MAY 2024 — ACCESSIBILITY & INCLUSION IN STEMM

SCIENCE VICTORIA

Overcoming Barriers in STEMM

16 People Share Their Stories
— pg 18

Advocating Accessibility

Art Making Science Inclusive
— pg 31

Closing Gaps

Women in STEMM Leadership
— pg 38

Inside

ISSN 2981-8664
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Photograph: Roman Samborskyi via Shutterstock

In This Issue

THIS EDITION: ACCESSIBILITY & INCLUSION IN STEMM

If only one group of people encountered barriers in accessing STEMM education and careers, we might consider that group as an outlier. However, when many different groups of people encounter multiple barriers related to access and inclusion in STEMM, it suggests a systemic issue rather than isolated and unrelated incidents.

ON THE COVER

Visitors in Melbourne Museum's Tyama exhibition. Photograph: Rodney Start/ Museums Victoria.

Upcoming Submission Deadlines

For all 2024 editions and deadlines, refer to page 45.

JUNE 2024	DUE DATE
Victoria & Climate Change	*5pm, 17 May*

JULY 2024	DUE DATE
Building Scientific Competency	*5pm, 14 June*

From the Editor

SCOTT REDDIEX
Editor-in-Chief — Science Victoria

'Science' isn't a destination. It's not a single subject, or job, or task. We're not at risk of completing 'science', or running out of things to discover. Instead, science is a toolkit. It's a method (or methods) of evidence-based inquiry that humans have developed to answer questions about our universe.

This toolkit doesn't have opinions or restrictions. Anyone can use it, and indeed everyone does use it, every single day. Making a judgement call on whether you can walk across a road before a car reaches you involves use of the scientific toolkit. Cooking a meal, hammering a nail… it all uses the toolkit, however intuitive it may be.

In addition, everyone has ideas, and some degree of creativity. If I asked you to draw a happy tree, you would be able to do that. It might not win any art prizes, but you'd still have demonstrated creativity.

Finally, there is subjectivity. Everyone is living their own life, filled with their own lessons, experiences, ideas, and the results from use of their scientific toolkit. What's best for you may not be best for someone else.

I'm sure that no-one would disagree with any of this. Science is a toolkit that everyone uses in every part of their life, people have creative ideas, and unique experiences. Nothing contentious there.

So how can anyone contest that 'STEMM is for everyone'?

In this edition of *Science Victoria*, we are looking at Accessibility and Inclusion in STEMM. In 2024, there are still many barriers that many different groups face to studying or working in science. All of these barriers are built *and maintained* by people. They didn't spontaneously arise, and 'science' won't stop if they are removed.

> Is studying science only for the rich? If not, then why do those in low socioeconomic areas still face barriers? Do only straight, white men have scientific ideas? If not, then why are there more barriers facing those who aren't straight, not white, or not male? Can scientific concepts only be taught and used within metro Melbourne? If not, then why are there barriers for those living in regional, rural, and remote parts of our state?

For all of the incredibly complex problems that we have solved using a refined scientific toolkit, why is equity and access still something the STEMM community struggles with?

We've asked our authors to cover some of this ground in this month's edition; it makes for insightful reading, and we hope it offers some scope for overcoming the many barriers to inclusion and participation in the scientific community.

SCIENCE VICTORIA

VOLUME 4, NUMBER 4, MAY 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**

Photograph: Clay Banks via Unsplash.

Building Diversity Accessibility and Inclusion in STEM

PROF CAROLINE MCMILLEN AO
Vice President, The Royal Society of Victoria

In February of this year, the Australian Government released an important document, the Final Recommendations of the Pathway to Diversity in STEM Review.[1] This review prioritised engagement with communities underrepresented in STEM, including First Nations peoples, people living with disabilities, women and girls, those facing age-based discrimination, culturally and linguistically diverse people, those in low socioeconomic areas, LGBTQIA+ people, neurodivergent people, and those living in regional and remote areas.

The review is timely, as it is projected that Australia's STEM workforce pipeline will not meet the future demand for STEM skills, and that this will have a significant negative impact on economic and productivity growth. Australia's Jobs and Skills Report (2023) also highlights that requirements for future professional, scientific, and technical services include an increase of 233,600 people by 2033.[2]

Persistent gaps in STEM education and workforce participation pipelines will continue to impact future STEM workforce gaps. While girls make up 47% of all enrolments in Year 12 STEM subjects, it is notable that the percentage of Year 12 girls enrolled in engineering (23%) and information technology disciplines (24%) are significantly lower.[3] This underrepresentation of women and other cohorts impacts productivity, as there is a rich database highlighting that workforce diversity results in an increase in innovation, financial, and productivity outcomes.[4]

Most Australian scientists are aware that the diversity of colleagues within their laboratories, lecture theatres, and conference venues does not reflect the diversity of Australia's population. In 2022, only 36% of STEM university students identified as female, around 5% of people studying university STEM subjects in 2021 were living with a disability, and less than 1% of

First Nations people held a university STEM qualification.[5] While many academics engage in programs to increase diversity, their commitments to STEM education and research require significant time in the competitive environment of global discovery.

There can also be outdated views within scientific communities – just as occur in the broader community – that the diversity, accessibility, and inclusion of different equity groups in science is a social or personal equity issue, rather than one which impacts outcomes in all STEM fields. This blind spot may be because of a belief in the primacy of the 'scientific method' and that its 'rigour' will protect from the lack of representation in STEM research or innovation from any one social group.

But this view is misguided.

In their 2019 paper on the use of commercial AI algorithms to guide decisions in the U.S. healthcare system, Obermeyer et al. found evidence of unforeseen racial bias in one widely used algorithm.[5] Black patients that were assigned the same level of risk by the algorithm were actually more sick than White patients. Assigning the same risk level to both Black and White patients would have resulted in identifying fewer than half of the Black patients requiring additional care, despite their higher level of sickness.

Bias occurred because the algorithm used health costs as a proxy for health needs, but it failed to consider the fact that less money is spent on Black patients who have the same level of need. The algorithm concluded therefore that Black patients are healthier than equally sick White patients. The authors concluded that *"reformulating the algorithm so that it no longer used costs as a proxy for needs eliminated the racial bias in predicting who needs extra care"*.[6] Such examples highlight that our methods in STEMM, including building and training AI algorithms, are only as good as our ability to recognise bias.

> When the scientific community combines the scientific method with the strength of diversity in communities, outcomes can be remarkable.

The All of Us Research Program is a longitudinal cohort study aiming to enrol a diverse group of at least one million individuals across the USA to accelerate biomedical research and improve human health.[7] In their recent Nature paper the program has released genomics data of >245,000 genome sequences.[8] The authors highlight that "*This resource is unique in its diversity as 77% of participants are from communities that are historically under-represented in biomedical research and 46% are individuals from under-represented racial and ethnic minorities".*

Leveraging linkage between genomic data and the longitudinal electronic health record, they found variants associated with 117 diseases and high replication rates across both participants of European ancestry and participants of African ancestry. The authors conclude that the diversity of "this dataset will advance the promise of genomic medicine for all of us".

Those programs that reflect the diversity present in Australia's communities within Australia's research and innovation teams will be key to addressing our national challenges across environmental, energy, health, and other major sectors. The critical elements of building an inclusive STEM research and innovation ecosystem resides in the capacity of States and Territories across Australia to deliver on those Final Recommendations of The Pathway to Diversity in STEM Review.

The Royal Society of Victoria has faced many challenges in its role as a champion of great science, technology, engineering and mathematics over many decades – I have no doubt it will meet this next challenge as it works with and across the State to ensure equity and excellence both underpin remarkable STEM discovery and a remarkable future.

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5 The state of STEM gender equity in 2022. (2022, September 22). STEM Equity Monitor; DISR. industry.gov.au/news/state-stem-gender-equity-2022

6 Obermeyer, Z., et al. (2019). Dissecting racial bias in an algorithm used to manage the health of populations. Science, 366(6464), 447–453. doi.org/10.1126/science.aax2342

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April 2024 Edition of *Science Victoria*

JOIN THE CONVERSATION

Share your thoughts, opinions, and expertise on articles, events, and issues relating to science in Victoria by sending us a letter. Refer to our Guidelines for Authors, and email **editor@ScienceVictoria.org.au**.

REFERENCES:

1 World Health Organisation. (2023, March 7). Disability and Health. https://www.who.int/news-room/fact-sheets/detail/disability-and-health

WEBSITE

hdsunflower.com/au/

Making Invisible Disabilities Visible

DR CATRIONA NGUYEN-ROBERTSON MRSV

> One in six people around the world live with a disability.[1] Many of these disabilities may not be immediately obvious and may be acquired at some point in life. It's the largest minority group in the world, and it's one that any of us could join at any time.

Just because you can't see it, it doesn't mean that it's not there.

For some, this can make it hard to understand and to believe that someone with an "invisible" condition genuinely needs support. People might be asked if they really do have a disability, because they "look fine to me", forcing them to justify why they might need help.

There was a time that I needed concessions. I had a disc herniation and the resultant pinching of my spinal cord meant that I was unable to stay standing for more than a minute. I was unable to stand on public transport, but because I looked "young and healthy", it was sometimes difficult to convince people that I needed a seat.

It also impacted my ability to do research in a lab. Like many jobs, my role required a degree of manual handling, as well as long stints sitting in place as I analysed tube after tube. Not being able to sit down on public transport, or not being able to comfortably set up experiments might not seem a big deal, but for me, it could be the difference between having a prolonged, intense period of pain and not.

While it was a painful three years with reduced mobility, I am incredibly fortunate that my disability was temporary. However, the sudden onset meant that it was difficult to navigate my struggles because I had never needed workspace adjustments, and most people judged me on how they knew me and how I looked. It got harder and harder to work in a lab while also trying to get the right help for my back and to and it was a major factor for me eventually losing my motivation to continue in that environment. Ironically, a date for back surgery – the solution – marked the end of my career in academia.

It's not just me. Within the pressure-cooker that is academia, managing invisible conditions can be especially difficult. It is expected that academics constantly generate data, publish papers, and work long hours, but this may not always be feasible when juggling fatigue, medical appointments, and even other jobs to pay for said medical appointments. Instead, we sometimes get the impression as students and early career researchers that powering through is seen as "tough".

Now my career has moved to education, where I work with many children and diverse audiences. Some people tell me upfront that I may need to make adjustments for them or the person they are caring for (e.g. allowing one child to do a completely different task in a workshop or to lie down in a show when everyone else is sitting), or to be more patient (e.g. to navigate around a person constantly calling out or coming up to me as I present a science show). Other times, I might not immediately understand why someone is distracted and/or distracting others.

How do you know to identify, acknowledge, or understand the daily barriers faced by people living with an invisible disability?

The Hidden Disabilities Sunflower

The Hidden Disabilities Sunflower makes invisible disabilities visible. It is a global symbol designed to encourage inclusivity, acceptance and understanding. It is a simple tool for people to voluntarily share that they have a hidden disability.

By wearing a sunflower lanyard, lapel or wristband, people with disabilities that aren't immediately apparent can signal to others they may need extra help, understanding, time, or alternative communication methods as they go about their day.

The Hidden Disabilities Sunflower lanyard. Photograph: Dr Catriona Nguyen-Robertson

I think everyone should know about this fantastic initiative. I was surprised that people I knew – who have worked with people with disabilities – had never heard about the Sunflower.

When it comes to STEMM education, it also means that educators know to adjust their teaching accordingly or ask, "how can I help you?". The academic outcomes for students with disabilities can undoubtedly be improved by working together to strengthen disability inclusion in education. Wearing a Sunflower not only allows students and staff to indicate to those around them that they have a non-visible disability, but it also helps transform the academic culture, challenge students' mindsets, and perceptions of disability.

Organisations are also joining the Sunflower network. In doing so, they commit to training their entire workforce using our Sunflower training suite - to know what the Hidden Disabilities Sunflower is, to have a broad understanding of hidden disabilities and to be confident to support someone wearing it. It would be great to see more STEMM-based organisations joining.

What can you do if you see someone wearing the Sunflower?

People with disabilities can have different needs at different times. There is no one way to offer support to a Sunflower-wearer. Invisible disabilities can be physical, visual, neurological, cognitive, respiratory, pain or fatigue-based — and their severity can fluctuate day to day, or situation to situation.

The Sunflower aims to start the conversation, inviting you to ask a person how you can assist. The lanyard, pin, or wristband doesn't tell you everything you might need to know about interacting with someone wearing it, but it disrupts our autopilot. You might stop to think whether you might need to do something differently - and the best way to know exactly what that is, is to ask. Asking could make all the difference to a person.

Something like this would have helped me. People may have had more understanding when I couldn't stand for long periods, nor reach for things on high shelves or in low drawers, or when I needed longer booking on lab equipment to allow for breaks from sitting still. I may have also felt more justified in claiming a seat on public transport, or taking Zoom meetings with a camera off.

I didn't know about the Sunflower until I read about it. Since then, I've taken more notice of people wearing it, and been more considerate and asked how I can help. Now that you know, hopefully you can be more aware too.

Vale

Professor John Alfred Talent FRSV

1932 – 2024

The Council of the Royal Society of Victoria sorrowfully acknowledges the passing of Emeritus Professor John Alfred Talent FRSV, a distinguished figure in the field of Earth and Planetary Sciences.

Professor John Talent in 1989. Photo: Bruce Miller Source: Fairfax Media Library

REFERENCES:

1 Kumar, S. (2018, April 4). India's paleontologists fight destruction of its fossil riches. Science. doi.org/10.1126/science.aat7646

Professor Talent's academic journey commenced at the University of Melbourne, where he earned a Bachelor of Science in geology, chemistry, and mathematics in 1952, followed by a Master of Science in geology in 1954, and eventually culminating in a Ph.D. in geology in 1959. A true Renaissance Man, his appetite for academic pursuit led him to diverse fields, with a further Bachelor of Arts in French, Fine Arts, and Arabic in 1966.

Throughout his career, Professor Talent held various esteemed positions, including Geologist and Senior Geologist at the Department of Mines in Melbourne from 1955 to 1967. He later joined Macquarie University, where he served as a Senior Lecturer, Associate Professor, and ultimately Professor until his retirement in 2006, beyond which he continued to contribute actively as Emeritus Professor of Earth and Planetary Sciences at Macquarie University.

Professor Talent's international engagements were extensive and impactful, spanning across continents and institutions. Noteworthy among these was his tenure as a UNESCO Professor of Geology at the University of Dacca, East Pakistan, and his leadership roles in international geological programs, including the International Geological Correlation Program.

Recognised globally as a committed advocate for research integrity in his field, he systematically and famously challenged the fraudulent research of Dr Vishwa Jit Gupta, perpetrator of the 'Himalayan Hoax,' in the late 1980s. Talent revealed that decades of Gupta's fundamental research into the geology and fossil record of the Himalayan region had been manipulated, faked and plagiarised, with the result of inundating the "geological and biogeographical literature of the Himalayas with a blizzard of disinformation so extensive as to render the literature almost useless."[1]

His research interests were diverse, covering topics such as stratigraphy, tectonics, biostratigraphy, biogeography, and the isotopic signatures of global extinction events. Professor Talent's contributions to the understanding of Earth's history and dynamics are evidenced by over 23 monographs, 140 peer-reviewed papers, and numerous other publications spanning more than five decades.

Professor Talent played an instrumental role in developing innovative teaching methods in palaeontology and promoting interdisciplinary learning. His efforts extended to public engagement, including lectures, workshops, and media appearances aimed at fostering scientific understanding and appreciation.

In recognition of his exemplary contributions to science and academia, Professor Talent received numerous accolades and honours, including being named a Foreign Fellow of the Senckenbergische Naturforschende Gesellschaft, Frankfurt, and a Fellow of the Royal Society of Victoria. He was the inaugural presenter of the annual Howitt Lecture, a joint presentation by the RSV with the Geological Society of Australia (Victoria Division) in 2004.

Victoria's Science Society conveys condolences to family, friends, and colleagues and celebrates a life well-lived in the pursuit of understanding the many mysteries of our planet with passion and rigour. The family has requested donations to the Myasthenia Gravis Foundation in John's memory: **myasthenia.au/fundraising/donations/**

NEW LEADERSHIP AT THE RSV

The Royal Society of Victoria is delighted to announce the following appointments to our governing Council:

VICE-PRESIDENT

Professor Caroline McMillen AO MRSV

As a former Chief Scientist and Vice-Chancellor, Caroline has led and facilitated collaborations focused on delivering a positive impact on the economic, social and cultural health of Australia throughout her career. She is an active champion for science, innovation and technology, particularly for girls and women in science, and was a Member of the Expert Advisory Group for Science in Australia and Gender Equity (SAGE).

Caroline will fulfil the current tenure of the Vice-President's role, recently vacated by Dr Catherine de Burgh-Day MRSV, until May 2025 (subject to re-election/appointment). Council conveys its thanks and appreciation to Catherine for her many years of service in the interests of RSV members and the conduct of our science engagement programs.

COUNCILLOR

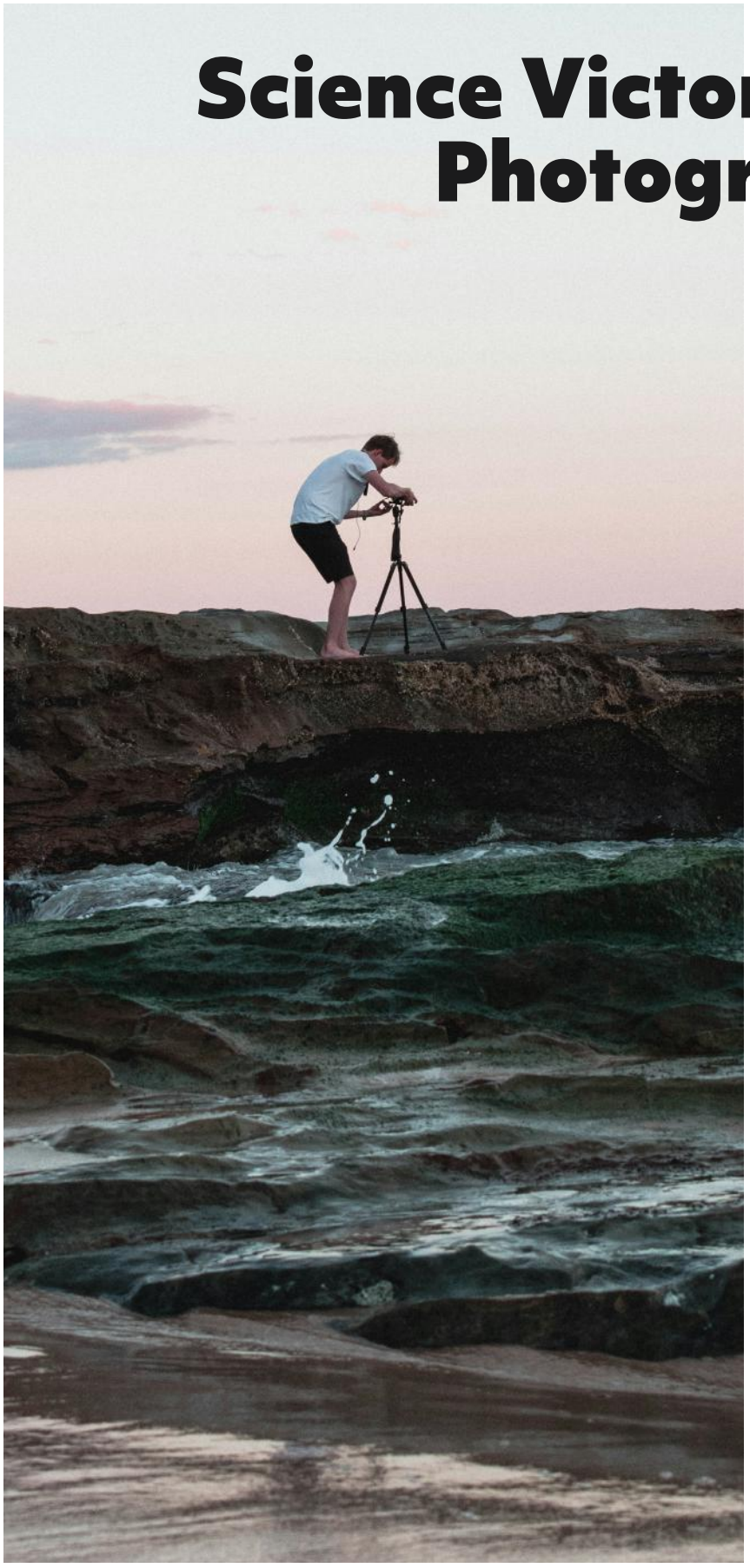
Mr Tony Clemenger MRSV

Tony was born into Australasia's largest advertising and marketing communications conglomerate, Clemenger Group Ltd, started by his grandfather and today one of the most awarded communications agencies in the world. His diverse career demonstrates leadership, expertise and outstanding performance in marketing, advertising, consulting and academia, with national and international experience.

COUNCILLOR

Mr Brendan Cohen MRSV

Brendan's recently completed science degree in animal biology stems from a deep interest and passion for wildlife and conservation. He is co-founder and President of the Emerging Scientists Network, a collective of RSV student members devoted to fostering connections, knowledge exchange, and employment opportunities for current undergraduates and recent graduates from Victorian universities.



Photograph: Karl Hedin via Unsplash

Science Victoria STEMM Photography Prize

Win $300 and celebrate the world of STEMM.

We are excited to announce the first annual *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, the images published each month will form a shortlist, from which a winner will be selected at the end of the year.

Applications for the 2024 round are open until 15 November (the deadline for the December edition), and a winner announced in the February 2025 edition of *Science Victoria*.

The winner will receive a $300 prize, and a certificate.

Images must be 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.

PRIZE:
$300 prize, and a certificate.

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

SUBMISSIONS:
Submissions can be made by emailing **editor@ScienceVictoria.org.au.**

SUBMISSION DATE:
By 15 November

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

Learning Facilitator Selwyn Hoffmann presenting the Auslan tour to families at Melbourne Museum. Photograph: Rodney Start/Museums Victoria.

Dr Chris Jackson, Bioinformatician at Royal Botanic Gardens Victoria, studying the genomes of plants sequenced as part of the Genomics for Australian Plants Framework Initiative. Photograph: Royal Botanic Gardens Victoria.

Image: Google DeepMind via Pexels

Artificial Intelligence Summit

Join us for a unique opportunity to connect with expertise and local sector leaders across the Australian medical, education and technology industries to deepen understanding and discuss critical considerations in deploying enterprise artificial intelligence (AI) solutions.

Our journey in AI is not just about technological advancement; it is about harnessing the power of AI to solve some of the world's most pressing problems. We can imagine a world where AI is used to anticipate and mitigate disasters from natural hazard and extreme weather events, help preserve our planet for future generations, or support practitioners with diagnostics and treatments to revolutionise patient care in our health system, ensuring that no one is left behind due to a lack of access or resources. From climate change and healthcare disparities to poverty and education inequality, the potential for AI to drive positive change is considerable.

Rotary Melbourne · The Royal Society of Victoria · TOMORROWX

Presented by the Rotary Club of Melbourne and the Royal Society of Victoria. Refreshments provided by event partner, TomorrowX.

FEATURING PRESENTATIONS FROM:

A/PROF MAGDALENA SIMONIS AM
Clinical Associate Professor, University of Melbourne & Board Directo

MR FINBAR O'HANLON
Consulting Innovator & Entrepreneur

DR DIMITRIOS SALAMPASIS
FinTech Capability Lead & Senior Lecturer, Emerging Technologies and FinTech Innovation, Swinburne University of Technology

MR AARON SEMPF
Next-Gen Tech Lead (Asia-Pacific-Japan), Amazon Web Services

DATE/TIME:
Wednesday 29 May
12 - 1:30pm

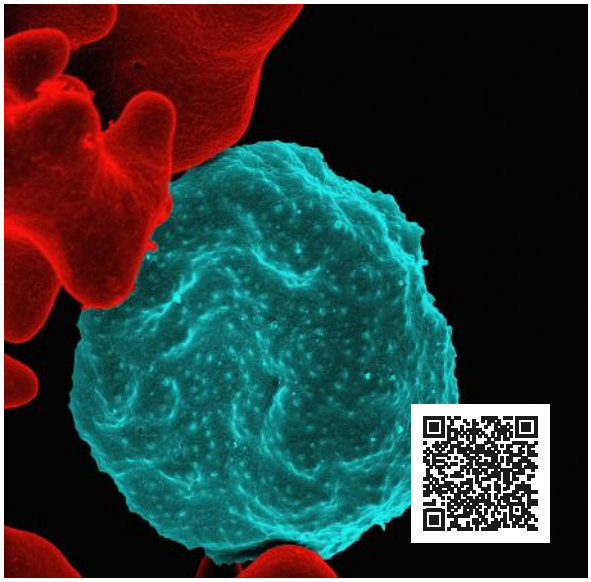
PRICE:
In-Person
$30 (non-members)
$25 (RSV members)

Online:
$5 (non-members)
Free for RSV members

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

BOOKING LINK:
rsv.org.au/events/artificial-intelligence-summit

NAID via Unsplash



Dr Benoît Laleu – Medicines for Malaria Venture

Despite the efforts towards malaria eradication, the latest estimates from the recent WHO World Malaria Reports show that the number of cases is rising and malaria continues to have a devastating impact on the most vulnerable populations.

Medicines for Malaria Venture (MMV) is a not-for-profit Swiss Foundation acting as a Product Development Partnership (PDP) with the mission to reduce the burden of malaria in disease-endemic countries by discovering, developing and facilitating the delivery of new, effective and affordable antimalarial drugs in collaboration with international partners.

Presented as part of the WEHI Seminar Series by Dr Benoît Laleu, Director of Research Drug Discovery, Medicines for Malaria Venture, Switzerland

DATE/TIME:
Wednesday 26 June, 10-11am

PRICE:
Free

LOCATION:
Online (via Microsoft Teams)

BOOKING LINK:
wehi.edu.au/event/dr-benoit-laleu-medicines-for-malaria-venture

Photograph: Dr Gresley Wakelin-King

Australian Desert Rivers: So Cool, So Dry, So Dynamic

Iconic names like Cooper Creek, Kati Thanda-Lake Eyre and the dusty Diamantina have a big footprint in our national narratives. Despite this, we generally only notice them when they become least like themselves: when it's rained, the bushes are green and there's water flowing in the channels.

Australia's dryland rivers are qualitatively different from "normal" (temperate zone, perennial) rivers. It's not just that they don't often flow: it's because aridity creates special conditions for rainfall, run-off, vegetation-landform relationships, biotic life cycles, and the pace of landscape evolution. Australia's geological history has given these rivers a very specific topographic and sedimentological context.

Join geologist, geomorphologist and research scientist Dr Gresley Wakelin-King, who will challenge the misconception of this continent's "dead heart" and explore the dynamic nature of the dryland rivers that support life and land in the landscapes of Australia's arid interior.

DATE/TIME:
Thursday, 27 June from 6pm

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

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

BOOKING LINK:
rsv.org.au/events/australian-desert-rivers

Photograph: Margaret McFall-Ngai via Wikimedia Commons (CC BY 4.0)

Science Gallery Living Light Experiment

You are invited to participate in a mysterious new immersive bioluminescent art experience that is part performance, part experiment.

Encounter the ancient light of bioluminescent bacteria A. fischeri and have a chance to contemplate how the living colony has evolved this extraordinary light over aeons through a symbiotic relationship with the Hawaiian bobtail squid. You'll be asked for feedback on your perception of living light.

This project is a collaboration between bioengineer Matt Faria, biomathematician Stuart Johnston, and artists Robert Walton, Madeleine Flynn and Tim Humphrey. The group is conducting one of the first studies of human perceptions of beauty in bioluminescent light with the aim of developing sustainable lighting sources in collaboration with living systems.

DATE/TIME:
Wednesday 29 May & Thursday 30 May, 11am-5pm

PRICE:
Free

LOCATION:
Science Gallery Melbourne
700 Swanston St (Enter via Grattan St)
Carlton VIC 3053

BOOKING LINK:
melbourne.sciencegallery.com/events-list/living-light-experiment

via Unsplash

National Youth STEM Summit

Are you 18-25 and ready to kickstart your career in science and technology?

- Gain insights from leaders in STEM from a diverse range of disciplines and career stages;
- Up-skill with workshops in communications and media, leadership, work-life balance & personal branding and interview skills;
- Connect with your peers and exchange ideas on the current trends in STEM fields;
- Network with business, government & senior representatives in the STEM sector;
- Celebrate NYSFs 40th anniversary at a Gala Dinner at the Australian Parliament House.

DATE/TIME:
17 - 19 August 2024

PRICE:
$295 - $625

LOCATION:
The Australian National University, Canberra

BOOKING LINK:
nysf.edu.au/programs/national-youth-stem-summit

What's On

The RSV hosts many STEMM-related events, public lectures, and meetings throughout the year. Most RSV events are hybrid, held both in person (at 8 La Trobe St, Melbourne) and broadcast online via Zoom and Youtube. Our public lectures comprise the "Science in Focus" component of the Inspiring Victoria program in 2024.

May

RSV 2023 AGM

Full RSV members (i.e., members with voting rights) are asked to register to attend the 2023 Annual General Meeting for review of last year, noting a quorum of 50 will be required.

DATE
9 May 2024

REGISTRATION
rsv.org.au/events/2023-annual-general-meeting

Artificial Intelligence Summit

Presented in partnership with the Rotary Club of Melbourne.

Join us for a unique opportunity to connect with expertise and local sector leaders across the Australian medical, education and technology industries to deepen understanding and discuss critical considerations in deploying enterprise AI solutions.

DATE
29 May 2024

TICKETS
rsv.org.au/events/artificial-intelligence-summit

June

Australian Desert Rivers: So Cool, So Dry, So Dynamic

The 2024 A. W. Howitt Lecture, presented in partnership with the Geological Society of Australia (Victoria Division). Join geologist Dr Gresley Wakelin-King to challenge the misconception of this continent's "dead heart" and explore the dynamic nature of the dryland rivers that support life and land in the landscapes of the arid interior.

DATE
27 June 2024

TICKETS
rsv.org.au/events/australian-desert-rivers

Later

RSV Phillip Law Postdoctoral Award Lecture

Please note that this event has been rescheduled from November 2023 to Late 2024.

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

DATE
TBA

TICKETS
rsv.org.au/awards-and-prizes/phillip-law-award

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/JL6SIKT9JSI
Aiming Higher: Improving Science Education in Victorian Schools

YOUTU.BE/ODSSDCSUO0O
Reimagining Humanity in the Age of Generative AI

YOUTU.BE/HJNBCCQ5N8G
Green Chemistry: Reinventing the Chemical Industry

YOUTU.BE/1SYKWQKZF48
Glaciers and Ice Sheets in a Warming World

Awards & Prizes

National Science Week - Victorian Seed Grants

APPLICATIONS CLOSE *12pm, 31 May 2024*

The *Inspiring Victoria* Partnership Board invites public libraries and community sector organisations to apply for seed funding to run a public event, activity or program during National Science Week (10-18 August 2024).

With applications opening on 1 May 2024, grants are up to $1000 each (GST free). Organisations may submit multiple applications for different proposals.

Feel free to get creative! Previously, National Science Week has featured workshops, lectures, demonstrations, exhibitions, festivals, competitions and film screenings, but as long as your proposed event meets the eligibility criteria, we would love to hear about it. The Science Week Library Activities booklet offers case studies, activity ideas and heaps of resources, and is available online from **www.scienceweek.net.au/wp-content/uploads/2020/03/Science-Week-Library-activities-ideas.pdf**.

▸ For more information, and to apply, please visit **inspiringvictoria.org.au/programs/national-science-week-victoria/grants/victorian-seed-grants-libraries-community-organisations**.

national science week

Photo: Robert Kneschke, via Shutterstock

Global Science & Technology Diplomacy Fund - Strategic Element

SUBMISSIONS CLOSE *31 May 2024*

Expressions of interest are now open for the Global Science & Technology Diplomacy Fund - Strategic Element.

$6 million in grants are now available to grow international collaboration in our region, enhance Australia's standing as a science and technology leader, and drive innovation and commercialisation in priority areas.

Grants from AUD $100,000 to $1,000,000 are available for eligible Australian organisations collaborating on key areas of science and technology with priority partner countries across the Asia-Pacific region.

Applicants must focus on one of five priority themes and include at least one priority partner country. The themes are Advanced manufacturing, Quantum computing, Artificial intelligence, Hydrogen production, and RNA (including mRNA) vaccines and therapies. The eligible partner countries are Brazil, Indonesia, Japan, South Korea, Malaysia, New Zealand, Singapore, Thailand, and Vietnam.

▸ For more information, visit **glodip.org.au**

National Cancer Institute via Unsplash

Young Scientist Research Prizes - 2024 Competition

SUBMISSIONS CLOSE *31 May 2024*

To foster and recognise excellence in the next generation of our State's scientists, the Royal Society of Victoria has established four prestigious, competitive prizes open to post-graduate, doctoral students in all areas of the Biomedical & Health Sciences, Biological Sciences (Non-human), Earth Sciences and Physical Sciences.

Now a part of the *Inspiring Victoria* program, the Society is grateful for the generosity of our members, past and present, in supporting these prizes since 2012.

Prize Categories

The category of **Biomedical and Health Sciences** includes the fields of Endocrinology, Epidemiology, Genetics, Human Physiology, Human Anatomy, Immunology, Medical Parasitology, Microbiology, Neurology, Nuclear Medicine, Pathology, Pharmacology, Radiology and related human sciences apart from clinical trials.

The category of **Biological Sciences (Non-human)** includes the fields of Agriculture, Biochemistry, Botany, Cell Biology, Ecology, Evolutionary Biology, Forestry, Zoology, and related non-human science.

The category of **Earth Sciences** includes the fields of Geochemistry, Geochronology, Geology, Geophysics, Planetary Physics, Meteorology, Oceanography, Palaeontology, Physical Geography and related sciences. In 2024, this category and its prizes are kindly supported by Geoscience Australia.

The category of **Physical Sciences** includes the fields of Astronomy, Astrophysics, Chemistry, Mathematics, Physics, all branches of Engineering and related sciences. In 2024, this category and its prizes are generously sponsored by the Australian Radiation Protection and Nuclear Safety Agency.

Eligibility:

Applications are open to candidates enrolled in the final year of their doctoral candidature at universities in the State of Victoria at the time of application, and who are members of the Royal Society of Victoria. Candidates who have submitted, or will submit their final thesis before 31 May 2024 are ineligible.

In order to promote the interests of young people starting their careers following many years of scholarship, we are limiting applications to doctoral candidates under 40 years of age.

▶ For more information and applications, please visit **rsv.org.au/awards-and-prizes/young-scientist-research-prizes**

Young Scientist Research Prizes
Recognising Excellence in Early Career Scientific Research

Australian Government
Geoscience Australia

Australian Government
Australian Radiation Protection and Nuclear Safety Agency

arpansa

Little Scientists Early STEM Education Awards

APPLICATIONS CLOSE *31 May 2024*

Nominations are now open for Little Scientists Early STEM Education Awards, Australia's only dedicated awards to celebrate STEM excellence in early childhood education.

Our biennial awards proudly recognise the early childhood educators and early primary teachers driving STEM education for children aged 0-7 years across Australia.

Little Scientists Early STEM Education Awards has two categories:

▶ Category 1. Excellence in Early STEM Education Award recognises early learning services & early primary classrooms.

▶ Category 2. Outstanding Early STEM Education Leader Award recognises early childhood educators & early primary teachers.

The theme of this year's awards is: Overcoming gender bias in early STEM education.

About Little Scientists:

Little Scientists is a not-for-profit initiative supported by the Australian

Government. Its mission is to champion inquiry-based STEM education for all young children across Australia by empowering early childhood educators and early primary teachers with STEM te teaching skills through their pedagogy-based PD workshops.

▶ For more information, and to apply, visit **littlescientists.org.au/stem-awards-hub**

Cooperative Research Centres Projects (CRC-P) Grants

APPLICATIONS CLOSE *5pm, 5 June 2024*

CRC-P grants round 16 is now open for applications.

This grant supports short-term (up to 3 years), industry-led research collaborations with matched funding $100,000 and $3 million.

Projects must:

▶ develop a product, service or process that will solve problems for industry and deliver real outcomes

▶ benefit small to medium enterprises (SMEs)

▶ include education and training activities.

This is not a complete list and other costs may also be eligible.

▶ For more information, and to apply, visit **business.gov.au/crc-p.**

Overcoming Barriers in STEMM

Personal Stories from Employment and Education in STEMM

As we talk about barriers to access and inclusion in STEMM education and employment, it can be difficult to understand exactly what those barriers are and what they mean if you have never experienced them.

We are likely unaware of the different hurdles that each of our peers have had to overcome to be where they are. Without recognising and understanding these barriers, it is harder for us to make meaningful changes that benefit everyone.

This month, we asked a diverse group of people about their experiences in STEMM. Each person highlights some of the barriers that they have faced, as well as what did or would have made STEMM more inclusive and accessible for them. We've kept contributors anonymous, so that they can share their stories with you without concern.

The compilation includes stories from women, gender diverse people, LGBTQIA+, Aboriginal or Torres Strait Islanders, people of colour, people whose first language is not English, those living with a disability, who are neurodiverse, or who are from a regional, rural, or remote area. Note that not all of the responses explicitly state which categories they may fall under, to avoid disclosing identifiable information.

It can be very draining to reflect on and share the challenges you have faced, and we are incredibly grateful to those who have been able to share their experiences with us to learn from. We encourage you to read all submissions, as each person has a unique experience. Underrepresented groups should not be left to advocate for themselves, and in reading these stories, we ask that you consider how you might contribute to making STEMM more inclusive and accessible.

Photograph: Mihály Köles via Unsplash

> “ Throughout my studies and career, I was dealing with chronic pain, and everything that comes with that diagnosis. I found it extremely difficult, as there were limited supports available for those with non-visible illnesses at the time. ”

Person 1

What is your experience in STEMM (in the workforce or education) as someone who may have faced barriers to access/inclusion?

I have a degree in chemistry, and my career in STEMM was predominantly in the pharmaceutical industry. Throughout my studies and career, I was dealing with chronic pain, and everything that comes with that diagnosis. I found it extremely difficult, as there were limited supports available for those with non-visible illnesses at the time.

‘Chronic pain’ doesn’t mean that the pain level is at 100% all the time, but it would spike at seemingly random times (before the triggers were diagnosed), creating a lot of anxiety – in turn, leading to burn-out. My passion was always for bench work, whether it be in prac classes, projects, or working in quality control. It quickly became apparent that lab spaces couldn’t adjust to allow seated working, or to minimise tasks carried out for extended periods above waist height. In the end, it was unsustainable for me. As a relatively recent graduate at the time, alternative roles weren’t visible or discussed, so I had to leave the field.

What would make – or did make – the most meaningful difference for you?

The most meaningful thing for me was learning that, after you have completed your STEMM degree, you are not tied to one single role, discipline, or setting. Even though my passion still lies in chemistry, I have been able to pivot into the technology sector, where my knowledge for systems and statistics are valued.

Understanding where your passions lie, while studying at a supportive institution, is the best foundation for a career in STEMM. It means that when you graduate, you have a better idea about the range of roles that are more suited to your particular interests and limitations. There are now plenty of jobs that will allow you to work at your own pace and in an environment where you can thrive in spite of your illness or disability.

Person 2

What is your experience in STEMM (in the workforce or education) as someone who may have faced barriers to access/inclusion?

I have adult-onset hearing loss, and going to seminars and conferences - some of the cornerstones of information sharing in my field - is very difficult. I am quick to push back on “I don’t need a microphone, I’m loud enough” (yes, you do), but many smaller talks are held in spaces without an AV setup. Team meetings are also a challenge — they are designed for smaller, more casual conversations, but when more than two people talk simultaneously in a space, I can’t understand a thing.

Being the facilitator of these meetings is far easier than being a participant. I find that teaching is not as difficult now that I am three years out from the loss, but during my first semester after treatment (and the first lockdown), it was impossible to hear students in tutorial rooms due to multiple groups of students all chatting at once.

What would make – or did make – the most meaningful difference for you?

When people recognise my loss as something that can be accommodated, that makes a huge difference. My lab manager helped me to find alternative computer labs to teach in that would be quieter, until my brain had adjusted more. My students are all also wonderful (literally no student has given me a hard time about it). Being upfront about my limitations (e.g. ‘You will need to come over to me if I don’t hear you calling from your desk’, or ‘approach from the left side’) is often draining (I teach a lot of classes and have to do it for every new group of students) but the difference it makes is worthwhile. Some of my student groups have also had informal and formal training from me on working with hearing loss, and their willingness to help and change makes things far more bearable!

Person 3

What is your experience in STEMM (in the workforce or education) as someone who may have faced barriers to access/inclusion?

As a woman of colour in STEM, my journey has been marked by both triumphs and challenges. I’ve encountered barriers to access and inclusion at various stages of my education and career. From facing stereotypes and biases to navigating environments where diversity was not always valued, I’ve experienced firsthand the systemic barriers that exist for women of colour in STEM. Despite these challenges, I’ve remained resilient and determined to carve out my path in the field.

What would make – or did make – the most meaningful difference for you?

The most meaningful difference for me has been the support of mentors, allies, and communities that recognise and champion diversity and inclusion. Finding mentors who have walked a similar path and receiving support from colleagues and organisations committed to equity and representation has been invaluable. Additionally, creating and participating in communities like STEM Sisters, where women of colour can connect, share experiences, and support each other, has been transformative. These networks provide a sense of belonging and solidarity that empowers us to overcome barriers and thrive in STEM.

> “ The things that would have made the most meaningful difference for me are actually just the same amount of support everyone should have access to (and do have in other fields). The same quality of workplace, protections, and levels of accountability ”

Person 4

What is your experience in STEMM (in the workforce or education) as someone who may have faced barriers to access/inclusion?

I’m a queer, Aboriginal woman with a chronic illness. Not all these things are “visible” and not all of them impact me equally. I often face unconscious biases in the workplaces that imply I don’t belong. For example, colleagues may use male pronouns when talking about someone with my set of skills.

Often, I’m the only woman in a meeting, and people assume I’m there as a non-technical person. I’ve been apologised to for discussions getting “too technical and boring me”. I’ve also experienced the unintentional use of racist slurs or offensive comments about me “not acting like an Aboriginal person.” My experiences have driven me to advocate for positive change, but also mean that I spend time thinking about these problems instead of the STEMM work I’ve been hired to do.

What would make – or did make – the most meaningful difference for you?

There is a lot of research on finding solutions to improve workplace inclusion and diversity. We just have to implement them. Offer flexible working conditions to everyone and build a culture that means staff feel like they can access them. Open a two-way dialogue by talking to your colleagues and acting on their advice. Targeted funding to help underrepresented groups in STEM has really helped me – I was worried about my career being hindered by my lack of postgraduate study, and now I have financial support to return to study.

Good mentors and support networks are also essential. Underrepresented people often find brand new challenges, and having a network means you can find out how others have handled similar challenges.

Person 5

What is your experience in STEMM (in the workforce or education) as someone who may have faced barriers to access/inclusion?

Neither of my parents had the opportunity to finish high school because of the Vietnam War. They instilled in me a deep appreciation for learning and placed significant emphasis on the value of education.

When I moved to Australia as a teenager, my first year was mostly spent learning English. I discovered science the following year and chose the typical STEM subjects – chemistry, physics, and maths…but didn’t choose biology because most of the words were too long and difficult to pronounce! It was very challenging to try and fit into the foreign life as a teenager, but through this I learned resilience, perseverance, adaptivity and resourcefulness, which helped build the person that I am today.’

I went through my career without any role models that look like me. There are not many Vietnamese–Australian scientists in my work environment, and the number of women is even fewer. I understand how difficult it is to try and be what you cannot see.

What would make – or did make – the most meaningful difference for you?

I consider myself incredibly fortunate to have many supporting and motivating teachers and mentors who have been instrumental in shaping my journey throughout school, university and professional life. Their encouragement prompted me to pursue scholarships and supported me through transformative training opportunities.

Organisations can create a culture of inclusivity through training on unconscious bias and increasing access to education, training and mentorship for underrepresented groups.

I feel a personal sense of responsibility to lead by example and be a role model for younger women of colour. To you, I say: ‘Don’t be discouraged by setbacks. Find a strong network of mentors and allies. Every obstacle is an opportunity to learn and grow. As long as you follow your passion and strengths, and work hard towards your goals, success will find its way to you.

Diversity in Our State

In a room of 1,000 Victorians:

754 live in Greater Melbourne, with the remaining 246 living in other parts of the state.[1]

650 were born in Australia, 40 in India, 27 in England, 26 in China, and 15 in New Zealand.[1]

10 people identify as Aboriginal and/or Torres Strait Islander.[2]

596 people are between 20-64 years old. 178 are under 20, and the remaining 168 are 65 or over, with a median age of 38.[2]

170 people are living with a disability. 131 of these are people have a physical disability (who may also have a cognitive disability).[3]

508 are female, and 492 are male.[2] However, 2 of these people are transgender/gender diverse, and 2 are intersex.[4]

57 of the adults openly identify as LGBTQIA+, although the real number across all ages is likely higher.[4]

292 have a bachelor's degree or higher, while 149 didn't complete further study after finishing year 12.[2]

Around 140 people have a STEM qualification from either university or VET providers.[5]

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4 Victorian Agency for Health Information (VAHI). (2021, December 28). The health and wellbeing of the lesbian, gay, bisexual, transgender, intersex and queer population in Victoria - Findings from the Victorian Population Health Survey 2017. Victorian Agency for Health Information (VAHI). vahi.vic.gov.au/reports/population-health/health-and-wellbeing-lgbtiq-population-victoria

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Person 6

What is your experience in STEMM (in the workforce or education) as someone who may have faced barriers to access/inclusion?

I have been sexually harassed in male-dominated spaces. The repercussions made it harder to stick around. In my first year of undergrad, I studied a year-long STEMM subject in which I was one of a few girls. By mid-year, we had formed friendship groups that doubled as study groups, and I was the only girl in that. Then one of my male study mates started asking me out and tried to get physically close to me, even when I said no – he felt entitled as we had studied together, and he had helped me. I still don't like that subject anymore, and it had been one of my favourites in high school. Years later, one of my male peers in academia also would not take "no" for an answer. I was cornered in the lab, I lost friends…I didn't want to stay in that team, nor in research anymore.

What would make – or did make – the most meaningful difference for you?

From my experience, instances of professors and academics making sexual advances towards younger researchers have mostly been hushed up — not only by victims fearing retaliation, but also by institutions determined to keep their name untarnished. For anyone "in the wrong", they were more likely to be quietly promoted out of the institution rather than face consequences. This makes them believe they can continue to get away with it.

It would have been great to have someone senior who had my back. It's difficult for women to speak about their experiences, especially when they feel like they might not be taken seriously as an individual. In the US, there have been groups of brave women speaking up in recent years, forcing scientific institutions to take steps to protect students and staff. Sexual misconduct is not exclusive to science, but we certainly do need to change the culture of "straight, white, men" being the predominant leaders in STEMM if we want to keep academics around who don't tick all those boxes.

Person 7

What is your experience in STEMM (in the workforce or education) as someone who may have faced barriers to access/inclusion?

Growing up on the outskirts of Melbourne, a 'career in STEMM' to me meant 'healthcare', or 'something with a labcoat'. I loved science, but I had no practical idea of what a career in academia actually meant – and didn't until around my third year of undergrad.

As someone who subsequently acquired a disability, my experience in STEMM changed immediately. I 'indefinitely paused' (quit) my PhD and took a couple of years out of science before returning to a lab. I was determined to succeed, and did so at the cost of any work-life balance. It took me a few years before realising that was a really bad idea.

While things seem to be changing, STEMM still feels like a very risky place to discuss any kind of condition. You definitely feel like you're making yourself vulnerable to bias, and it is exhausting having to advocate for yourself 24/7.

What would make – or did make – the most meaningful difference for you?

The things that would have made the most meaningful difference for me are actually just the same amount of support everyone should have access to (and do have in other fields). The same quality of workplace, protections, and levels of accountability.

If a staff member or student goes through a traumatic experience – whether it be a life-changing injury, death in the family, or a mental health crisis – you would want to ensure that they have support. Ask them what would help. Maybe discuss changing a PhD to part-time or converting to a Masters. Provide links to your institute's support services.

Most importantly, create a supportive team culture, so everyone knows they can approach you if things are getting overwhelming. If someone looks like they're struggling, or there is inappropriate behaviour from a team member, leaders need to speak up immediately.

These actions cost absolutely nothing – less than another purely symbolic morning tea.

NIAID via Unsplash

Person 8

What is your experience in STEMM (in the workforce or education) as someone who may have faced barriers to access/inclusion?

Probably the biggest barrier to STEMM that I personally experienced was just a lack of exposure and access to educational facilities in the STEMM field. Growing up in a regional area meant that any (fun) STEMM related activity had to be done in the city (mostly Melbourne, sometimes Geelong). Many local schools found it difficult to organise a whole-day excursion, which meant these types of opportunities were scarce.

The overall feeling that kids my age had towards STEMM tended to lean towards it being 'dull' or 'boring', but I would also put some of that down to the lack of engaging resources available locally. In fact, the most significant experience (and turning point) I had in deciding on a career in STEMM happened while on an excursion down in Melbourne - but only once I started studying VCE Biology. It's a shame that I had to wait until VCE before I was able to do science experiments I found 'fun', and that it was only available in Melbourne (at the time).

What would make – or did make – the most meaningful difference for you?

I know efforts have been made to increase specialised STEMM facilities that aim to engage students in regional areas (e.g., Tech Schools, of which there are currently 10 with 6 more being built), which I think is a step in the right direction. It would be difficult to equip all schools with specialised facilities that allow for more engaging STEMM activities but having these 'hubs' is more feasible. It's a little too late for me, but I hope these types of facilities allow future generations of regional kids to find their own little spark of 'fun' in the STEMM field- hopefully without having to be in the city.

Person 9

What is your experience in STEMM (in the workforce or education) as someone who may have faced barriers to access/inclusion?

I am a 53-year-old gay man. In all other parts of my persona, I have privilege: white, male, cis-gendered, educated, able-bodied. When I first started on my career path as an Earth Scientist in the UK, I could not come out. I was surrounded by 'vintage' heterosexual white men and homophobia was rife. The workplace was hostile to 'the homos and lezzers'. If I had come out, my career would have been compromised. Fast forward three decades and I am now very comfortable in my own skin as a proud gay man who has been married for 17 years and has just had a baby boy with a close friend of mine. I am content.

But the journey has been tough, especially the last few years where I have experienced casual (and not so casual) homophobia in the workplace. I couldn't report it as I was (still) on a casual academic contract – if I had rocked the boat then would my contract be renewed? Especially as the main perpetrators were signing off on these contracts. Casual racism is nauseating. The relationship status of my 'husband' was changed to 'friend' on OHS field trip forms. I was explicitly told that I was not to let students know I was married to a man. Just a few examples. Yes, I am angry and yes, I am frustrated. When I finally achieved tenure late last year, I initiated reporting this homophobia, but I just wasn't being listened to – it was clear to methat the complaints procedure in this educational institute was not built for minorities.

What would make – or did make – the most meaningful difference for you?

How can I help stop this from happening to my LGBTIQA+ brethren? By being out and proud: representation is key. Identification of intersectional challenges is also important. Finally, acting as a mentor for queer STEM professionals.

Person 10

What is your experience in STEMM (in the workforce or education) as someone who may have faced barriers to access/inclusion?

My path in STEMM has been riddled with those who saw my difference as a deficit. They questioned my worth, some even using their power to impinge on my dreams. Yet, my passion for the work was my shield. I held on, refusing to let them deny the future I envisioned for myself and will claim.

What would make – or did make – the most meaningful difference for you?

My sense of self, forged by the strength of queer authors and elders, has been my guiding compass. Their moral clarity, in all they do, taught me to strive. We owe it to those who came before, and those who will follow, to hold our ground. The most meaningful difference would be a shift: support for our unique dreams, not pressure to change them. We need guidance on how to overcome obstacles, not how to become palatable for someone else's comfort.

Person 11

What is your experience in STEMM (in the workforce or education) as someone who may have faced barriers to access/inclusion?

I see inequity and a difference of experience for transgender and gender-diverse staff and students in my workplace. For example, I have to walk to a different building to use the bathroom as there aren't many gender-neutral bathrooms in mine. Plus, that bathroom is in high demand because it's the only cubicle across multiple buildings for both people who need gender-neutral bathrooms and people with accessibility needs.

My job also expects me to attend conferences in other locations. I need to consider whether being trans at the destination is safe or even legal, let alone getting there. Going through airports and sex-based security scanners is one of the most stressful and embarrassing parts of travel; being misgendered, being patted down, and it all exacerbates my existing anxiety associated with racial targeting by airport security.

Technology also works against many transgender people. University systems will often be tied to your 'legal name', which leads to people like me being 'deadnamed' (having their previous name revealed) to colleagues and students. I also have academic papers published under my old name, which can be difficult or impossible to have changed by some journals.

What would make – or did make – the most meaningful difference for you?

I have some great colleagues and mentors who have also had a lesser experience in the STEMM workplace, which has traditionally been dominated by cisgender men. They put me forward to apply for grants and other opportunities, and they help improve the workplace for transgender people so I don't have to do it all myself. Members of minority groups shouldn't be expected to solve all the problems and left to advocate for themselves.

For organisations, start with self-reflection. 'Is your representation of marginalised groups lower than in the general population?' and 'Does the representation of those groups go down with seniority?'. If so, it's likely that employment and promotion practices don't account for biases, or people from those marginalised groups don't want to stay in that workplace. In either case, those inequities ought to be fixed. But very few workplaces have measures and opportunities that aim to correct them.

QueersinScience at the 2023 Midsumma Pride March. Photograph: Kim Kwan/QueersinScience.

> " Before I came out, I was very worried that it would be the end of my science career. "

Person 12

What is your experience in STEMM (in the workforce or education) as someone who may have faced barriers to access/inclusion?

I grew up in a rural area. People didn't talk much about becoming scientists. I dropped out of university to work a variety of trade jobs. But then I went back to university to study science and had to take tons of basic classes to catch up. I'm a few years older than most people at my career stage. In some ways that doesn't matter, but in other ways it does show up.

As one of only a handful of openly transgender researchers in my field, I have felt isolated and dealt with a fair bit of workplace discrimination. Before I came out, I was very worried that it would be the end of my science career.

For someone like me, there's extra work that you have to do on top of an already challenging job. But for all those difficult situations, there are also great people that just want to do exciting things.

What would make – or did make – the most meaningful difference for you?

Having a good support network is essential. I found one through Queers in Science, which gives me a group of people that I can talk to about both my personal life and my work life.

For LGBTQIA people, the lack of mentors or people that are visibly successful in technical fields is a challenge. It makes handling negative events even harder since there's no one to talk to. It is why many young people leave research. And while I still don't have people that can serve as mentors for me, I've found it rewarding to play the role of mentor for younger LGTBQIA – and especially transgender – people working in STEM.

Organisations need to step up and put more effort into championing, supporting, and promoting the careers of people from underrepresented groups. This has an aggregate impact, because they then act as examples and mentors for the next generation. Fellowships that take the extra benefits of diversity into account would be a clear way to do this.

Person 13

What is your experience in STEMM (in the workforce or education) as someone who may have faced barriers to access/inclusion?

There are several ways I've struggled while trying to navigate STEMM academia, thanks to multiple intersecting identity and disability factors. First of all, in my experience, the self-sacrificing grind culture prevalent in academia leads to particularly harsh judgements of limitations which arise from invisible illness or disability. As a result, even without overt discrimination, one's success is hindered due to the requirement of constant existence in environments that were not built with disabilities in mind. I've also always found a huge amount of ambiguity surrounding what accessibility arrangements are actually available.

Furthermore, the ongoing dismantling of the "boys club" culture in STEMM is in such infancy that it is primarily focused on promoting women, often sidelining other gender minorities who remain erased and overlooked. Finally, STEMM PhD candidates are encouraged to attend international conferences, which fundamentally ignores that not all travel opportunities are safe or accessible to everyone, and fails to provide alternative options for people with the financial burden of ongoing medical expenses. In academia, you are also almost expected to do an overseas postdoc or two, which just might not be feasible.

What would make – or did make – the most meaningful difference for you?

What has made, and continues to make, the most meaningful difference for me is support from mentors and peers who not only empathise with (and reassure me of) the generic struggles of a PhD journey, but also recognise and validate the additional challenges I face. The visibility of others who share my identity, or other underrepresented identities, has also been crucial, as has forming connections with these people.

Finally, it has been affirming and important to connect with a community of similar people outside of STEMM, and to share and reflect that these access/inclusion issues unfortunately exist elsewhere, but that positive change is slowly happening.

NIAID via Unsplash

> " It's exhausting and isolating to feel as though you are constantly being asked to both explain your existence and justify your presence in STEMM. "

Person 14

What is your experience in STEMM (in the workforce or education) as someone who may have faced barriers to access/inclusion?

In STEMM - across lab science & technology roles - I've found I've had to advocate for myself nearly continuously. It can seem like people around me have not considered that disabled and neurodivergent people exist, let alone have jobs. I had no guidance about how to use a walking stick in sterile labs, and had to design my own processes; similarly, I've found myself having to explain the nature of autism to multiple HR departments over my career (often triggered because I disclosed internally). It's exhausting and isolating to feel as though you are constantly being asked to both explain your existence and justify your presence in STEMM.

I can fly under the radar as a minority, so work often feels like a continual stream of coming out, making myself vulnerable, and in doing so risking my income.

What would make – or did make – the most meaningful difference for you?

Peer support, diverse leadership, and working in high trust environments are all critical elements to support someone like me. Feeling like you're the "only one" going through something can have severe mental health impacts - not being alone in a challenge provides critical social support.

A lot of the change necessary must come from leaders, managers, and members of the more privileged groups in STEMM. On an individual level, a greater awareness of your personal power and influence. Those who hold power need to be aware of how they influence others - power over marginalised people and people earlier in their careers that they are mentoring.

Reflecting meaningfully on what power you hold and how you can leverage that to support other people is something anyone can do. Doing some thinking and homework will go a long way to developing your skills as an advocate and ally.

Person 15

What is your experience in STEMM (in the workforce or education) as someone who may have faced barriers to access/inclusion?

Neurodiversity is likely very common in STEMM, even if many people are very unaware of it. I was formally diagnosed with ASD and ADHD after two years at my current laboratory job (following a diagnosis for depression in my Honours year), and these diagnoses have made me retrospectively realise the challenges I faced during both my education and my early career.

Despite specialising in viral immunology, these two subjects were ironically my worst two subjects at university, as they were rote-learning heavy - something I am now realising that I struggle with due to my ADHD. Yet my interest in science meant I was able to excel at practical subjects and maintain a strong overall knowledge which held me in good stead for my further studies.

When beginning in new environments, I am also often uncertain and take a while to fit in due to my ASD, so starting out in new positions has been challenging, especially as my communication is somewhat impaired without considerable 'learning' over time, leading to some misunderstandings with colleagues.

What would make – or did make – the most meaningful difference for you?

While we have come a long way in understanding neurodivergence, there is still a long way to go. For me, being open and honest, first with my managers and then with my colleagues, has greatly improved my working relationships. Many people are still hesitant to discuss their neurodivergence with others, and understandably so, but information and communication are so important for understanding one another. I also sought management options from my doctor and now take medication which greatly helps with my ADHD symptoms.

Knowledge of my conditions, and subsequently treatments to manage them, would have made my education and early career significantly easier. STEMM institutions would greatly benefit from greater awareness, education and, foremost, openness regarding neurodivergence to help those within thrive rather than struggle.

Photograph: Rodney Start/MuseumsVictoria.

NIAID via Unsplash

Person 16

What is your experience in STEMM (in the workforce or education) as someone who may have faced barriers to access/inclusion?

Academia largely remains a male and cis-heteronormative space. To fit in with my colleagues and to be taken seriously within my research group and the wider academic community, I could not be myself. To be acknowledged by the "boys club" in a team that was predominantly male and only had male seniors, I was expected to behave more like them.

I often found myself being vague about what I did on the weekend so as not to divulge that I was doing things that could "out" me – and dancing around my queerness at work because it is not a safe place is stressful. A lot of the time we're not conscious of it because we shut it out, but that stress and discomfort does creep up on you. Not to mention I was once directly told not to speak about my sexuality by a more senior academic – any chance of me feeling safe was wiped out the window.

What would make – or did make – the most meaningful difference for you?

When I changed fields and started working with a different group of people who were so warm, inviting, and welcoming, I completely changed. I could be myself without having to hide parts of me. I enjoy work much more now and am more productive and collegial as a result. Find your people – it really makes a difference!

People who call themselves "allies" need to step up and be allies. And we do need allies and advocates. People in underrepresented groups didn't create the problem, but are often relied on to fix it. Training sessions and awareness helps, but individuals and organisations need to put their money where their mouths are. I've worked for organisations that gave out cupcakes for International Women's Day, gave out compliment notes to students, or had free massages and pats with puppies for mental health – but there was no systemic change.

A History of Queerness in STEMM

BY DR MOHAMMAD TAHA *and* **DR CHLOE MACKALLAH**
National Co-Convenors of QueersInScience

The assumption that working in STEMM exists outside the influence of identity is a misconception. How might the challenges of belonging, faced by LGBTQIA+ (queer) scientists, shape their unique contributions? Why do we continue to erase their histories from the narrative of scientific discovery?

rawf8 via Envato Elements

Projects like QueersInScience's exploration of queer STEMM history in Australia aren't simply about the past. These aren't dusty stories to stick back on a shelf. Uncovering hidden figures combats the ongoing lie that only a narrow few can do great science. They offer role models, a sense of belonging, and a powerful counter-narrative to the myth that science is the domain of only straight, cis men.

Hidden figures

Unearthing the history of LGBTQIA+ scientists is a fight against erasure. Unlike straightforward birth and death certificates, records about personal identity often don't exist. When LGBTQIA+ identities were criminalised, people hid what made them unique to survive.

It's not just words missing from files – it's whole lives scrubbed from history, and stories of individuals changed to suit contemporary views.[1] This 'silence' in the archives wasn't accidental – it reflects the systematic erasure of LGBTQIA+ lives and their contributions.

The power of terminology

The terminology used to refer to people was hazy, shifting with the times. As part of this project, the QueersInScience team found that the word "queer" was one of these terms, used differently to its current meanings.

"Queerness" was expressed in varied ways throughout history, and so our team has searched for the impacts of its usage beyond modern labels.

Despite the variations, "queer" was consistently used to refer to people whose gender identity and/or sexuality did not conform perfectly to the ideals of the time. This didn't just mean someone who was LGBTQIA+ – in different settings, it seems to have been used to describe women who supported feminist ideologies.[2,3]

Collaborating with historical experts allows us to navigate the nuances of past language and cultural contexts. Most importantly, the team acknowledges the emotional weight of unearthing stories overshadowed by discrimination and marginalisation.

Women overshadowed

Ruby Payne-Scott (1912-1981) was a pioneering Australian radio astronomer, who worked for the CSIRO. She is also an example of how women who didn't conform to contemporary values were questioned and overlooked.[4]

While her name may not be widely known, her contributions were nothing short of ground-breaking. Working on solar observations and military radars between 1945 and 1947, Payne-Scott and her collaborators studied solar flares - sudden and violent explosions in the Sun's atmosphere that occur once every half-hour or so on average, and which are the most powerful form of explosion in our solar system. She discovered three of the five categories of solar bursts originating from the corona (the upper layer of the Sun's atmosphere), fundamentally altering our understanding of the Sun.[5]

But her impact goes beyond discovery. In 1946, Payne-Scott and her colleagues pioneered the aperture synthesis technique. This method allows for the combining of data from multiple similar telescopes, a technique that is now a cornerstone of modern astronomy, as seen in such projects as the Australian Square Kilometre Array Pathfinder (ASKAP) radio telescope in Western Australia. Ruby was the first person to ever conduct radio interferometry.[5]

QueersinScience collaborated with Science & Technology Australia, Science Gallery Melbourne, and the ARC Centre of Excellence for All Sky Astrophysics in 3D to present TEA FOR TRANS. Trans and non-binary people in STEMM spilled the tea on what it's like to be trans and non-binary at different career stages. Photograph: QueersinScience.

QueersInScience were invited to celebrate queer science at Museums Victoria's Nocturnal: Hot & Bothered event. Photograph: Tim Carrafa/MuseumsVictoria.

Despite her brilliance, Payne-Scott faced significant discrimination due to the scientific sexism of her time.[3,4,5] This, unfortunately, adds her to a long lineage of overlooked innovators in STEMM, who were marginalised and labelled for their non-conformity to contemporary values - and relative 'low status' in a patriarchy.[6]

Moving forward (while looking back)

Though Payne-Scott's time was marked by prejudice, organisations like QueersInScience are actively changing this legacy. Their LGBTQIA+ STEMM Day celebrates contemporary role models while connecting them to this hidden history. Initiatives like the Scott Johnson Awards honour advocacy and achievement, while also providing mentorship opportunities to early-career LGBTQIA+ professionals. This fosters a much-needed support network, combating the isolation that often drives promising talent out of STEMM. Additionally, QueersInScience actively partners with First Nations STEMM advocates and organisations, recognising shared history of erasure and the need for collaboration in building a more inclusive and equitable future.

QueersInScience recognises that the landscape of LGBTQIA+ STEMM is far too complex for a one-size-fits-all story. Ruby Payne-Scott faced discrimination, stemming largely from sexism within a mostly straight field. LGBTQIA+ people of colour navigate a far more treacherous path. They're hit with racism, sexism, AND the constant fear of exposure due to their sexual orientation or gender identity. This forces large amounts of unseen labour – advocacy, mentorship, community organising, and fighting for basic respect – that goes unappreciated and unrewarded. It's the burden of being a trailblazer in a field that treats you like you don't belong.

The pressure to "play it safe" to survive hits even harder for First Nations and queer/trans/intersex People of Colour (QTIPOC) in STEMM. Their experiences are erased, not just due to old-fashioned bigotry, but because institutions don't even track the data that would prove their existence. Not only does this rob them of rightful recognition, but it also deprives future generations of QTIPOC STEMM professionals of a true reflection of their community. How can you dream of being something you've never even seen?

This systemic invisibility cuts deep. It's one thing to be overlooked, but quite another to have your struggles dismissed because they don't fit the neatly packaged narrative of "diversity" that institutions want to promote. True inclusivity means lifting up ALL marginalised voices, particularly those that have been silenced the longest. QueersInScience is committed to amplifying these voices, prioritising equity, and fighting for a STEMM landscape where every exceptional mind is not only seen, but celebrated.

QueersInScience recognises the link between the damage done to queer history and the ongoing suppression of Indigenous knowledge systems within STEMM. It's the same toxic mindset at work. First Nations scientists, engineers, and knowledge holders possess a unique perspective that enriches our understanding of the world. However, their contributions have long been dismissed or appropriated within Western scientific frameworks. QueersInScience seeks to honour and amplify these voices, fostering a more holistic and inclusive approach to Australian STEMM.

The past, present, and future of Australian STEMM are undeniably queer. QueersInScience is forging an inclusive tomorrow, carrying this legacy forward by prioritising visibility, advocacy, community, education, and intersectionality. Their work champions LGBTQIA+ professionals and ensures the next generation thrives. By unearthing forgotten stories, challenging systemic bias, and amplifying diverse voices, they ensure the Ruby Payne-Scott's of today find acceptance and platforms for their genius, ensuring a brighter future for STEMM and society as a whole. Yet, this work relies on the support of everyone who believes in the power of science to uplift, innovate, and solve our world's greatest challenges. Whether through donations, allyship in the workplace, or simply celebrating queer brilliance, you can play a vital role.

▶ *Dr Mohammad Taha is a researcher at the Melbourne School of Engineering. Dr Chloe Mackallah is a climate scientist at CSIRO. They are the National Co-Convenors of QueersInScience.*

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Tactile models for the Monash Sensory Science Exhibition are made of felt, food, and other materials. Photograph: Monash University.

Advocating Accessible Science

Using Art to make Science Inclusive for Blindness, Low Vision, and Diverse Needs

DR ERICA TANDORI
Artist in Residence at Monash Biomedicine Discovery Institute

With **DR STU FAVILLA**
Head of the Swinburne Sonic Research group

And **DR CATRIONA NGUYEN-ROBERTSON**
Senior Editor, Science Victoria

Dr Erica Tandori may be legally blind, but that hasn't stopped her becoming an award-winning artist, researcher, and academic.

She uses her skills and art to help people experience and touch the invisible world of molecular biology. Erica also creates exhibitions that use interactive sculptures to engage and inspire audiences of all ages and abilities. Science can often be inaccessible to individuals with disabilities, particularly those with blindness or low vision, due to the predominantly vision-focused approach in education, employment, and communication.

In science and biomedicine, the analysis of data derived from machines, such as particle accelerators and microscopes, is critically dependent on the ability to see. But this dependence on vision may be unnecessarily limiting. For instance, the sonification of data, which uses non-speech audio to convey information or data, may be an opportunity for those with low vision or blindness to access meaningful information through hearing.

Recognising the need for greater inclusivity in STEM, the Monash Sensory Science initiative was launched in response to these challenges. Erica joined the Rossjohn Infection and Immunity Lab, Monash University as Artist in Residence, where she creates multi-sensory, multi-modal artworks communicating biomedical research to blind and low-vision audiences.

In 1989, Erica was a young Arts student. That year, she was diagnosed with macular dystrophy, a genetic disorder causing her to go blind by the middle of the year. It was her impending blindness that nudged her to embrace the artistic talent she had put aside as a fully sighted student of journalism, English literature, and philosophy. As a child, she had dreamed of being an artist, and has now made that dream a reality.

Monash Sensory Science

Monash Biomedicine Discovery Institute held its inaugural Sensory Scientific Exhibition and Discovery Day in 2018, a free sensory exhibition curated specifically for blind, low-vision and diverse needs audiences. Monash Sensory Science has significantly expanded its reach over the years, with flagship annual exhibitions and outreach efforts.

Some of the displays have included 3D-printed models of immune cells, tactile models made of clay, food, papier-mâché and other materials, sounds synchronised to live videos of immune cells, ASMR (autonomous sensory meridian response) soundscapes, and olfactory displays. All the models are accompanied by descriptions in both large text and braille.

Most of Erica's work explores infection and immunity. In 2019, the exhibition focused on cancer, featuring a suite of tactile art and models that depicted cells and cell division, tumour growth and invasion, how cancer treatments work, and more. Last year, they created technologies and interactive displays exploring autoimmune processes - the ways in which the body mistakenly attacks its own organs and tissues, resulting in health conditions such as type 1 diabetes, multiple sclerosis, and celiac disease.

During the COVID-19 lockdowns, Erica's work went viral (literally). She worked on the HIV Capsid Data Projection Project, a work created with interaction designer and video artist Dr Stu Favilla, Head of the Swinburne Sonic Research group. The human-sized interactive sculpture was made up of individual hexagonal and pentagonal tiles smothered in tiny foam balls, simulating the structure and surface of the viral HIV protein. Dynamic computer-generated molecular structures were also projected onto the sculpture that changed based on genetic mutations to incorporate the fact that HIV virus evolves rapidly. These rhythms of light projections were set to a pulsating dance beat, as though this giant viral capsid was taking to a dance floor, for an online exhibition. They may have taken a little poetic licence with the music given the lockdowns, but for future exhibitions they intend to align data sonification of the viral mutations with the visual data projections on the surface of the sculpture.

More recently, Erica and Stu have collaborated to create sensory science books. Their books are inspired by the beautiful Ology series of books by Dugald Steer and others. The Ology books are illustrated and interactive, presented in an encyclopaedic format, but are inaccessible to people like Erica due to their small print. Erica and Stu's sensory science books are filled with tactile artwork and are also interactive: cameras above the displays determine which page a reader is on to read the text and play appropriate sounds.

The Monash Sensory Science initiative has been invited to present at prestigious events and been featured in esteemed journals. This year, the team was invited to co-create a set of tactile artworks with five scientific teams at the University of

Participants at the 2023 Monash Sensory Science Exhibition learning about autoimmunity. Photographs: Monash University.

Cambridge as part of the Cambridge Festival. They have also been recognised globally in competitions; Erica was a Finalist in the 2020 Berlin Falling Walls Breakthroughs in Science Art in Science Award, and Monash Sensory Science was a 2019 Australia Museum Eureka Prize for STEM Inclusion Finalist and Highly Commended at the 2023 Victorian Premier's Design Awards for Design Strategy.

Through exhibitions and collaborations, Monash Sensory Science and Erica's work have raised awareness, promoted interest in STEM studies and careers, and empowered individuals with disabilities to engage with STEM concepts. The number of people who attend the annual exhibits currently sits between 140-160, but the audience is growing as the program expands its reach.

Opportunities to change the way we do science

In our technology driven world, so much is screen-based. This presents both a problem and an opportunity for those with low vision or blindness. Vision-based data is devoid of any other sensory experience apart from sound, as screens are not very interesting to touch. On the other hand, screens with zoom functionality enable those with low vision to see data at greater magnification, as well as access text-to-speech functions. Erica, for example, uses her peripheral vision and zoom technologies on her computer screen to see as much as possible of what she creates. If we can release data from this screen-bound environment with multimodal delivery, we may be able to further eliminate obstacles to data access in myriad ways with enormous implications for diverse needs.

Making science accessible to people with diverse needs is an important mission of the Rossjohn Laboratory. The lab offers student scholarships and graduate internships to people with disabilities to broaden the diversity of people engaged in scientific discovery and to offer an inclusive opportunity to gain career experience in biomedical research.

The collaborative efforts of Erica, Jamie, Stu, and others have led to significant strides in advancing accessible science for individuals with disabilities. Through the Monash Sensory Science initiative, they have demonstrated the transformative power of inclusivity and creativity in STEM education and communication. As the initiative continues to evolve, it serves as a beacon of innovation and inspiration for promoting accessibility and inclusion in the scientific community.

1875

Malaria-Free Among the Gum Trees

BY SCOTT REDDIEX MRSV
Editor-in-Chief, Science Victoria

For those applying a European model of science in Australia, the 19th and early 20th centuries were a time of boundless exploration and inquiry. The extensive collection, cataloguing, and description of everything was a singular purpose for many during this period – with many past presidents and members of the RSV counted amongst them.

Scientific theories that had been developed, tested, and refined predominately in Western Europe and the Americas had to be re-tested in this new environment. Similarities and differences were studied between here and there in every facet of the land, sea, and sky.

In the 1875 *Proceedings of the Royal Society of Victoria*, Joseph Bosisto explored the reasons behind one such difference noted by Europeans in Australia: a surprising lack of malaria. At the time of publication, it wasn't yet known that malaria was caused by particular *Plasmodium* spp. parasites, transmitted by particular species of mosquitoes. However, the impacts of the disease were well known, and for centuries it had contributed to the deaths of millions each year.[1]

This was especially true for Europeans in the tropics, who arrived as naïve (non-immune) people in a region where malaria was endemic, which made them much more likely to die from it.[1]

How was malaria not endemic in Australia? Bosisto presented a hypothesis, based on a number of observations about eucalypts that had been sent to Europe for study: *"...its early maturity, together with its power to absorb considerable moisture, and to permeate the air with its peculiar odour, led to the belief that this tree, attractive in itself, exerts a beneficial influence upon malarious districts."*

"Australia on the whole may be said to be pretty free from virulent endemic or miasmatic fevers, and the latter may be said to exist only as the eucalyptus recedes."

In other words, Australia lacks malaria, but Australia does have eucalypts. Are eucalypts responsible for keeping people safe? And, if so, how?

Bosisto had started with the question of 'what makes Australia different to places that have malaria?', and then ruled different factors in or out. He decided that geography couldn't be the reason, because there are similar geographical features between Australia and regions where malaria is endemic. However, there is a large amount of unique Australian flora – perhaps a plant was responsible for the lack of malaria observed in this part of the world?

If a plant was responsible, which one? Eucalypts are unique to Australia, found across the country, and thought to have that *'beneficial influence on malarious districts'*.

If eucalypts were the reason, how were they doing it? Bosisto noted that eucalypts have three main features different to other plants: *"a tannate gum resin, a volatile acid, and a volatile [eucalyptus] oil."* If eucalypts were doing anything special, he reasoned, then it was most likely due to one of these – but only if the responsible feature could naturally access the environment without the help of man.

At this point in the article, Bosisto revealed that he has spent recent years extracting, purifying, and studying the oil from eucalypts:

"Before taking up this question with the above queries, I think it but right (although known to most of the members of this Society) to mention that my operations on the eucalyptus, both as to its solid and volatile contents, for technical and medical purposes, have extended over many years"

He next provided extensive details about his studies, particularly the amount of oil found in the leaves of different eucalypt species growing in different parts of the country, before returning to the question of how eucalyptus oil might be curing malarious fever. Bosisto suggested that the eucalyptus oil released naturally from the leaves could be turning the oxygen in the air into ozone, and/or *"peroxide of hydrogen"*.

From there, there was no direct assertion that eucalyptus trees are leading to more ozone or hydrogen peroxide in the air, and there was no mention again of malaria. This didn't stop Bosisto from ending his lengthy article with an unconvincing conclusion: *"In conclusion, may we not say with some authority that the evidence set forth in this paper on our own vegetation is in favour of the eucalyptus being a fever-destroying tree?"*.

FROM:
Transactions and Proceedings of the Royal Society of Victoria, Volume XII, 1875. Article VII - Is the Eucalyptus a Fever-destroying Tree? By J. Bosisto, Esq.

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OPPOSITE:
A lithograph label of a bottle of Bosisto's Eucalyptus Oil from 1871, originally held by the Victorian Patents Office. Source: State Library of Victoria, accession no. H96.160/2153 (Public Domain).


EUCALYPTUS
OIL
From the true Species of
AMYGDALINA ODORATA
REGISTERED
TRADE
MARK
PRIZE MEDALS AWARDED
By the Society of Arts London. 1862
" " Intercolonial Exhibition 1862
" " International 1862
" " Victorian 1862
" " Dublin 1865
" " Intercolonial 1867
" " Special Medal by the Commissioners 1867
This is the Genuine Eucalyptus Oil as distilled by J. Bosisto & Co.'s Patent Process, and all bearing the signature and trade marks of our firm may be relied on.
INTRODUCED, PATENTED AND STEAM DISTILLED BY
J. Bosisto & Co., Manufacturing Chemists & Distillers of Essential Oils from Australian Vegetation, - RICHMOND - MELBOURNE
WHOLESALE AGENTS - MESSRS FELTON, GRIMWADE & Co., MELBOURNE
PURTON, LITH. MELBOURNE.

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

Caption: Learning Facilitator Selwyn Hoffmann presenting the Auslan tour to families at Melbourne Museum. Photograph: Rodney Start/Museums Victoria.

Empowering All Learners

Museums Victoria's Approach to Inclusive STEM Engagement

JILL MITCHELL
Head Public Programs and Education, Museums Victoria

If you have spent any time in Melbourne, there is a good chance that you have visited Museums Victoria. Racing Cathy Freeman at Scienceworks, walking among dinosaurs in Melbourne Museum, perusing stalls in markets and fairs inside the Royal Exhibition Building – these are a shared experience for many Victorians.

This year marks the 170th anniversary of Museums Victoria, the largest public museum organisation in Australia that welcomes over 2 million visitors annually. Since its inception in 1854, Museums Victoria has evolved from two small rooms in a government office on La Trobe Street in Melbourne, to a vibrant multi-disciplinary institution comprising Melbourne Museum, Scienceworks, the Immigration Museum, and the Royal Exhibition Building. Throughout our dynamic history, Museums Victoria has been instrumental in advancing STEM education across the state. Every year we engage with over 290,000 Victorian students and teachers, and we enrich the cultural and scientific life of all Victorians through research, education programs, exhibitions, and experiences.

As we look to the future, our work to enhance access and inclusion within our STEM education programs has never been more pressing. The recent Pathway to Diversity in STEM Review, highlights the importance of Australian organisations taking coordinated action to increase diversity and inclusion of all people currently underrepresented in STEM education and jobs.[1] In Museums Victoria's commitment to building skilled and passionate future generations — equipped to solve tomorrow's problems and create sustainable solutions — empowering access and inclusion for all learners is a critical part of our mission.

Initiatives for inclusive STEM engagement

A key area of focus across our museums is breaking down barriers to participation in STEM learning programs. This includes geographical or financial barriers, perceived gender and cultural barriers, and ensuring inclusive program design for people with disabilities. We've developed several targeted initiatives to support inclusive STEM engagement:

Science is a superpower

Science is a Superpower is a new program aimed at engaging tween girls and non-binary people (9-13 years old) in STEM. The program was therefore developed to address the under-representation of women and non-binary people in STEM fields and to create positive connections to STEM subjects. These middle schooling years have been identified as critical for the promotion of interest and aspiration in STEM careers.[2] *Science is a Superpower* includes workshops and a digital content series to increase interest in STEM, directly addressing low enrolments in STEM tertiary subjects and the fact that only 15% of STEM-qualified jobs are held by women.[3]

During one Science is a Superpower workshop, participants were challenged to ideate designs for Moon habitation. They were required to consider the physical environment of the moonscape, the resource limitations, and the psychological and sensory difficulties humans would face. Beyond the basic requirements of a sustainable supply of oxygen, water, and food, settlers would also need to consider a long-term power supply, shelter from space radiation that damages DNA and electronics, lunar soil that can be quite sharp and toxic, and falling micrometeorites.

Unlike the Apollo astronauts, lunar settlers would not be able to carry all their required resources on their rocket. The load would be too heavy. Instead, they would have to make much of what they would need to survive with what is at hand on the Moon. Participants considered solar panels with batteries to help last the fortnight-long lunar night, inflatable shelters to be expanded in lava tunnels, shielded below the lunar surface, and the use of elements extracted from lunar soil for oxygen and building concrete structures.

Museum outreach

Our "museum in a van" outreach program delivers daily STEM learning experiences to schools and kindergartens across Victoria, with a focus on regional schools and those that can't visit museums due to geographical and other barriers. One of our most popular programs, *Robotics on the Road*, engages regional students in logic and algorithmic thinking, compelling students to collaborate using block-based programming language. In addition to building their STEM skills, these workshops provide opportunities for students to learn about future STEM careers and the applications of their newly acquired skills.

We live in an era where many tasks are now automated thanks to robotics. A robot is an autonomous machine that can perform certain tasks based on the inputs taken by sensors. These sensors can either mimic human senses or perceive what humans cannot. While the notion that people have five basic human senses is often considered a universal truth, neuroscientists count over 20 different senses – a fact that surprises students, and even some teachers.

Some robots have cameras that create images similar to what we see with our eyes. The sound waves heard with human ears can also be detected by some robot sensors, like microphones, while others perceive ultrasound. Robots also have many sensors that compare to balance and proprioception, your body's awareness of where it is in space. Just as you know where your body parts are to be able to touch your finger to your nose with your eyes closed, robots can sense which way up they are and sometimes even their exact position in space using GPS. In the Robotics on the Road workshop, students program robots to process information from their sensors and complete challenges.

Bilingual libraries pilot

In 2024, Museums Victoria piloted a new multilingual outreach program in partnership with Hume City Council, a rapidly expanding regional area for new migrant communities. Hume City Council Libraries and our education team partnered to deliver staff professional development that supported library staff to build a summer holiday STEM program offering free, multilingual learning experiences for families in Sunbury, Craigieburn, and Broadmeadows Libraries.

This unique professional development opportunity for participating staff enabled Museums Victoria and Hume Libraries to effectively co-create an adaptation for existing Dinosaur presentations and Robotics workshops and enable more families access through translation into a variety of languages including Arabic, Assyrian, Punjabi, Urdu, Dari and Turtranskish. The program is being evaluated and hoped to continue in Summer 2025.

Accessible programs and events

Museums Victoria has strengthened access for deaf people by providing programs in Auslan. We also develop regular social scripts and sensory maps for neurodiverse and autistic people, and hold sensory sessions in our galleries to reduce barriers to engaging with exhibitions at Scienceworks and Melbourne Museum. Experiences are designed to be wheelchair accessible and have tactile components for people with low vision.

Challenges and future

Museums Victoria's suite of initiatives reflects a commitment to continuous improvement and inclusive STEM engagement. Our work to deliver excellent, hands-on STEM experiences that engage a diversity of learners is enabled through skilled museum education staff and the support of partners and philanthropy. This talent and partner support is critical to these efforts to shape a more inclusive and empowered STEM learning ecosystem, as we continue to break down barriers and foster a love for STEM in all learners.

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2 Department of Industry, Science and Resources. (2023). The State of STEM gender equity in 2023. industry.gov.au/news/state-stem-gender-equity-2023#:~:text=Girls%27%20confidence%20in%20STEM%20subjects,17%25%20of%20VET%20STEM%20enrolments.

3 Chan, E., et al. (2015). Educational engagement through the middle years of schooling. The Victoria Institute, Victoria University. vu.edu.au/sites/default/files/victoria-institute/pdfs/Educational%20Engagement%20through%20the%20Middle%20Years%20of%20Schooling%20%28web-version2%29.pdf

Leadership in a Time of Change

Women in STEMM Leadership

DR CATRIONA NGUYEN-ROBERTSON MRSV
Senior Editor, Science Victoria

The world is rapidly changing in many ways. The global average temperature is rising, technological progress is accelerating, and the number of Australian women in STEM-qualified occupations increased by around 9,000 (4%) from 2021 to 2022.[1]

We need to harness the skills and experiences of women and non-binary people in STEMM as we navigate the unknown and uncertain. We're getting there, but we're not there yet.

The annual International Day of Women and Girls in Science is a reminder that women and girls play a critical role in STEMM and that their participation should be strengthened.

Several factors perpetuate the STEMM gender gap. Gender stereotypes portray certain STEMM fields as masculine, girls have fewer role models to inspire their interest in these fields, and subsequently, because fewer women study and work in STEMM, these fields tend to sustain exclusionary, male-dominated cultures that are not supportive of or attractive to women and other underrepresented groups – it is a perpetual cycle that we need to break.

To discuss the way forward, Parliament of Victoria, the Royal Society of Victoria, and the *Inspiring Victoria* program convened a panel of four remarkable women in STEMM to discuss *Leadership in a Time of Change*.

Having just returned from a warming Antarctica as part of the Homeward Bound leadership program for women and non-binary people in STEMM, A/Prof Vanessa Wong, A/Prof Jen Martin, Dr Catherine Lopes, and Fern Hames PSM shared their insights to the role leadership plays in a sustainable future in a conversation mediated by Natasha Mitchell.

The transformational power of a place like Antarctica

As part of the Homeward Bound voyage, all four women spent 20 days in the Antarctic Peninsula, bearing witness to the impacts of a changing climate. It was beautiful, like being in a documentary, but also devastating to see the planet changing. They were mesmerised by the beauty of the Antarctic icebergs, but the large number of icebergs they saw early in the summer was unusual – perhaps due to warmer temperatures meaning that more were being calved off from glaciers. They also saw the destruction of avian flu amidst such a bird-rich, remote area.

With the words often used to describe being in Antarctica: "picturesque", "surreal", and "majestic", it is easy to think of it as otherworldly. But, as Fern points out, it is part of our planet. For a long time, we have thought of Antarctica as isolated from the rest of the world, but the consequences of climate change do not just stop at the Southern Ocean. We cannot ignore our impact.

TOP:: Dr Catriona Nguyen-Robertson (RSV), Fern Hames, A/Prof Jen Martin, Natasha Mitchell, A/Prof Vanessa Wong, and Dr Catherine Lopes in Queen's Hall at Parliament House. Photograph: A/Prof Jen Martin.

BOTTOM: Dr Catherine Lopes, A/Prof Vanessa Wong, A/Prof Jen Martin, Fern Hames, and Natasha Mitchell with The Hon. Maree Edwards MP, Speaker of the Legislative Assembly. Photograph: Catriona Nguyen-Robertson.

'When my children are old enough, it might not be there,' says Catherine. 'They may have to rely on virtual reality while standing in a fridge or cold room to get the same effect.' But, of course, it won't be the same.

We've got to step up and act – and women and non-binary people have different approaches and views that we should include in the solutions to these global challenges.

Working across disciplines to develop climate solutions

"I want to make the world a better place," says Vanessa. "And I'll use science as my tool." The four scientists work across different disciplines of STEMM but are all committed to mitigating the effects of climate change, with a particular sense of urgency after witnessing a changing Antarctica.

Vanessa studies soil, a fundamental part of our lives: it is an important part of the nutrient cycle, is where we grow food, cleans water, and is the base on which our infrastructure sits. There is growing interest in storing carbon in soil to reduce atmospheric carbon dioxide and buy us time.[2] Carbon is sequestered in soil via the photosynthesis of plants, and soil carbon is strongly linked to greater soil quality and plant growth. She works hard to ensure that this process is robust, and to improve land and water management strategies.

Passionate about nature, Fern is concerned about the clear impact that climate change has on ecosystems. She advocates for people looking towards nature-based solutions to reduce these impacts. She is passionate about wild places, and about connecting people with nature and science. Evidence shows that people who connect with nature are more likely to value and take action to protect the environment,[3] and so she is helping to unite Victorians with nature, especially through storytelling.

Catherine tells stories in another way: with data. For over 30 years, she has worked in computer science and artificial intelligence. She generates data to develop solutions for global challenges and then tells the stories of that data. Among many roles, Catherine is a member of the Governing Board at the Environment Protection Authority Victoria, where she contributes strategic insights to drive positive environmental outcomes.

It is all very well for scientists to create solutions, but we need society on board too. In an era of misinformation and disinformation, Jen is focused on improving science literacy. She aims to ensure that people are armed with facts – and that those facts are accurate. As an ecologist who studied possums, she realised that for her work to have any meaning, she would need to talk to local farmers, politicians, and land managers – not the academics she had been trained to communicate with. She therefore wants to help other scientists develop their communication skills to make STEMM and scientific information to be inclusive for everyone.

It is all very well for these women to have ideas. But how do their voices get heard? Fact #8 of the Homeward Bound 28 Cold Hard Facts Impacting Women in Leadership states that "She tends to be ignored while he is listened to".[4]

Being heard as a leader in a male-dominated landscape

How can women be taken seriously in a field that has for so long been dominated by men? What do women need to feel safe enough to stand up? Many of the students who attended the session expressed their concerns, especially noting that only a handful of female and non-binary students take certain STEMM subjects in year 12 (i.e. specialist maths and physics).

'Women say "sorry" a lot,' says Natasha. But they don't need to. The panellists advise women to keep their heads up high, stick to what you believe in, and wait for their moment – rather than constantly shouting, pick your battles.

Acknowledging the problem is a start. All four panellists have been in situations where they were the only – or one of very few – women in the room. But building allies and finding people around them to be their support has helped them stand their ground. Working with others is an important part of success, for both the support and for different viewpoints when it comes to solving problems. Homeward Bound's motto is that "we are stronger together" – for good reason.

As women leaders – and the students in particular – continue to carve out their paths in STEMM, their contributions will be indispensable for cultivating a sustainable future. Through their resilience, determination, and innovative thinking, they not only break through literal ice and barriers but also pave the way for inclusivity, diversity, and collaboration in scientific endeavours. In the journey towards sustainable progress, the voices and leadership of women in STEMM are not just valuable – they are essential.

The students in attendance at Parliament House brilliant questions that reflect some of the concerns of young girls and non-binary people in STEMM:

- ▶ How can we be taken seriously in a male-dominated space?
- ▶ Have you ever been undermined in your workplace, and how did you deal with that?
- ▶ Currently there are only two girls studying Specialist Mathematics in the whole school. How can schools better support us from the start to get into mathematics and STEMM?
- ▶ How can we address the gender gap in STEMM leadership? What are the barriers?
- ▶ How did you persevere when facing challenges in your career?
- ▶ Back when you were in high school, did you picture yourselves being where you are today?
- ▶ What are the personal motivations you have and how do they keep you going?
- ▶ What – other than personal interest – influenced your decision to go into science and maths?
- ▶ Given that you are in such different fields of science, what role does your field play in climate change?
- ▶ How do you communicate the impacts of climate change that you just saw in Antarctica?
- ▶ How can we help you do that as young people?
- ▶ What was the goal you wanted to achieve in Antarctica, and did it change during the trip?
- ▶ What was daily life in Antarctica like? Were there different challenges each day?
- ▶ What do you think are the consequences of avian influenza in Antarctica?

The Hon. Maree Edwards MP, who hosted the event, says that she hopes these students will go off to become "scientific influencers'' as the next generation of STEMM leaders. With them asking questions like this, their future is already looking bright.

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3 Arthur Rylah Institute. (2023). "Victorians Value Nature". People and nature. ari.vic.gov.au/research/people-and-nature/victorians-value-nature

4 Dattner, F., et al. (2019). Mother Nature Needs Her Daughters: A Homeward Bound Global Review and Fact Sheet Investigating Gender Inequality in STEMM. Western Sydney University, Research Direct Library. doi.org/10.26183/5d22d5fbe2349

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.

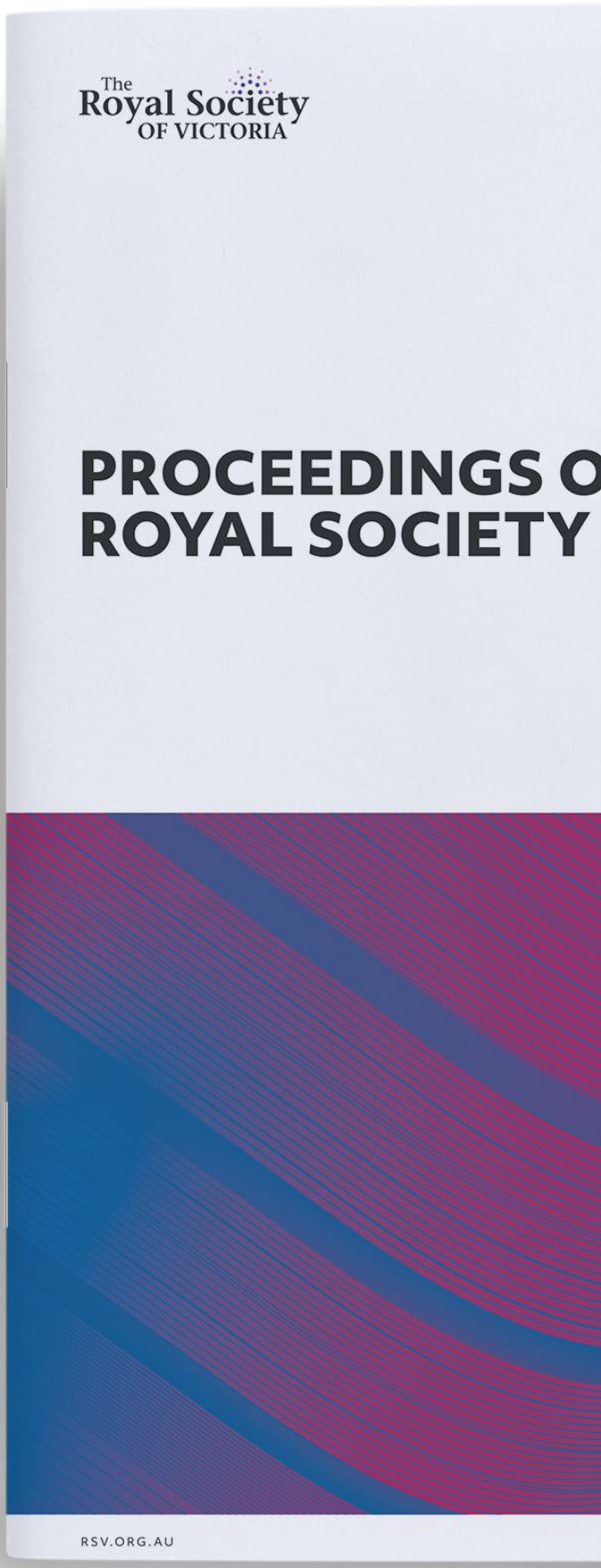
The journal began in 1855 as an irregular publication under the title *Transactions of the Philosophical Society of Victoria,* with the present name adopted in 1889. Since then, volumes of the journal have been published annually, often across one or more parts.

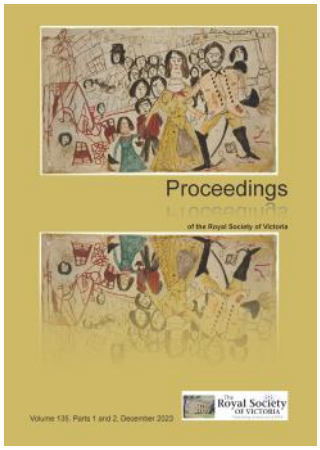
The online content published by CSIRO Publishing extends back to Volume 118, 2006, and is available at **publish.csiro.au/rs**.

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**





Baron Alexander von Humboldt (1769 - 1859). Artist: Julius Schrader. Open access image courtesy of The Metropolitan Museum of Art.

Honouring Humboldt

Research for a Sustainable World

Volume 135 of the Proceedings of the Royal Society of Victoria is now available online, open access from CSIRO Publishing, hosted at publish.csiro.au/rs/issue/11551.

This volume is substantively dedicated to the theme 'Humboldtian Research Towards a Sustainable World,' drawn from the proceedings of the 19th Biennial Conference of the Australian and New Zealand Associations of von Humboldt Fellows in 2022.

There is an additional paper from Dr Thomas Darragh and Dr Ruth Pullin, translating letters from the celebrated German painter Eugene von Guerrard, then based in Australia, to the Ethnological Museum in Berlin from 1878 – 1880, along with the collected abstracts from colleagues presenting at the RSV's 2022 symposium on 'Next Generation Biocontrol of Invasive Vertebrate Pests.'

Alexander von Humboldt has been referred to as 'the forgotten father of environmentalism.'1 As early as 1844, he wrote that humans change the climate 'by cutting down forests, by changing the distribution of water bodies, and through the production of large vapour and gas masses at the centres of industry.'2 Humboldt also described the greenhouse effect in his opus magnum, 'Kosmos'. And time and again in his writings and in his lectures, he emphasised the interconnectedness of all living creatures on this planet. In times when the effects of climate change become ever more visible and palpable around the globe, it is imperative that the global academic community addresses the topic of sustainability in all its dimensions.

Dr Thomas Hesse
Deputy Chair, Alexander von Humboldt Foundation

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1 Andrea Wulf, 'The Forgotten Father of Environmentalism' in The Atlantic, 23 December 2015 (theatlantic. com/science/archive/2015/12/the-forgotten-father-of-environmentalism/421434/).

2 'durch Fällen der Wälder, durch Veränderung in der Vertheilung der Gewässer und durch die Entwicklung großer Dampf- und Gasmassen an den Mittelpunkten der Industrie' quoted in Frank Holl (2018), Alexander von Humboldt und der Klimawandel: Mythen und Fakten HiN XIX, 37.

Papers from Volume 135

Genome banking of ancestral haplotypes for future survival

ERWIN A. PAZ, LANI A. WADE, ANTHONY J. LLOYD, SALLY S. LLOYD AND ROGER L. DAWKINS
C.Y. O'Connor ERADE Village Foundation

Abstract:

The human genome contains Polymorphic Frozen Blocks (PFB) dedicated to the maintenance of haplotypes which are responsible for functional and survival differences between individuals. These Conserved Polymorphic Sequences (CPS) are protected from mutation and are retained as 'safe deposits' available in the future.

Domestic livestock have been bred to select for certain traits of commercial significance. Here we show the red Wagyu (Akaushi) cattle genome appears to have been restructured, with potential loss of these reserves. We propose the establishment of genome banks to curate and preserve founder sequences containing a full complement of CPS.

▸ Read this article for free at **publish.csiro.au/RS/pdf/RS23005**

Photonic reservoir computing for energy efficient and versatile machine learning application

KATHY LÜDGE
TU Ilmenau, Institute of Physics

Abstract:

Time-multiplexed reservoir computing is a machine learning concept which can be realised in photonic hardware systems using only one physical node. The concept can be used for various problems, ranging from classification problems to time-series prediction tasks, while being fast and energy efficient. Here, a theoretical analysis of a reservoir computer realised via delay-coupled semiconductor lasers is presented and the role of the internal system time-scales and the bifurcation structure is discussed. Further, optimal performance can be reached by tailoring the coupling delays to the specific memory requirements of the given task.

▸ Read this article for free at **publish.csiro.au/RS/pdf/RS23006**

WHERE ARE WE AT WITH SHAPE-MEMORY ALLOYS IN THIS 'HIGH-TECH' WORLD?
Trevor R. Finlayson
▸ pp. 58-63
publish.csiro.au/RS/pdf/RS23010

Current Government Consultations of Interest to Victoria's Science Community

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

Chris McLay via Unsplash

Tom Rumble via Unsplash

CONSULTATION CLOSES 26 MAY 2024

Homes Victoria - Our Communities: Our Values

Consultation is currently open on developing a set of community values and principles to guide how we engage and listen to renters and communities throughout the redevelopment of the housing towers across Melbourne.

engage.vic.gov.au/our-communities-our-values

CONSULTATION CLOSES 30 JUNE 2024

Help us shape the future for Victoria

The Department of Transport and Planning is seeking input on reimagining the future of our cities, suburbs, towns, and regions.

engage.vic.gov.au/shape-our-victoria

Bogomil Mihaylov via Unsplash

Zac Edmonds via Unsplash

CONSULTATION CLOSES 31 JULY 2024

Inquiry into Women's Pain Survey

Women face real and enduring challenges when seeking care and support for pain. The Department of Health wants this to change, and the first step is to ask you about it.

engage.vic.gov.au/inquiry-into-womens-pain-survey

CONSULTATION ONGOING

Victorian Murray Floodplain Restoration Inquiry and Advisory Committee

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

engage.vic.gov.au/VMFRP-SIAC

Submission Guidelines

Pitch it to us!

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

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

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

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

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

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

Style Guide

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

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

Feature Articles

Recommended length: 600 - 1,800 words

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

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

Use of sub-headings and figures to break up longer pieces is strongly encouraged.

Not quite sure about the tone for your piece? Have a look at articles published in previous editions of *Science Victoria*, or in other scientific publications for a general audience, like *The Conversation, Cosmos, New Scientist, or Scientific American.*

Opinion Articles

Recommended length: 600 - 1,800 words

In contrast to a feature article, an opinion piece conveys your informed opinion on, or experiences with, a particular topic. Clearly state your argument, outlining the details of the problem you are addressing, and build to a strong conclusion.

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

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

Letters

Recommended length: 200 – 1,000 words

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

Letters are also the best format to share current or recent news relating to science, with an emphasis on science in Victoria or news that impacts Victoria's scientific community. News could relate to funding announcements/grant outcomes, new STEMM-related projects, high-impact publications relevant to Victoria, successes of Victorian scientists, or relevant STEMM-related policy news.

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

What I've Been Reading

Recommended length: 600 - 1,800 words

This is a column for you to tell us about a book broadly relating to STEMM that you've read. These pieces typically include a summary of the book and its ideas, as well as your interpretations or conclusions. Possible questions to consider: Do you think the author was correct in any assumptions? Was the author's style of writing approachable? Did they do the subject matter justice? Who would you recommend this particular book to? What did it mean to you? What did you learn?

Images and Figures

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

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

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

References

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

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

Submission Deadlines

MARCH 2024	**DUE DATE**
Victoria's Fauna	*16 February*

Everything *Animalia* in Victoria, particularly native fauna.

APRIL 2024	**DUE DATE**
The Four Planetary Crises	*15 March*

Biodiversity Loss, Climate Change, Pollution & Waste, and The Rise of Misinformation

MAY 2024	**DUE DATE**
Accessibility & Inclusion in STEMM	*19 April*

Supporting the education, employment, and engagement of everyone in STEMM.

JUNE 2024	**DUE DATE**
Victoria & Climate Change	*17 May*

The impacts of, research on, and responses to climate change in Victoria.

JULY 2024	**DUE DATE**
Building Scientific Competency	*14 June*

Empowering individuals and communities to understand the scientific method.

AUGUST 2024	**DUE DATE**
STEMM Throughout Victoria	*19 July*

The opportunities for learning and engaging with STEMM across the state.

SEPTEMBER 2024	**DUE DATE**
Pollution in Victoria	*16 August*

The different pollutants, sources, impacts, and responses required.

OCTOBER 2024	**DUE DATE**
Victoria's Ecosystems	*13 September*

The many and varied ecological niches across Victoria

NOVEMBER 2024	**DUE DATE**
Science & Policy	*18 October*

From lab bench to front bench: how scientific understanding can positively influence policy.

DECEMBER 2023	**DUE DATE**
Science & Business	*15 November*

Creating a sustainable industry, start-ups, med-tech, patents, and ethics.

Hold Your Next Event at the Royal Society of Victoria

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

Services Available

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

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

The Facilities

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

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

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

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

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

The Burke and Wills Room

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

SUITABLE FOR

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

CAPACITY

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

The Ellery Lecture Theatre

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

SUITABLE FOR

Presentations, seminars, lectures.

CAPACITY

Any Booking	*≤110 people*

The Millis Room

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

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

The Cudmore Library

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

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

The Von Mueller Room

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

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

Become a Member of the RSV

We bring together an independent community of science practitioners, educators, industrialists, and enthusiasts to promote an understanding and utilisation of scientific knowledge for the benefit of the state of Victoria.

	STUDENT $40 PER YEAR	FULL $120 PER YEAR	ORG. $1000 PER YEAR	SCHOOL $1000 PER YEAR	AFFILIATE $500 PER YEAR
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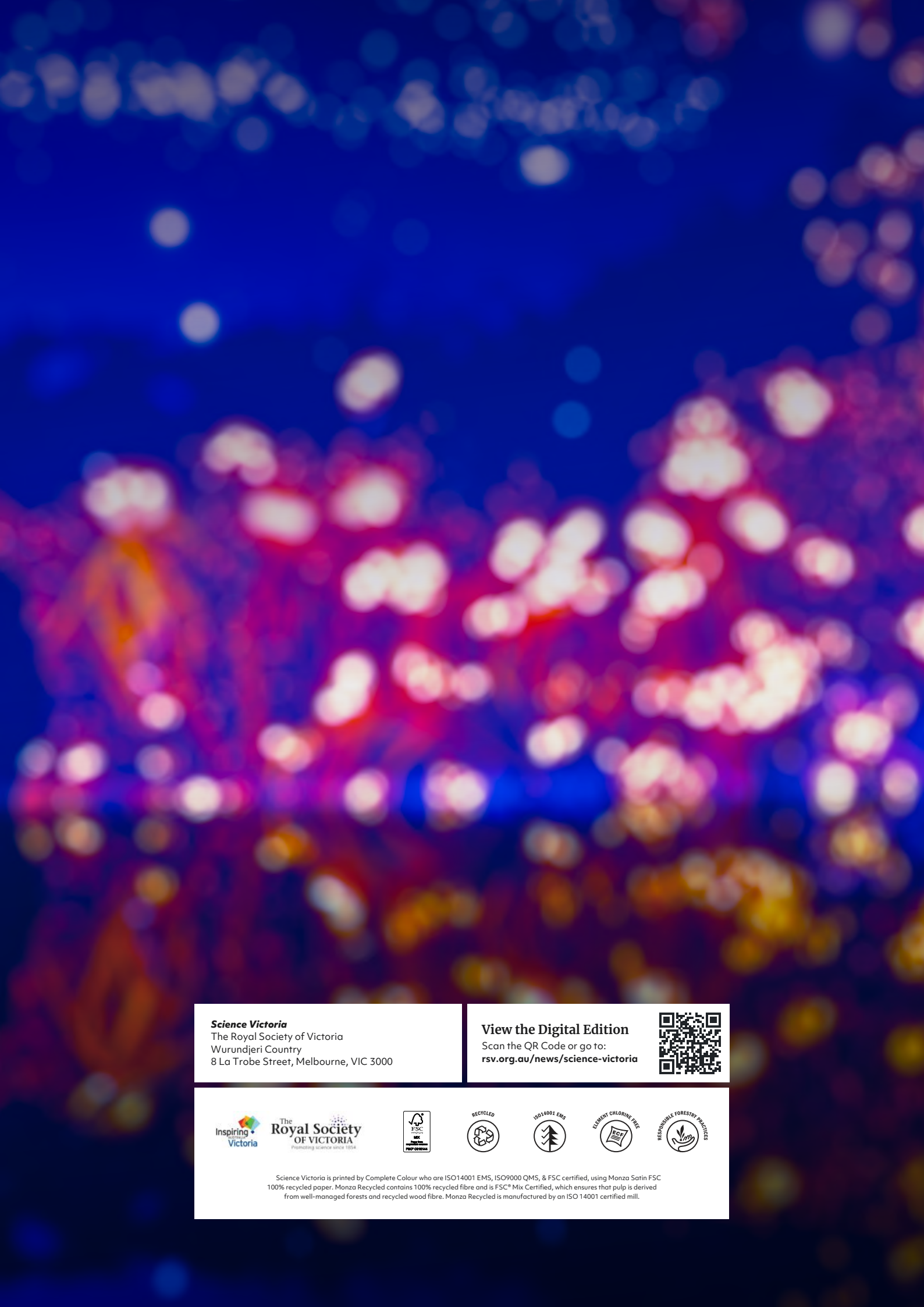
* The 'Schools Supporting Schools' membership program allows a school to sponsor the membership of one or more schools at a discounted rate of $750/year, allowing less-resourced schools the same benefits and opportunities of RSV membership.



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