DECEMBER 2024 — SCIENCE & BUSINESS

SCIENCE VICTORIA

Science, in Other Words

The Business of Science Communication with Scientell
— pg 15

Nature, Not Profit

Restoring Nature with Greenfleet
— pg 22

Bosses Monitoring Brains

Parliament Inquiry into Future Workplace Tech
— pg 35

Inside

ISSN 2981-8664
9 772981 866005 11

The pharmaceutical industry is a multi-billion dollar industry, based on the application of science. Photograph: Myriam Zilles via Unsplash.

In This Issue

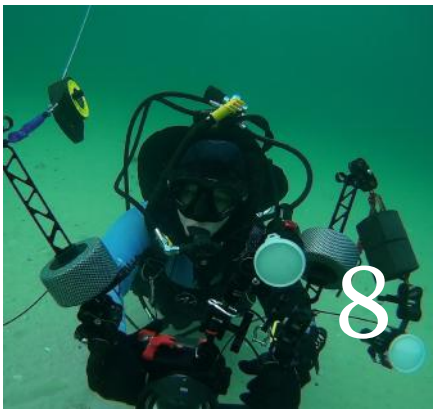
SCIENCE & BUSINESS

With research predominately publicly funded in Australia, much of the work and study is focused on scientific advancement, publications, and securing grants – rather than 'science' as a commercial product or service.

In this edition we look at the intersection of Science & Business, and some of the ways that science and scientists are succeeding in the market.

ON THE COVER

Wurneet Laang Laang in South Gippsland. Planted and protected by the not-for-profit Greenfleet, this seven-year-old forest forms the first part of the Strzelecki Nature Link. Photograph: Alese Watson/Greenfleet.



Upcoming Submission Deadlines

For all 2025 editions and deadlines, refer to page 45.

JAN - FEB 2025	DUE DATE
Biotech	*5pm, 17 January*

MAR - APR 2025	DUE DATE
Preventing Future Problems	*5pm, 7 March*

From the Editor

SCOTT REDDIEX
Editor-in-Chief — Science Victoria

A (Brief) Annual Review of *Science Victoria*

At the end of another year of *Science Victoria*, we look back at the year that was, and to what the future holds for our magazine. I am immensely proud of what we have produced this year, and incredibly thankful to all the brilliant contributors we have featured on a wide range of topics – from AI, native fauna, and pollution in our state, to accessibility and inclusion, building scientific competency, and more.

Thanks go as well to the people who are involved with the production and distribution of every edition: our Senior Editor and writer Dr Catriona Nguyen-Robertson, RSV CEO Mike Flattley, graphic designer Rosie Everett, RSV President Rob Gell, RSV Business Manager James McArthur, and Geoff Lawyer and his team at Complete Colour for printing. It is a team effort to get each edition over the line, and your support is invaluable.

2025 marks the beginning of the fifth volume of *Science Victoria* – meaning that we have produced 44 editions over the last four years (all of which can be read for free at **rsv.org.au/science-victoria**). In the interest of sustainability of production, from 2025 we will be moving to a bi-monthly publication cycle. Six editions, publishing every second month, with individual articles shared throughout the year. You can find the themes of each future edition and submission deadlines later in this edition.

The Business of Science

"There's no money in science!" is something that many considering a career in STEM will have heard, especially relating to a career in academia. Securing grant funding is intensely competitive in all fields at all levels, as an increasing number of researchers fight over a decreasing pool of public and philanthropic funds.

Many research groups depend on the 'cheap labour' of a PhD student workforce, who subsist on scholarship stipends, and can often find upon graduating that there is no money to pay them a post-doc salary. Those considering alternatives to academia are often told of a greener pasture called 'industry' – i.e., the private sector.

But what does that actually mean? How do businesses that have 'science' products or services get started, and – more importantly – make enough money to keep running? Who and where are the customers?

In this edition of *Science Victoria*, we look at the intersection of Science & Business. Dr Simon Torok shares the story of Scientell, the science communications business he founded with the late Paul Holper, and their successes, struggles, and lessons learned. Greenfleet CEO Wayne Wescott explains how they are studying, restoring, and protecting nature as a not-for-profit, while I take a look at the sustainability of a science society in 1925.

Dr Catriona Nguyen-Robertson looks at how we can create a world-leading manufacturing sector in Victoria, while Amanika Sahu explores a different way of recycling plastics.

Elsewhere in this edition, Ben Kimber from the Parliament of Victoria covers the recent inquiry into new technologies in the workplace, and the policy and regulatory positions being advocated for by business and academics.

We hope you enjoy this edition of *Science Victoria*. Thank you for reading, and we hope you will join us again in 2025!

SCIENCE VICTORIA

VOLUME 4, NUMBER 11, DECEMBER 2024

The Monthly Publication of the Royal Society Victoria - Established 1854 for the promotion and advancement of science. Supported by the *Inspiring Victoria* Program.

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Acknowledgement of Country
The Royal Society of Victoria acknowledges our headquarters are located on Wurundjeri land, never ceded, and convey our respect to Elders past and present. The RSV welcomes all First Peoples, and seeks to support and celebrate their continued contributions to scientific knowledge.

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

Amsterdam, The Netherlands, was ranked first in the 2024 Arcadis Sustainable Cities Index. Photograph: Azhar J via Unsplash.

Science & Business

ROB GELL
President, The Royal Society of Victoria

A colleague often reminds me that in Australia we need to develop 'a lust for change'.

There is ample evidence that 'business as usual' is not delivering the sustainable development outcomes we need. At a high level, after five decades, the Club of Rome's 1972 treatise *The Limits to Growth* has been reviewed, confirmed, updated, and redelivered as *Earth for All: A Survival Guide for Humanity*, describing five 'extraordinary turnarounds' to bring real systems change and the need to rethink economic growth.[1]

Earth for All incorporates an understanding of planetary boundaries, climate tipping points, wellbeing economics and the need to move to a new economic system since the current one keeps crashing.

> The dominant economic model is destabilising societies and the planet. It is time for change.[2]

Not a small task, but there is no doubt that significant change is both necessary and inevitable.

Agents of change

An important component of the necessary change will be the adoption of new technologies. We need to support, collaborate, and invest in energy efficiency, renewable energy generation and storage systems, green chemistry, advanced manufacturing, nanotechnologies, regenerative technologies (rather than extractive ones), materials science, 'AI for good', and the circular economy. The science behind many of these topics have been the focus of many articles published in *Science Victoria* over the past several years.

These are now being rapidly explored by research institutions and startup companies worldwide. In Australia during 2023, private equity and venture capital assets under management grew, however, the majority of investment has been in what is referred to as 'dry powder', and also in real estate, particularly for private investors.[3] Dry powder is a term used to describe low risk, highly liquid securities, kept in reserve for emergencies.

In contrast, investors in the United States have shown a strong preference for investing in startups and early-stage companies, particularly in the technology sector.[4] Venture capitalists in Australia also have a preference for technology and innovation-focused startups supported by foreign investors, including from the Asia-Pacific region, and secondly by the Australian Government.

Analogy for adoption

In early 1987, I was able to participate in a summer voyage to Antarctica with the Australian Antarctic Division. Early one morning, we were set up to watch Adélie penguins making their way to the ocean to fish.

After we had set up the camera, I noticed that the birds stayed in their group close to the edge of the ice. Why weren't they going into the water? It was pointed out that there were a couple of Leopard seals nearby, waiting for their penguin breakfast.

What happened next was interesting: the birds at the back push forward, until someone at the front falls in… and 'pops' straight back out again landing mid flock; safe.

The process continues until the seals have had their fill (of those that didn't pop up quick enough), and then the whole flock of penguins pour into the water like a waterfall.

I have always recalled this sight when discussing how Australia adopts technology, with the adoption of electric vehicles as one example – cautiously waiting on the brink, unwilling to commit until the perceived risks are managed/ others have gone first, before adopting *en masse*.

Time to rock the boat

Many excellent technologies are available today, but suffer from an inertia in adoption – particularly in Australia. We do not aggressively seek out new technologies, and frequently maintain cumbersome programmes and clumsy decision-making frameworks that safely retain the *status quo*. Prioritisation of probity ensures that government tendering programmes are almost impossible to penetrate.

Cities provide a great opportunity to introduce 'sustainability thinking', and the promotion of innovations in sustainability. In years gone by, the City of Melbourne has bathed in the glory of being the world's 'most liveable city'. This is an assessment by the Economist Intelligence Unit (as sister company of the *The Economist* magazine) of the suitability of cities for the relocation of international business executives; a ranking of cities offering the highest quality of life; a Global Liveability Ranking.[5] Vienna won this year; Melbourne is back to fourth, Sydney seventh.

A better assessment, and perhaps acknowledgement of the need for change, is the Arcadis Sustainable Cities Index, which focuses on the United National Sustainable Development goals.[6] Melbourne and Sydney rank thirty-second and thirty-third respectively in the 2024 assessment (57th and 58th on environmental factors). Amsterdam ranks first, as a world leader in circular economy design, and for the adoption of a number of air pollution, emissions reduction, renewables, transport, and waste management technologies and systems.

There is much that can be done, and we need to move to a mindset of rapid change, seeking out the best technologies available and adopting them as quickly as possible.

Adélie penguin (*Pygoscelis adeliae*) at Brown Bluff, Antarctica. Photograph: Tam Minton via Unsplash.

REFERENCES:

1. Sandrine Dixson-Decleve, Gaffney, O., Ghosh, J., Jorgen Randers, Johan Rockstrom, & Per Espen Stoknes. (2022). Earth for All. New Society Publishers.
2. Earth4All. earth4all.life
3. Preqin. (2024). Australian Private Capital Market Overview: A Preqin and the Australian Investment Council Yearbook 2024. Preqin. go.preqin.com/australian-private-capital-market-overview-yearbook-2024
4. Global Liveability Ranking. Wikipedia. en.wikipedia.org/wiki/Global_Liveability_Ranking
5. The Arcadis Sustainable Cities Index 2024 (2024). Arcadis. connect.arcadis.com/sci-report-2024-a

Artificial Intelligence and Ethics

BY DR CATRIONA NGUYEN-ROBERTSON

How does an artificial intelligence (AI) algorithm know what is right and what is wrong when it comes to our values? How does it know what to label as 'appropriate' content, and filter out anything 'inappropriate'?

Someone has to teach it.

There are people behind the machines.

AI bots like OpenAI's ChatGPT and Google's Bard are examples of large language models – AI systems that are trained using extensive datasets and self-learning, and then refined. We rarely discuss the human toll behind the "quality assurance" of these AI models.

There are people whose job it is to screen the content that powers and trains AI algorithms – even the horrific content that represents the worst of humanity.

I was one such person – only very briefly, and it wasn't anything near the extent of what others have been subjected to, but it was enough to shake me up a little.

You may have used OpenAI's ChatGPT since its release at the end of 2022. It has many potential uses: brainstorming ideas, drafting text, answering questions, coding assistance, and more. According to OpenAI's usage policy, you are not allowed to use ChatGPT for:[1]

- Illegal activity
- Content that exploits or harms children
- Generate hateful, harassing, or violent content
- Activity to harm yourself or others

But for large language models to recognise these things, the algorithms must be fed examples. Humans have to train it.

This data collection and content labelling work is done thousands of kilometres from tech office headquarters in Silicon Valley. It's done in east Africa and Asia, at a fraction of the cost.

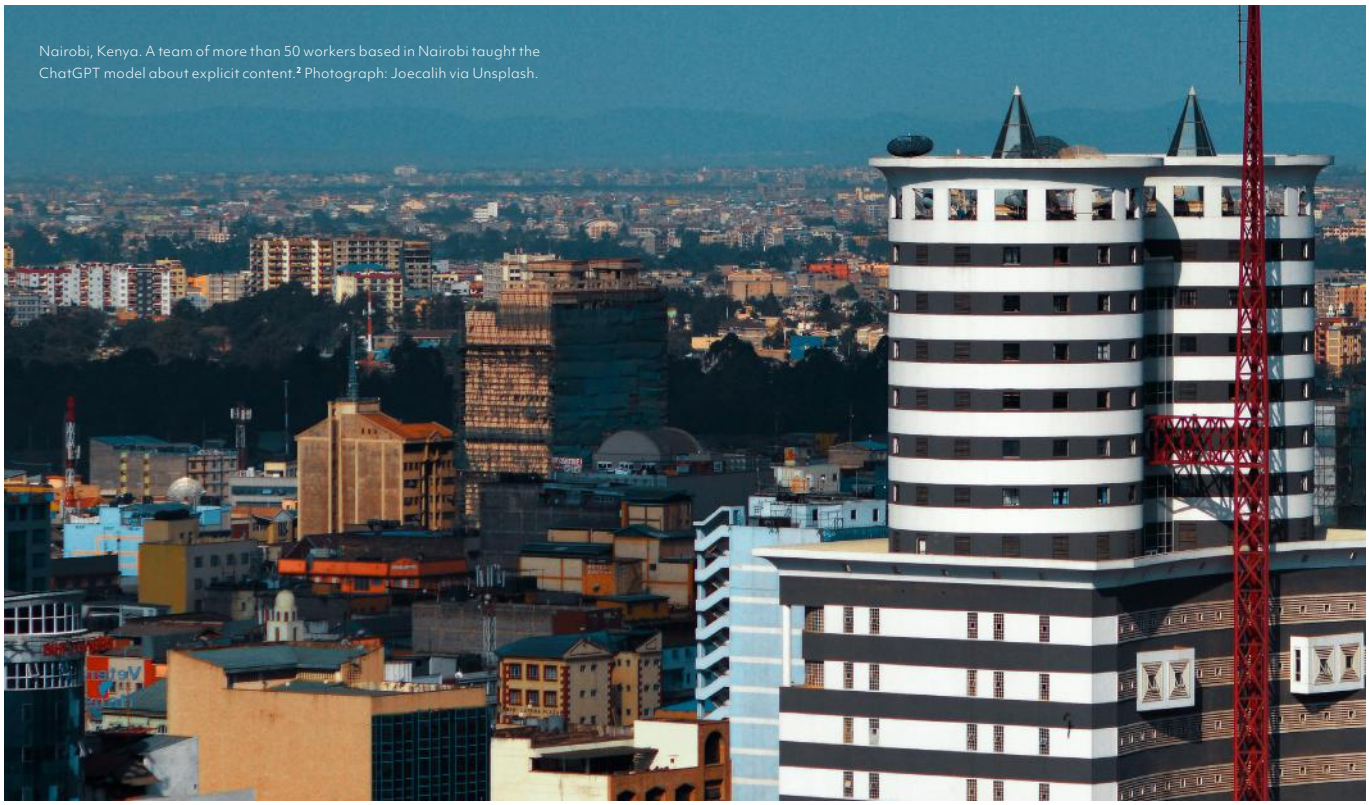
A team of more than 50 workers based in Nairobi, Kenya, taught the ChatGPT model about explicit content.[2] The goal was to train the model to keep such content away from users – but they were the ones who had to repeatedly view and read explicit text to categorise it for the model, so that it learned to recognise and avoid it.

For nine hours per day, five days a week, they were tasked with reviewing text and images depicting graphic scenes of violence, child abuse, necrophilia, murder, rape, self-harm, sexual acts (including bestiality), and more.[2] Someone – in this case, these workers in Nairobi – had to teach the AI model to label explicit content.

Mophat Okinyi, one former content moderator for ChatGPT, would read up to 700 passages of text per day – many depicting graphic sexual violence. This destroyed his view of the people around him, and broke his family apart.[3] This type of work has been crucial for AI bots like ChatGPT and Bard, but it horrified and scarred the people who have had to do it.

While I can't say that I have reached anywhere near this level of psychological trauma, I was recently thrown into a dark headspace while preparing an AI algorithm for use.

I was recently involved in the preparation of a program for school students for which they were to use KidGPT, a child-friendly version of ChatGPT, to build their own website. The students would have free reign to design and build entire custom websites, and AI would bring their ideas to life.



Nairobi, Kenya. A team of more than 50 workers based in Nairobi taught the ChatGPT model about explicit content.[2] Photograph: Joecalih via Unsplash.

But before we unleashed the students on KidGPT, we had to ensure that it was safe for them to use. This meant making sure any profanities would be removed, any attempts at cyberbullying would be nipped in the bud, and any content that raises concerns would be flagged.

But again, how does an AI bot know what constitutes something that should be flagged? And how would an AI bot predict a child's intentions as they asked it to help build a website – whether or not their intentions were harmless?

My task was to try and 'break' the system to test for weaknesses (similar to "white hat" hackers who are paid to hack into systems), and tweak the algorithm's code to ensure that it became "unbreakable". To do this, I had to try and think like a bully – someone who would take every opportunity to make someone's life worse – or like someone in a terrible situation.

I did indeed find that there were ways around the barricades that KidGPT were trying to put up. If I asked to help it create a website to feature "embarrassing photos of someone in my class" explicitly, it wouldn't, but if I asked it to create a photo gallery and I would select photos of my own choosing, that was fine. After a while, profanities would stop being removed. I also started having a conversation with the AI as though I was being bullied, abused or witnessing abuse, or intending to harm myself to see what it would pick up. It didn't always pick up on the hints to provide support – but sometimes it did.

Putting myself into the headspace required wasn't a particularly pleasant experience.. While it was nothing compared to what the workers in Nairobi go through, it provided some insight into the experiences of the people behind these revolutionary technologies.

Data categorisation is monotonous at best, traumatic at worst. An investigation in 2022 detailed how nearly 200 young people in the one Nairobi datacentre had been confronted with videos of murders, rapes, suicides and child sexual abuse as part of their work, while earning as little as $1.50 an hour when performing similar tasks as content moderators for Facebook (Meta).[4]

When companies like Facebook, Google, Microsoft, and OpenAI claim to take responsibility for safety measures, consider who they may be palming the responsibility off to.

REFERENCES:

1. Sandrine Dixson-Decleve, Gaffney, O., Ghosh, J., Jorgen Randers, Johan Rockstrom, & Per Espen Stoknes. (2022). Earth for All. New Society Publishers.
2. Earth4All. earth4all.life
3. Preqin. (2024). Australian Private Capital Market Overview: A Preqin and the Australian Investment Council Yearbook 2024. Preqin. go.preqin.com/australian-private-capital-market-overview-yearbook-2024
4. Global Liveability Ranking. Wikipedia. en.wikipedia.org/wiki/Global_Liveability_Ranking
5. The Arcadis Sustainable Cities Index 2024 (2024). Arcadis. connect.arcadis.com/sci-report-2024-a

Photograph: Martin Lostak via Unsplash.

Geography Victoria and Geocaching at the RSV

BY PETER MCCLIVE
Geocaching Victoria

Geocaching is a real-world, outdoor treasure hunting game using GPS-enabled devices. Participants navigate to a specific set of GPS coordinates and then attempt to find the geocache (container) hidden at that location. It began in 2000, when public access was granted to high resolution GPS navigation, and celebrates its 25th anniversary in 2025.[1]

On Saturday 19 October 2024, Geocaching Victoria ran an introductory workshop in partnership with Geography Victoria.[2] Participants learned how to use the Geocaching app, and then tested their skills in Carlton Gardens to find a range of hidden containers.

During the workshop a new, permanent geocache was published at the Royal Society of Victoria (Geocache Code: GCAXTN4, Geocache Name: Geography Victoria@RSV 2024) and participants worked together to locate it and sign the logbook.[3]

The day was a wonderful experience for many reasons. There was a real sense of excitement and enthusiasm as participants learned and applied new skills, and Melbourne provided some great weather in which to enjoy the outdoors. The real positive of the day was the way in which people who did not know each other, and might be generations apart, came together to learn, problem solve and celebrate their achievements.

Geocaching is a great way to experience the outdoors and discover new places solo or with a group. This applies equally to geocaches in your neighbourhood and to those found whilst travelling. Each geocache is placed and maintained by a local geocacher who is keen to introduce people to their area and share their local knowledge. Geocaching events also bring together diverse but like-minded people to share their passion and enjoyment and create new friendships.

Geocaching Victoria is a not-for-profit incorporated body that seeks to promote the pastime of geocaching in the state of Victoria.[2] It is governed by a committee of enthusiastic geocachers who volunteer their time and energy for the advancement of geocaching in Victoria. Collectively we aim to inspire great geocaching experiences, promote knowledge sharing and development, foster and grow the geocaching community, and help to showcase the best Victorian geocaching experiences to geocachers both from within and outside of the state.

We look forward to sharing many more outdoor adventures together. For information about upcoming Geography Victoria events, visit **geogvic.org.au**.

REFERENCES:

1. Geocaching. www.geocaching.com
2. Geocaching Victoria. geocachingvictoria.com.au
3. Geocache Information – GCAXTN4 Geography Victoria@ RSV 2024. coord.info/GCAXTN4

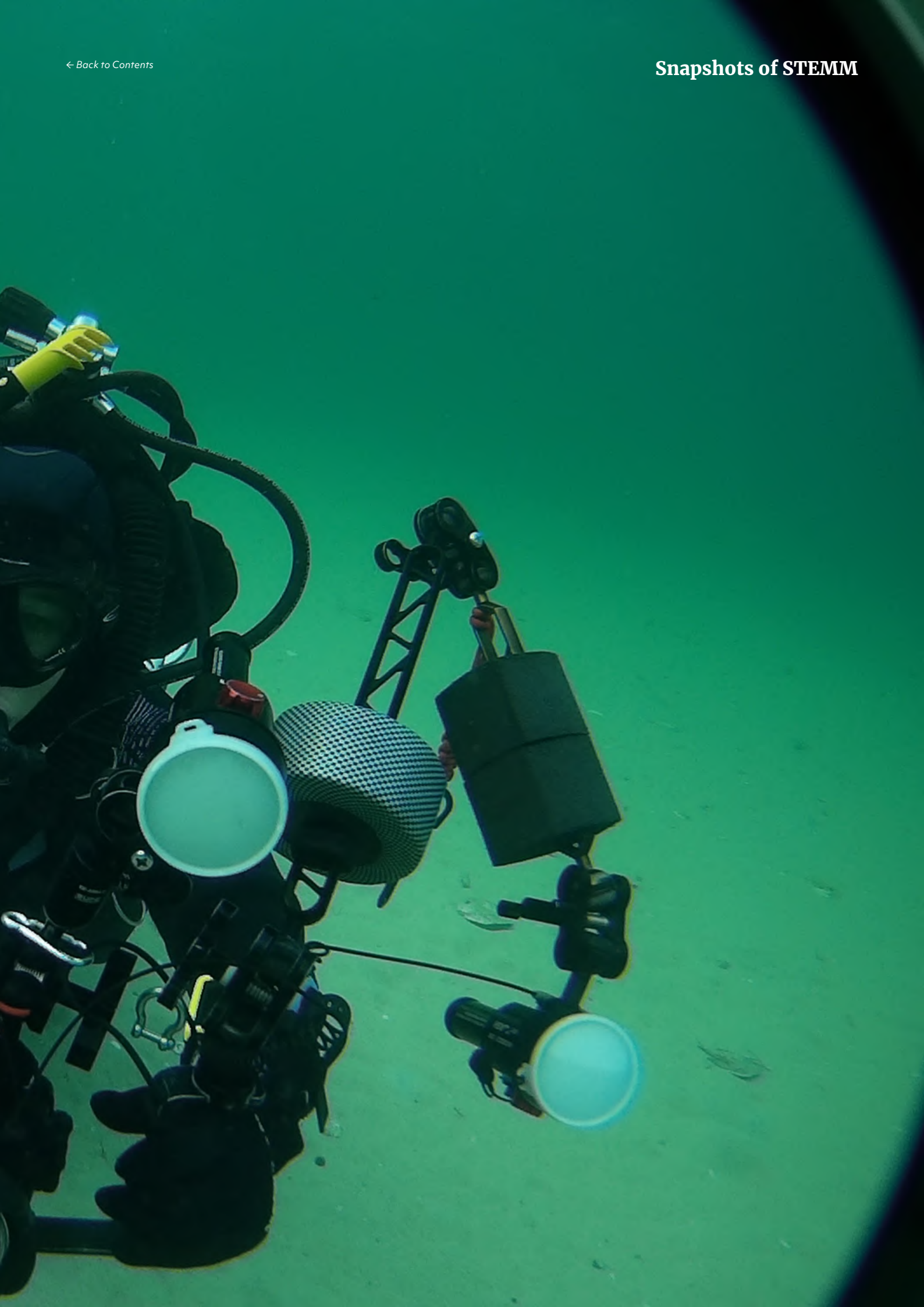
Back to Contents →

Photography Prize 2024 Winner

Dr Elodie Camprasse
Deakin University

Please join us in congratulating this year's winner **Dr Elodie Camprasse** from **Deakin University's Marine Research and Innovation Centre** photo from studying spider crabs in Port Phillip Bay.

Snapshots of STEMM



We are excited to announce the winner of the inaugural *Science Victoria Photography Prize*!

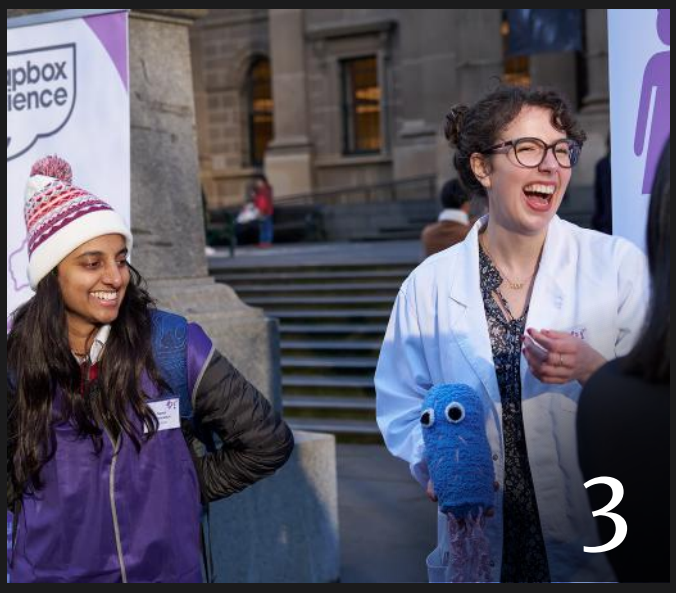
In 2023, we introduced the 'Snapshots of STEMM' section to our magazine, as a way to connect the images of everyday science with a general audience.

This year, we welcomed images from a range of contributors each month, from which our winner has been selected. Please join us in congratulating **Dr Elodie Camprasse** from **Deakin University's Marine Research and Innovation Centre**! She has won the $300 prize, and a certificate.

If you would like to participate next year, you can submit original photographs that capture your day-to-day work in STEMM. These are not stock photos or overly posed images. Instead, they show what working and studying in a STEMM field is actually like.

All photographs must be of sufficient size and quality for printing – as a rough guide, aim for >1.3 MB in file size. Submissions can be made by emailing **editor@ScienceVictoria.org.au**.

For any questions about submissions for the *Science Victoria STEMM Photography Prize*, please contact **editor@ScienceVictoria.org.au**.



Runners Up

1. Professor Euan Ritchie (Deakin University) and a stripe-faced dunnart. Photograph: Euan Ritchie.
2. Dr Joanna Sumner and Colin Silvey from Museums Victoria taking a scale clipping from an Eastern Brown Snake *(Pseudonaja textilis)* at Gippsland Lakes. Photograph: Mark Norman/Museums Victoria.
3. Alice Terrill, a PhD candidate at Monash Institute of Pharmaceutical Science, discussing her work on optimising antibiotic treatment with members of the public. This was part of the Soapbox Science event in 2023, held at the State Library of Victoria. Photograph: STEM Sisters.
4. Stream ecologist Dr Richard Marchant collecting river rocks from the Cumberland River to obtain emerging adult insects. Photograph: Rodney Start/Museums Victoria.
5. Scienceworks Learning Facilitator, Zofia Witkowski-Blake, at working with a child to make a ball hover in the air using the Bernoulli principle. Photograph: Phoebe Powell/ Museums Victoria.
6. As part of National Science Week, attendees to Castlemaine and Bendigo Libraries were invited to contribute to an art piece depicting local threatened species. Photograph: Goldfields LIbraries
7. Participants of the Homeward Bound program for women and non-binary people in STEMM during their Antarctica Voyage. Photograph: Oli Sansom/Homeward Bound.
8. Science Adventure: Hands-On Discovery Day at Yarraville Community Centre during National Science Week. Children learned how water travels through plants by watching coloured water travel between glasses via the plant stems. Photograph: Yarraville Community Centre.
9. The Eastern Barred Bandicoot (EBB) is a small marsupial endemic to south-western Australia. Here, the EEB Recovery Team from Zoos Victoria and community members prepare to release bandicoots on French Island. Photograph: Zoos Victoria.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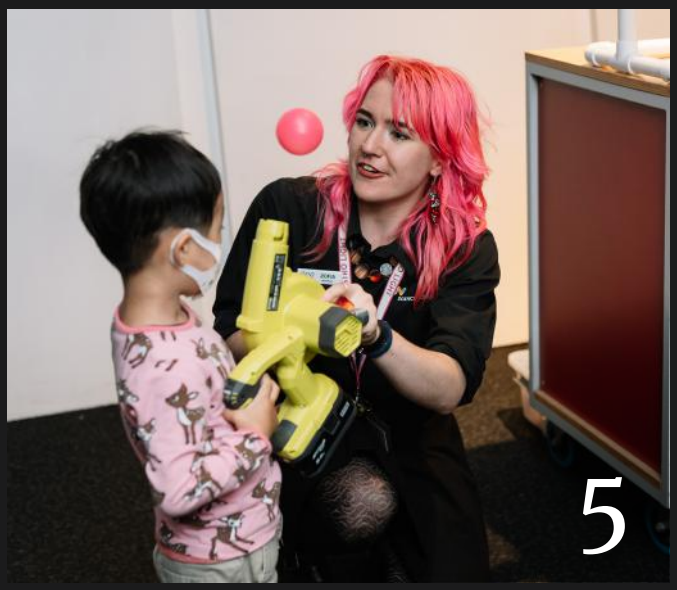
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Photograph: Welfact via Unsplash.

Climate Change on Trial: Mobilising Human Rights Litigation to Accelerate Climate Action

This talk is based on a forthcoming book that tells the twenty-year socio-legal story of human rights-based climate (HRC) litigation. Based on an original database of the totality of HRC lawsuits around the world as well as interviews with leading actors and participant observation in the field, it explains the rise and global diffusion of HRC litigation as a form of climate governance.

DATE/TIME:
Tuesday 10 December 2024, 6pm - 7pm

PRICE:
Free

LOCATION:
Law Building, The University of Melbourne,
185 Pelham Street
Carlton VIC 3053

BOOKING LINK:
events.unimelb.edu.au/event/44033-climate-change-on-trial-mobilizing-human-rights-litiga

Photograph: Luis Quintero via Unsplash.

Secrets Disclosed: Reading the Hand from Chiromancy to Genetics

In this lecture, Prof Alison Bashford explores the strange and surprising medical and scientific history of the palm and the hand. From early modern "chiromancy" to genetic studies of the so-called "simian line," decoding the hand has unfolded as medical sign-reading, bodily semiotics.

DATE/TIME:
Wednesday 4 December 2024, 6:30pm - 8pm

PRICE:
Free

LOCATION:
Arts West - North Wing (Building 148A)
The University of Melbourne,
Parkville VIC 3010.

BOOKING LINK:
events.unimelb.edu.au/event/43553-secrets-disclosed-reading-the-hand-from-chiromancy

RSV Events

The RSV hosts many STEMM-related events, public lectures, and meetings throughout the year. These are held at the RSV Building at 8 La Trobe St, Melbourne (unless otherwise indicated), and simulcast online. Our public lectures comprise the "Scientists in Focus" component of the Inspiring Victoria program in 2024.

Missed an RSV event?

You can catch-up on presentations from world-leading minds at **youtube.com/@RoyalSocietyVic**

Don't have time to watch a full presentation? Try one of the summary videos to catch the highlights.

youtu.be/7Mg0KHon6RU
Science, Media and the Law: Lessons from the Kathleen Folbigg Case

youtu.be/tMJN6RixaUE
Australian Drylands Rivers: Alive and Kicking

youtu.be/JL6SiKT9jSI
Aiming Higher: Improving Science Education in Victorian Schools

youtu.be/_cWif2yGmH0
Space To The Rescue: Australia's Dependencies on Space Technology

youtu.be/CDE446enrt0
Holocene Climatic Fluctuations in the Australian Region

youtu.be/OdSsdcSUO0o
Reimagining Humanity in the Age of Generative AI

Awards & Prizes

The Prime Minister's Prizes for Science 2025

APPLICATIONS CLOSE *Tuesday 17 December 2024*

Nominations are now invited for the 2025 Prime Minister's Prizes for Science.

The Prime Minister's Prizes for Science are Australia's most prestigious and highly regarded awards for demonstrated achievements in:

- scientific research
- research-based innovation
- excellence in science teaching

Category: Science Prizes

The prizes will award up to $1.15 million each year for demonstrated achievements.

- There are five science prizes for science and innovation:
- Prime Minister's Prize for Science ($250,000)
- Prime Minister's Prize for Innovation ($250,000)
- Malcolm McIntosh Prize for Physical Scientist of the Year ($50,000)
- Frank Fenner Prize for Life Scientist of the Year ($50,000)
- Prize for New Innovators ($50,000)

For more information, and to nominate a scientist, visit **business.gov.au/pmprizesscience**

Category: Science Teaching Prizes

The Science Teaching Prizes recognise Australian science educators for excellence in the teaching of science, technology, engineering, or mathematics.

There are two science teaching prizes:

- Prime Minister's Prize for Excellence in Science Teaching in Primary Schools ($250,000)
- Prime Minister's Prize for Excellence in Science Teaching in Secondary Schools ($250,000)

For more information, and to nominate a science teacher, visit **business.gov.au/pmprizesteaching**

Photograph: Clarissa Watson via Unsplash.

Science Communication is Everyone's Business

DR SIMON TOROK
CEO and Director, Scientell

One of my favourite things about science communication is running a business. Let me explain.

In 2015, I founded the science communication consultancy Scientell Pty Ltd with Paul Holper. Scientell now comprises three other science communicators (Alysha Huxley, Dr Cintya Dharmayanti, and Sonia Bluhm), administrative staff, and over a dozen specialist subcontractors, including editors, designers, photographers, videographers, and animators.

Sadly, Paul died in September. While we greatly miss Paul's contribution to the Scientell team, and his generosity as a leader and friend, Scientell continues to have a lasting legacy in science communication.

How did we start, what did we accomplish, and what lessons did we learn along the way?

Origin story

I first met Paul 30 years ago at the Greenhouse 1994 climate change science conference, which he had organised in New Zealand. I was a student, finishing my PhD in climate change research, and Paul patiently answered my questions about how to succeed in science communication and get a job like his.

Our paths crossed again in 1996 when Paul was the communication manager for CSIRO Atmospheric Research, and I started as the communication manager for CSIRO Environmental Mechanics. A couple of years later, Paul suggested we write a science trivia book together, which was published by ABC Books in 1999.

Each year for the next 20 years we wrote one popular science book a year for a range of publishers, including Pan MacMillan, Oxford University Press, and CSIRO Publishing. This was in our spare time, while Paul worked for CSIRO in Melbourne, and I worked in Canberra, then England, and then also at CSIRO in Melbourne. Many of the books were for children, and some were translated into Spanish, Portuguese, Chinese, Korean, and Hungarian.

The efficient, spare-time writing one book on average each year laid the foundation for Scientell.

Scientell: science, in other words

Scientell is a science communication company that seeks to maximise the impact of science. We work closely with clients to transform their scientific and technical information into clear messages for non-scientific audiences such as policymakers, young people and the wider community.

We distil and synthesise science into clear and usable knowledge via various publications, such as brochures, factsheets, booklets, books, newsletters, reports, and education material, as well as presentations, websites, videos, animations, and infographics. We also have experience in communication planning and implementation, development of strategic plans, workshop facilitation, and communication training.

Over the past nine years, Scientell has worked on over 350 projects for clients including universities and research centres, Commonwealth, state and local government, CSIRO, and private companies. In addition, before founding Scientell, I worked at senior levels in science agencies and contracted consultants. So I've looked at consulting from both sides now.

Through our work, we aim to increase the accessibility, enjoyment and impact of science. We work on projects that enhance the impact of science, research and technology with evidence-based, accessible communication activities and products provided in an approachable way.

We aim to tell a good story, framing information in ways that appeal to people's values, while basing the content on robust and credible evidence. We consider what the audience needs to hear more than what scientists want to say. Rather than simplifying, our work is about clarifying – it's not about dumbing down or dulling down; it's about using clear, jargon-free language while maintaining the integrity of the information, and the excitement of the science.

Scientell won the microbusiness category of the Monash Business Awards in 2016-17, and has been shortlisted as a finalist for the Australian Small Business Champion Awards. We've had articles included in *The Conversation Yearbook 2019* and *The Best Australian Science Writing 2017*.

Dr Simon Torok with the late Paul Holper signing books at the Brisbane Writers' Festival in 2003. Photograph: Dr Simon Torok.

Simon and Paul wrote 20 books together, laying the foundation for Scientell. Photograph: Dr Simon Torok.

LESSONS WE HAVE LEARNED

Paul noted nine things he learned in his first year of our business, as he transitioned from the corporate world to company director.

- Establish a workspace, ideally a dedicated office. It helps you focus on work, and you don't want to waste time gathering your resources each time you start work.
- Develop a routine. Commuting to a workplace imposes structure on your work life.
- Maintain networks and socialise. Have regular catch-ups with colleagues and former workmates. These meetings are part social and part business.
- Reach out and contact at least one person each day. It's good for business, good for networking, and good for the soul. It might be a phone call or simply an email forwarding interesting information.
- Attend events. Be known and keep up with advances in science and science communication. Look out for relevant workshops and conferences.
- Collaborate. Working with others is often more productive (and more fun), and including others in project pitches increases your chances of success.
- Join and participate in professional groups, such as the Australian Science Communicators.
- Get a good accountant, bookkeeper, and lawyer. Setting yourself up properly maximises your chances of success. Find people you trust.
- Invest in software for accounting, editing, project management and file management.

TIPS FOR SCIENCE-BASED BUSINESS

We've also noted nine tips for running a sustainable science-based business:

- Choose your team members wisely. In a small business, you need to ensure the team shares the same values, has a strong understanding of scientific processes, and demonstrates good interpersonal skills.
- Manage the peaks and troughs of a small business through planned business development activities. Know which months are generally quieter and plan business development activities in advance to bring in business.
- Understand your market, and price your products and services accordingly. NGOs and local governments have different budgets to private companies, and governments all have different procurement thresholds.
- Ask the client about their budget range when quoting, as doing so can avoid misunderstanding about the size and scope of the project.
- Once contracted, help your client understand what they need from the project by clarifying the scope, objectives, and precisely what the end product(s) will look like.
- Always look for ways to improve your client service and expand the job: have a continual improvement mindset, and consider what else you can do to help the client.
- Consider yourself part of the team in the organisation that is employing you. Your client should see you as part of the team and treat you like colleagues, not outsiders.
- Define your audience(s). A campaign for multi-million dollar funding will be very different from an internal awareness-raising project. And don't just call the audience the 'general public'; there's no such thing.
- Advocate for the importance of science communication in science. It is not an add-on at the end, but an essential and integral ingredient in science (see below).

The team with Paul (far left) outside the Scientell office at the RSV. Photograph: Scientell.

KEY TAKEAWAYS

1 **Science communication isn't rocket science – it's communicating rocket science, which is just as hard. Science communication is difficult and needs to be approached professionally and respected as a profession.**

2 **Science communicators aren't saving the world – we're helping the people saving the world to save the world. Science communicators help by ensuring science has impact. As a communication professional, you have a lot of value to add – such as providing advice on how to increase impact, getting people to think about their audience rather than themselves, and providing expert help and facilitating scientists' communication.**

3 **Science communication isn't the icing on the cake, it's an essential ingredient in the cake. Science communication shouldn't just come at the end. It's integral to science, needs to be there from the start, and has to be a part of how science is done. The science cake won't taste as good if this essential ingredient is omitted.**

Carbon fibre is used to manufacture a variety of products, including parts for cars, bicycles, and motorbikes. Photograph: Komorebi Photo via Unsplash.

Home Made

Creating a World Leading Manufacturing Sector in Victoria

DR CATRIONA NGUYEN-ROBERTSON MRSV

The Boeing 787 Dreamliner is composed of 50% composite material. Photograph: Daniel Eledut via Unsplash.

How do we create a world-leading manufacturing sector in Victoria? Building on a long tradition in automotive, aerospace, defence, metal, food, chemical, and general manufacturing, Victoria is the epicentre of Australian manufacturing. Combined with a highly skilled workforce, infrastructure, education, and research, we have the potential to be a global hub for science infrastructure and research & development (R&D).

Fourth time around

Industry 4.0 – also called the Fourth Industrial Revolution – will help get us there.

There have been four industrial revolutions over the past four centuries. Mechanisation came first in the 18th century, led by steam power. Next was electricity and oil-based power, which supported mass production. A new era of computers and electronics then drove automation in the third revolution. Now, new technologies are emerging for "digitisation" of the sector, such as the rise of data and connectivity, human-machine interactions, and improvements in robots, that provide the capacity for smarter, self-correcting manufacturing processes.

"Industry 4.0 offers enormous opportunities for Australian manufacturers," says Professor Bronwyn Fox, Fellow of the Australian Academy of Technological Sciences and Engineering (ATSE). "We can re-shore manufacturing in a highly competitive way, especially by translating learnings from our world-leading mining sector into other manufacturing processes."

> "We will be able to produce high value, low-cost components here in Australia."[1]

This wave of change in the manufacturing sector began in the mid-2010s and holds significant potential for operations and the future of production.

Building with carbon

When considering materials made of carbon, the arrangement and bonding between individual carbon atoms can lead to very different properties. The graphite form of carbon in pencil lead is quite different to carbon in diamonds, the hardest known material – which is different again to the carbon that you scrape off burnt toast.

You might be familiar with the term 'carbon fibre' in products like prosthetics, golf clubs, car parts, suitcases, and more. Carbon fibre composites have been around since the 1970s, and are becoming increasingly adopted by different industries.[2] They are materials made from spinning carbon fibres and a resin into long, tightly interlocked chains of carbon atoms (with a few non-carbon in the mix) that are then packed into the desired shapes.

Carbon fibre composites have so far been used in aerospace and automotive applications to produce strong, lightweight structures that reduce environmental emissions and improve fuel efficiency as the load is lighter. For example, the Boeing 787 Dreamliner is composed of 50% composite material, saving around 20% in fuel due to the reduced weight, and BMW is using carbon fibre composites to produce lightweight electric cars so that the battery can take the car further.[3,4]

By splitting the layers of graphite into single layers of latticed carbon atoms, a new material, graphene, was discovered. Graphene could radically change the manufacturing and infrastructure industries, especially once it becomes price competitive. Current research is exploring its use in enabling 6G communications, solar cells, energy storage, and creating smart sensing materials (e.g., detecting leaks of hazardous materials in the environment).[1]

But we are only at the beginning of its industrial applications.

Building with carbon fibre in Victoria

Bronwyn knew that there was a demand for carbon fibre production here in Australia, but no mechanism with which to supply that demand. She therefore co-founded an Australian research facility focused on the manufacture of the raw materials that comprise carbon fibre composites: the Carbon Nexus facility at Deakin University.

This innovation hub created a "composites manufacturing ecosystem" that brings together multidisciplinary teams and industry-research partnerships, contributes to national manufacturing capability, supplies products and services globally, and provides around 1,400 jobs in the Geelong region, employing skilled workers who had been displaced by the closure of local manufacturers between 2014-16.[5]

A decade in, Carbon Nexus houses a 100-tonne pilot-scale production line and continues to investigate ways of further improving the manufacturing process.[6] For example, a high-quality carbon fibre requires a high-quality precursor polymer building block, and researchers at Deakin are researching the chemistry of the carbon fibre composites. In addition, while traditionally made from crude oil, renewable carbon fibres are also coming onto the scene (e.g., bio-based acrylonitrile made from sugars – most commonly polyacrylonitrile or PAN).

In 2021, CSIRO and Swinburne University of Technology combined forces to establish the National Industry 4.0 Testlab, the world's first industrial scale 3D printing approach to making carbon fibre composites.[7] By building materials made of carbon fibre composites from the bottom up, layer by layer, only the required material was used to create the final produce (i.e., materials are not cut out or shaved off). It became possible to create smarter, lighter materials with increased strength and reduced manufacturing cost and waste generation.

In addition, integrating sensors that collect data into the materials as they are being built means that we can create cars, and other products can tell us when they need repair. We could also integrate sensors into the design process to make it automated and self-correcting, and therefore more efficient. It won't only be our phones and watches that are "smart" – many things could be.

Building with data

One of the megatrends shaping the future of the manufacturing sector is the Internet of Things (IoT). Put simply, the IoT encompasses a range of electronic devices and sensors that can communicate and exchange data with each other over a network, which may or may not be connected to the public internet.

The IoT allowed for the emergence of 'digital twins' that simulate manufacturing processes. This means that people can now use data from multiple sources to virtually test machines and accurately predict what maintenance needs to be done. In addition, test products can be commercialised in the digital space before people invest in physical resources.

There has also been a shift in mindset within the sector due to IoT. Data is becoming more decentralised, and more widely shared so that manufacturing processes can be replicated around the world. Furthermore, sustainability has become a large focus in supply chains. Larger companies have started selecting partners based on real-time data of which companies are working sustainably. Australia risks exclusion from supply chains if we cannot provide evidence of reducing carbon emissions.

We can learn from the successes of the mining sector's use of digitisation and automation to implement in the manufacturing industry. For example, CSIRO developed artificial intelligence to help drones navigate mines and a technology that can generate a virtual mine to simulate its operation. Together, these technologies make the mining process more streamlined and sustainable.[8]

Building tomorrow's workforce

The manufacturing sector is evolving, and we are producing world-class infrastructure here in Victoria, but do we have a workforce that can keep up with its evolution? With all the elements that we mine and use in products, the most important element of all is the people.

We need to nurture the next generation of leaders in STEM. There has been a dive in numbers of secondary and tertiary students taking advanced mathematics and science subjects,[9] when the skills gained in those subjects are highly valuable – whether students become pure mathematicians or scientists or not. We need multiple points of intervention as people diverge from the path of STEM throughout school and their careers.

Not only do we need more young people pursuing STEM, but we also need to create a supportive environment for those who do. While things are improving, there remains relatively little culture of crosstalk between academia and industry. Victoria's Lead Scientist Dr Amanda Caples makes an analogy to biochemistry: Research and Development needs to be more of a dynamic equilibrium between industry and academia, with ideas and support going both ways.[1]

CSIRO's 'On Innovation' programs are one such example of ways to connect research organisations with commercialisation pathways. They help Australia's publicly funded researchers and small and medium enterprises develop the skills needed to fast-track their technology and ideas into the market.

Our state is home to many success stories in advanced manufacturing, and it will only grow from here. To sustain momentum, a skilled workforce and robust multi-disciplinary collaboration between academia and industry are essential. By fostering STEM education and strengthening innovation ecosystems, we can unlock the sector's full potential. Together, these efforts will position Victoria as a leader in sustainable, high-tech manufacturing.

REFERENCES:

1. The Royal Society of Victoria. (2020, December 19). Scaling Australian Manufacturing Through Digital Platforms. YouTube. www.youtube.com/watch?v=wr20BBFiz24
2. Zhang, J., et al. (2023). Past, present and future prospective of global carbon fibre composite developments and applications. Composites Part B: Engineering, 250(110463), 110463. doi.org/10.1016/j.compositesb.2022.110463
3. Pal, G., & Kumar, S. (2016). Modeling of carbon nanotubes and carbon nanotube–polymer composites. Progress in Aerospace Sciences, 80, 33–58. doi.org/10.1016/j.paerosci.2015.12.001
4. Jacob, A. (2010). BMW counts on carbon fibre for its Megacity Vehicle. Reinforced Plastics, 54(5), 38–41. doi.org/10.1016/s0034-3617(10)70173-9
5. Snanshall Woodhams, E. (2024, May 15). Deakin research facility celebrates a decade of carbon manufacturing. Carbon Nexus. carbonnexus.com.au/2024/05/deakin-research-facility-celebrates-a-decade-of-carbon-manufacturing/
6. Deakin University. (2024). Carbon Nexus. carbonnexus.com.au/
7. CSIRO. (2020). CSIRO and Swinburne Testlab. www.csiro.au/en/work-with-us/services/research-and-development/prototyping/testlab
8. The Royal Society of Victoria. (2022, July 7). Creating a World Leading Manufacturing Sector in Victoria. YouTube. youtu.be/mqwElMfyUG4
9. Department of Education. (2022). Why is STEM important? education.gov.au/australian-curriculum/national-stem-education-resources-toolkit/introductory-material-what-stem/why-stem-important

Weather and air-quality sensors – like the Attentis sensor at the RSV – are an example of an Internet of Things (IoT) device. Photograph: RSV.

A Strzelecki Koala found in Greenfleet's Strzelecki Nature Link Forest in South Gippsland. Photograph: Dr Cara Sambell/Greenfleet.

For Nature, Not-For-Profit

Combining Science and Business for Environmental Restoration.

WAYNE WESCOTT
CEO, Greenfleet

The sun had barely risen on a very cold Gippsland morning when Fred the scat-seeking dog led his handler, Laura, through the Strzelecki Nature Link Forest on Boonwurrung Country in Victoria. They were in search of koala poo. But not just any poo – ideally, scat from the Strzelecki koala, famous as the 'original' gene pool of the koala in Victoria.[1]

The Significance of Scat

Koalas in Victoria have a complicated history. Hunting, land clearing, and bushfires in the early 20th century brought them to the brink of extinction. To rebuild populations, koalas from King and Phillip Islands were relocated to mainland Victoria. In 2024, the descendants of these translocated koalas have grown in numbers to dominate the state's gene pool. Only a few small, resilient colonies of 'native' koalas – like those in the Strzelecki Ranges – remain.[1,2]

Months after Fred's scat-collecting adventure, laboratory tests confirmed what we had hoped: the Strzelecki koala was living in the restored Strzelecki Nature Link Forest.

It was a small but significant victory. This forest, planted by Greenfleet in an area stripped bare for agriculture, spans four adjoining properties purchased for restoration in the Strzelecki Ranges.[3] The presence of a Strzelecki koala meant it had either travelled some distance to reach the forest, or had been surviving in nearby remnant vegetation yet to be explored.

Either way, the discovery moved the dial a little on protecting a species that might hold the key to the future of Australia's koalas.

Wurneet Laang Laang, the seven year old forest that forms the first part of the Strzelecki Nature Link. Photograph: Alese Watson/Greenfleet.

Greenfleet: Restoring Nature, Removing Carbon

This discovery reflects the work of Greenfleet, a 27-year-old environmental not-for-profit focused on removing carbon, restoring nature, and advancing reconciliation in Australia.

Greenfleet does not rely on government grants but instead is supported by thousands of individuals and hundreds of companies. This independence allows us to maintain integrity and focus on our mission.[4,5]

The removal of carbon is a critical part of climate action, though not without challenges. Many other organisations in our sector have made carbon offsetting politically difficult. The Australian Carbon Credit Units (ACCUs) and Australia's Climate Active program have been marred by controversies around greenwashing, financial manipulation, price gouging and poor business practices. But despite these difficulties, the need to remove carbon from the atmosphere is undeniable—and this is where Greenfleet's approach stands apart.

Our method involves planting mixed, locally native forests and securing their long-term protection through legally binding agreements. These agreements ensure that the forests cannot be cleared or developed – no harvesting, no housing construction – even if the land is sold. By protecting forests with an on-title agreement for up to 100 years, we minimize the risk of reversals due to policy changes – a vulnerability of the 25-year cycle of the Emission Reduction Fund, for example - and maximize their impact on biodiversity and carbon sequestration.

This means the forests will be sequestering carbon right through to the time when, hopefully, we have completed the transfer from legacy fossil fuels to a future powered by renewable energy.

Picking Up What They're Putting Down: Why Collect Koala Scat?

Collecting koala scat serves several purposes:

- It helps us to better understand the Strzelecki koala as a target for ecological restoration.
- It contributes to meeting the methodological requirements of our standards.
- It allows us to validate the scientific methodology behind our impact.
- It provides a compelling story for our supporters.

Greenfleet operates in the voluntary carbon offset market, where success is driven by quality rather than price. Our supporters value stories of hope and progress, which inspire them to set personal and organisational carbon reduction goals.

To ensure scientific rigor, we adhere to best-practice forestry standards and use tools like the Full Carbon Account Model (FullCAM) to measure carbon uptake. While we have always brought carbon removal and nature restoration together, we are now working with a major Australian university to develop a best-practice standard that formally aligns them. Already, we utilise tools to measure the broader ecological outcomes of our projects.

Fred the dog, who assisted in the discovery of koala scat in the Strzelecki Nature Link. Photograph: Annabel O'Neill/Greenfleet.

For example, studies comparing moth populations in open paddocks, remnant forests, and restored ecosystems show that within three to seven years of planting, restored forests begin to support species diversity and population density similar to remnant forests. While not conclusive, this encouraging result suggests we can restore ecosystems to a similar state that existed before clearing.

Other research includes bird counts, environmental DNA (eDNA) analysis to detect species like platypuses, studies of carbon accumulation in soil and ongoing work with the Giant Gippsland Earthworm (a particular favourite of Greenfleet). These initiatives position our sites as living laboratories for sustainability research.

Advancing Reconciliation Through Collaboration

Our relationships with Traditional Owners are incredibly important for us and we know we are working with the longest standing land managers on Earth. First Nations peoples' immense knowledge of local environments complements our Western ecological scientific knowledge and practices, enhancing restoration efforts through an effective collaboration.

These partnerships take time and effort. The political climate, including the recent referendum outcome on a Voice to Parliament, has not made collaboration easier. Nevertheless, we continue to develop relationships with groups such as the Boonwurrung people in Victoria and the Kabi Kabi in Queensland where we are providing resources, creating jobs, and fostering mutual learning.

Restoring Over Conserving

Greenfleet's mission is rooted in restoration, not conservation. While conservation protects what remains, restoration brings degraded land back to life. Our work focuses on areas that have been cleared and on bringing back the ecosystems that once existed.

This dual approach—combining carbon offsetting with "carbon plus nature" ecological restoration—offers a powerful model for the restoration movement to address both climate change and biodiversity loss. As the restoration movement grows, Greenfleet is committed to ensuring our contributions are backed by science, not greenwash and disinformation. No amount of assertion will help us if we cannot prove our case scientifically.

For example, at one site in Gippsland, we are using eDNA to identify the presence of platypuses at the headlands of the Lang Lang River, and testing how riparian habitat improvements downstream might extend their range.

Self-funded research like this, alongside partnerships with universities, is central to our mission. It not only proves the impact of our work but also inspires others to join the restoration movement. We would like to expand that even further, as our sites are living laboratories for important research over the coming decades on broad sustainability issues.

A Call to Restore

Greenfleet believes in restoration as a key activity for this century. By combining rigorous science with inspiring stories, we aim to engage communities, restore ecosystems, and sequester carbon for a sustainable future.

The discovery of the Strzelecki koala in our restored forest is just one example of what's possible. It's a small victory but a meaningful one, pointing the way toward a future where degraded landscapes can thrive again—and where science and community work hand in hand to protect life on Earth.

A key part of this is securing locations to restore, in order to ensure that they have these protections. As a land manager, we have 11 properties of our own and, working with many other partners, we have planted over 550 sites in the last quarter of a century.

Greenfleet believes strongly that we need to decide and fund our own research direction – slightly unusual for a not-for-profit. We seek partners in developing long-term research programs based on the need to prove the science, create data sets over time, and encourage more of our community to become engaged in restoring forests that sequester carbon around Australia. This becomes a daily demonstration of the business value of research for our organisation.

REFERENCES:

1. Attachment 3 - Parliamentary Submissions on the Strzelecki/South Gippsland Koala. Parliament of Australia. www.aph.gov.au/DocumentStore.ashx?id=d6b70c36-1e62-4fd9-8011-2161af4ec50e
2. Moyal, A., & Organ, M. (2008). Koala: a historical biography. CSIRO Publishing.
3. Strzelecki Nature Link, VIC. (2016). Greenfleet. www.greenfleet.com.au/blogs/forest/strzelecki-nature-link
4. Greenfleet Australia – Financials & Documents. (2024). ACNC. www.acnc.gov.au/charity/charities/ad09e587-3aaf-e811-a963-000d3ad24077/documents
5. Publications. (2023). Greenfleet. www.greenfleet.com.au/pages/publications

Seedlings planted at Strzelecki Nature Link as part of 2024 revegetation operations. Photograph: Alese Watson/Greenfleet.

Plastic to Power

AMANIKA SAHU
Monash University

Imagine the gentle morning chorus of birds and the tranquil beauty of green scenery greeting you as you breathe in the fresh air. Yet, for the residents of Bandhwari, this is a distant dream.

Their reality is the Bandhwari landfill in India, where the only birds in sight are crows scavenging through mounds of waste. This stark contrast poses a question: how did we arrive at such a crisis? The answer may be as close as the discarded chip packet at your feet.

Mechanical vs chemical recycling

Humans produce about 300 million tons of plastic each year – equivalent to the weight of roughly 60,000 Melbourne Cricket Grounds filled to capacity with fans.[1] Yet only 9% of this is recycled.[1]

Currently, mechanical recycling stands as the most prevalent recycling method. This approach has led to the creation of innovative and sustainable plastic products such as eco-bricks, plastic roads, and 3D-printed furniture.[2] However, it falls short in addressing hard-to-recycle plastics.

Incineration – a seemingly straightforward solution – converts waste to energy…but at a cost. Burning plastic releases a range of chemicals into the environment, including known pollutants dioxins and furans, and also leaves behind microplastics in the ash, creating further environmental pollution.[3]

"The same properties that make plastics so useful—their durability and resistance to degradation—also make them nearly impossible for nature to completely break down."[4]

Instead, we must turn to *chemical* recycling: breaking down plastics to their molecular components – hydrogen and carbon – which are also the building blocks of fuels. This method can process a broader range of plastics, including mixed or contaminated ones, through techniques like depolymerization, pyrolysis, and gasification.[5]

Carbon building blocks

Carbon is an element found in all known life, and is the main component of plastics. Recycling carbon keeps it locked in a product, and prevents it from becoming harmful carbon-based greenhouse gases like carbon dioxide (CO_2) or methane (CH_4).

Soft plastics that have traditionally been hard to recycle and destined for landfill (e.g., chocolate wrappers) can be converted into oil. This oil can then be refined and turned back into food-grade packaging as part of a more circular economy.[6] The carbon from plastics could also replace fossil fuel-based carbon for various chemical uses, like making medicines, or to replace fossil fuels as an alternative fuel for diesel engines.[7,8]

Advancing technologies that allow us to recycle plastics in these ways not only tackles the problems of plastic pollution and waste management, but also address the global energy crisis by producing greener and cleaner fuel.

In Australia, a number of companies are progressing with recycling plastic into usable fuels. Licella has designed a Catalytic Hydrothermal Reactor (Cat-HTR) system, while Melbourne's APR Plastics is using Biofabrik WASTX pyrolysis tech to turn kerbside plastic waste into valuable crude oil.[6,9] Advanced Recycling Victoria plans to establish a plastic recovery plant in Altona, and Viva Energy is investing in Geelong refinery infrastructure for waste-to-fuel processing.[10,11]

At Monash University, Professor Sankar Bhattacharya has created a prototype plant that repurposes plastic and waste tires into diesel fuel.[12] The process involves pyrolysis, heating of shredded plastics to produce oil and gas vapours that can be separated for different purposes: heavy oil for wax, and light oil for power generation directly or to be further converted into gasoline or diesel. This initiative is timely, as China's termination of waste imports has prompted Australia to find domestic recycling solutions.

The process, while energy-intensive, is designed to be self-sustaining by recycling the gases it produces. Professor Bhattacharya is working with local councils to scale this technology, aiming to reduce landfill waste and fossil fuel reliance.[12]

Plastic waste is everywhere – even in the heights of the Himalayas. Photograph: Sylwia Bartyzel via Unsplash.

Scientists around the world are developing methods to recycle plastic to produce a greener alternative fuel source. Photograph: Jay.Jarosz via Wikimedia Commons (CC BY-SA 4.0).

Plastic collected for recycling. Photograph: Killari Hotaru via Unsplash.

Factors to consider

Although effective, chemical recycling presents environmental and health challenges, including the release of various pollutants during the process. The problem of plastic pollution isn't going to be solved through exacerbating another problem in the form of greenhouse gases.

The oil obtained from plastic waste is more volatile than standard diesel, increasing the risk of spontaneous ignition. The inconsistency of feedstock and the varied breakdown of polymers during pyrolysis add complexity.

Additionally, the current process requires extremely high temperatures, making it expensive and inefficient.[13] More research is underway to address the environmental impacts, commercial feasibility, and handling of contaminated and mixed waste.

Research ongoing

Innovative techniques are being developed to transform plastic into fuel more effectively, without high temperatures or plastic residues. For instance, Washington State University researchers discovered a method using a ruthenium metal and carbon catalyst combination that can convert 90% of plastic waste into fuel within an hour at a lower temperature of 220°C, making it more efficient and cost-effective than current chemical recycling standards.[14]

A team from the University of Delaware employs hydrocracking, a chemical process that breaks down the carbon bonds in plastic, using a catalyst composed of zeolites and mixed metal oxides. This method uses 50% less energy than comparable technologies, operates at normal kitchen oven temperatures, and does not release carbon dioxide into the atmosphere.[15]

The Pacific Northwest National Laboratory developed a new method combining cracking with alkylation catalysts to produce gasoline-like fuel without unwanted byproducts[16]. This process is conducted at low temperatures and with high yield, reducing the cost of recycling plastics.

These pioneering methods represent promising strides towards more efficient and eco-friendly ways to recycle plastic waste into fuel. However, many of these technologies are still in the development and scaling stages.

A revolution to make the plastic industry circular

The journey from "landfill to oilfield" is not just a scientific endeavour but a societal imperative. By further investigating the plastic-to-fuel revolution, we could address the dual challenges of plastic pollution and energy scarcity – as long as we also mitigate any unwanted by-products.

REFERENCES:

1. UN Environment Programme. (2022, February 16). World leaders set sights on plastic pollution. UNEP. www.unep.org/news-and-stories/story/world-leaders-set-sights-plastic-pollution

2. Waste Managed. (2024, February 7). Innovations in plastic recycling 2024 | waste managed. Waste Management Services | Recycling | WasteManaged.www.wastemanaged.co.uk/our-news/recycling/innovations-plastic-recycling/

3. Yang, Z., et al. (2021). Is incineration the terminator of plastics and microplastics? Journal of Hazardous Materials, 401(123429), 123429. doi.org/10.1016/j.jhazmat.2020.123429

4. Maxwell, R. (2024, May 6). Recycling idea gave Indigenous communities plastic hope. National Indigenous Times. nit.com.au/06-05-2024/11214/recycling-idea-gave-indigenous-communities-plastic-hope

5. Cheng, L., Chen, X., Gu, J., Kobayashi, N., Yuan, H., & Chen, Y. (2024). Chemical recycling of waste plastics: current challenges and perspectives. Fundamental Research. doi.org/10.1016/j.fmre.2023.12.023

6. Korycki, L. (2022, May 6). Plastics into oil at APR plastics. Waste Management Review wastemanagementreview.com.au/plastics-into-oil-at-apr-plastics/

7. Vollmer, I., et al. (2020). Beyond mechanical recycling: Giving new life to plastic waste. Angewandte Chemie International Edition, 59(36), 15402–15423. doi.org/10.1002/anie.201915651

8. Padmanabhan, S., et al. (2022). Energy recovery of waste plastics into diesel fuel with ethanol and ethoxy ethyl acetate additives on circular economy strategy. Scientific Reports, 12(1), 5330. doi.org/10.1038/s41598-022-09148-2

9. Australian Renewable Energy Agency (2013, February 28). Licella Awarded Federal Government Advanced Biofuels Investment Readiness (Abir) Grant [Press release]. www.licella.com/wp-content/uploads/2017/06/licella-28-feb.pd

10. Advanced Recycling Victoria Pty Ltd (APP016941). (2022, September 21). Engage Victoria. engage.vic.gov.au/advanced-recycling-victoria

11. Prime Mover Magazine. (2024, April 15). Viva energy team up with cleanaway to address hard-to-recycle plastic waste. Prime Mover Magazine.primemovermag.com.au/viva-energy-team-up-with-cleanaway-to-address-hard-to-recycle-plastic-waste/

12. Bhattacharya, S. (2019, August 23). Making waste plastic fantastic. Monash Lens. lens.monash.edu/@sankar-bhattacharya/2019/08/23/1351620/turning-plastic-into-fuel

13. Jia, C., et al. (2021). Deconstruction of high-density polyethylene into liquid hydrocarbon fuels and lubricants by hydrogenolysis over Ru catalyst. Chem Catalysis, 1(2), 437–455. doi.org/10.1016/j.checat.2021.04.002.

14. Jia, C., et al. (2021). Deconstruction of high-density polyethylene into liquid hydrocarbon fuels and lubricants by hydrogenolysis over Ru catalyst. Chem Catalysis, 1(2), 437–455. doi.org/10.1016/j.checat.2021.04.002.

15. Liu, S., et al. (2021). Plastic waste to fuels by hydrocracking at mild conditions. Science Advances, 7(17), eabf8283. doi.org/10.1126/sciadv.abf8283

16. Zhang, W., et al. (2023). Low-temperature upcycling of polyolefins into liquid alkanes via tandem cracking-alkylation. Science, 379(6634), 807–811. doi.org/10.1126/science.ade7485

1925

What was Victoria's Science Society doing 100 years ago?

SCOTT REDDIEX MRSV
Editor-in-Chief, Science Victoria

The rate of scientific understanding and application has increased exponentially since the Royal Society of Victoria (RSV) was established in 1854. We have a significantly greater understanding of our universe: its origins through the big bang, many formerly fatal diseases are now easily treated through an understanding of germ theory, electricity was harnessed, and humanity went from the first manned flight in a powered aircraft (~1900 +/- 3 years), to walking on the moon (1969) in the space of ~70 years.

In 1924, Victorians found themselves in the roaring twenties. The "Great War" and the 1918 influenza pandemic were over, and the Great Depression of the 1930s had not yet arrived. In the ten years between 1914 and 1924, some of the most significant scientific discoveries in history had been made: Einstein's General Theory of Relativity, Rutherford's discovery of protons, the development of Quantum Theory by Niels Bohr, the discovery of insulin and vitamins, and more.

The RSV held 16 meetings throughout the year, at which members came together and discussed some of the breaking scientific research of the day – at a range of scales. As one example, on the 20th of November 1924, they heard from the Society's "Mathematical and Physical Section":

"Papers: "The Mechanical Equivalent of Heat," by Professor T. H. Laby, M.A., Sc.D., and Mr. E. O. Hercus, M.Sc,; "The Thermal Conductivity of Gases" (a contribution to the International Critical Tables), by Professor T. H. Laby, M.A., Sc.D., and Miss Nelson, M.Sc. Lantern slides, showing changes which occur on the refrigeration of beef, were shown by Dr. W. J. Young and Mr. J. R. Vickery, B.Sc., and exhibits of wireless apparatus and a loud speaker by the Western Electric Company."

Common throughout the histories of all societies, the struggles of finances and relevance were documented in the RSV's annual report. Should they relocate? Is the building suitable for its intended purpose? Where can they source funding?

"*During the year the Council, at several meetings, considered the question of increasing the usefulness of the Society, and the possible removal to a more central position [in the Melbourne CBD] has been discussed. It was decided that it would be inadvisable for the Society to move, and that efforts should be made to improve the condition of the hall and grounds."*

On the subject of funding, the RSV has had somewhat of an intermittent financial arrangement with successive Victorian Governments throughout its history. The value of the Society's work has been generally recognised, but this recognition has not always been followed with funds.

Fortunately, 1924 had seen both the return of a government grant, and funding for minor renovations of the Society's hall at 8 La Trobe St.

"The financial position of the Society has improved somewhat during the past year. This is due chiefly to the restoration of the Government grant to £200. The execution of the promised repairs to the hall and cottage, also, has relieved the Council of considerable anxiety on the score of finance."

"The Government of Victoria was approached, and the Society has to thank the Ministry for undertaking the renovation of the hall, both inside and outside, and the erection of a new wire fence. This work is now in hand, and the hall will be ready when the meetings recommence in March. It is proposed to improve the grounds in the near future."

However, with each of the seminars well attended, and rooms leased by the Commonwealth Government, the Field Naturalists' Club, and the Microscopical Society throughout the year, it was recognised that more work was needed.

"The Society is no nearer the acquisition of a satisfactory lecture theatre, though much thought was given to the matter during the year. The Council will have seriously to consider whether it should not renew its attempts to let a portion of the grounds."

The outcome of this is, of course, now known. The RSV has endured as Victoria's science society, its building renovated in 1959 to gain a second floor (containing a lecture theatre), and seminars continue to be held throughout the year. With continued interest and support, we hope it will exist to support promotion and understanding of the scientific discoveries of the next 200 years.

FROM:
Proceedings of the Royal Society of Victoria, Volume 37 (New Series), 1925.

OPPOSITE:
Balancing the books: the RSV's financial statement for 1924. Source: *Proceedings of the Royal Society of Victoria*, Volume 37 (New Series), 1925. Annual Report for 1924.

Financial Statement for period February 1st, 1924, to December 31st, 1924.

RECEIPTS.				EXPENDITURE.			
Balance at Current A/c, 1st February, 1924		£253 8 9		Publication, Printing and Postage—			
Cash in hand		0 3 5		Printing and Publication	£286 7 9		
Subscriptions—				Postage	20 12 11		
Members—Subs. in arrears	£2 2 0					£307 0 8	
,, for 1924	154 7 0			Maintenance—			
,, in advance	2 2 0			Assistant Secretary ...	£30 0 0		
Associates—				Assistant Librarian ...	12 0 0		
Subs. in arrears	13 13 0			Caretaker's A/cs. ...	20 12 2		
,, for 1924	84 10 6			Rates	13 11 8		
,, in advance	2 2 0			Insurance	5 1 3		
Country Members—				Sundries — Gas, Electric Light, etc.	11 9 8		
Subs. in arrears	1 1 0			Petty Cash	7 16 5		
,, for 1924	12 12 0					100 11 2	
,, in advance	2 2 0			Library		7 5 8	
		274 11 6		Building and Depreciation Fund, Deposits		354 8 8	
Rents—						£769 6 2	
Com'wealth Government	£62 10 0			Credit balance as on 31/12/24—			
Field Naturalists' Club...	12 0 0			Current Account ...	£47 19 2		
Microscopical Society ...	12 0 0			Cash in Hand	1 4 1		
		86 10 0				49 3 3	
Sales of Publications		3 8 3					
Victorian State Government Grant in Aid		200 0 0					
Exchange on Cheques		0 7 6					
		£818 9 5				£818 9 5	

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.* 27/2/25 C. A. LAMBERT, J. SHEPHARD, } *Hon. Auditors.*

The amount standing to the credit of the Society at the State Government Savings Bank on 1/7/24 was £511 16s. 2d

Subscriptions still owing for 1924 were—Members £18 18 0
Associates 19 19 0
Country Members ... 3 3 0
£42 0 0

Liabilities to Messrs. Ford & Son for printing Proceedings are £123 3s.
In addition, the 1924 Volume of the Proceedings which is in process of publication is estimated to cost £300.

10

Inspiring Victoria

inspiringvictoria.org.au

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

Inspiring Victoria encourages involvement in STEM through initiatives (such as National Science Week Victoria - **scienceweek.net.au/your-state/vic**) that are governed and delivered by the RSV's program partners:

PUBLIC LIBRARIES VICTORIA
plv.org.au

NEIGHBOURHOOD HOUSES VICTORIA
www.nhvic.org.au

PARLIAMENT OF VICTORIA
parliament.vic.gov.au

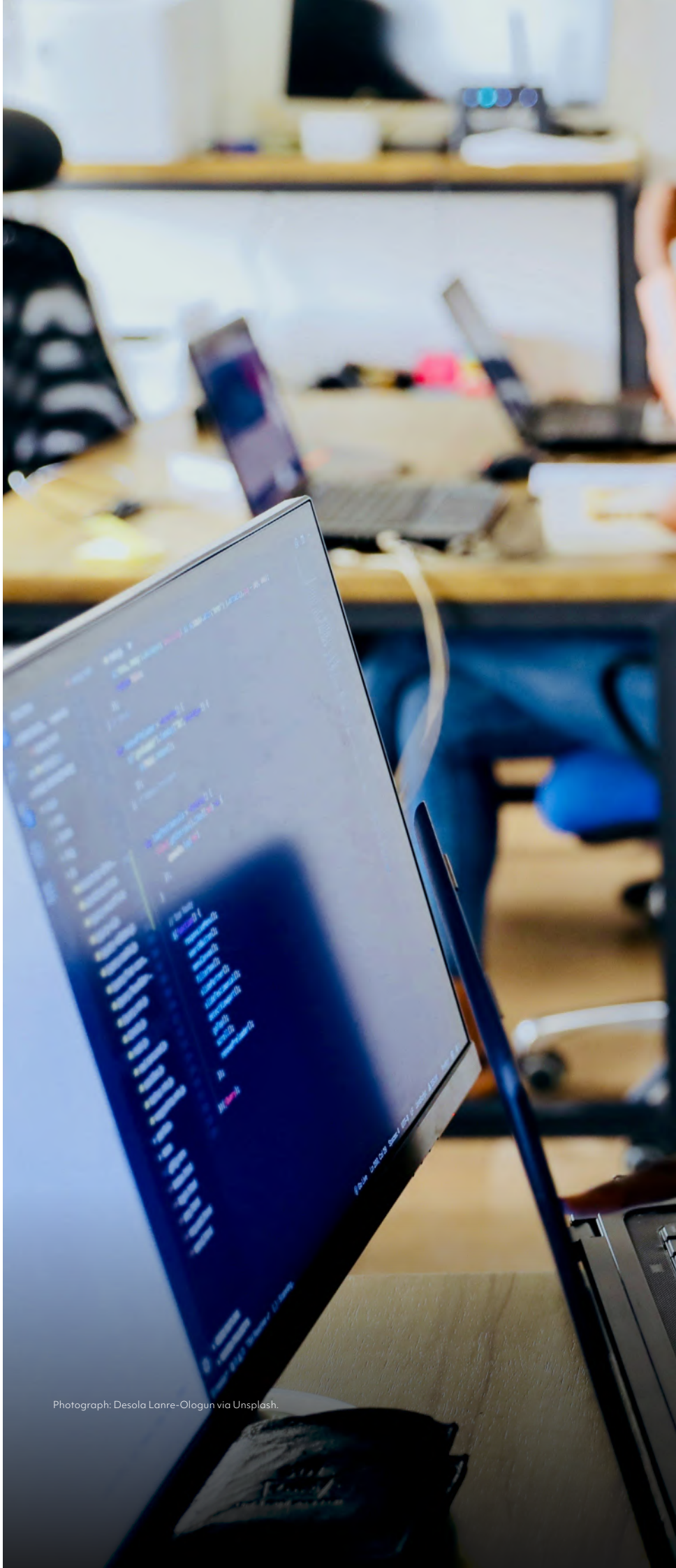
MUSEUMS VICTORIA
museumsvictoria.com.au

ROYAL BOTANIC GARDENS VICTORIA
rbg.vic.gov.au

ZOOS VICTORIA
zoo.vic.gov.au

QUESTACON
questacon.edu.au

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



Photograph: Desola Lanre-Ologun via Unsplash.

December 2024

The Future of Work with an Eye on New Technologies

BEN KIMBER
Communications Adviser, Legislative Council, Parliament of Victoria

Striking a balance between employer expectations and employee rights is becoming increasingly complicated due to new technologies, including artificial intelligence (AI).

Businesses are embracing systems that supposedly "boost productivity," and a parliamentary inquiry into workplace surveillance has heard some are also using them to keep a closer eye on their workers.

One measure used to watch employees is keystroke monitoring, which tracks and records every keystroke entry made on a computer – often without the express permission or knowledge of the user. While this may already seem rather extreme, the Legislative Assembly Economy and Infrastructure Committee was also told about the prospect of future forms of surveillance going even further.

Monitoring an employee's brain

"Neurotech is technology that either directly monitors the brain or peripheral nervous system or directly stimulates it or does both," legal academic and President of the Institute of Neurotechnology and Law Dr Allan McCay said.

"It is now possible to use hospital-grade neurotech to decode mental images or songs that a person is listening to from a person's brainwaves, and even to decode intended speech ... it seems reasonable [to assume], given the investment environment, that these monitoring and decoding capacities will start to become available in more portable devices.

"It also seems reasonable to assume that, in time, employers will have access to more capable brain-reading devices than are currently available and some may wish to employ them."

Dr McCay said there are situations when an employer might reasonably want to use what he calls 'workplace neurosurveillance', for instance in the interests of safety, to stop fatigued operators of machinery harming themselves or others.

"A second reason why they might want to engage in workplace neurosurveillance is related to productivity," he said. "They might want to know about an employee's attention levels in order to make them more productive."

Dr McCay said there are several ethical issues relating to workplace neurosurveillance, including 'mental privacy', and urged law reformers to not just focus on existing technologies.

"I think we have to consider the future challenges and not just focus on the way things are now," he said.

Business Council insists "no need for more regulation"

Business Council of Australia General Counsel Kat Eather argued for maintaining the status quo and no further regulation.

"While Victoria does not have a standalone law dealing with workplace surveillance, existing Commonwealth and state laws that deal with aspects or effects of workplace surveillance include the Occupational Health and Safety Act, the Fair Work Act, the Privacy Act and the Surveillance Devices Act 1999 (Victoria)," she said.

"The ability to monitor workplaces and interrogate actions that have occurred on an employer's technology or communication system and devices can be critical for a range of reasons, ranging from worker safety to security of equipment and premises, recording working hours and attendance to ensure wage compliance and that adequate breaks are taken, and that employees are paid properly.

"It is essential that any move to further regulate workplace surveillance in Victoria does not impede the use of surveillance for those essential functions."

Addressing the risks of harm

ARC Centre of Excellence for Automated Decision-Making and Society's Dr Jake Goldenfein said regulating AI won't necessarily result in a set of prescribed uses, but it will instead put forward standards which resemble product safety law.

"What we need is principled sectoral regulation that says, for instance, if you are going to use a new digital system for workplace management, whether it is making managerial decisions, human resources decisions, task allocation, for instance, it should not cause harm to workers," he said.

"To me this is the most basic principle. If you are going to introduce a surveillance system, it should not cause harm to workers, because what we are getting are reports of all kinds of harm."

Some of these harms were identified as work intensification, loss of privacy, low morale, anxiety and stress.

LEFT: Members of Parliament heard submissions as part of the inquiry. Photograph: Ben Kimber/Parliament of Victoria.

Privacy and transparency

The handling of personal data collected through workplace surveillance is also being examined.

"One of the real challenges in this area is that there is very little transparency about what is being gathered and how it is being used," National Tertiary Education Union's representative Associate Professor Dr Alysia Blackham said.

Dr Blackham said AI systems are being trained on huge amounts of data – potentially workers' data, without their consent or knowledge.

"One of the real concerns we have put forward in our submission is that there is no restriction on employers on-selling workers' data for a profit and commoditising it in that way, which is a major gap in the regulatory framework," she said.

Artificial "Intelligence" lacks wisdom, consciousness

Australian Nursing and Midwifery Federation, Victorian Branch Professional Officer Alana Ginnivan said AI is not infallible, because it is a probability-based model.

"It does not understand the data. It does not contemplate, from our members' experience, data obtained within a clinical healthcare setting," she said. "The risks are, when this workplace surveillance is obtained and improperly used, for the data that was obtained for workplace surveillance the intent was not for AI modelling.

"AI is the way of the future; we do see that—but there are no obligations and safeguarding in place to protect the workers or the patients and consumers."

A representative for the Victorian Government told the inquiry the Department of Government Services is looking at the use of AI in the public service and the privacy provisions it has in place for inputting material into generative AI tools.

The Lower House Committee will prepare a report for parliament in 2025. To read all of the public hearing transcripts and watch video snapshots, visit **vicparl.news/wsi**

FROM LEFT TO RIGHT:
Alana Ginnivan from the Australian Nursing and Midwifery Federation, A/Prof Dr Alysia Blackham from Melbourne Law School represented the National Tertiary Education Union at the inquiry, and Dr Jake Goldenfein from the ARC Centre of Excellence for Automated Decision-Making and Society advocated for principled sectoral regulation.
Photograph: Ben Kimber/Parliament of Victoria.


Alysia Blackham
Australian Nursing


Jake Goldenfein

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.

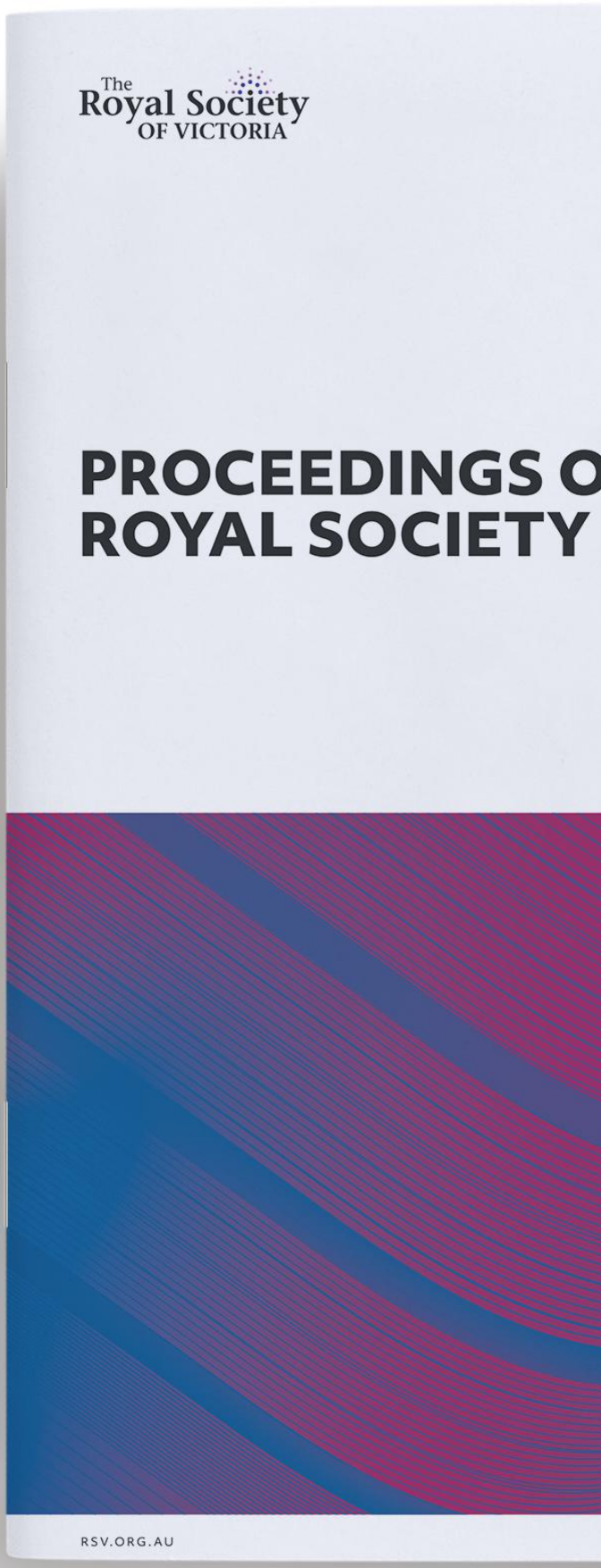
The journal began in 1855 as an irregular publication under the title *Transactions of the Philosophical Society of Victoria,* with the present name adopted in 1889. Since then, volumes of the journal have been published annually, often across one or more parts.

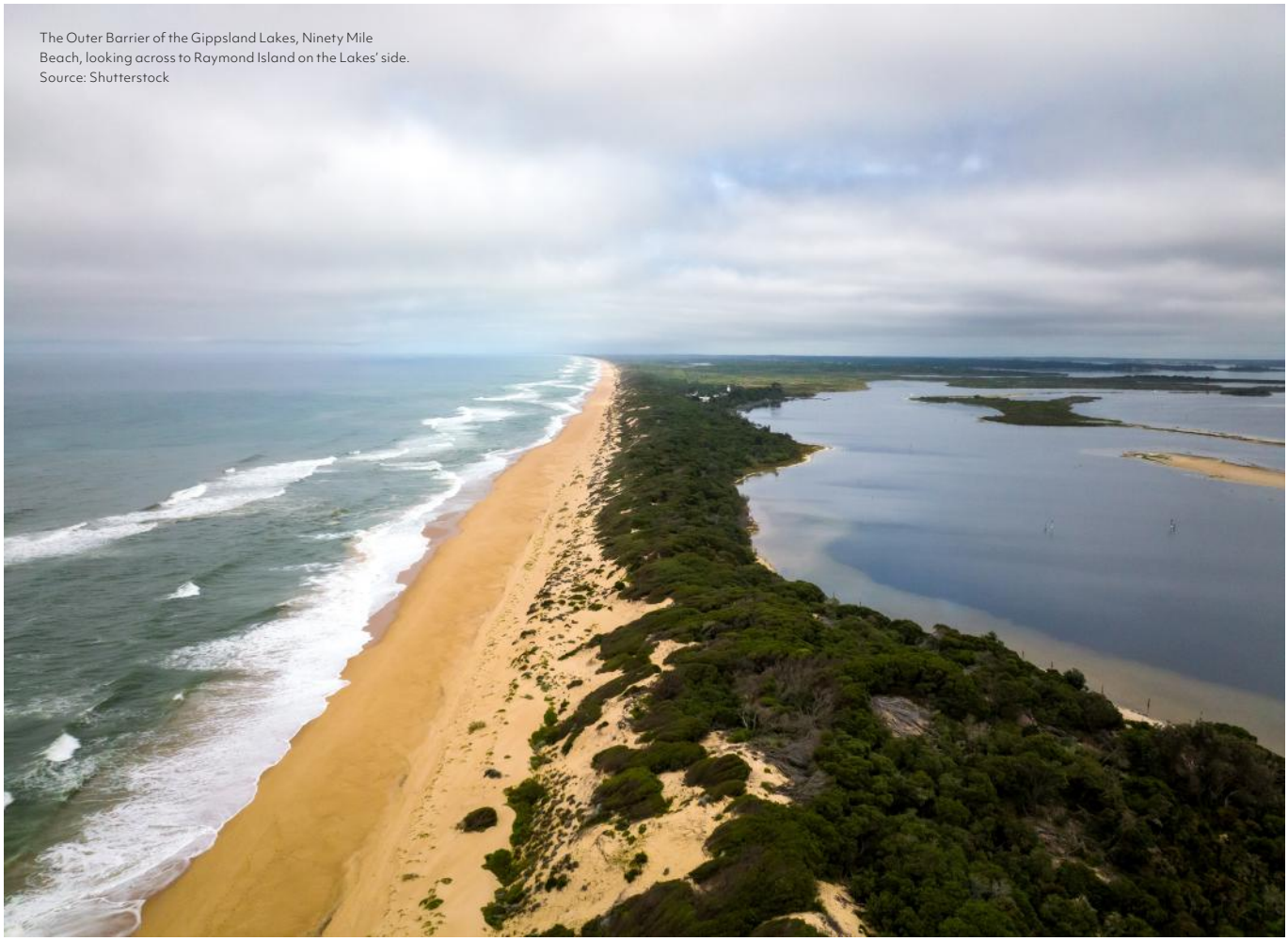
The online content published by CSIRO Publishing extends back to Volume 118, 2006, and is available at **publish.csiro.au/rs**.

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**





The Outer Barrier of the Gippsland Lakes, Ninety Mile Beach, looking across to Raymond Island on the Lakes' side. Source: Shutterstock

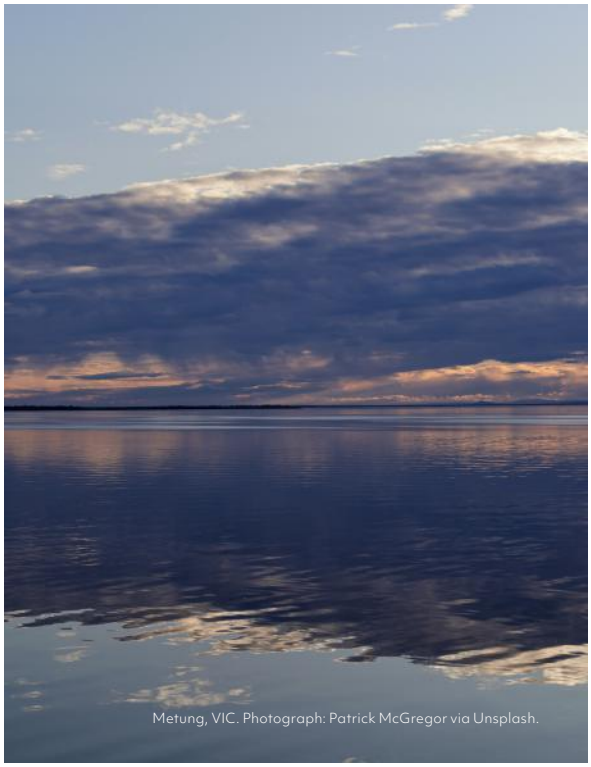
The Future of the Gippsland Lakes

PROCEEDINGS OF THE ROYAL SOCIETY OF VICTORIA, VOLUME 136

The first papers from Volume 136 of the *Proceedings of the Royal Society of Victoria* are now available online, open access from CSIRO Publishing, hosted at **publish.csiro.au/rs/collection/12070**. This volume is the first to be released under CSIRO Publishing's new 'publish-as-you-go' model, progressively collecting the volume over the course of the year.

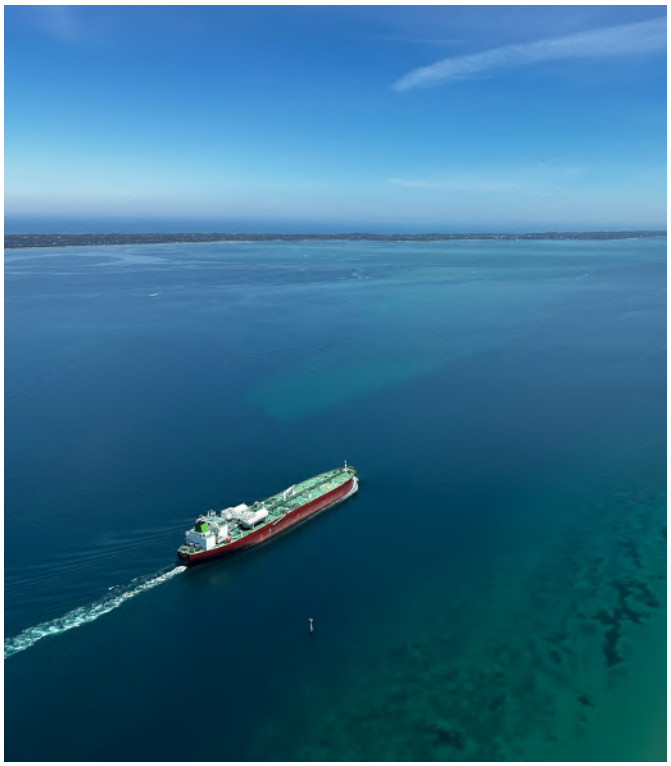
This collection on the Gippsland Lakes compiles papers commissioned following the roundtable held at the Royal Society of Victoria on 26 May 2023, involving research expertise along with First Nations (Gunaikurnai) representation. It summarises the geomorphological character of the Lakes system, the current state of estuarine health, and anticipates the impacts of intensified human activities, a drying regional climate and rising sea levels on the interaction of the marine and freshwater ecological conditions.

The Society's report from the roundtable, titled 'Securing the Future of the Gippsland Lakes,' is also available at **rsv.org.au/gippsland-lakes**.



Metung, VIC. Photograph: Patrick McGregor via Unsplash.

Papers from Volume 136



Johnny Sanchez via Unsplash

Effects of varying levels of nutrient inputs to coastal marine systems: a case study of a semi-enclosed bay influenced by a large urban population.

BY GREGORY P. JENKINS, KERRY P. BLACK, AND PERRAN L. M. COOK.

Port Phillip Bay (PPB) is the largest marine bay on the Australian coast and is the site of Australia's second largest city, Melbourne. A major environmental study in the 1990s recommended a reduction in the nitrogen input to the bay. Subsequently, improvements to sewage treatment efficiency in the 2000s coincided with the longest and most severe drought in recorded history, resulting in nitrogen inputs dropping by more than half compared with the 1990s.

Here we review studies conducted over the past 30 years to understand the effects of varying nutrient levels on the ecology of PPB. Studies showed that PPB is a nitrogen-limited system both in time and space. Biological productivity in PPB was markedly affected by reduced nitrogen loads during the drought, resulting in declines in seagrass and kelp cover, as well as benthic fish biomass. Overall, while setting conservative limits on nitrogen input will effectively negate the risk of widespread eutrophication, there will likely be a trade-off in reduced bay productivity.

► You can read this open access paper in the *Proceedings of the Royal Society of Victoria* via CSIRO Publishing at **publish.csiro.au/RS/RS24006**.

Where are we at with shape-memory alloys in this 'high-tech' world?

BY TREVOR R. FINLAYSON

Shape memory relies on a change in the crystallography of the material via a martensitic transformation. While many alloys show shape-memory properties, only certain materials have 'made it' to technological applications. The most notable of these is Nitinol, the commercial name for a nickel–titanium alloy. The most important current and future applications for Nitinol are, and will continue to be, as various medical devices. The material is most favourable for medical applications, firstly, because it exhibits shape-memory behaviour at very close to body temperature (37°C) and, perhaps equally importantly, only an extremely small percentage of human beings have any allergic reaction to either nickel or titanium.

Not so important are magnetic shape-memory materials for which, particularly the material Ni2MnGa, there are increasing numbers of applications requiring the shape-memory behaviour to be controlled by an applied magnetic field. The properties of some shape-memory materials relevant to current applications are summarised and, consistent with the theme of sustainability, some comment is made on the likely future of shape-memory materials in the market place.

► You can read this open access paper in the *Proceedings of the Royal Society of Victoria* via CSIRO Publishing at **publish.csiro.au/RS/RS23010**.

Haydn Pound via Unsplash

Current Government Consultations of Interest to Victoria's Science Community

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

Mariana Proença via Unsplash

CONSULTATION CLOSES 11 DECEMBER 2024

Victorian Renewable Energy Terminal

Public comment is invited on the draft scoping requirements for the Victorian Renewable Energy Terminal Environment Effects Statement (EES).

engage.vic.gov.au/victorian-renewable-energy-terminal-ees-scoping-requirements

James Qualtrough via Unsplash

CONSULTATION CLOSES 15 DECEMBER 2024

Potential water access for Latrobe mine rehabilitation

Have your say on applications to amend existing water entitlements and to grant new water entitlements for mine rehabilitation in the Latrobe Valley river system.

engage.vic.gov.au/potential-water-access-for-latrobe-mine-rehabilitation

Bob van Aubel via Unsplash

CONSULTATION CLOSES 17 DECEMBER 2024

Review of the Safe Drinking Water Regulations

The Department of Health is seeking your feedback on proposed changes to Victoria's safe drinking water regulations

engage.vic.gov.au/review-of-the-safe-drinking-water-regulations

pen_ash via Unsplash

CONSULTATION CLOSES 12 JANUARY 2025

The future of Victoria's state forests

The Great Outdoors Taskforce is seeking your input and feedback to inform a new era for the future of state forests.

engage.vic.gov.au/the-future-of-state-forests

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 sci entific 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.

2025 Editions & Deadlines

JANUARY TO FEBRUARY 2025	DUE DATE
Biotech in Victoria	*17 January*

Biotechnology and medical technology, and the interaction of synthetic with organic.

MARCH & APRIL 2025	DUE DATE
Preventing Future Problems	*7 March*

Identifying and preventing problems that threaten our planet in the future.

MAY & JUNE 2025	DUE DATE
Fighting 21st Century Diseases	*9 May*

Tackling the leading causes of morbidity and mortality.

JULY & AUGUST 2025	DUE DATE
Future Science & Tech	*4 July*

Opportunities, barriers, and risks of emerging fields in science and technology.

SEPTEMBER & OCTOBER 2025	DUE DATE
Science Engagement	*5 September*

Meaningful connection of STEMM with everyone.

NOVEMBER & DECEMBER 2025	DUE DATE
Knowledge Systems	*5 September*

Acknowledging, understanding, and Integrating the science of different knowledge systems.

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

Take a Virtual Tour of the building at: **matterport.com/discover/space/royal-society-victoria**

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	*≤90 people*

Book online for your meeting, conference, or a larger event.

Just visit **rsv.org.au/facility-hire** to explore our rooms, check availability, and secure the perfect space for your needs. Book now to ensure your date!

The Cudmore Library

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
Meetings, seminars, and videoconferencing.

CAPACITY
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
Meetings, seminars, and videoconferencing.

CAPACITY
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	FULL	ORG.	SCHOOL	AFFILIATE
	$40 PER YEAR	$120 PER YEAR	$1000 PER YEAR	$1000 PER YEAR	$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			
Each edition of *Science Victoria* mailed for free		✓			
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.			✓	✓	✓

Call for Nominations

Nominations for four Council Officers and up to five Ordinary Members of the Royal Society of Victoria's governing Council for 2025 and 2026 are sought. If required due to more nominations being received than places are available, all nominees will be elected by postal ballot during February 2025.

Newly elected Officers and Councillors of the Society will take up tenure from the Annual General Meeting to be held in May 2025 – all current Ordinary Councillors of the Society appointed for the 2023-24 term will continue until that date. All current 2024-25 Councillors continue until the AGM to be held in May 2026.

Please download the nomination form for more information: **rsv.org.au/rsv-council-nomination-form-2025-26**

The form must be returned to the Society, attention to the Returning Officer, along with the nominee's 200-word statement by **3.30 pm, Monday, 16th December 2024**.

Vale

DR ROGER FRANKENBERG

MRSV (1935 –2024) – a member since 1967

Roger was a zoologist, completing his PhD on identifying different (and new) species of glacierfish. He worked for a time with the NSW Health Department, studying the control of mosquitoes in rice crops, and joined the Australian Rare Fauna Research Association to track the activities of feral cats. Roger's life was well spent, farming and exploring diverse scientific, technical and sporting interests at Moorwatha in southern NSW with wife Judy and family, to whom the RSV Council conveys its sad condolences.

Individual Members

DR DANIEL CZECH
Senior Lecturer, Biotechnology, The University of Melbourne

DR JASON ALEXANDRA
Researcher, Australian National University

MS KERRI SPILLANE
Advertising Sales Manager

DR TUNG CHENG
Primary Care Physician & Public Health Researcher

How to Join

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
The Royal Society of Victoria
Wurundjeri Country
8 La Trobe Street, Melbourne, VIC 3000

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