FEBRUARY 2023 — SCIENCE VICTORIA 2023

SCIENCE VICTORIA

Written in Stone
The Evolution of Life on Earth — pg 16

Optimising Healthcare
Validated Treatments — pg 14

Sunken City
The Great Floods of Melbourne — pg 24

Inside

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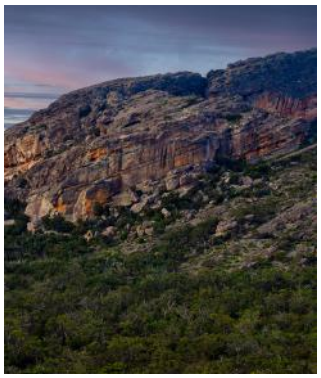
Looking inland from the Great Ocean Road, Victoria.
Photograph: Tobias Stonjeck via Unsplash.

This Edition: *Science Victoria* in 2023

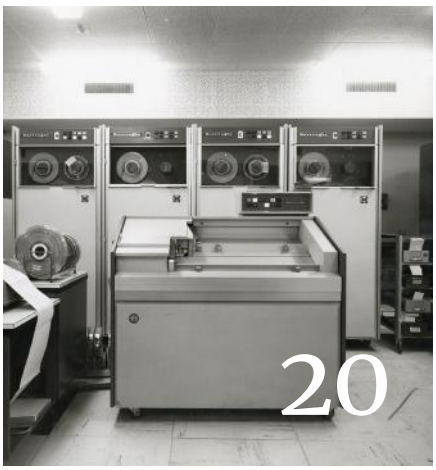
With a significant rise in misinformation following the COVID-19 pandemic, the clear, engaging communication of scientific topics for a general audience has never been more important.

This month, we present the updated format of *Science Victoria* as a platform for high-quality science communication. Focussing on STEMM topics important to Victoria, we will bring informed articles, public STEMM events, grant opportunities, content from *Inspiring Victoria* partners, and more.



On the Cover

Spanning lands of the Djab Wurrung and Jardwadjali peoples, Gariwerd (also known as the Grampians National Park) in south-western Victoria is home to imposing sandstone peaks, and over 90% of the rock art made by First Peoples in Victoria. Photograph: Huzaifa Tariq (via Unsplash)



Upcoming Submission Deadlines

MARCH 2023	**DUE DATE**
Women in STEMM	*21 February*
APRIL 2023	**DUE DATE**
Powering Victoria	*21 March*

On the Year Ahead

MIKE FLATTLEY
CEO — The Royal Society of Victoria

Welcome to 2023! After a tumultuous 2022 it's good to be looking ahead, with freshly elected governments at the State and Commonwealth levels bringing new portfolio leaders up to speed and shuffling the public service's deckchairs into scintillating new arrangements for our bemused interpretation.

While nothing will ever be perfect, I must say it's been terrific to see so much progress being sought in policy and legislation to establish onshore manufacturing capabilities while protecting and recovering Australia's many unique environments; there's a palpable movement towards positive, sustainable change at work in our nation, and we aim to contribute as always.

Our small team at the RSV are back from a lovely summer break and we've hit the ground running with a presentation with the Parliament of Victoria for the International Day of Women and Girls in Science on Saturday 11th February (join us in person or online), and at the time of publishing a presentation on "Science at the Edge" from our friends at Queers in STEM for the Midsumma Festival will be in our rear view mirror. We aim to have video content available for those interested in the coming weeks.

The Inspiring Victoria program proposal for this year awaits the final approval of the Commonwealth and State Governments, but I'm confident we have an amazing year ahead for communities across the State, thanks to our vibrant partnerships with other NGOs, government agencies, public institutions, industry members, peak bodies, and research enterprises. We're planning a Lunar L ife program with the Parliament of Victoria (where science meets civics), new citizen science programs with a range of partners, and small grant programs to promote community engagement and familiarity with concepts across Science, Technology, Engineering, Mathematics and Medicine (STEMM).

Finally, I'd like to welcome Mr Scott Reddiex to the substantive role of Editor for Science Victoria. Scott is a wonderful colleague – a vigorous proponent of research translation with a passion for effective visual design and science communication – and the RSV's Council is indebted for his continued commitment and service to our State's science community. We have big ambitions for our magazine, and I'm looking forward to seeing our efforts in community science engagement grow through the good works of Scott and our long-serving science communicator Dr Catriona Nguyen-Robertson.

Enjoy the read, and have a great month!

SCIENCE VICTORIA

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

Subscribe to receive Science Victoria online at **eepurl.com/bg-fjH**

LEFT: Photograph: Gatis Marcinkevics via Unsplash

The Why of the Weather and Societies Royal

ROB GELL AM MRSV
President — The Royal Society of Victoria

The Interdecadal Pacific Oscillation

You might have heard of the Southern Oscillation Index, one of Australia's important climate drives. It's also called ENSO, the 'El Niño-Southern Oscillation'.

You may also be aware of the Indian Ocean Dipole (IOD) and the Southern Annual Mode (SAM), but perhaps not the IPO – the Interdecadal Pacific Oscillation.

The IPO is another climate 'influencer' that I heard about more than a decade ago and hadn't thought of much of it at the time. It was suggested to me recently (by someone that I thought might have a handle on it), that we had entered a thirty-year IPO wet phase in 2010!

The IPO has been described as El Niño's cranky uncle by those that do know, and after our third La Niña in a ture climate will be determined by natural processes and anthropogenic warming, with the latter able to modify the characteristics of that natural variability, as can the IPO. So, what causes the IPO? It's all very complex and more work needs to be done to completely understand it. We don't know enough yet for all of this to be predictable, but it may be that understanding sub-surface elements in the ocean will help future prediction.

It all becomes more interesting when considering ENSO's influence between the two phases of the IPO. IPO negative (cool) phases can make for bigger ENSO impacts – important to think about as we emerge and dry out a little after our third La Nina in a row.

An important thing to know about the IPO is that the negative phase producing cool water in the tropics absorbs heat from the global greenhouse effect and slows anthropogenic warming. The 'cranky uncle' phase does the reverse.

I was anxious to know what phase we're in now. Scott directed me to the *US National Oceanic and Atmospheric Administration's Physical Sciences Laboratory*, who monitor the IPO. Inside twelve hours the reply was that all three Sea Surface temperature (SST) datasets used to provide the index show a negative value. Good news for the moment, but look out for a 'cranky uncle'.

The Royal Society

You will no doubt be aware that the Royal Society of Victoria started as a merger of two earlier organisations founded in 1854, the Philosophical Society of Victoria and the Victorian Institute for the Advancement of Science. It follows the tradition of The Royal Society, "to recognise, promote, and support excellence in science and to encourage the development and use of science for the benefit of humanity."

The Royal Society, formally The Royal Society of London for Improving Natural Knowledge, is a Fellowship of many of the world's most eminent scientists. Established in 1660, it is the oldest continuously existing scientific academy in the world.

Its motto is the Latin phrase '*Nullius in verba*' – 'on the word of no one' or 'take nobody's word for it'. The Society's website explains that this is "an expression of the determination of Fellows to withstand the domination of authority and to verify all statements by an appeal to facts determined by experiment."

Current Royal Society President, Sir Adrian Smith, was previously the Deputy Vice-Chancellor of the University of London, before becoming the Institute Director and Chief Executive of The Alan Turing Institute. Sir Adrian is a mathematician with expertise in Bayesian statistics. He's had a remarkable career including, with Antonio Machi, translating the Italian

Sir Adrian Smith, current President of the Royal Society.

probabilist statistician and actuary Bruno de Finetti's Theory of Probability into English.

I was interested to read Sir Adrian's 2022 Anniversary Day Address,[3] in which he describes a number of challenges and opportunities: "War continues to rage in the Ukraine and as the recent COP meeting has shown there is huge progress still to be made on tackling climate change. Then we have rampant biodiversity loss and the threat of future pandemics. We are living in difficult and even dangerous times."

Sir Adrian welcomed a 35% increase in the UK's science budget, recognising science as a 'guiding light' in dangerous times, and also the engine of economic growth. He noted that although the UK does not have abundant natural resources, it can compete, as it has one exceptional competence advantage: its science base. Sir Adrian identified advances in AI, quantum computing, carbon capture and storage, and renewable energy sources and storage as critical areas where smart countries can potentially gain a competitive advantage.

The CSIRO has recently produced an *Australian Silicon Action Plan*,[4] with PricewaterhouseCoopers (PwC) identifying silicon as critical to decarbonisation, and the establishment of Australian manufacturing capacity to be independent of international solar cell supply chains.

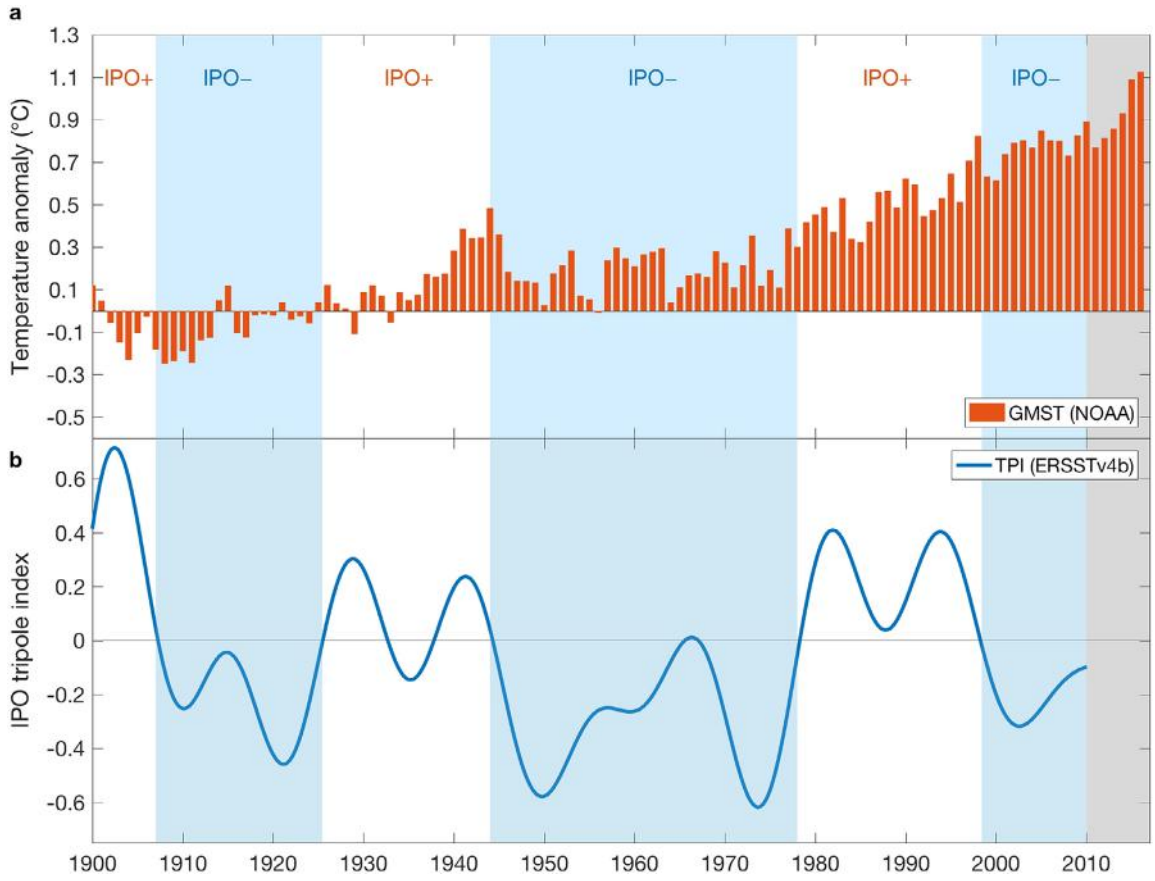
It will be wise for the Australian Government to also adopt the intention of the Royal Society's motto *Nullius in verba*, which we might interpret as 'science-based decision-making'.

I note that the Royal Society's Council Room doesn't seem to be nearly as luxurious as ours, nor does it have the character that ours exudes. We might have to see if we can get to know the Royal Society of London for Improving Natural Knowledge a little better.

From Club to Hub

The Royal Society of Victoria is now encouraging both Organisational and Affiliate membership. We have a number of companies as members, some using our facilities for functions, and, in one case of an ASX-listed company, for an Annual General Meeting.

It is important that the RSV engages positively with the science and technology corporate sector, and we encourage more companies to join us. Similarly, we are engaging other science-focused organisations to become affiliates, and to use our premises for meetings and to share ideas and opportunities. Both of these initiatives are intended to bring the RSV into view as a 'hub' for science discussions and engagement.



The Interdecadal Pacific Oscillation, 1900-2010. Source: Geophysical Research Letters, Volume 44, Issue 9 p. 4256-4262

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On the RSV's Response to the Biodiversity Crisis

JUDITH DOWNES FRSV

Adapted from a presentation given at the **induction of 2021 + 2022 RSV Fellows, December 2022**

RSV President Rob Gell AM with 2022 RSV Fellow Judith Downes FRSV. Photograph: RSV.

On behalf of the newly appointed Fellows, I'd like to first express our appreciation of the honour of being appointed as Fellows of the Royal Society of Victoria (RSV).

As highlighted by events such as last year's COP15,[1] there is increasing focus on the global biodiversity crisis, highlighting the prescience of the RSV in its development of the report "*Towards Conservation and Recovery of Victoria's Biodiversity*".[2]

The Society's report has benefited from the input of many people, including four new Fellows, and we are humbled by the acceptance given to our initial papers, and proud to be named as contributors to the report.

Key to the work this year has been delivering specific recommendations for achievable actions.

Preparation of the report, our June cross-sector forum on biodiversity conservation and recovery, and our participation in the STEM and Society webinar arranged by the Royal Society of Victoria and the Victorian Parliament, have all actively demonstrated one of the recommendations made in the RSV report: that 'each sector of our society has a role to play' to prevent further loss, and recovery where we can, of biodiversity.

The 2022 Fellows represent First Nations people, government, academia, and finance & business.

As a representative of the finance & business sector, I know that more work is needed to understand the impact of biodiversity loss.

In March 2022 the Network for Greening the Financial System (NGFS) – a group of central banks, including the Reserve Bank of Australia – noted "*nature-related risks, including those associated with biodiversity loss could have significant macroeconomic implications, and that failure to account for, mitigate, and adapt to these implications is a source of risks*" for financial stability.[3] While climate scenarios developed by the NGFS were used in the recent work by major Australian banks to model the impact of climate change, I could find no reference to biodiversity loss in the resulting publication from our banking regulator.[4]

On the global level, various bodies increasingly emphasise the interplay between climate change and biodiversity loss. The Task Force on Nature-related Financial Disclosures recognises that consideration of biodiversity loss and other nature related issues is new for many businesses, but an important risk that needs consideration, management, and disclosure.[5] And the Global Risks Report from the World Economic Forum in 2022 listed biodiversity loss as the third most severe risk identified by global executives.[6]

While these global bodies are influential and well known, translating their recommendations into action and regulations is a work in progress. The recognition, management, and mitigation of the increasing risk posed by biodiversity loss is not yet a regular part of risk management, as climate change has become.

There is still work to do to raise awareness of the economic impact of biodiversity loss, and then to manage and reverse this impact. "*Towards Conservation and Recovery of Victoria's Biodiversity*" provides recommendations and practical actions to assist us all to contribute to solutions to the existential crisis we currently face.

With the Kunming-Montreal Global Biodiversity Framework adopted at the COP15 summit,[7] we now look forward to discussing the recommendations of the Society's report with leaders from all sectors in Victoria. And perhaps, hopefully, we will be working with cross-sectoral teams to implement these recommendations for the betterment of all life in our state.

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Snapshots

ABOVE: Caring for the Rare during National Science Week 2022 at the Royal Botanic Gardens Victoria's Cranbourne Gardens. Photo: RBGV

LEFT: RMIT students in Queen's Hall, Institute of Applied Science (Science Museum), Melbourne, 1968. Photographer Unknown. Source: Museums Victoria (CC BY 4.0)

The Council of the Royal Society of Victoria records with sadness the passing of the following valued colleagues.

Professor John Lovering

AO FAA FTSE FRSV

27 March 1930 – 4 January 2023

Last month, we bid a sad farewell to an RSV Member (later Fellow) of some 54 years and a past President of our Society.

John Lovering held a BSc (Hons) and MSc in geology from the University of Sydney (1951, 1953), and a PhD from the Division of Geological Sciences, California Institute of Technology (1960), where he was taught by Richard Feynman. He received a second MSc in 1971 while working at the University of Melbourne.

While studying, John worked at the Australian Museum in Sydney from 1951 to 1955. His first major post was as a Research Fellow, and then later as a Senior Fellow, in Geophysics and Geochemistry at the Australian National University from 1960 to 1969.

1969 was a big year for John - he became a Professor of Geology, with a specialisation in petrology, at the University of Melbourne; he covered the live broadcasts on ABC TV of NASA's historic Apollo 11 mission to the Moon; he led the recovery of pieces of the Murchison Meteorite for scientific study (revealing the existence of over 70 amino acids of extra-terrestrial origin);and he joined the Royal Society of Victoria as a Member.

As Head of the School of Earth Sciences, he expanded the teaching and research programs. During this time, John was elected President of the Royal Society of Victoria for the term 1977-78. A feature of his tenure was the conduct of a 1977 symposium on the Murray-Darling River System, and the associated publication of scientific papers in the 1978 edition of the Proceedings of the Royal Society of Victoria (Volume 90).

He served as Dean of the Faculty of Science from 1983 to 1985, and was Deputy Vice-Chancellor (Research) from 1985 to 1987. John retired from the University of Melbourne in 1987 to move to Adelaide as Vice-Chancellor of Flinders University, overseeing the University's response to the Dawkins reforms, which saw amalgamations with colleges and institutes, and student fees re-introduced in Australia.

At the end of his term in 1995 he returned to live and work in Melbourne, and became Professorial Fellow of Earth Sciences at the University of Melbourne (from 1999), performing several roles for the university and further afield (e.g., Chairman of the Environment Conservation Council, 1998; President of the Murray Darling Basin Commission). His final role was Chair of the academic committee of the University's Office for Environmental Programs (until 2015), which established a student scholarship in his name.

Council records its gratitude for Professor John Lovering AO's lifetime contributions and achievements in science and conveys sincere condolences to his surviving partner and fellow geologist Kerry Lovering OAM and their three children.

Professor Will Steffen

25 June 1947 – 29 January 2023

We are saddened by the tragic loss of Professor Will Steffen following a battle with pancreatic cancer.

With a BSc, MSc and PhD from the University of Florida, Will Steffen has a long history in international global change research, serving from 1998 to 2004 as Executive Director of the International Geosphere-Biosphere Programme (IGBP), based in Stockholm, Sweden, and before that as Executive Officer of IGBP's Global Change and Terrestrial Ecosystems project.

Will was the Inaugural Director of the Australian National University's Climate Change Institute, from 2008-2012. Prior to this, he was Director of the ANU Fenner School of Environment and Society. From 2004 to 2011 he served as science adviser to the Australian Government Department of Climate Change and Energy Efficiency. He was a Climate Councillor with the Climate Institute, and from 2011 to 2013 was a Climate Commissioner on the Australian Government's Climate Commission; Chair of the Antarctic Science Advisory Committee, Co-Director of the Canberra Urban and Regional Futures (CURF) initiative and Member of the ACT Climate Change Council.

In 2011, he was the principal author of a government climate report, The Critical Decade, which advocated for a tax to be placed on carbon emissions. Following the dissolution of the Climate Commission in 2013 by the Abbott government, Will became one of the founding members of the Climate Council, with whom he frequently co-authored reports and engaged the media on issues relating to climate change and renewable energy. In 2018 he was an author of the *Special Report on Global Warming of 1.5°C* published by the Intergovernmental Panel on Climate Change.

Will's scientific interests spanned a broad range within the fields of sustainability and Earth System science, with an emphasis on the science of climate change, approaches to climate change adaptation in land systems, incorporation of human processes in Earth System modelling and analysis; and the history and future of the relationship between humans and the rest of nature. Along with the late Nobel Prize winner Dr Paul Crutzen, he was a prominent advocate of the term "Anthropocene" to describe our current geological epoch and initiated international debate on the concept of "planetary boundaries" to determine the "safe operating space" for humanity, which has sparked significant reforms in environmental, social and governance management in industries and governments around the world.

Will Steffen delivered one of the Royal Society of Victoria's most impactful presentations in recent years: "The Anthropocene: Where on Earth are we Going?" was filmed in early 2021 during Victoria's pandemic restrictions and remains essential viewing. It can be found at **youtube.com/watch?v=HvD0TgE34HA**

The RSV Council conveys both its gratitude for Professor Will Steffen's lifetime contributions to science - in particular, his enormous achievements in science communication and advocacy - and its condolences to all of his family, friends and colleagues.

Dr Peter Woodgate

20 December 1957 – 23 December 2022

We are saddened to learn of the passing of Dr Peter Woodgate in late December 2022.

Peter was an honorary fellow of the Surveying and Spatial Sciences Institute, a life member of the International Society for Digital Earth, and a graduate of the Institute of Company Directors. He held a Doctorate in Business Administration from RMIT University, a Masters of Applied Science from the University of New South Wales, a Bachelor in Forest Science and a Diploma of Forestry from the University of Melbourne.

A forest scientist by training, Peter's career changed course in the aftermath of the devastating Ash Wednesday bushfires in 1983. He realised that addressing the magnitude and scale of such natural disasters needed the contribution of innovative spatial information technologies. This was the start of a pioneering journey and stellar career across space and spatial information technologies, working at the interface between Australian research and industry for more than thirty years.

From the humble beginnings of Spatial Vision in the 1990s to the creation of the Cooperative Research Centre for Spatial Information (CRC-SI) and its later incorporation as Frontier SI, Peter has been a trailblazer and undisputed thought leader in Australia.

Peter was the Chair of Australia's spatial intelligence network AURIN, the SmartSat CRC, and Canthera Discovery (a cancer research organisation) and was a Board member of Public Sector Mapping Agencies (PSMA). Peter had just been appointed as a director and inaugural President of the newly created Geospatial Council of Australia (GCA).

Peter chaired a recent (2021) online presentation during one of Victoria's pandemic lockdowns to a joint meeting of the Royal Society of Victoria and the Institute of Foresters of Australia titled "Next-Gen Spatial Tech for Forest Management." It's an exciting overview of how both remote satellite and ground-based sensing networks are contributing to close, real-time monitoring of remote terrestrial environments both in Australia and North America, and viewing is highly recommended.

He is survived by his wife Janet and his children Bronwyn and Will. The Council of the Royal Society of Victoria records its thanks for Dr Peter Woodgate's lifetime contributions to science and environmental management, and conveys condolences to all family, friends and colleagues.

What's On

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

CLOCKWISE FROM LEFT: Dr Isabelle Kingsley and Natasha Mitchell; A/Prof Sophie Adams and Dr Marguerite Evans Galea; Prof Madhu Bhaskaran and Dr Isabelle Kingsley. Photography by Parliament of Victoria.

STEM & Society

Women and Girls in Science

To celebrate the United Nations' International Day of Women and Girls in Science, the Royal Society of Victoria and partners convened this special event on International Day of Women and Girls in Science Saturday 11 February at Parliament House.

This special panel discussion, broadcast from the Parliament of Victoria, marked the International Day of Women and Girls in Science.

Tackling some of the greatest challenges of our age — from improving health to combating climate change — will rely on harnessing all talent. This international day celebrates and promotes the participation, achievements, and contributions of women and girls in the field of science, technology, engineering, and mathematics (STEM).

The day aims to raise awareness about the gender disparities in STEM fields and to promote gender equality in education and the workplace.

Our panel addressed the cultural and structural barriers to participation and leadership by women in Australia's STEM workforce, and the ways in which we're seeking to balance an historical disparity for a brighter future

Watch Now

Hosted by ABC Science journalist and presenter Natasha Mitchell, the full session is available to view now from the Parliament of Victoria's Facebook page at **fb.watch/iFxtY4qYBa**

We welcome your reflections and letters on this wonderful event at **editor@sciencevictoria.org.au**

Professor Madhu Bhaskaran

Co-Chair, Women in STEMM Australia

Professor Madhu Bhaskaran FTSE is an engineer and innovator who has developed stretchable, skin-like electronic devices for better health care. She also works extensively with industry, manufacturing, and design partners to commercialise her research

Madhu is a recently appointed Fellow of Australian Academy of Technology and Engineering. Her ground-breaking research has won numerous awards including a Eureka Prize and Academy's Batterham Medal and Frederick White Medal.

She's a passionate advocate for inclusion and diversity in STEM, having played a key role in Science in Australia Gender Equity (SAGE) initiatives, fulfilling duties as an advisory Board member for STEM Sisters, and co-leading the national advocacy initiative Women in STEMM Australia.

Associate Professor Sophie Adams

Medical Director, Mental Health Division, Austin Health

A/Prof Sophie Adams FRACMA FRANZCP is a Consultant Psychiatrist with interests in leadership, clinical governance, youth mental health, neuropsychiatry and consultation liaison psychiatry.

She has a systems level focus and an interest in building safe cultures, developing sustainable teams and enabling others. She has expertise in the front end of health systems, service design, innovation and evaluation, primary and tertiary, public and private health systems, clinical governance, quality and safety, peer engagement and workforce, workforce accreditation, credentialing and engagement, and co-creation in a range of environments.

Sophie has contributed to the development of women in science leadership through the Homeward Bound program, and is currently publishing an article on how women can have natural leadership advantages.

She is a Fellow of the Royal Australian and New Zealand College of Psychiatrists and the Royal Australian College of Medical Administrators.

Dr Marguerite Evans-Galea

Director, STEM Careers Strategy, Australian Academy for Technology & Engineering

Dr Marguerite Evans-Galea AM has led research in cell and gene therapy in the United States and Australia, and is currently the Associate Editor Australasia of the journal Gene Therapy.

A leading advocate for STEM research, innovation, inclusion and allyship, Dr Evans-Galea led the development of ATSE's flagship industry engagement program, the Industry Mentoring Network in STEM (IMNIS), and oversees three STEM Careers initiatives – IMNIS, STELR, and Elevate: Boosting Women in STEM program.

Dr Evans-Galea has represented Australia through the Asia-Pacific Economic Cooperation (APEC) and served on research and workforce advisory groups including the Expert Advisory Group for the SAGE initiative and Victoria's Ministerial Council for Women. She is currently a member of the Policy Committee with Science & Technology Australia and a participant in the Women in Leadership Development (WILD) Program.

Dr Isabelle Kingsley

Research Associate, Office of the Women in STEM Ambassador

Dr Isabelle Kingsley leads research projects to investigate how to dismantle barriers to girls' and women's participation in STEM. Specifically, investigating research grant funding in Australia, including a 20-year analysis of awarded grants by gender, and a national trial to study the effects of anonymising grant applications.

Dr Kingsley leads national efforts to embed evaluation into equity programs, producing a digital evaluation tool and online repository to support equity program evaluation on a national scale. Her role also involves contributing evidence-based advice to government, industry, peak bodies, and funding bodies on the best ways to improve gender equity in STEM.

Isabelle is a former high school teacher and museum educator, having worked at museums in Canada and Australia, and producing award-winning education programs and communicating science on daytime television. She is co-founder and former director of the Sydney Science Festival and former Chief Education and Research Officer for Arludo (a STEM e-learning company).

Walter Fisher Grant for Mycology Research

APPLICATIONS CLOSE *11.59 pm, 5 March 2023*

Applications are now open for grants from The Royal Society of Queensland Research Fund.

An amount of up to $20,000 is offered for one or more projects with a focus on microscopic or macroscopic fungi.

The perspective of the 2023 Walter Fisher Grant(s) will lie within the general purview of mycology, within the natural, physical, social, or biomedical sciences. Cross-disciplinary studies will be welcomed.

About Walter Fisher

Walter Thomas Fisher was a mycologist, and had a long career working with breweries to manage yeasts and maintain strict process hygiene.

His family have donated $20,000 to honour his lifetime achievement in mycology and his long-standing willingness to encourage younger researchers.

► Further information about the fund can be found at **www.royalscietyqld.org/research**. For any questions, please email **research@royalsocietyqld.org.au**

Science Meets Parliament 2023 Scholarships

APPLICATIONS CLOSE *10 February 2023*

Want a chance to attend Australia's most significant event for deep engagement between the science and technology community and policymakers at no cost?

Science & Technology Australia is offering nine scholarships to Science Meets Parliament (SMP) 2023, granting access to the full program of events, including the gala dinner.

SMP Online (professional development) will take place 7-9 March. SMP On the Hill on 22 March includes a full day at Parliament House followed by a gala dinner.

Secure a Scholarship to Science Meets Parliament 2023

Scholarship applications close on 10 February in the following categories: First Nations, STEM Pride, technology, regional and remote, disability, and neurodivergent scholarships.

To be eligible, you must be a member of – or employed by – an STA member organisation.

► For more information, visit **scienceandtechnologyaustralia.org.au/smp2024**

Australian Science Policy Fellowship Program 2023-24

APPLICATIONS OPEN	*8 Feb – 7 Mar 2023*
INTERVIEWS	*March 2023*
FORMAL OFFERS MADE	*April – May 2023*
COMMENCEMENT	*July 2023*

Apply now to be an Australian Science Policy Fellow in 2023-24.

The program provides an opportunity for early-to-mid-career researchers to bring their scientific mindsets to the Australian Public Service.

Fellows are employed as APS6 policy officers in host departments for up to 12 months. Previous placements have spanned the breadth of government activities, from climate adaptation to space strategy.

Applicants must be Australian citizens, hold a STEM PhD and be no more than 15 years post PhD completion.

Applications for the 2023-24 cohort are open from 8 February to 7 March 2023.

► To apply, visit the Australian Chief Scientist website at **chiefscientist.gov.au/australian-science-policy-fellowship-program**

Photo by Sara Cottle via Unsplash

David Syme Research Prize

VALUE *$10,000AUD, and a medal*
CLOSING DATE *31 March 2023*
OUTCOME DATE *30 April 2023*

Nominations are now open for the David Syme Research Prize.

The annual prize rewards the best original research in Biology, Physics, Chemistry, or Geology produced in Australia during the two years preceding the closing date for applications.

Preference will be given to original research of value to Australia's industrial and commercial interests (i.e., the impact of the research on the discipline and more broadly).

The prize is made by nomination only. Senior members of the academic or research community such as co-authors or co-researchers, heads of department or deputy vice-chancellors (research) are invited to nominate eligible colleagues. Self-nominations are not accepted.

▶ Full details and the nomination form are available at: s**cienceunimelb.smartygrants.com.au/DavidSymeResearch2023**. All enquiries should be directed to: **science-internalfunding@unimelb.edu.au**

Grimwade Prize

VALUE *$7,500AUD, and a medal.*
CLOSING DATE *31 March 2023*
OUTCOME DATE *By 28 April 2023*

Applications are now open for the Grimwade Prize for outstanding work in Industrial Chemistry.

The Grimwade prize is open to graduates of the University of Melbourne (or other recognised institutes); and undergraduates of the University, who have spent a period of not fewer than two semesters in study or research in a laboratory of the University.

Candidates must submit an original thesis, or papers embodying the results of an investigation, pursued by the candidate in Victoria within five years in connection with some branch of industrial chemistry. The subject of the investigation must be approved by the Faculty of Science.

Application Process

Applications for the Grimwade Prize are submitted through SmartyGrants. If a joint entry is being submitted, relevant information about allcandidates should be supplied. If the work has been carried out in collaboration with other persons, candidates (except in the case of a joint entry) should state their own share in the work.

▶ Full details and the nomination form are available at: **scienceunimelb.smartygrants.com.au/GrimwadePrize2023**. All enquiries should be directed to: **science-internalfunding@unimelb.edu.au**

Young Tall Poppy Awards 2023 Prize

VALUE *$7,500AUD, and a medal.*
CLOSING DATE *31 March 2023*
OUTCOME DATE *By 28 April 2023*

Applications for the 2023 Young Tall Poppy Awards will open soon on the 14th February and close on 14th April.

The Tall Poppy Campaign recognises the achievements of Australian scientists through the prestigious annual Young Tall Poppy Science Awards.

The Campaign's Tall Poppies engages the winners of Young Tall Poppy Science Awards ('Tall Poppies') in activities to promote interest in science among school students and teachers, as well as an understanding and appreciation of science in the broader community.

All applications should be made via the online application form.

▶ For further information, and to apply, visit the Tall PoppyCampaign website at **aips.net.au/tall-poppy-campaign**

Optimising Healthcare

When Medical Treatment Doesn't Make Things Better

Photo by RDNE Stock project from Pexels.

DR CATRIONA NGUYEN ROBERTSON MRSV

Healthcare is costly and contributes to 7% of Australia's carbon footprint.[1] Is it always worth that cost?

While medical care undoubtedly provides many benefits to many people, sometimes treatments can be ineffective and sometimes even downright harmful.

As a clinician, Professor Rachelle Buchbinder constantly wanted to determine what was best for her patients. How could she best diagnose and treat them? This mentality taught her to ask questions and investigate where scientific evidence behind any clinical practice came from. She did not take anything for granted.

Rachelle has spent decades combining clinical practice with research, investigating ways to reduce waste in the health care system, and identifying more efficient and effective diagnosis and treatment methods. She was awarded the 2022 RSV Medal for Excellence in Scientific Research for her research relating to the treatment of musculoskeletal conditions, as well as work to improve communication with patients and general health literacy.

It's all about communication: improving public health by improving messaging

Almost everyone experiences low back pain at some point in their lives. In the decade leading up to 1997, it was proving quite debilitating in the workforce: workers' compensation costs for back-pain claims tripled and rates of back pain were rising. The Victorian WorkCover Authority launched a media campaign that ran from 1997-1999 in response: "*Back Pain: Don't Take It Lying Down*".

The main goal of the campaign was to encourage people with low back pain to take charge of their own recovery. A key message was that they should continue with their usual routines rather than resting for prolonged periods. There is a lot people can do to help themselves recover, and therefore the idea was to avoid people seeking unnecessary medical treatment. The message was widespread, especially at the beginning: it was on television, on the radio and plastered on billboards. But how successful was the campaign?

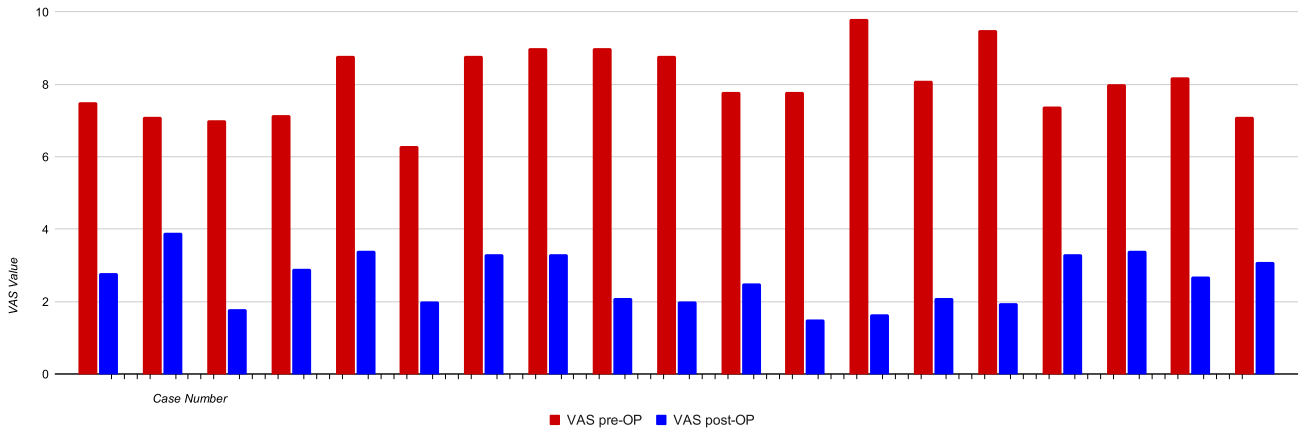
Rachelle was tasked with evaluating its effectiveness.[2] She found that there had been a great shift in attitudes among doctors and the general population around back pain beliefs following the campaign. The number of WorkCover claims fell by over 3,000, and there were reductions in the amount of time taken off work and medical costs associated with back pain. Although the campaign had been successful at the time, 20 years later the over-medicalisation of back pain remains a problem.

To combat this, Rachelle led an international team of authors to publish a series of papers in The Lancet in 2018 calling for urgent global action to address low-value care for low back pain.[3] The team worked with advocacy and policy consultants to raise public awareness of the issue, resulting in 594 media stories being published across 41 countries. In addition, they devised a Twitter campaign, *#LowBackPain*, which was seen by almost 15 million people. Importantly, the scientific accuracy of media coverage of low back pain was excellent during the campaign itself, however, it did not translate to long-term accuracy. The media regressed back to containing stories that sell unvalidated products and inaccurate messages.

Rachelle therefore advocates for media advocacy combined with changes in national policies that restrict the marketing of inaccurate messages for back pain. By influencing large numbers of people simultaneously, well-designed health messages have the potential to encourage change over time for the better.

Fact or fiction: looking into the true benefits of treatments

Only one in 20 medical treatments have high-quality evidence to support their claimed benefits.[4] It is particularly worrying that the harms of healthcare interventions are not always quantified. For a doctor or patient to be properly informed when deciding whether to use a treatment, they need to know whether the benefits outweigh the harms.



ABOVE: If the average pain reported after treatment (blue) dropped compared to before treatment (red), would you believe the procedure works? Rachelle asked this of the audience…and then promptly pointed out that the placebo effect had not been taken into account. Yet this is the only data that supported the use of this treatment in clinics.

If the harms have been inadequately measured, an "informed choice" is not possible.

The mind is a powerful thing. The placebo effect - the idea that your brain can convince your body that a fake treatment is working - has been around for millenia. But medicine should not simply rely on this. The fairest way to test a treatment is to subject it to a randomised placebo-controlled trial: one group of people receive the active treatment while another receives a "dummy", and no one knows who received which until the end. This way, any difference in outcome can be attributed to the treatment itself.

Rachelle investigated a common treatment for vertebral fractures caused by osteoporosis. One of the go-to treatments is vertebroplasty, an injection of cement into the fracture to seal it. However, the data supporting its presumed benefits did not stem from a randomised controlled trial. When Rachelle looked into it, she found that it was ineffective - no better than the placebo. Furthermore, sometimes the treatment could be harmful if the cement became dislodged and ended up in a lung or the heart. With a vertebral fracture occurring every 22 seconds worldwide in people over age 50,[5] Rachelle openly voiced her concern to prevent potential harm to patients for whom this treatment was being recommended.

But Rachelle's finding was not popular among the community for whom vertebroplasty was a lucrative business. She quickly learned that publishing unpopular results could lead to personal attacks. Some clinicians retaliated by claiming that her study was "fake news", a sham.

It can be hard to investigate accepted treatments and speak against loud voices. But despite pushback, Rachelle forged ahead, and has since built a list of other treatments that we now know have no or limited true benefits. We therefore need to be sceptical of unproven treatments and question where conclusions around their effectiveness come from. Rachelle thus encourages doctors to question data, and patients to ask questions of their doctors and do their own research (e.g. reading lay summaries in the Cochrane Library).

From low back pain to optimising the entire healthcare system

Unnecessary overtreatment costs Australia $30 billion. Furthermore, we could save more than 8,000 kilotons of carbon emissions by scrapping low value care that does not even provide any benefit. Most developed countries now spend so much money and waste so many resources that healthcare itself has become one of the leading dangers for public health. Only 60% of diagnostics and treatments are effective, while 30% is of no or little value and 10% can be harmful.

Medical professionals may request diagnostic tests and recommend treatments that are unnecessary. Rachelle gave the example of ultrasound-guided injections: while they do have benefits, sometimes a simple injection into the arm would suffice. She worked with clinicians at the Hospital Israelita Albert Einstein in Brazil to establish a consultancy clinic within the hospital to provide a second opinion to patients with degenerative spinal conditions. In doing so, the team found a large discrepancy between the first and second opinions regarding diagnosis and need for spinal surgery. Many patients did not proceed with surgery and had the same outcomes - without the trauma of an invasive procedure.

Doctors want to believe that they are helping their patients. And we want to believe that they are. But sometimes they can overestimate the benefits of certain treatments and underestimate the risks. Not only does this problem in the healthcare system fail to provide benefit and sometimes causes harm, it also diverts scarce resources away from those that need them most. Rachelle is therefore dedicated to optimising healthcare and ensuring that new evidence is translated into practice as soon as it emerges.

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[1] Malik, A., et al. (2018). The carbon footprint of Australian health care. The Lancet Planetary Health, 2(1), e27–e35. https://doi.org/10.1016/s2542-5196(17)30180-8

[2] Buchbinder, R. (2008), Self-management education en masse: effectiveness of the Back Pain: Don't Take It Lying Down mass media campaign. Medical Journal of Australia, 189: S29-S32. https://doi.org/10.5694/j.1326-5377.2008.tb02207.x

[3] The Lancet: Low Back Pain series. From https://www.thelancet.com/series/low-back-pain

[4] Howick, J., et al. (2022). Most healthcare interventions tested in Cochrane Reviews are not effective according to high quality evidence: a systematic review and meta-analysis. Journal of Clinical Epidemiology, 148, 160-169. https://doi.org/10.1016/j.jclinepi.2022.04.017

[5] Johnell, O., & Kanis, J. A. (2006). An estimate of the worldwide prevalence and disability associated with osteoporotic fractures. Osteoporosis international, 17(12), 1726–1733. https://doi.org/10.1007/s00198-006-0172-4

Written in Stone

The Evolution of Life on Earth

DR CATRIONA NGUYEN ROBERTSON MRSV

'The early Earth was a fundamentally weird place', according to Dr Ashleigh Hood. Around 3-3.5 billion years ago, the orange sky was still, the barren landscape had no plants in sight, and the green ocean lacked any creature that we would recognise today.

Earth is teeming with life. It appears to be an oasis in our Solar System as we are yet to find any evidence of life elsewhere. Yet it was once very different. Dr Ashleigh Hood, recipient of the 2022 Phillip Law Postdoctoral Award, studies the story of life on Earth as it is told in sediment and the geological record.

After Ashleigh mapped a massive, "weird", ancient reef the size of the Great Barrier Reef as a geology student, she was hooked. It was unlike anything she had seen in the modern world, and it was the beginning of many adventures that would take her around the globe. From the Flinders Ranges, where she was stalked by emus, to the US, Namibia, and Canada, she has trekked the world to understand what it was like hundreds of millions of years ago.

Scientists have a good understanding of Earth's more "recent" history – the last billion years – however it becomes more enigmatic the further back in time they go.

The methane atmosphere and the iron- or hydrogen sulphide-rich seas were quite inhospitable. They were all devoid of oxygen. But then cyanobacteria appeared. These bacteria photosynthesise – they can convert sunlight into energy, producing oxygen in the process. Oxygen (O_2) began to accumulate in the atmosphere, initiating the Great Oxidation Event 2.4 billion years ago. Atmospheric oxygen levels rose to 10% of their present levels by the end of the Great Oxidation Event - a rise that was only transient before dipping down again.

The following period is sometimes dubbed as "the Boring Billion". It has long been considered a period when little happened on Earth in terms of biological evolution and changes in climate, the oceans, or the atmosphere. The first eukaryotes (cells with an advanced cell structure) had already evolved but the pace of evolution seemed to have stalled.

As time went on, marine life developed. It flourished in large reefs around 715 million years ago, quite different to the reefs of coral that we are used to. Ochre-rich red seabeds were littered with stromatolites, microbial reefs created by cyanobacteria. The reefs grew upwards, stretching towards the sunlight, their source of energy. Creatures unknown to Ashleigh and other scientists lurked below – but whatever was in the depths, they did not need light or much oxygen.

It did not help that, as things started to get going, Earth experienced two massive glaciation periods. For over 50 million years – which is almost the period since the extinction of dinosaurs up till now - the oceans virtually froze over all the way from the poles to the equator.

How did any life survive when the planet was encased in ice? Ashleigh and her team examined iron-rich rocks that were deposited around 700 million years ago, as the iron chemistry tells a story about oxygen dynamics during that time. In the absence of oxygen, iron was dissolved in seawater, but if present, oxygen would react with iron to form rocks that fell to the seafloor.

As it turns out, the team discovered that seawater closest to the ice-covered shoreline was oxygen-rich – the first direct evidence for any oxygen-rich marine environment during Snowball Earth. This provides a possible explanation for how marine life of the time may have survived and later evolved. Perhaps little pockets of oxygen were enough.

Oxygen levels continued to (unsteadily) climb at the start of the Cambrian period, 538.8 million years ago. Early fluctuations of oxygen levels provided life with new opportunities: aerobic metabolism is much more efficient than anaerobic. As the evolution of animal species took off, plants also appeared on the scene. However, early plants were small and restricted to coastal swamps, thereby having little impact on the biosphere.

Ashleigh found evidence for a second large jump in oxygen. She traces oxygen levels using cerium as a proxy, known as the cerium anomaly. The concentration of cerium (Ce) is sensitive to the presence of oxygen and is either depleted or enriched in a rock relative to other rare-earth elements. In oxygenated waters, it is oxidised to form insoluble Ce that accumulates and is left behind. It was not until 380 million years ago, in the Devonian, that the cerium anomaly indicated a spike in oxygen levels. This coincides with the evolution of trees and root systems.

'Trees are the architects of the modern world,' says Ashleigh. At the end of the Devonian, forests were emerging and becoming more widespread, providing a great source of oxygen via photosynthesis. While some scientists believed that the evolution of animals was the driver of Earth becoming closer to the familiar world we know, Ashleigh's work suggests that it may not have happened the way it did without the oxygen that plants provided. Changes in oxygen caused a change in the trajectory of animal life. The world today is starkly different to the Devonian or Cambrian - or before both – as the creatures that lived then were adapted to very little or no oxygen. As Ashleigh says, 'there were lots of whacky things' back then.

Not only does Ashleigh's work reveal Earth's history, it also highlights what we might look for in other worlds in the universe that may indicate the presence of life (or at least, conditions amenable to life). The conditions that we are used to supporting life here on Earth only were created in the last 400 million years. With over 4,000 confirmed exoplanets, just give it time. But don't hold your breath – there is now thankfully plenty of oxygen to go around.

ABOVE: Ashleigh's research has taken her all over the world. Hundreds of millions of years of history are encapsulated in these rocks. Image: Dr Asheigh Hood.

PREVIOUS PAGE: Ashleigh undertakes field work in the Flinders Ranges because they are a series of 10 km-long preserved records of the reefs that existed at the time. Photograph: Pexels

We know a lot about Earth's recent history, but as we approach the edge of animal life, our knowledge spirals out of control. 'We don't really know what's happening [in that part of the geological time scale],' says Ashleigh. Image: Dr Asheigh Hood.

1973

Early Use of Computer Programs for Ecological Studies

BY SCOTT REDDIEX MRSV

'Mark-Recapture' studies have long been utilised as a practical method for estimating the size and other attributes of an animal population. The fundamental process is a simple one: capture a random sample of individuals from a population, mark them in some fashion (e.g., an ear tag), and promptly release them back into their habitat. At a later point, capture another random sample from the same population, and assess the number of animals that were part of the first sample. With this data, different mathematical models can be utilised to estimate the total population size.

In the 1973/74 Proceedings of the RSV, researchers Daphne and George Ettershank from Monash University's Department of Zoology published their work on developing a computer program to simulate an animal population subjected to a mark-recapture study.

The authors outline the purpose of creating a simulation program, stating that "*The present paper presents the results of a computer simulation study in which four estimation models were examined. The selection of these models was influenced by their being used or under consideration for use in studies of the Desert Biome Program of the US/IBP Analysis of Ecosystems. As mark-recapture studies were to be used for a wide range of taxa, a comprehensive, realistic model of a population subject to such study was required.*"

Their simulation program, called SYNPOP, was written in the coding language Fortran IV and initially run on an IBM360/50 computer at New Mexico State University, New Mexico. It was later adapted and expanded for a Burroughs B5500 computer at Monash University, which boasted a maximum 192kb of directly accessible memory.

OPPOSITE: A Burroughs B5500 computer – the first of its kind in Australia – at Monash University's Computer Centre, 1969. Source: Monash University Gazette Vol 6, No 1 (1969).

FROM: *Proceedings of the Royal Society of Victoria,* Vol 86 (New Series), 1974. Article 9 - A Computer Simulation Study of Mark-Recapture Methods in Ecology.


Burroughs
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1923

Government Investment in Victoria's Science Society

BY SCOTT REDDIEX MRSV

The Society's Annual Report for the year 1923 details the renewed investment of the Victorian Government of Sir Harry Lawson in the RSV.

"A deputation from the Council waited on the Chief Secretary on the 25th July to urge that the Annual Government Grant to the Society be restored to £200 [~$17,000 in 2021], and that a sum of £1000 [~$85,300] be made available for carrying out urgent repairs to the buildings, replacing the fence, and binding the publications. It was pointed out that in 1906 the Government Grant was reduced from £200 to £100 [~$8,530], and that during and since the war the greatly increased cost of publishing had been a severe strain on the Society's funds. The buildings and fences were in urgent need of repair, and it had not been possible to do any binding for some years. The Minister expressed his appreciation of the work done by the Society, and thought the Grant should be increased. He undertook to put the matter before the Treasurer and the Cabinet. On the 27th September, representatives of the Council waited upon the Treasurer, Sir William McPherson, and put the matter before him, with the result that the Government has agreed to restore the Government Grant to £200, to have the buildings thoroughly renovated, and the binding of approximately 800 volumes done by the Government Printer.

Arrangements for the renovation of the buildings are now being made by the Chief Secretary's Department, and an instalment of the binding is in the hands of the binder."

The RSV Treasurer, Edward Kidson obe, wrote in his report of the dire state the Society had found itself in prior to the grant:

"It will be obvious from the Statement, that the Society's credit balance has been maintained only by abstaining from much-needed works. It is a great pleasure, therefore to be able to announce that the Victorian State Government has agreed to restore the Grant in aid to £200, to repair the Cottage and Hall, and to bind publications. It behoves the Society, by a display of increased activity, to show its appreciation of this more generous treatment. Furthermore, our library accommodation is becoming increasingly inadequate, while the lecture rooms, besides being too small, are lacking in every convenience for their purpose. Instead of resting content with the present position, therefore, the Society should spare no effort, until, by increasing its membership, and by otherwise securing the support of the public, it becomes possessed of sufficient resources to enable it to undertake the erection of a building adequate to its needs."

OPPOSITE: Pounds, Shillings, and Pence – the RSV finances of 1924.

FROM: *Proceedings of the Royal Society of Victoria*, Volume 36 (New Series), 1924.

Financial Statement for period March 1st, 1923, to January 31st, 1924.

RECEIPTS.					EXPENDITURE.				
Balance at Current A/c, 1st March, 1923			£213	9 10	Publication, Printing and Postage—				
Cash in hand			3	1 11	Printing and Publication	£275	19 3		
Subscriptions—					Postage	21	9 2		
Members—Subs. in arrears	£4	4 0						£297	8 5
„ for 1923	148	1 0			Maintenance—				
„ in advance	2	2 0			Assistant Secretary ...	£30	0 0		
Associates—					Assistant Librarian ...	12	0 0		
Subs. in arrears	29	12 0			Caretaker's A/cs. ...	19	13 7		
„ for 1923	77	14 0			Rates	15	11 4		
„ in advance	4	4 0			Insurance	5	1 3		
Country Members—					Sundries — Gas, Electric Light, etc.	12	12 2		
Subs. in arrears	1	1 0			Repairs	8	2 6		
„ for 1923	13	13 0			Petty Cash	8	19 4		
„ in advance	6	6 0						112	0 2
			286	17 0	Library			4	17 6
Rents—								£414	6 1
Com'wealth Government	£37	10 0			Credit balance as on 31/1/24—				
Field Naturalists' Club...	12	0 0			Current Account			253	8 9
			49	10 0	Cash in Hand			0	3 5
Sales of Publications			12	11 6					
Victorian State Government Grant in Aid			100	0 0					
Donation			2	2 0					
Exchange on Cheques			0	6 0					
			£667	18 3				£667	18 3

We have examined Pass Books and hereby certify that all amounts entered herein have been paid to the credit of the Society. We have seen receipts for all payments.

EDWARD KIDSON, *Hon. Treas.* 25/2/24 A. E. V. RICHARDSON, C. A. LAMBERT, } *Hon. Auditors.*

The amount standing to the credit of the Society at the State Government Savings Bank on 1/7/23 was £150 13 10

Subscriptions still owing for 1923 are—Members (2)	£4	4 0	
Associates (16) ...	17	17 0	(including one in arrears for 1922 also)
Country Members (2) ...	2	2 0	
	£24	3 0	

Liabilities to Messrs. Ford & Son for printing Proceedings are estimated at £210.

1868

Addressing the Great Floods of Melbourne

BY SCOTT REDDIEX MRSV

"It will thus be seen that the danger to human life and property is greatly increased by the suddenness of the change from the dry street to the bed of a raging torrent."

On the 14th of May 1873, RSV Vice President Alexander K. Smith read his paper "On the Prevention of Street Floods in the City of Melbourne" to members.

The piece was written in response to the significant increase in the frequency of and damage caused by flash flooding in the Melbourne CBD – a result of the rapid development of the area without due consideration of its disruption to the drainage of the land.

The space now occupied by Elizabeth St had originally been a waterway named "Williams Creek". Rain falling in the local catchment area – roughly bounded by Grattan St in the north, William St in the west, Brunswick St in the east and Flinders St in the south – had previously drained down to the creek and then out into the Yarra River. With the creek filled in and a grid of streets built in a large water catchment area, storm water continued to trace a path of least resistance to the river, predominately via Swanston and Elizabeth Streets. The result was that Melbourne recorded six 'great floods' between 1839 and 1849, each associated with extensive damage and deaths.

In what might come as no surprise, the Europeans could have mitigated the deaths and destruction that came from over 50 years of flooding events - since 1835, local indigenous people had warned the newcomers of the risk of flooding in the area, but had been dismissed as 'black ruse'.1

Following the onset of a thunderstorm, Smith had found that it took only 14.5 minutes for the city's streets to become impassable for pedestrians, and that this was half the time it had taken in 1856. He attributes this to 'the Melbourne of 1873 [being] widely different from that of 1856', particularly in respect to the ability of previously unsealed or unused ground to absorb much of the stormwater 'before the remainder found its way to the street-channels'.

In his article, Smith proposes a solution: "I, therefore, after a careful review of all the circumstances connected with the flooding of our streets, think, that to intercept the water and carry it off by a tunnel is the best and cheapest plan; and in conclusion I venture to express a hope that the necessity of doing so will be promptly recognised and the work speedily executed."

While a series of subterranean stormwater drains were the eventually implement solution, a missed opportunity regarding Williams Creek/Elizabeth St was lamented upon by William Westgarth: "Melbourne missed a great chance in filling up with a street this troublesome, and, as a street, unhealthy hollow. … A reservation of the natural grass and gum-trees between Queen and Swanston streets would have redeemed Melbourne up to the first rank of urban scenic effect, and the riotous Williams might, with entire usefulness, have subsided into a succession of ornamental lakes and fish ponds."2

OPPOSITE FROM TOP:
Elizabeth street in flood, December 5. by F. A. Sleap (1882). Source: State Library of Victoria (Public Domain)

Melbourne in 1838, from the Yarra Yarra, by Clarence Woodhouse (1888), depicting Williams Creek prior to it being filled in. Source: State Library of Victoria (Public Domain)

FROM: *Transactions and Proceedings of the Royal Society of Victoria*, Volume XI, 1874, Article I - On the Prevention of Street Floods in the City of Melbourne.

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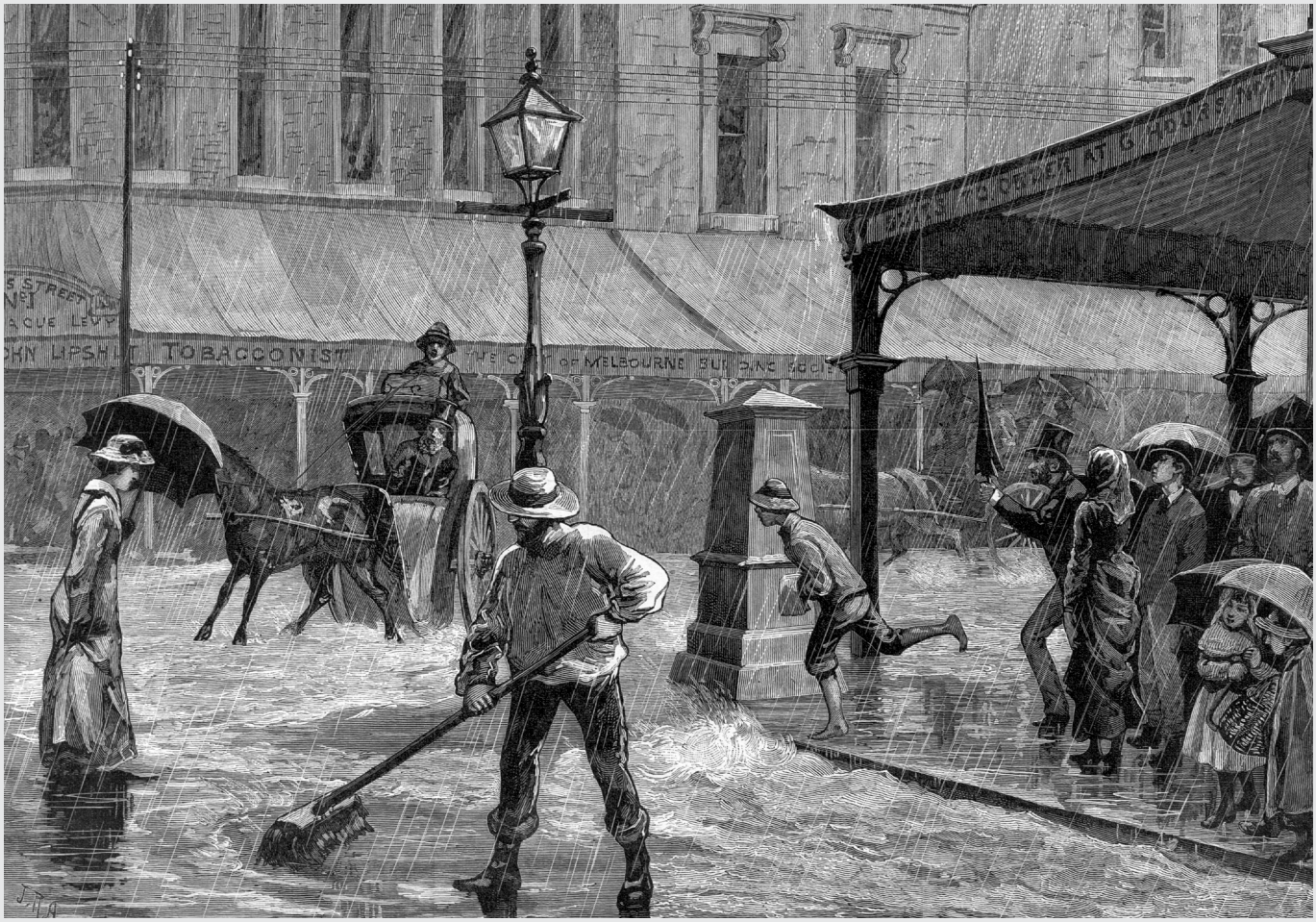
[1] Finn, Edmund, The chronicles of early Melbourne, 1835 to 1852: Historical, anecdotal and personal, vol. 1, p. 211

[2] Westgarth, William, 1888, Personal recollections of early Melbourne & Victoria, p. 30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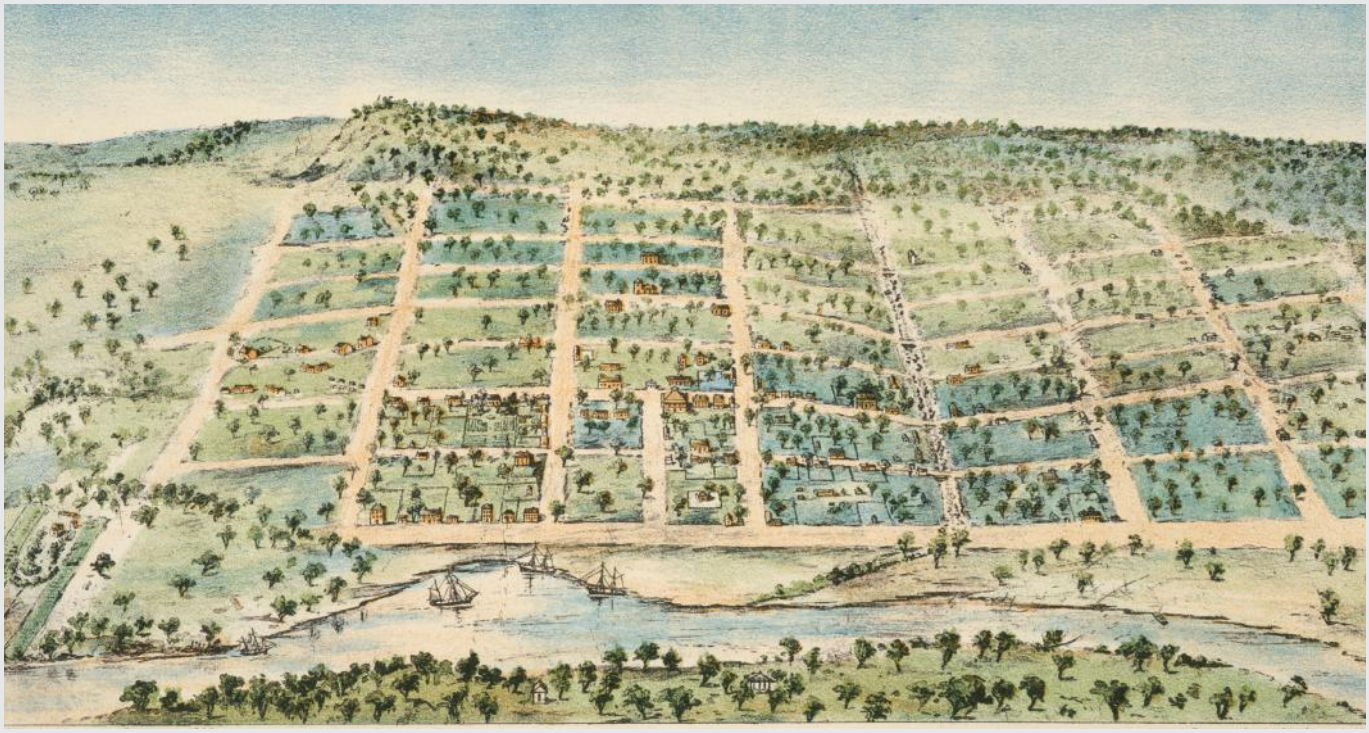


Current Government Consultations of Interest to Victoria's Science Community

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

ONGOING CONSULTATION

Victorian Murray Floodplain Restoration Inquiry and Advisory Committee

Have your say on the Standing Inquiry and Advisory Committee appointed to advise on the proposed Victorian Murray Floodplain Restoration Projects and their potential effects.

engage.vic.gov.au/VMFRP-SIAC

CONSULTATION CLOSES 10 FEBRUARY 2023

Port Fairy Decommissioned Landfill Management

Have your say on the options for the management of the decommissioned landfills along East Beach, Port Fairy.

engage.vic.gov.au/port-fairy-landfill-management

CONSULTATION CLOSES 17 FEBRUARY 2023

New EPA Guidelines for Industry Separation Distances and Landfill Buffers

Have your say on the Standing Inquiry and Advisory Committee appointed to advise on the proposed Victorian Murray Floodplain Restoration Projects and their potential effects.

engage.vic.gov.au/separation-distances-and-landfill-buffers

CONSULTATION CLOSES 26 FEBRUARY 2023

Cape to Cape Resilience Project

Have your say on the second stage of the development of the Cape Paterson to Cape Liptrap Resilience Plan.

engage.vic.gov.au/cape-cape-resilience-project

CALL FOR SCIENTIFIC PAPERS

AVAILABLE ONLINE AT PUBLISH.CSIRO.AU/RS

The Proceedings of the Royal Society of Victoria is our refereed journal, published twice annually by CSIRO Publishing.

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

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

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

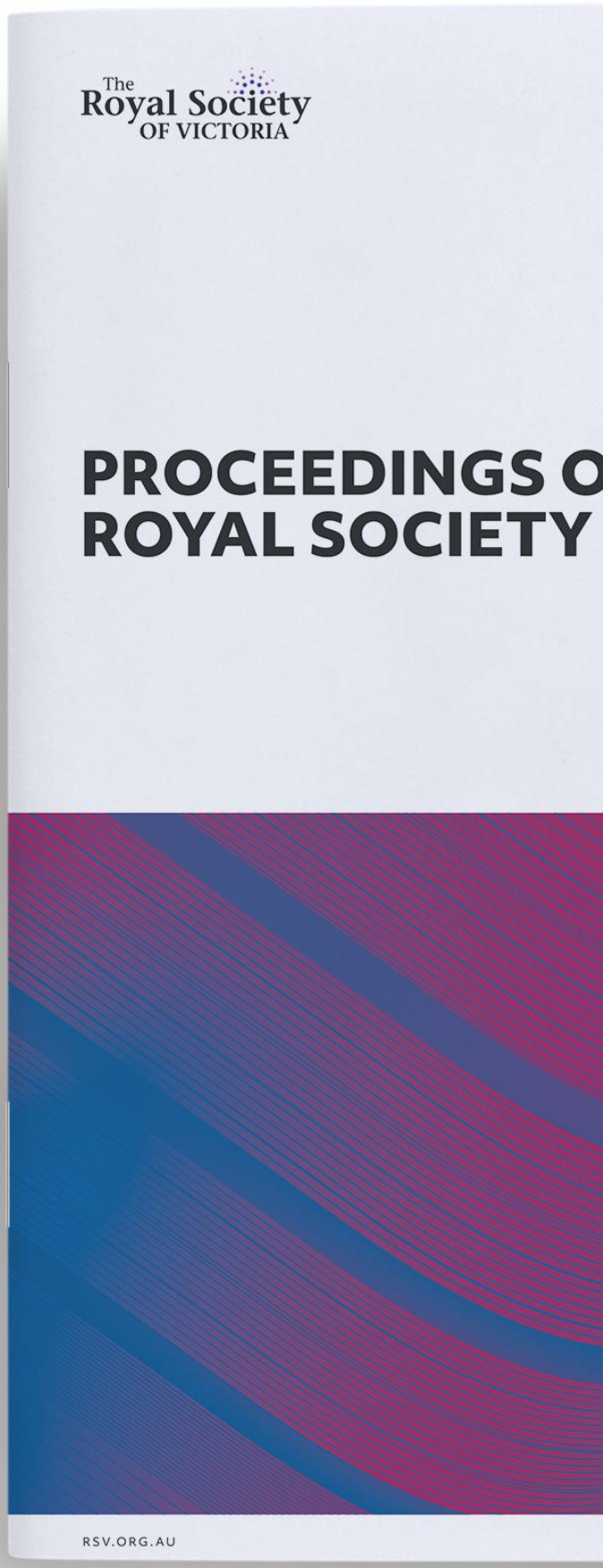
The journal began in 1855 as an irregular publication under the title *Transactions of the Philosophical Society of Victoria,* with the present name adopted in 1889. Since then, volumes of the journal have been published annually, often across one or more parts.

The online content published by CSIRO Publishing extends back to Volume 118, 2006, and is available at publish.csiro.au/rs.

All volumes of the *Proceedings* and its predecessors from 1854 to 2006 are also available free online at **biodiversitylibrary.org/creator/6984**.

Submissions

Those interested in submitting papers should review the Author Instructions at **publish.csiro.au/rs/forauthors/AuthorInstructions**. Manuscript submissions for the Proceedings are now made using the ScholarOne platform. Any enquiries regarding submission can be made to **editor@rsv.org.au**



Submission Guidelines

Pitch it to us!

Have an idea for an article?
We want to hear from you!

Briefly outline your key message, why it should be shared in *Science Victoria*, and the proposed article type. Pitches can be submitted at any time, but check submission deadlines if you're interested in publishing in a particular edition.

All pieces will be reviewed prior to publishing, and may be edited for length and clarity (although we will not alter the message or context of your work).

Send pitches and any questions to **editor@ScienceVictoria.org.au**.

We welcome your pitches relating to current scientific research in Victoria, recent scientific discoveries, social and policy issues, technical innovations, and overviews of impactful research.

Science Victoria's articles are written in plain, non-academic language, and thoroughly referenced (see: References).This is not a platform for scientific journal articles or media pieces. For more information on what we're looking for, see below.

Style Guide

All pieces should have readability in mind. A good litmus test is knowing that most people have read a piece or been to a presentation that managed to make the most interesting topics incredibly boring and/or confusing. This is what you want to avoid.

A general guide for readability is that it should be understood by an educated 16-year-old – or ask a friend or family member to proofread!

Feature Articles

Recommended length: 600 - 1,800 words

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.

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

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 publications for a general audience, like *The Conversation, Cosmos, New Scientist, or Scientific American.*

Opinion Articles

Recommended length: 600 - 1,800 words

In contrast to a feature article, an opinion piece conveys your informed opinion on, or experiences with, a particular topic. 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; ethical problems related to scientific projects or careers in STEMM; 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.

We welcome well-informed opinion articles from all authors, particularly from those with significant expertise in a given area. Articles may reference your own work; however, these are not promotional fluff pieces.

Letters

Recommended length: 200 – 1,000 words

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. Potential subject areas include responses to articles in previous editions of *Science Victoria*, seminars at scientific events, science-related issues and policies, or topics you'd like to see in future editions.

Letters are also the best format to share current or recent news relating to science, with an emphasis on science in Victoria or news that impacts Victoria's scientific community. News 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.

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

What I've Been Reading

Recommended length: 600 - 1,800 words

This is a column for you to tell us about a book broadly relating to STEMM that you've read. These pieces typically include a summary of the book and its ideas, as well as your interpretations or conclusions. Possible questions to consider: 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?

Images and Figures

Images are strongly encouraged, however please only provide files that are either completely original, in the Public Domain, or covered by an appropriate Creative Commons license. Images must include details of the source, license, and any relevant descriptions.

If suitable images are not provided, we may include relevant Public Domain/Creative Commons images.

All images must be of sufficient size and quality – as a rough guide, aim for >1.3 MB in file size.

References

Please reference primary sources/journal articles for any non-trivial scientific claims, or for publications that prompted your writing of the article. If references aren't provided, we will request them for specific statements.

References for all articles should use a modified APA 7th edition format: reference list in author-year format, with numbered in-text citations. Refer to articles in previous editions for examples. Please do not submit pieces that use MS Word's References/Footnote/Endnotes feature, as it forces us to manually re-write your references.

Submission Deadlines

FEBRUARY 2023 *Introducing Science Victoria*	**DUE DATE** *20 January*
MARCH 2023 *Women in STEMM*	**DUE DATE** *21 February*
APRIL 2023 *Powering Victoria*	**DUE DATE** *21 March*
MAY 2023 *Water & Waste*	**DUE DATE** *14 April*
JUNE 2023 *The Future of Healthcare*	**DUE DATE** *19 May*
JULY 2023 *Careers in STEMM*	**DUE DATE** *16 June*
AUGUST 2023 *Plastics*	**DUE DATE** *14 July*
SEPTEMBER 2023 *Victoria's Flora*	**DUE DATE** *18 August*
OCTOBER 2023 *Science & Food*	**DUE DATE** *15 September*
NOVEMBER 2023 *Victoria & Space*	**DUE DATE** *20 October*
DECEMBER 2023 *The Future of Drug Discovery*	**DUE DATE** *17 November*

Hold Your Next Event at the Royal Society of Victoria

The RSV engages communities with scientific knowledge through aligned partnerships, events, festivals, conferences, and education programs.

Services Available

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

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

The Facilities

The RSV's facilities are available for hire to organisations, companies, or private groups.

Audio-visual and seminar equipment is available for use, including videoconferencing facilities for hybrid Zoom/MS Teams meetings.

There is a commercial kitchen on the ground floor, suitable for your own use or by a caterer. Limited parking is available on-site, and a commercial parking operator is adjacent on La Trobe Street.

▸ Take a Virtual Tour of the building at: ▸ matterport.com/discover/space/Royal-Society-Victoria

▸ Email rsv@rsv.org.au to discuss your needs and ideas!

The Burke and Wills Room

The beginning and end of the ill-fated Victorian Exploring Expedition of 1860-61 is a beautiful, multi-function space with an adjoining kitchen, suitable for a range of events.

SUITABLE FOR

Workshops, roundtables, luncheons, dinners, seminars, and functions.

CAPACITY

Workshops	*≤30 people*
Dinners	*≤60 people*
Catered Functions	*≤80 people*

The Ellery Lecture Theatre

First-floor lecture theatre, with raked seating, speaker's podium, and audio/visual equipment. Perfect for lectures, presentations, and conferences.

SUITABLE FOR

Presentations, seminars, lectures.

CAPACITY

Any Booking	*≤110 people*

The Millis Room

A versatile room on the ground floor, with views of the Carlton Gardens. Suitable for smaller meetings, group/individual work, or seminars.

SUITABLE FOR	CAPACITY	
Meetings, group/individual workspace, and seminars.	*Any Booking*	*≤15 people*

The Cudmore Library

A picturesque room with videoconferencing and projection equipment. Great for larger meetings and seminars, with in-person or hybrid attendees.

SUITABLE FOR	CAPACITY	
Meetings, seminars, and videoconferencing.	*Any Booking*	*≤15 people*

The Von Mueller Room

A light-filled room on the first floor, perfect for smaller meetings and seminars, or group/individual work.

SUITABLE FOR	CAPACITY	
Meetings, seminars, and videoconferencing.	*Any Booking*	*≤15 people*

Support Victoria's Science Society in 2024 and help us to engage individuals and communities with STEMM

WHO WE ARE

Founded in 1854, the Royal Society of Victoria (RSV) is our state's science society.

We are a membership based, non-government organisation, advocating for the importance of science, technology, innovation, and building the skills for Victoria's future industries, governments, community leaders, and research superstars.

WHAT WE DO

We manage the Inspiring Australia program in Victoria (inspiringvictoria.org.au), meaningfully engaging communities with science.

We encourage, profile, and celebrate the achievements of Victorian scientists through public lectures, awards, and prizes, which are supported by the donations and bequests to the RSV Science Foundation.

WHERE YOUR DONATIONS GO

Your donations allow us to continue the work we have been doing for Victoria for more than 160 years. This includes hosting organising/hosting/running STEMM events, running a public lecture series (in-person and online), producing the magazine Science Victoria, celebrating Victorian scientists through awards and prizes, publishing Victorian science in our academic journal (the Proceedings of the Royal Society of Victoria), and empowering the next generation of scientists.

HOW TO SUPPORT

We also support a number of smaller organisations, which are listed at **rsv.org.au**.

You can donate online now at **rsv.org.au/support-the-rsv**, or alternatively contact us at **rsv@rsv.org.au** for information about other payment methods.

Become a Member of the RSV

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.

	STUDENT $40 PER YEAR	FULL $120 PER YEAR	ORG. $1000 PER YEAR	SCHOOL $1000 PER YEAR	AFFILIATE $500 PER YEAR
Special Membership rates at RSV and affiliate events.	✓	✓			
Networking opportunities – national and local.	✓	✓	✓	✓	✓
Recognition of membership through use of post-nominal affix	MRSV	MRSV			
Science Victoria Digital Edition (Printed copy available for an additional fee).	✓	✓	✓	✓	✓
Free monthly printed copies of *Science Victoria* for school libraries.				✓	
Recognition of achievements through awards programs.	✓	✓			
Discounted advertising in *Science Victoria*			✓	✓	✓
Discounted facility hire at 8 La Trobe Street, Melbourne.			✓	✓	✓
Discounted membership rate for eligible full-time students.	✓				
Discount on purchases from CSIRO Publishing	✓	✓			
'Schools Supporting Schools' Membership Program*				✓	
Listing of membership on the RSV.org.au website.			✓	✓	✓

New Individual Members

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For more information:
rsv.org.au/how-to-join

* The 'Schools Supporting Schools' membership program allows a school to sponsor the membership of one or more schools at a discounted rate of $750/year, allowing less-resourced schools the same benefits and opportunities of RSV membership.

Science Victoria
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Wurundjeri Country
8 La Trobe Street, Melbourne, VIC 3000

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rsv.org.au/news/science-victoria

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