be presented with the Royal Society of Victoria's 2022 Phillip Law Postdoctoral Award and a prize of $3,000.

ABOUT THE PHILLIP LAW POSTDOCTORAL AWARD

The **Phillip Law Postdoctoral Award** was made possible by the generous bequest to the Society from the estate of the late **Dr Phillip Garth Law AC** (1912-2010), a leader of the Australian National Antarctic Research Expeditions that established our nation's bases in the southernmost continent, and a former President of the Royal Society of Victoria. The award is for excellence in scientific research by an early career researcher within seven years of attaining a PhD from a Victorian research institution. Allowances are made for career interruptions due to parenting obligations.

Next year, the Award will be made in Category III: Biological Sciences (non-human). Applications will open on 1 June, 2023.

TRANSACTIONS

FEATURES AND ARTICLES

Too Late to Save: The Extinct Australian Species

By Scott Reddiex MRSV

As part of this year's National Science Week, the Royal Society of Victoria partnered with the Victorian Parliamentarians for STEM to deliver the *STEM and Society* series of presentations. In the third of these presentations, Caring for the Rare, experts from Victorian institutions (Museums Victoria, Royal Botanic Gardens Victoria and Zoos Victoria) discussed our state's threatened species, and the important work they are doing to keep these species from extinction.

You might be familiar with some of these threatened animals, like the **Mountain Pygmy-possum**, the **Eastern Barred Bandicoot**, the **Baw Baw Frog**, or the **Helmeted Honeyeater.** They are accompanied by threatened plant species like the **Mountain Swainson-Pea**, the **Stony Bush-pea**, or the plant that sounds like it needs its own superhero film: **The Phantom Wattle**.

The Helmeted Honeyeater, listed as critically endangered in Victoria.

These are just a handful of the hundreds of species unique to this continent that are currently fighting for their survival, and urgent action is needed to ensure that they continue to contribute to Australia's biodiversity.

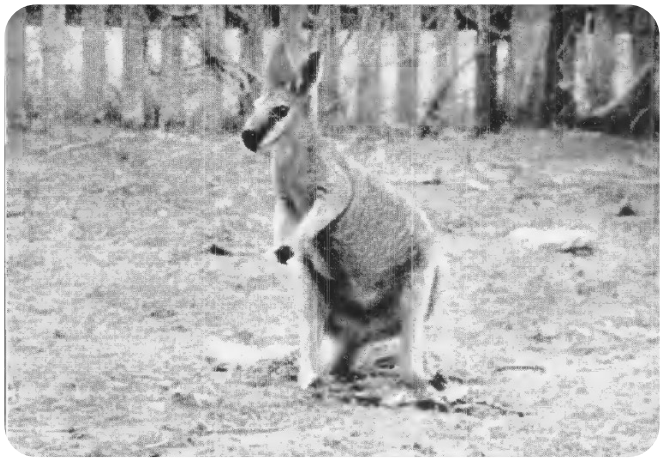
CONFINED TO HISTORY

However, for too many Australian native species, it is already too late. Since the arrival of Europeans in 1788, more than 100 species endemic to Australia have been documented as becoming extinct. Plants, fish, frogs, reptiles, birds, mammals, invertebrates, and even protists have all been eradicated from existence in the last 234 years[1]. It is almost impossible to determine the real/total number of species driven to extinction: without recorded observations, we cannot determine what existed.

THE IMPORTANCE OF REMEMBRANCE

While the poster child for extinct Australian species is the Tasmanian tiger, there are many others you might be less familiar with. The value of learning about these species is understanding that the fate of the thylacine *was not an isolated incident in Australia's recent history* – rather, it represents a story repeated so often that it lacks the shocking impact it should have. To compare with a different story that regularly draws greater national focus: every 4 years Australia has sent athletes to compete at the Olympic Games, while every 2.34 years Australia has completely removed another species from existence.

Toolache Wallaby (Notamacropus greyi)



A female Toolache Wallaby (N. greyi) in Transactions and Proceedings of the Royal Society of South Australia, Vol. LI. (1927)

The Toolache Wallaby (also referred to as Grey's Wallaby) was described by the naturalist George Robert Waterhouse in his 1846 book *A Natural History of the Mammalia*.

It was a reportedly elegant animal, which pre-disposed it to being hunted by Europeans for its pelt, and measured around 1.5m from nose to tail. Dr Hedley H. Finlayson of the South Australian Museum wrote of its appearance in 1927, "*The early settlers were ill-disposed to see beauty many of the native animals, but a partial exception was made of the Toolach, which is very generally spoken of with some approach to admiration, even by those who have played a leading part in its destruction.*"[2]

Originally inhabiting swampy grassland of south-eastern South Australia, its numbers dwindled following the arrival of Europeans, who hunted the Toolache Wallaby for its pelt, destroyed its habitat, and brought the invasive European fox (*Vulpes vulpes*) to the continent.

A last-minute attempt to save the species is documented in the *Transactions and Proceedings of the Royal Society of South Australia*. Zoologist Hedley H. Finlayson wrote that, by 1923, the only surviving population "*was a small band of perhaps fourteen individuals, located on the south end of Konetta sheep run, some twenty-six miles south-east of Robe.*"

The conservation effort, led by Professor Frederic Wood Jones, had aimed to capture and relocate the animals to a sanctuary on Kangaroo Island. Unfortunately, this haphazard attempt instead resulted in the deaths of most of the wallabies they were trying to save. The last known Toolache Wallaby died in captivity in 1939.[3,4]

Paradise Parrot (Psephotellus pulcherrimus)

The Paradise Parrot, illustrated by H.C. Richter in *The Birds of Australia, Vol. V* by John Gould.

Described by ornithologist John Gould in the fifth volume of *The Birds of Australia 1848*, the Paradise Parrot (also known as the 'Beautiful Parakeet') was originally found in the grassy woodlands along the NSW-Queensland border. As with all of Gould's ornithological descriptions, its likeness was immortalised through illustration by Henry C. Richter.[5]

Gould noted that the birds mostly ate seeds 'from the grasses and other plants growing on the plains' – which he of course confirmed by killing them and cutting open their stomachs.

Between 1890 and 1900, the Paradise Parrot population declined significantly, thought to be the result of a number of factors: death of birds due to hunting/trapping (for aviaries, or to taxidermy and display) or predation by feral cats, and the destruction of habitat, through clearing of native grasses, overgrazing, and introduction of invasive species (such as the Prickly Pear Opuntia).[6]

On the brink of extinction, in the 1920s it was determined that the birds survived as a small population near the town of Gayndah, Queensland. A conservation effort was launched by amateur ornithologist Alec H. Chisholm, however it proved too late, with the last confirmed sightings of the Paradise Parrot made in 1927.[7]

The story of the Paradise Parrot is captured in Penny Olson's book *Glimpses of Paradise: The Quest for the Beautiful Parakeet* (Publisher: National Library of Australia, ISBN: 9780642276520

In addition to the Paradise Parrot, John Gould documented more than 32 native Australian bird species. In her 2012 book, *John Gould's Extinct and Endangered Birds* (Publisher: National Library of Australia, ISBN: 9780642277657), Sue Taylor details those described by Gould that have since become endangered or extinct.

Victorian Grassland Earless Dragon (Tympanocryptis pinguicolla)

Illustration of the Victorian Grassland Earless Dragon (*Tympanocryptis pinguicolla*) by John James Wild. Published in *The Prodromus of the Zoology of Victoria* (1888) by former RSV President Frederick McCoy

The Victorian Grassland Earless Dragon is currently MIA, with the last confirmed sighting of the lizard made in 1969. With more than 50 years since it was last observed, it is likely extinct – however the hunt for any survivors is ongoing.[8]

Its story highlights the difficulty in monitoring the status of a species. To paraphrase a famous thought experiment: if a lizard crawls through a forest floor, yet no-one is around to see it, how do we know it still exists?

It also demonstrates the significance of taxonomy in determining extinction: it was thought that populations of *T. pinguicolla* persisted in other parts of the country, however all of these have subsequently determined to be distinct species.[9]

Nevertheless, the quest to find the dragon continues. Zoos Victoria have been hunting for any signs of the lizard since 2017, as part of their *Fighting Extinction* program. Details of the hunt can be found at **zoo.org.au/fighting-extinction/local-threatened-species/grassland-earless-dragon-victorian-species**, and any potential dragon sightings can be reported at **zoo.org.au/dragonsearch**.

Yallara/Lesser Bilby (Macrotis leucura)

The Yallara, or Lesser Bilby, in Thomas, O. (1888). Catalogue of the Marsupialia and Monotremata in the Collection of the British Museum (Natural History).

The Yallara (also known by the unfortunately prophetic name of 'Lesser Bilby') was one of only two species of bilby, with the other being the Greater Bilby (*Macrotis lagotis*) – which is itself currently facing extinction.

Known by the Wangkangurru people as "Yallara", it was smaller than its larger relative, and surprisingly aggressive. It inhabited the Great Sandy and Gibson deserts of Central Australia, with zoologist Hedley H. Finlayson noting in 1935 that the population was 'plentiful' near Cooncherie (north-eastern South Australia).[10]

Given its relatively isolated habitat and nocturnal nature, its decline is attributed to the impact of introduced feral cats, foxes, and rabbits. The most recent physical evidence of the species is a skull found in the Simpson Desert in 1967, however it was determined that the animal had died ~15 years prior. Oral history of local indigenous communities places the last known sighting in the 1950s-1960s.[11]

Is there a particular extinct species of plant, fish, frog, reptile, bird, mammal, invertebrate, or protist whose story should be told? Are you involved in a citizen science project to conserve Australia's unique biodiversity? Have you heard about the work to 'de-extinct' the thylacine? We'd love to hear your thoughts! Send us a letter at **editor@sciencevictoria.org.au**.

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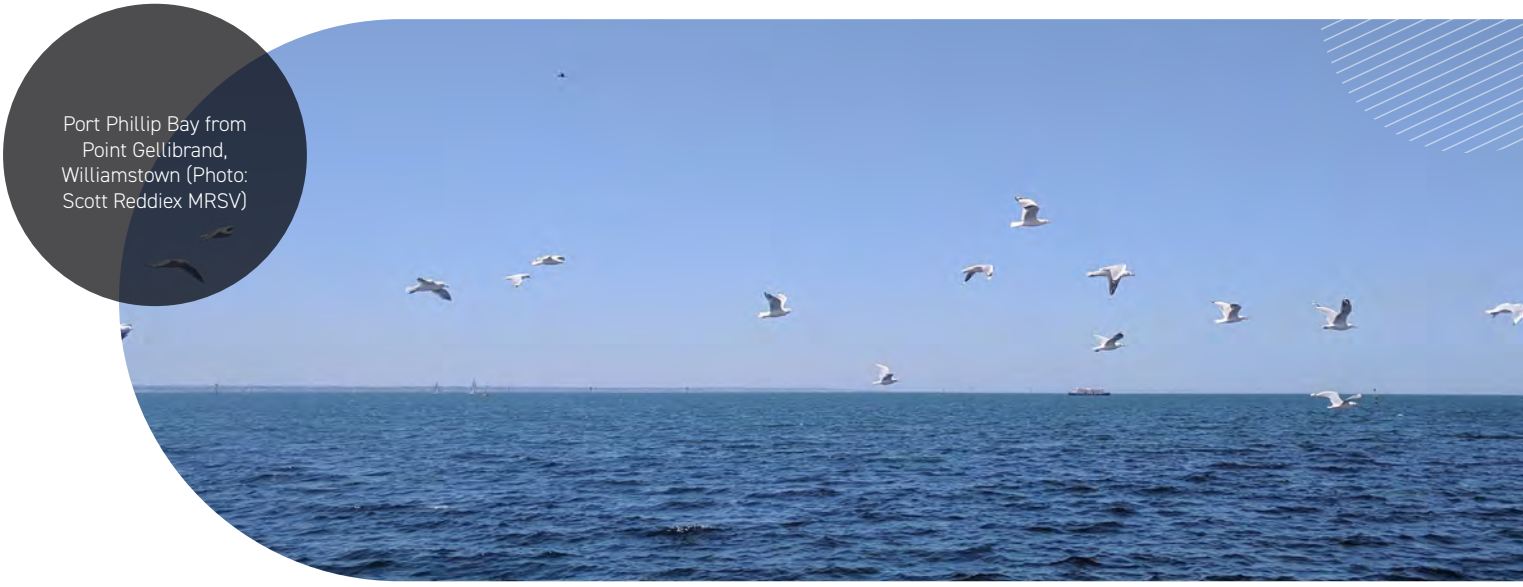


Port Phillip Bay from Point Gellibrand, Williamstown (Photo: Scott Reddiex MRSV)

What's in the Water?

By Rob Gell AM FRGS

Adapted from a presentation at the Bay Environment Forum, 5th of October 2022

Part 2

Haven't read Part 1? Find it in the October 2022 edition of Science Victoria, or read online at ***rsv.org.au/whats-in-the-water-part-one/***

Currently on **change.org** you'll find a petition posted by John Gemmil from the **Clean Ocean Foundation**. The Clean Ocean Foundation is a group that I can recommend.

The petition is called 'Save the Weedy Seadragon. Modernise Victoria's water policy to allow use of recycled water'[1].

John's petition says:

> **Every day, around Victoria's coastline we dump a toxic cocktail of pollutants that includes microplastics, harmful chemicals, heavy metals and germs that can have catastrophic impacts on marine life and human beings. We are killing our oceans and risking our health.**

This is not a new idea of course. As a junior Liberal party minister, Greg Hunt, the former member for Flinders, convinced Prime Minister John Howard to proclaim that all ocean outfalls should be closed by 2025.

The real question is, can the human species continue to consider that we can continue to dump our personal waste into the sea - for how much longer can this be a realistic proposition, given what we know about the condition of our oceans?

Melbourne Sewerage Strategy 2018 states:

> **"...there are also many emerging contaminants that are either starting to appear in our sewage for the first time, or that we are only now realising can have negative impacts on our environment and public health. These include things like micro-plastics, pharmaceuticals and a range of other chemicals used for household or industrial applications. Some of these are removed at some or all of our treatment plants, but some are not."**

1 Save the Weedy Seadragon. Modernise Victoria's water policy to allow use of recycled water. Change.org

I need to mention plastic here. Plastic pollution is currently one of Victoria's largest threats to waterway health, globally and certainly in Port Phillip Bay.

The wonderful people at **Port Phillip EcoCentre** with the Port Phillip Baykeeper, Neil Blake OAM have studied microplastics in the bay.

The **Clean Bay Blueprint** was a three-year litter study conducted between July 2017 and June 2020; collaborating with over 50 organisations in total: DELWP, Yarra Riverkeeper Association, Werribee River Association, Beach Patrol Australia, and many others and funded by the Victorian Government's Port Phillip Bay Fund.

5.5 years' worth of data in total - the first of its kind, and we should ask, "why?".

The study was of microplastics smaller than 5mm - broken-up from larger items as a contribution to the **Port Phillip Bay Environmental Study**.

The study found that over 2.5 billion litter items flow into Port Phillip Bay annually from the surface waters of the Yarra and the Maribyrnong. Over 2 billion of these items, 85%, are microplastics.

It's mostly hard plastic, also polystyrene and soft plastics, things called nurdles[2], pre-production plastic pellets that are spilled from ships, spilt around factories; they're a global problem; there are bottle caps, straws, twine, and cigarette butts.

A number of Port Phillip Bay studies have shown that the nitrogen load to the bay must be managed to prevent algal blooms - eutrophication; the sort of thing that occurs in the Gippsland Lakes regularly.

The **2018 Melbourne Water Corporation Sewerage Strategy** identifies that there is a risk that Port Phillip Bay might not be able to assimilate nutrient loads some time in the future. Our population is growing, water consumption volumes are increasing as are discharge volumes. Melbourne's waste volume is expected to grow as our population grows.

Melbourne Water does produce 40 GL of 'recycled water' from the Western Treatment Plant at Werribee, but still we throw 140 GL into Port Phillip Bay. How about we clean all that water up and use it better?

The Melbourne Sewerage Strategy[3] says:

> **The largest single volume of recycled water is available at the Eastern Treatment Plant, where around 120 billion litres of Class A water (120 GL) produced each year, with the majority of this very high-quality water being discharged into Bass Strait.**

The Federal Government is searching for an additional 450 GL of environmental flows for the Murray Darling Basin. Stressed Victorian Rivers like the Loddon, Campaspe and the Goulburn need more water. Because we take water from the Yarra catchment for our water supply, the Yarra comes under stress and that will increase as our climate continues to warm.

The Melbourne Sewerage Strategy[4] of 2018 also acknowledges that:

> **Increasing treated water quality through greater levels of treatment can provide an improvement to the receiving environment, however there are limits to what each technology can achieve.**
>
> **Alternative options include increasing diversion of treated water from the water environment to a beneficial use, or managing the treated water so that it enhances a receiving environment.**
>
> **An example might include more highly treating, and/or providing storage of water so that it can be used for environmental flows in a beneficial manner, or diversion to agriculture to support food security and potentially reduce extractions from the local waterway.**

2 Plastic Resin Pellets
3 Melbourne Sewerage Strategy, page 69
4 Melbourne Sewerage Strategy, page 58

The Eastern Treatment Plant, located in the suburb of Bangholme, processes ~330 million litres of Melbourne's sewage every day.

I've restricted my comments here to water quality issues. Aquatic systems, by their nature, distribute pollutants widely and effectively. Port Phillip Bay is currently impacted by a range of introduced pollutants and its long-term viability needs to be reassessed. New standards and technologies should be reconsidered, and system-wide thinking applied to the management of our limited water resources; particularly in a time of climate change and population growth.

The matter that I have not addressed is that of the management of our coastlines. Changes in global climate have increased sea levels almost 20 cm over the past 100 years, with about half of that increase occurring since 1993. They could rise another 30 cm by 2050.

If I can remind you that waves in deep water have more energy than shallow water waves, you can see that with increased storms likely we now have a significant problem to reassess. The long-term protection of legacy coastal structures will be very costly and unlikely to be successful.

Coupled with what we've learned from the recent national **State of the Environment Report**, our most valued and productive environments, our coasts, need proactive collaborations and governance to protect and sustain their natural, cultural, and social richness[5]. There are numerous ongoing challenges for the conservation, inclusive management, and sustainable use of coastal assets.

Business as usual will **not** be the solution - we need to develop a 'lust' for change in our thinking.

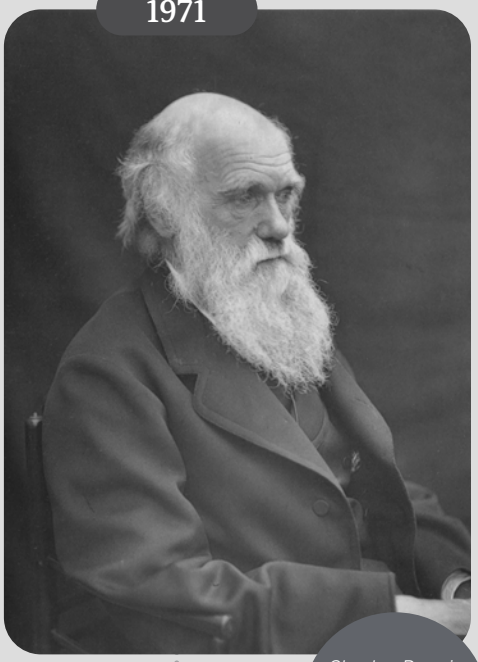
We welcome your letters and responses:
president@rsv.org.au

5 Australia State of the Environment 2021: Coasts

FROM THE ARCHIVES

Compiled by Scott Reddiex MRSV

1971



Charles Darwin (1878), author of On the Origin of Species

Source: Public Domain

SCIENCE AND PHILOSOPHY

In the 1971 edition of the *Proceedings of the Royal Society of Victoria*, American zoologist Professor Richard D. Alexander penned a piece entitled *The Search for an Evolutionary Philosophy of Man*. The 21-page article was an expansion to a presentation made to the society in 1969, and discusses what he deems an unprecedented urgency and widespread anxiety about the explanations for human behaviour.

Prof. Alexander sets the stage by opening with a quote from palaeontologist Professor G. G. Simpson, which states that all attempts to answer the question 'What is man?' prior to the publishing of Darwin's *On the Origin of Species* in 1859 "*are worthless and that we will be better off if we ignore them completely*". The context given for this statement is that "*that whatever we may think or believe about man must be consistent with what we know about evolution and man's history*", and that this was not possible before we had an understanding of evolution by means of natural selection.

The question is posed: how much of our own behaviour is a product of civilization, and how much is instead a great deal older and more complex than this, and '*perfectly reasonable or understandable in terms of our evolutionary history*'?

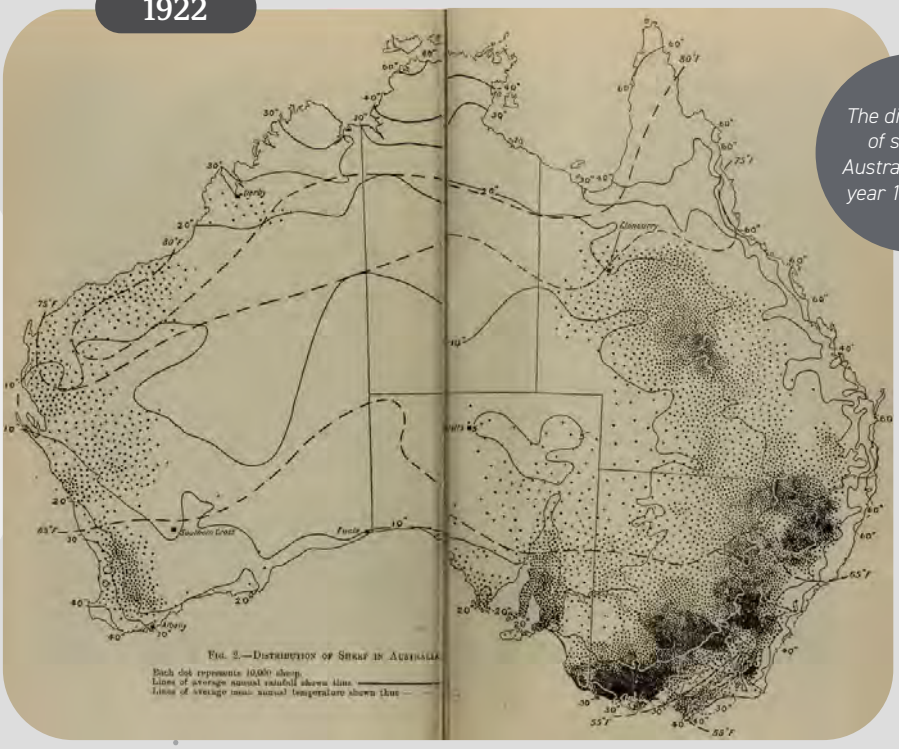
He breaks his piece down into sections, discussing facts and theories relating to evolution, Natural Selection and Reproductive Competition, Instinct and Learning, Selection and Altruism, Reproductive Selfishness and Overpopulation, and Aggression. Prof. Alexander's article is a stimulating read and well referenced, and is particularly interesting when the questions raised are considered in the context of the present day.

Reference:

Alexander, Richard D. 1971. "The search for an evolutionary philosophy of man." *Proceedings of the Royal Society of Victoria. New series* 84(1), 99–119.

The full-length article by Professor Alexander can be viewed for free online at **https://www.biodiversitylibrary.org/partpdf/302792**.

1922



The distribution of sheep in Australia, for the year 1918-1919.

Source: *Proceedings of the Royal Society of Victoria (New Series), Volume 34, 1922*

COUNTING SHEEP (AND WHEAT, AND CATTLE)

The weight of audience members' eyelids was surely tested on the 10th of November 1921, as Dr A. E. V. Richardson presented a paper that included the total numbers of sheep in Australia through the recent years. The paper, entitled *Present and Probable Future Distribution of Wheat, Sheep and Cattle in Australia*, was written by R. G. Thomas from the Victorian Department of Agriculture, and mapped the distribution of the units of these three primary industries around the country.

Thomas writes that for the year 1918-1919, "*the sheep population of Australia numbered some 85,194,503, and of these New South Wales claims 37,381,874, Queensland 18,220,985, Victoria 15,773,902, Western Australia 7,183,747, South Australia 6,625,184, and Northern Territory 8,811 head. This number represents approximately 16 per cent of the world's sheep, emphasising Australia's position as a leading sheep and wool-producing country.*"

He goes on to map the sheep, cattle, and wheat crop census data, with consideration of rainfall and temperature, concluding that "*we can see room for a tremendous increase in Australia's population, her stock and agricultural industries, before there is need to seriously consider how we are to support her excess population in that arid interior of which we are frequently reminded.*"

Dr Arnold E. V. Richardson, who presented the paper to the RSV, was an agricultural scientist and a leading member of Australia's scientific community during the first half of 20th century. In addition to being the CEO of CSIR (the predecessor of the CSIRO), his CV includes inaugural Dean of the University of Melbourne's Faculty of Agriculture, Director of the Waite Agricultural Research Institute, inaugural President of the Australian Institute of Agricultural Science, and twice President of the Australian and New Zealand Association for the Advancement of Science.

1869

Illustrations of Gibbons' water samples under the microscope.

Source: Transactions and Proceedings of the Royal Society of Victoria, Volume X (1874)

AIR AND WATER POISONING IN MELBOURNE, PART I: IT WAS NOT GOLD THAT LINED THE STREETS...

"A stink, as I have long since declared, is Nature's monitor, that something noxious requires removal..."

In November and December of 1869, William Sydney Gibbons presented to the Royal Society of Victoria on the subject of *Air and Water Poisoning in Melbourne*. The series of presentations addressed two matters: 1. the current state and treatment of sewage in Melbourne, and 2. the possible pollution of the Yan Yean Reservoir.

It might be difficult (and unpleasant) to visualise, but during this time in Melbourne's history there was no co-ordinated system for managing the city's sewage. In 1868, "*the city health officer (to whose activity we are already so much indebted) ... found that in many places, excrementitious matters were systematically discharged into the street channels*". The City Health Committee therefore asked Gibbons to investigate and report on the current state of behaviours regarding these 'excrementitious matters', solutions to the problems, and the difficulties they may encounter.

As part of his investigations, he took samples from seven locations around Melbourne, including multiple sites in the CBD, a "*gully in Fitzroy Gardens, draining Albert-street and Victoria Parade*", and the Yan Yean reservoir (for a 'clean water' control). Gibbons describes his macro- and microscopic analysis of these samples in putrid detail, accompanied by hand-drawn depictions of what he saw under the microscope.

While the idea of discharging human waste into gutters is a disgusting one, Gibbons acknowledged that it is the lesser evil when compared to "*storing it in open pits adjacent to our dwellings, there to ferment and to set other and more offensive matters fermenting; and, as the change proceeds, to eat its way through the walls of the puts and saturate the ground under our parlour and kitchen floors, and to kill us with typhus, cholera, diphtheria, and a host of other diseases, not counting the intolerable nuisance.*"

This comprehension of the risk of disease followed lessons learned in the previous decade: in 1854, the English physician John Snow had famously linked the cholera outbreak in Soho, London, to the Broad Street water pump, which served as a foundation for modern epidemiology.

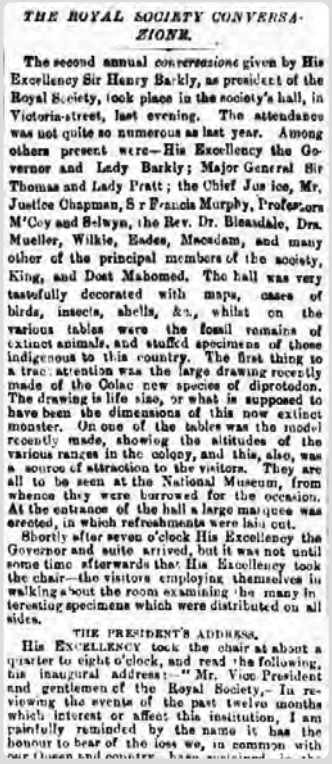
Cleaning up Melbourne's act was slow. It would take the nickname "Smellbourne", many typhoid epidemics, a Royal Commission into public health in 1888, and the establishment of the *Melbourne and Metropolitan Board of Works* in 1890 before work could finally begin on building a sewerage system, draining the city's sewage first to the Spotswood Pumping Station, and then finally onto Werribee Farm.

The **Spotswood Pumping Station** was once the heart of Melbourne's sewerage system. As the lowest point in the city, all waste flowed there by gravity, before steam engines then pumped 36 million litres of raw sewage every day out to Werribee Farm (now known as the Western Treatment Plant).

A surprisingly grand example of Second Empire style architecture, the Spotswood Pumping Station is now under the care of Museums Victoria. **You can book a tour today** to learn more about the history of the sewerage system that saved the lives of thousands.

Newspaper Clipping: The Royal Society Conversazione of 1862

Printed in *The Argus*, Tuesday 29 April 1862.



THE ROYAL SOCIETY CONVERSAZIONE.

The second annual *conversazione* given by His Excellency Sir Henry Barkly, as president of the Royal Society, took place in the society's hall, in Victoria-street, last evening. The attendance was not quite so numerous as last year. Among others present were—His Excellency the Governor and Lady Barkly; Major General Sir Thomas and Lady Pratt; the Chief Justice, Mr. Justice Chapman, Sir Francis Murphy, Professors M'Coy and Selwyn, the Rev. Dr. Bleasdale, Drs. Mueller, Wilkie, Eades, Macadam, and many other of the principal members of the society, King, and Dost Mahomed. The hall was very tastefully decorated with maps, cases of birds, insects, shells, &c., whilst on the various tables were the fossil remains of extinct animals, and stuffed specimens of those indigenous to this country. The first thing to attract attention was the large drawing recently made of the Colac new species of diprotodon. The drawing is life size, or what is supposed to have been the dimensions of this now extinct monster. On one of the tables was the model recently made, showing the altitudes of the various ranges in the colony, and this, also, was a source of attraction to the visitors. They are all to be seen at the National Museum, from whence they were borrowed for the occasion. At the entrance of the hall a large marquee was erected, in which refreshments were laid out.

Shortly after seven o'clock His Excellency the Governor and suite arrived, but it was not until some time afterwards that His Excellency took the chair—the visitors employing themselves in walking about the room examining the many interesting specimens which were distributed on all sides.

THE PRESIDENT'S ADDRESS.

His EXCELLENCY took the chair at about a quarter to eight o'clock, and read the following his inaugural address:—" Mr. Vice President and gentlemen of the Royal Society,—In reviewing the events of the past twelve months which interest or affect this institution, I am painfully reminded by the name it has the honour to bear of the loss we, in common with

"The second annual conversazione given by His Excellency Sir Henry Barkly, as President of the Royal Society, took place in the society's hall, in Victoria Street, last evening.

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INSPIRING VICTORIA

Inspiring AUSTRALIA Victoria

Parliament Presents the STEM and Society series

Parliament of Victoria

by Dr Catriona Nguyen-Robertson MRSV

The STEM and Society series of panel discussions highlights the game-changing work being undertaken by various Victorian scientists and researchers. This year, the series had a particular focus on biodiversity conservation and recovery with Bill Bainbridge facilitating discussions with leaders in this area to share their perspectives on protecting Victoria's biodiversity. Presented as a partnership between the Parliament of Victoria, the Royal Society of Victoria, and Victorian Parliamentarians for STEM, and held in the chambers at Parliament House, the grandeur added gravitas to these conversations.

1. *A Conservation Conversation,* pg 38
2. *Science on Country*, pg 41
3. *Caring for the Rare*, pg 44

A Conservation Conversation

L-R: Prof Brendan Wintle, Judith Downes, session host Bill Bainbridge, Fern Hames, Damien Bell

*This article follows a **panel discussion on World Environment Day** with Fern Hames, Director of the Arthur Rylah Institute for Environmental Research; Damein Bell, Board member and former CEO of Gunditj Mirring Traditional Owners Aboriginal Corporation; Judith Downes, Bank Australia Chair; and Professor Brendan Wintle, Conservation Ecologist and former Director of the Threatened Species Recovery Hub.*

This continent is home to more than one million known species of plants and animals, with many endemic – found nowhere else in the world.

Victoria's biodiversity provides the foundation for healthy ecosystems. Biodiversity is essential for the processes that support all life on Earth, including humans. There would be no clean air without forests, no agriculture without pollinators, no protection of coastlines without corals and mangroves, and we would be left without many of our medicines without plants. Nature is invaluable.

But it continues to decline due to amplifying threats. *The State of the Environment 2018* report states that a third of Victoria's native species and entire ecological communities are on the brink of collapse.

Since colonisation, there have been drastic changes to the Australian landscape. Over the past 200 years, species have been wiped off the planet because of various threats. Australia has lost 34 mammals, which is about the same number as the rest of the world combined. We have the worst rate of mammal extinction, but also have lost many birds, frogs, insects, and plants. At least 110 species have gone extinct – which is likely an underestimate. Australia has lost more species to extinction than any other continent.

And the rate of loss has not slowed. Last year, **1991 species** were listed as at risk of extinction in Victoria alone.

'It's a shockingly big problem. We've lost a lot,' says Damein.

Damein Bell FRSV

WHAT DRIVES SPECIES LOSS?

The continent's initial wave of extinctions following colonisation surged due to hunting, rapid urban and agricultural expansion as well as the introduction of feral animals. Even now, ongoing threats continue to

place our ecosystems under severe pressure and at risk of further decline or extinction.

Ongoing land clearing leads to habitat loss and fragmentation. Two thirds of Victoria is private land, and of this, 79% has been cleared of native vegetation. Victoria has the greatest native vegetation cleared proportional to land mass of any Australian states.

Changes to fire frequency and intensity also contributes to the direct loss of species and habitat destruction. The Black Summer fires dramatically increased the scale of immediate environmental risk with nearly 10 million hectares of the eastern states torched after years of prolonged drought. Indeed, climate change is considered as a threat multiplier – as temperatures continue to rise and we get more heatwaves, droughts and bushfires, threatened species will be in an even worse place than they are now.

Tien Kieu MP with Rob Gell AM

Judith Downes FRSV with Bill Bainbridge

Alongside land clearing, invasive plant and animal species pose the greatest risk. Invasive weeds have spread across the continent, replacing endemic species and choking the land. There are now more non-native plant species in Australia than native ones, but it is native plants that best support native animals. Introduced mammals such as deer and rabbits compete with native animals for this dwindling food supply and destroy their habitat. Feral and domestic cats also decimate small native animal populations, killing about **two billion** native reptiles, birds and mammals a year.

We need to step up.

IS THERE ANY HOPE TO HALT THE DECLINE OF THREATENED SPECIES?

Sometimes it feels as though we are helpless in this fight against extinction. Climate change seems to be already set on its course. As Fern pointed out, it can be disheartening or paralysing when you feel as though the problem is too large to tackle. She therefore recommends that we take this into account in communication around the issue.

Messages need to give people a sense of agency and hope. Because every single Victorian can make a difference for nature.

You could be a volunteer for nature, actively taking care of it, or a citizen scientist who monitors its health. You could tell stories and be a champion for nature, informing and inspiring others to connect with nature. Simple things to do around your home includes planting native plants in your garden to provide a habitat and refuge for native species.

Keep your pet cat indoors and your dogs on a leash when visiting natural areas - we sometimes underestimate their threat to wildlife. **The toll is quite high:** there are 3.8 million pet cats in Australia and a roaming pet cat will kill 186 mammals, reptiles and birds per year. If you keep your cat indoors, it will not be out and about, terrorising wildlife – plus you get more cuddles.

As well as the difference we can make as individuals, industry also has a role to play in protecting biodiversity – especially if we demand it of them. Bank Australia is a customer-owned bank: customers have a say on how the bank is run and the issues it acts on. To act on customers' concerns around climate change and biodiversity, Bank Australia bought a patch of land in 2008. Since then, the Bank Australia Conservation Reserve has grown, covering 2117 hectares across a range of habitats, and providing a home for 225 native plant and 234 native animal species.

Judith acknowledges that banks have an indirect yet large impact on the environment: lending funds to support construction and purchasing of buildings and motor vehicles that then produce emissions. She is therefore dedicated to using the business of banking to create a healthier planet. Bank Australia is the only bank in the world with a conservation reserve and runs on

100% renewable electricity. Judith hopes that customers feel proud to share ownership in a project that is offering hundreds of native animals a place to call home.

Importantly, it is not only about taking action ourselves but also listening to the knowledge and practices of Traditional Land Custodians. The removal of First Peoples disrupted their care of the land, halting tens of thousands of years of sustainable land management.

'This country has lost a lot of native flora & fauna,' says Damein. 'We need to start listening to Mob.'

Damein is a Gunditjmara man and advocates for Gunditjmara in native title, cultural heritage, cultural land management. The Gunditjmara have been Custodians of their Country in south-west Victoria for thousands of years.

In 2007, the Federal Court of Australia legally recognised the Gunditjamara as native title holders, giving back their rights to their traditional homelands and waters. Part of this Country is the Budj Bim Cultural Landscape, which holds one of the world's most extensive and oldest aquaculture systems. The Budj Bim lava flows provide the basis for channels, weirs and dams developed by the Gunditjmara to trap, store and harvest kooyang (short-finned eel). The Budj Bim Cultural Landscape has been listed as one of the 20 UNESCO's World Heritage sites across Australia, the only site listed for its Indigenous cultural values.

Traditional knowledge and the cultural expertise of First Nations peoples is critical to the health, vitality and future of our ecosystems, particularly in the face of extinction threats and climate change. Damein is excited that Traditional Owners are receiving support and a forum to share their knowledge, stories and history to ensure the ongoing protection of Country.

When faced with a problem as big as the survival of the natural world, how might we best align our efforts to gain the best outcomes from available resources? Opportunities for First Nations peoples to restore relationships with Country and look after land, initiatives within the private sector to invest in and protect the environment, and science-based interventions that can guide and resource local people in restoring ecological health all contribute. Government, industry, academia, communities, and every single one of us can play a part in supporting Victoria's biodiversity.

Re-watch the discussion on-demand at **https://www.facebook.com/VicParliament/videos/1695329027479828**

Brendan Wintle FRSV

Fern Hames FRSV with Damein Bell FRSV

Ian Mansergh addresses the Panel

Science on Country

L-R: Session host Bill Bainbridge, Kate Harriden, A/Prof Michael-Shawn Fletcher

*This article follows a **panel discussion during NAIDOC Week** with two Wiradjuri scholars - Associate Professor Michael-Shawn Fletcher and Kate Harriden – for a conversation about the exciting opportunities that Aboriginal knowledge offers for urban and regional environmental management.*

Yindyamarra. It is a Wiradjuri word that is often translated as 'respect'. However, the word has many meanings: gentleness, to honour, go slow, and take responsibility. It describes a way of living.

And it is how we should treat Indigenous Knowledge.

The tradition that we call "Western science" is barely 400 years old. Yet, across Australia, rich cultural knowledge traditions and practices have been passed down over tens of thousands of years by First Peoples.

When it comes down to it, what *is* science? Is it not merely a tool with which we observe the world around us and to pursue knowledge and learn to make predictions?

Cultures around the world have developed different views of nature throughout human history. First Peoples across the globe use observations to understand, interpret, and interact with their environment. Throughout history, they have created remarkable feats of engineering, developed tools, and learned to manage and use resources in their environment that ensures their conservation into the future. Their wealth of wisdom and experience of nature acquired over generations is rooted in their traditions and knowledge systems.

Western science and Indigenous Knowledge do not have to be separate. They each hold great value and are beginning to find a path to each other. Two Wiradjuri people, Associate Professor Michael-Shawn Fletcher and Kate Harriden are at the intersection of their traditional knowledge and academia. They believe that Indigenous Knowledge offers many benefits in urban and regional environmental management – only so long as it is treated with the respect it deserves.

THE DISRUPTION OF INDIGENOUS KNOWLEDGE

Indigenous Knowledge held by Aboriginal and Torres Strait Islander peoples has been built on careful observation over 65,000 years. But their rich history, knowledge, and traditions were disrupted. European principles of land, water and ecological management were forced upon this continent after invasion, leading to overwhelmingly poor ecological outcomes.

The dispossession of First Peoples has had a deep social and ecological impact. This includes neglect of entire ecosystems – the direct result of denying First Nations Australians the right to exercise their duty of care over Country. "Biodiversity loss and catastrophic fires: they began immediately after the invasion by the British into the Australian continent and the removal of Aboriginal burning," Michael-Shawn says.

By studying charcoal and pollen in natural archives (e.g. in lake sediments and ice cores that hold the history of the land), Michael-Shawn learns about changes in the environment. His work demonstrates that the most drastic change in environment on this continent since the Ice Age 12,000 years ago was British invasion.

For millennia, land-use and cultural practices of First Nations Australians shaped the environment. In turn, their environment heavily influences their way of life. Their landscape management creates a predictable, bountiful, safe environment. It fosters nature's ability to provide resources and to provide a secure place to live. This is scientific knowledge, accumulated by more than 3,000 generations of people who have passed on how to live on Country based on observation.

It does not make sense to shoehorn European ideas onto this land. Melbourne is notorious for its "four seasons in one day" and unpredictable weather. We also sometimes comment on the weather being "too warm" for winter or "too cold" for summer. But this is because people generally measure the weather against the norms of traditional European seasons from the other side of the globe.

Kate and Michael-Shawn argue that Indigenous weather calendars should be adopted as they are guided by observations of environment on Country. Careful observations and local knowledge of one area make environmental changes in that place a little more predictable.

One example of where a human-centric control of the landscape has suffocated Country is water management. As an academic, Kate is trying to find ways to incorporate Indigenous science practices into urban water management. We can learn from Indigenous practices to observe our water bodies over a long period of time rather than popping in to report every few years, and to work collaboratively in a whole community effort.

'We can't keep having stormwater channels function the way they do,' Kate says. 'They just flush dirty water out to some other place. It's all wasted water and you can't recycle the nutrients; you're just moving a pollutant from one area and over-polluting another.' She has particularly seen when concentrate infrastructure has resulted in clean water in an artificial pond and only 500 metres downstream the water was putrefied.

Michael-Shawn sees the same in his work in fire management. The dominant narrative of Western society is that fire is an agent of suppression. There were no large fires in Gippsland for 1500 years but now, the fires are uncontrolled, destructive, and catastrophic. The Gunaikurnai people, the Traditional Custodians of Country covering much of Gippsland, used fire to reduce fuel loads and support flourishing biodiversity. Now there is a desire to see Mob managing Country, and Michael-Shawn hopes that, with time and *yindyamarra*, the land will bounce back.

First Nations peoples have been actively creating, managing, and maintaining nature in Australia for tens of thousands of years. Now Australia faces a biodiversity crisis and we are looking for solutions. Integral to any solution needs Indigenous Knowledge and land management practices.

WORKING WITH MOB

Conservation efforts are critical right now. But can we rely on Western science alone to put things right when it created the problem in the first place? Kate and Michael-Shawn think not.

Western science has a history of excluding and exploiting First Nations people, which stems from the devaluing of Indigenous knowledge. It is still regarded as myth, legend and fable, and not seen as thousands of years' worth of observations. Even though Western science is also built on observation.

Yet the evidence that traditional knowledge holds so much value is there. Mob has generations-worth of knowledge on the behaviour and location of native animals and therefore conservation efforts are intrinsically more successful with their help. For example, an initial release of captive-bred critically

endangered regent honeyeater into the wild failed, but in another attempt, they were released on Wonnarua Country with guidance from the Mindaribba Local Aboriginal Land Council – this next time, they survived.

Many Western ecologists and environmental scientists rely on First Peoples to guide their work: helping them to find wildlife, to navigate rugged terrain or to understand changing weather trends. But these relationships have often felt colonial, extractive and unequal. "Science" has not always been a friend to First Peoples, with many atrocities having been performed in the name of science.

While it is important that Western scientists listen to Mob, they need to tread lightly. Traditional knowledge, while an incredibly valuable source of information, has been dismissed for so long by so many.

Even now, researchers drop into communities, gather data and leave — never contacting the Traditional landowners and local communities again, and selectively taking data sets that suit their purpose or excluding them from the publication process.

Kate and Michael-Shawn encourage researchers to instead go by yindyamarra. If Western scientists who do field work on Country invest time to have conversations with Mob, then we might have a chance of restoring the relationship, and subsequently, nature, culture, and communities. Michael-Shawn even suggested that Traditional Knowledge holders should be invited in scientific discussions as part of grant applications rather than only being contacted once funding has been secured and their knowledge is deemed needed. We all have to work together respectfully, or else we can never achieve the best research for Country and people.

First Nations peoples do not need Western scientists to validate or legitimate their knowledge systems. But their knowledge does need to be treated with respect. It is encouraging to see that more partnerships are developing worldwide with Indigenous knowledge holders and Western scientists working side-by-side.

Western science and traditional knowledge constitute different paths to knowledge, but they are rooted in the same reality, and really, Western science is only just catching up after several thousand years.

'We're always on Country. We're on Country right now...but you have to actively engage,' says Michael-Shawn.

Re-watch the discussion on-demand at **https://www.facebook.com/VicParliament/videos/1850127105335104**

Kate Harriden and A/Prof Michael-Shawn Fletcher discussing the importance of Indigenous Knowledge in the management of Country.

Caring for the Rare

L-R: John Arnott, Dr Megan Hirst, session host Bill Bainbridge, Dr Joanna Sumner, Dr Marissa Parrott, Darren Grover.

*This article follows a **panel discussion during National Science Week** with John Arnott, Manager of Horticulture at Royal Botanic Gardens Victoria; Dr Megan Hirst, Post-Doctoral Fellow at Royal Botanic Gardens Victoria; Dr Joanna Sumner, Manager of Genetic Resources at Museums Victoria; Dr Marissa Parrott, Reproductive Biologist at Zoos Victoria; and Darren Grover, General Manager of Threatened Species, Zoos Victoria.*

Why should we "care for the rare"? After more than 40-50 million years of independent evolution after Australia became an isolated continent, approximately 600,000-700,000 species now call Australia home. Of this, so much of our flora and fauna is endemic to this land – only found here and nowhere else in the world. It is therefore our responsibility to protect it.

Biodiversity is the collection of all the different types of life found in an area. It is the trees and grass that grow, the animals that call them home and even the microorganisms, like bacteria, that live on the plants and animals and in the soil. Biodiversity is all these things living together to create an ecosystem, which allows life to thrive. And every part of it is essential.

But 'there are only pockets of good habitat left,' according to Dr Joanna Sumner. We need to look after them or else we will lose our biodiversity. And once a species is gone, it is gone. It is wiped off the planet for good.

Sadly, Australia has a terrible reputation when it comes to extinction. Since European invasion, at least 100 of Australia's unique flora and fauna species have been lost. Australia's biodiversity is still in rapid decline with **more than 1,700 species** and entire ecological communities known to be threatened and at risk of extinction.

When populations decline, they lose diversity and their ability to adapt to changing environments. This means that once a species is threatened, it becomes harder and harder for them to bounce back.

As Darren Grover puts it: 'we've mucked things up'.

During National Science Week, we heard from our state's leading botanists, zoologists and collection managers who are caring for the rare in the face of mounting challenges.

PROTECTING PLANTS

About 27,500 introduced plant species have made their way into the country, and they now outnumber Australian natives. Many introduced species have become established in the wild and are regarded as invasive. Exotic species that were imported to decorate gardens can sometimes jump the fence and invade the countryside and bush. Invasive plants outcompete and choke native plants, depleting the soil (and nutrients) and becoming a devastating problem. Once invasive weeds spread, they are hard to control.

Conservation horticulturalist John Arnott cultivates rare and threatened species for their future survival as part of the Care for the Rare project. He works with regional botanic gardens to grow their local flora – plants that are indigenous to the specific region. While the display gardens that visitors can enjoy feature several rare species, the real magic is happens behind the scenes.

Amanda Gell, Rob Gell and Dr Tien Kieu MP

The heart of the Royal Botanic Gardens' conservation efforts is the Victorian Conservation Seedbank. It houses seeds and spores of native Victorian plants, especially endemic and at-risk species. Researchers like Dr Megan Hirst collect seed in the wild and determine how best to store them long-term so that these native plant species – some of which are on the brink of extinction – can be grown again in the future. The facility currently holds over 2,160 collections and many of these plants have never been propagated before. It is a learning process of trial and error but propagating the plants directly in the field – like in gardens across Victoria – seems to yield the best results.

Meg and her colleagues also deliver public programs to motivate people to become involved in plant conservation. Raising Rarity, for example, aims to increase public awareness of rare plants and ecosystems in Victoria, and provides resources from the Seedbank for home gardeners to grow threatened native plants at home.

Another major threat to flora is the changing climate. Botanists at the Royal Botanic Gardens Victoria adapt the living collections to adapt in response to increasing temperatures and sustainability imperatives, such as reduced water use. This way, they can ensure that plants grown in the Royal Botanic Gardens are well-suited to Melbourne's future climate.

The combination of future planning and saving what plants we already have will ensure that plants will thrive and survive in the future.

SAVING DWINDLING ANIMAL POPULATIONS

Zoos Victoria has a mission to fight extinction: no animal species will go extinct in Victoria on their watch. Their Fighting Extinction program is dedicated to the recovery of 27 threatened native species that are on the brink of extinction due to a range of threats including predation, disease, and loss of habitat.

While we often lament at the state of our declining biodiversity, the Eastern Barred Bandicoot Recovery provides a story of hope. These small nocturnal marsupials were once widespread across the grasslands and woodlands of western Victoria and South Australia, but by 1989, there were fewer than 150 left. Those that remained were collected for a captive breeding program and the species was declared Extinct in the Wild on mainland Australia.

In 1991, Zoos Victoria bred enough for release back into the wild. But for continued survival, the bandicoots relied heavily on fox control. Fences are costly to maintain and the releases on mainland failed. The best chance of survival was on fox-free islands.

The panellists deep in discussion with Bill Bainbridge.

The Eastern Barred Bandicoot Recovery Team, including reproductive biologist Dr Marissa Parrott, first did a trial release of 20 bandicoots on Churchill Island and the population quickly grew to over 100. The team has since established populations on Phillip Island and French Island, and works with private landowners who have fenced reserves on mainland Australia to keep bandicoots safe on their lands. After a 30-year captive

breeding and insurance program, populations of Eastern Barred Bandicoots now persist in several safe havens across the state. Their conservation status has been reclassified from Extinct in the Wild to Endangered – the first time a species has ever gone backwards on the extinction trajectory.

Dr Marissa Parrott, Reproductive Biologist with Zoos Victoria

But what happens once a population is gone? Thanks to the work of Dr Joanna Sumner, who manages the Ian Potter Australian Wildlife BioBank at Museums Victoria, it might not be too late.

The BioBank preserves tissue samples and DNA from Australian animals as a resource for conservation biologists in the field an opportunity to reintroduce genetic diversity to small populations at threat of extinction. Freezing tissues samples ensures that a snapshot of all the genetic information from threatened fauna is preserved. If their cells are kept safe, then scientists can retrieve their DNA.

Genetic diversity provides the building blocks of evolution. Without diversity, populations are vulnerable to change because if threatened animals become so genetically similar, they can all be wiped out with one threat. Both Zoos Victoria and Museums Victoria have projects that add genetic diversity back into vulnerable populations to give them a better shot. The goal of storing living tissue and DNA is not to revive species, but rather, to ensure that genetic information is not lost and can be used to restore genetic diversity. For example, there were once 12 Victorian populations of New Holland Mouse but now only five. Conservation biologists can use DNA from frozen tissue samples from extinct populations to add to the gene pool of the surviving populations, keeping them genetically healthy.

The Eastern Barred Bandicoot highlights the success of captive breeding programs and the reintroduction of animals back into the wild. However, if we want rare and endangered animals to survive, we need to deal with the threats to them. Just as the bandicoots cannot exist where there are foxes, there is no future for native animals if the threats to their populations are not managed. This is why it is important that we are all on board with conservation efforts.

WHAT CAN WE ALL DO TO HELP? THE POWER OF PEOPLE

All panellists agreed that we can all pitch in to make a difference. Help monitor animals with citizen science apps – all it takes is to upload photos of wildlife or recordings of their calls. Plant native flora in your garden to support pollinators and a provide refuge for other fauna. Try to be sustainable in your everyday life and share stories like those in this article.

Zoos Victoria understands the power of people in protecting animals. They have run multiple campaigns to spread awareness of harmful human activities and encourage change.

Balloons are the deadliest form of litter when ingested by seabirds. Zoos Victoria and Phillip Island Nature Parks developed the campaign "*When Balloons Fly, Seabirds Die*", encouraging people to blow bubbles rather than releasing balloons outdoors to avoid accumulating deadly litter in oceans or waterways. The campaign was so successful that releasing balloons into the environment is now considered illegal in Victoria.

Another campaign is "*lights off for the moths*", as light pollution was derailing the yearly nocturnal migration of Bogong Moths to the Victorian Alps. There, they are an important food source for many animals including the Mountain Pygmy-possum, one of Australia's mammals most at risk of extinction. Several years ago, the Bogong Moths stopped showing up to the alpine region, and when hungry pygmy possums woke from their winter hibernation, they had very little to eat. Marissa encourages us to minimise outdoor light and help track Bogong Moth migration with a citizen science app. With unnecessary outdoor lights switched off and citizen scientists looking out for Bogong Moths, there is still hope for the Mountain Pygmy-possums.

'Small things done on mass make a big difference,' says Marissa.

All of us can help protect Victoria's biodiversity. The botanists, zoologists and collection managers leading this important work are nurturing threatened species back to population health, but their endeavours will only be successful so long as we all help.

Re-watch the discussion on-demand at **https://www.facebook.com/VicParliament/videos/1113234029625194**

PROCEEDINGS

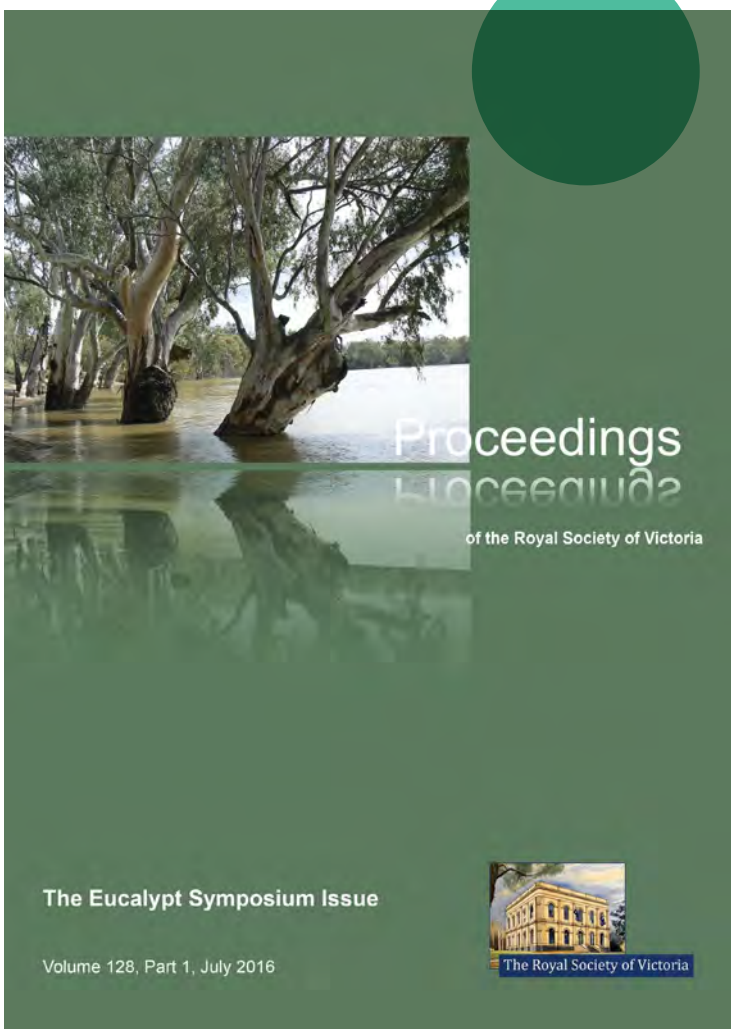
Call for Papers

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 http://www.publish.csiro.au/rs.

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. We are always interested in hearing from authors.

Papers, Reviews and Reports of experimental or descriptive research, submitted for publication by the Royal Society of Victoria, should not have been published hitherto, nor should they be under consideration for publication elsewhere. Published papers are typically concerned with natural history, encompassing the biological and earth sciences, in the Oceania region.

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

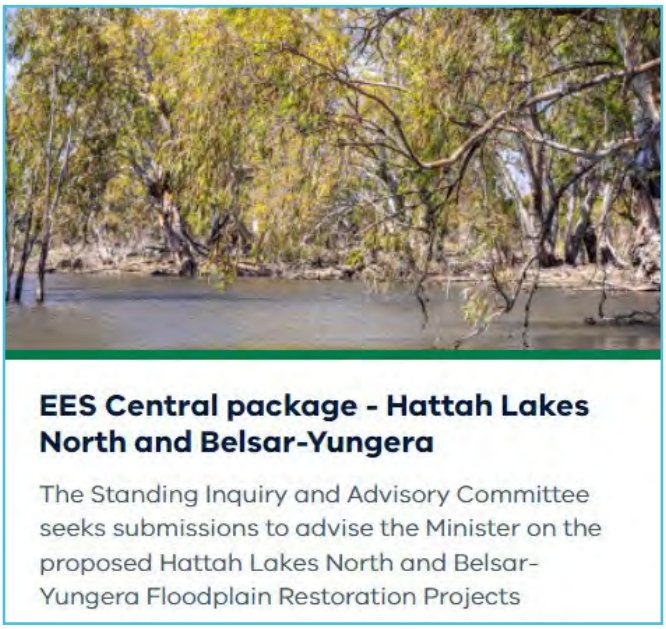


ENGAGE VICTORIA

Current Government Consultations of Interest to Victoria's Science Community

The Minister for Planning has appointed the Victorian Murray Floodplain Restoration Project Standing Inquiry and Advisory Committee (SIAC) to inquire into, and report on, each of the proposed nine Victorian Murray Floodplain Restoration Projects (VMFRP) and their potential environmental effects. The main page is at https://engage.vic.gov.au/VMFRP-SIAC.

The nine projects are being assessed in four 'assessment packages' to inform preparation of Environment Effects Statements (EES) or Environment Reports (ER). The first to open on consultations, concerning Hattah Lakes North and Belsar-Yungera, is below.



EES Central package - Hattah Lakes North and Belsar-Yungera

The Standing Inquiry and Advisory Committee seeks submissions to advise the Minister on the proposed Hattah Lakes North and Belsar-Yungera Floodplain Restoration Projects

Consultation closes 14 November.
https://engage.vic.gov.au/VMFRP-SIAC-EES-Central

Other Open Consultations:

The Victorian eating disorders strategy

Have your say and help us to develop the new Victorian eating disorders strategy.

Consultation closes 13 November 2022.
https://engage.vic.gov.au/the-victorian-eating-disorders-strategy

Protecting consumers of distributed energy resources (DER)

This consultation seeks your views on whether further consumer protections for users of Distributed Energy Resources are needed to protect Victorian consumers

Consultation closes 18 November 2022.
https://engage.vic.gov.au/protecting-consumers-of-der

Wellbeing in Victoria: A Plan to Promote Good Mental Health

Help shape Victoria's first ever Statewide Wellbeing Plan

Consultation closes 28 April 2023.
https://engage.vic.gov.au/wellbeing-in-victoria-a-plan-to-promote-good-mental-health

Water price review 2023

The Essential Services Commission is reviewing 14 Water businesses proposed pricing and key outcomes for 2023-28 and we want to hear what you think.

Consultation closes 1 December 2022.
https://engage.vic.gov.au/water-price-review-2023

Royal Exhibition Building and Carlton Gardens Review

The World Heritage Management Plan for the Royal Exhibition Building and Carlton Gardens is being reviewed.

Consultation closes 20 November 2022.
https://engage.vic.gov.au/rebcgreview

Unaccounted for gas benchmarks review 2022

The Essential Services Commission is reviewing the Victorian unaccounted for gas benchmarks. This is the gap between how much gas enters the system and what is delivered

Consultation closes 25 November 2022.
https://engage.vic.gov.au/unaccounted-for-gas-benchmarks-review-2022

Healesville Freeway Reserve

Have your say on the draft Park Layout Plan for the Healesville Freeway Reserve

Consultation closes 7 November 2022.
https://engage.vic.gov.au/healesville-freeway-reserve

Commonwealth Games Villages

Share your aspirations for the Commonwealth Games Village sites - for now and beyond the games.

Consultation closes 4 December 2022.
https://engage.vic.gov.au/commonwealth-games-villages

Science Victoria – Guidelines for Authors

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.

If you have any questions regarding suitability of your article for a particular style, or regarding putting your piece together, please contact **editor@ScienceVictoria.org.au**.

STYLE GUIDE

Letters and Columns

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, reviews and summaries of seminars or other scientific events, science-related issues and policies, concerns you'd like to raise with other readers, 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

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?

News Articles

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 the use of jargon or opinions unsupported by a robust evidence base, 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.

Feature Articles

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.

Our target audience comprises members of the general public with an interest in sustaining or extending their engagement with scientific ideas and knowledge, who share a commitment to the application of robust science to solve problems, or who are members of the scientific community outside of your particular field.

Please avoid using jargon, as it will quickly alienate anyone who isn't an expert in your field. Introducing one or two otherwise irreplaceable terms with a short explanation 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). The 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*.

Most of us have read articles or attended presentations that managed to somehow make the most interesting of topics incredibly tedious. This is the litmus test of what you need to avoid!

Opinion Articles

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. Please 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 could be submitted 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, bearing in mind we do not welcome self-promotional "fluff" pieces.

References

References for all articles should follow the Vancouver referencing style, however News Articles and Columns can either use a reference list either at the bottom of each page or grouped at the end of the article – whichever you prefer.

RSV Membership

Become a Member of The Royal Society of Victoria

OUR PURPOSE

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.

OUR WORK

- Fostering, recognising, and rewarding excellent Victorian scientists across their career trajectory through awards and prizes
- Promoting understanding of science in the community
- Promoting science literacy and education so that people of all ages discover and understand the value of science
- Assisting and lobbying governments on issues relating to science and evidence-based decision making

MEMBERSHIP BENEFITS

- Learn about developments in a wide range of science disciplines through our lecture program and symposia, and how this knowledge can be applied to issues confronting Victoria
- Connect and share knowledge with like-minded people, bringing together expertise and learnings from all backgrounds and fields.
- Collaborate with colleagues to deliver the Society's various programs and projects, using (and developing) your professional skills and experience
- Support the translation of science into action through development of policy and science education initiatives
- Access discounts to RSV events and forums, and car parking in the Melbourne CBD

MEMBERSHIP OPTIONS

Full Membership

Open to all adults (18+) with an interest in science! **$120/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) **$40/year**

Organisational Membership

For organisations to claim membership of the Royal Society of Victoria. Provides a method for general sponsorship of the RSV's programs, along with discounted rates for access to RSV facilities throughout the year. **$1000/year**

Contact us with any questions about membership
Email: **james.mcarthur@rsv.org.au**
Phone: **+61 3 9663 5259**
Or visit us at **8 La Trobe St, Melbourne VIC**

The Royal Society OF VICTORIA
Promoting science since 1854

RSV Services and Facilities

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!

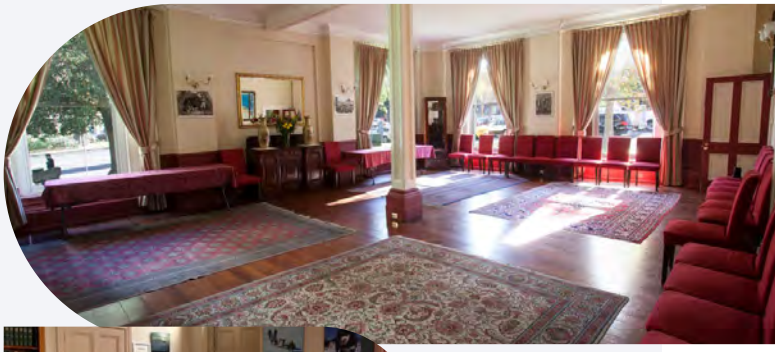
We provide services in **event management**, meeting **venues**, grants and awards **administration**, broadcasting and video **production**, social media c**ampaign management**, **recruitment** of scientific panels, and **convening** community engagement and deliberation processes where scientific work contributes to social, environmental, and economic impacts and benefits.

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

SERVICES AVAILABLE

The Burke and Wills Room
Multi-functional space with adjoining kitchen, suitable for: Workshops ‹*30 people; Dinners ‹60 people; Seminars, functions, catering, etc., ‹80 people.*



The Von Mueller Room
Seminar room for ‹*15 people.*

The Ellery Lecture Theatre
Raked seating for ‹*110 people.*

The Cudmore Library
Capacity for ‹*24 people*

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.

Support Victoria's Science Society

To support our programs with your donation, please fill out this form and return it to the Royal Society of Victoria, 8 La Trobe Street, Melbourne VIC 3000. You can also support our efforts through online donations and bequests at **https://rsv.org.au/support-the-rsv/**

RSV 2020 FUNDRAISING CAMPAIGN AMOUNT	*AMOUNT*
The Area of Greatest Need, as identified by the Society's Council	$
Inspiring Victoria – Community Science Engagement Program	$
Science Awards & Prizes	$
Science History & Heritage	$
Science for All - Citizen Science Programs	$
BioQuisitive Community Lab	$
The Phoenix School Program	$
The BrainSTEM Innovation Challenge	$
Australian Indigenous Astronomy	$
TOTAL	**$**

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VISA ☐ **MasterCard** ☐ **PLEASE CHARGE THE AMOUNT ENTERED AGAINST 'TOTAL' DONATIONS ABOVE TO MY CREDIT CARD.**

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Name on Card: _____ **Signature of Card Holder:**_____

☐ **Cheque or Money Order**

I enclose my cheque or money order made out to **The Royal Society of Victoria**.

Electronic Funds Transfer (EFT)

I have transferred my donation to the Royal Society of Victoria as follows:

BSB: 083-019
Account No: 51-515-2492
Account Name: The Royal Society of Victoria
Reference: Your Surname and "donation"

The Royal Society of Victoria