AUGUST 2024 — STEMM THROUGHOUT VICTORIA / NATIONAL SCIENCE WEEK

SCIENCE VICTORIA

National Science Week 2024

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Melbourne at night. Photograph: Finn Whelen via Unsplash.

In This Issue

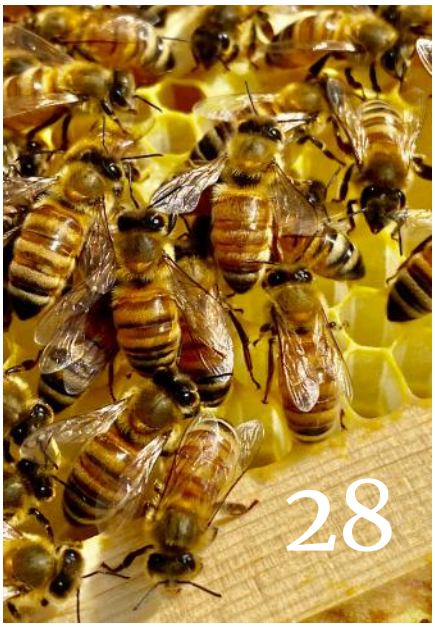
STEMM THROUGHOUT VICTORIA/NATIONAL SCIENCE WEEK

Learning and applying scientific concepts isn't confined to a high school class or a capital city – there are opportunities to engage with STEMM fields right across our state. This month, we look at the education, engagement, and application of STEMM in Victoria.

Also in this edition, we celebrate National Science Week 2024 (10 - 18 August), and showcase some of the events on offer in-person and online.

ON THE COVER

A view over Yarra Glen. Photograph: Richard Lin via Unsplash.



Upcoming Submission Deadlines

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

SEPTEMBER 2024 *Pollution in Victoria*	**DUE DATE** *5pm, 16 August*
OCTOBER 2024 *Victoria's Ecosystems*	**DUE DATE** *5pm, 13 September*

From the Editor

SCOTT REDDIEX
Editor-in-Chief — Science Victoria

National Science Week is here again! This month in *Science Victoria*, we showcase some of the events happening this month as part of National Science Week, while also taking a look at the subject of STEMM Throughout Victoria.

Last month, we looked at how we can build scientific competency in Victoria, for the benefit of our people, communities, and industries. While Greater Melbourne is a sprawling city, and home to ~76% of our state's population[1], science doesn't stop at the city's borders. A key part of building scientific competency is recognising the scientific value and opportunities across the state.

This month, we are doing exactly that, as we look at STEMM throughout Victoria. This includes things like the opportunities for people to engage with STEMM in their local area, the different research institutes and STEMM businesses, collaborative field work, and citizen science. It also means ensuring that everyone has the ability to apply scientific and critical thinking to parts of their work that call for it.

This is increasingly relevant in the face of the changing climate. Coastal and riverside towns dealing with sea level rises and altered flooding patterns. Communities centred on agriculture managing the impacts of increased heat and extreme weather events on livestock and crops. Alpine towns managing poorer snow seasons, and everyone preparing for the increased frequency and intensity of bushfires.

In this edition, we hear about some of the gaps that currently exist in STEMM education and engagement, and also some of the great ways that these gaps can and are being addressed. A/Prof Djuke Veldhuis talks about the value of science weeks, Sid Verma shares insights on the STEM divide between eastern and western suburbs, and Dr Catriona Nguyen-Robertson revisits Ballarat Tech School's chocolatey program.

National Science Week events are one way that everyone can engage with science, technology, engineering, and mathematics topics. Wherever you are, there are events running in-person and online that you can join to learn, participate, and have fun.

In the *Inspiring Victoria* section, we've listed a handful of the many events that will run during August as part of National Science Week. For a comprehensive list, visit **scienceweek.net.au/your-state/vic**.

We hope you enjoy this edition of *Science Victoria*!

REFERENCES:

1 Australian Bureau of Statistics. (2021). 2021 Greater Melbourne Census Quick Stats. abs.gov.au/census/find-census-data/quickstats/2021/2GMEL

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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**

STEM is Everywhere

ROB GELL
President, The Royal Society of Victoria

In May 2012, the former Governor of Victoria Linda Dessau made a comment that has stayed with me. She remarked that, as a lawyer, she had studied through a humanities stream, and had little engagement with science. Perhaps because she was formally recognising new RSV Fellows at the time, she commented that, "science is everywhere; it's in everything around us".

A definition for science and purpose

The International Science Council (ISC) defines science as the "systematic organisation of knowledge that can be rationally explained and reliably applied".[1] This definition includes natural and social science as primary focus areas, as well as the humanities, medical, health, computer and engineering sciences. The ISC uses this shorthand because there is no single word or phrase in English to adequately describe this knowledge community. The Governor was quite correct.

As Victoria's science society, the RSV's Council is wrestling with the question of whether "the promotion and advancement of science" is a limiting description of our purpose, as we endeavour to make our work widely accessible. Should we be a STEM (Science, Technology, Engineering, and Mathematics) organisation? Perhaps we're a STEMM society, including Medicine.

Is the ISC's definition sufficient to describe what we do?

Proofs into practice

There's no doubt that STEM issues are all around us, and that evidence-based decision-making is critical to the delivery of the best possible outcomes for our community.

RSV member Michael Spencer's feature article in the *Fifth Estate*[2] is an illustration of how political decision-making since 'the great onslaught of the forests' in the 1850s and particularly in the twenty years of VicForests left us with poor forests policy and a depauperate forest estate. The employment of STEM principles would likely have delivered a better outcome.

The RSV's two-day public symposium *Future of Victoria's Native Forests* in October 2023, with Organisational member Alluvium, Victorian National Parks Association (VNPA), and Friends of the Earth valuably addressed these issues.[3,4] The recordings of presentations from this symposium can be found at **youtube.com/@RoyalSocietyVic/playlists**.

Similarly, our roundtable on the *Future of the Gippsland Lakes* assessed the Lakes geomorphology, ecological, biocultural and socioeconomic values, and governance.[5] Undoubtedly, a STEM assessment that has now been sent to the Federal Minister for Environment by the Federal Member for Gippsland The Hon. Darren Chester MP.

Similar assessments of our northern rivers, river catchments in poor condition, threatened species, coastal management, climate adaptation strategies, resources management and circular economy strategies or protected areas proposals across the state may be worthy of the utilisation of the RSV's convening power and independent assessment capacity in future.

A role for the RSV in Victoria, for Victoria

The RSV will continue to engage students, organisations, community groups, and research institutes, in order to identify matters of significance, and to support the development of strategic, science-based solutions.

We're interested in your views on where and how we might (re)position The Royal Society of Victoria through engagement with new sectors of the community, our member organisations, and Affiliates. As usual we welcome your input; I'll be pleased to hear from you at **president@rsv.org.au**.

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1 About Us. International Science Council. council.science/about-us

2 Spencer, M. (2024, July 16). Where has all the wood gone? RIP VicForests. The Fifth Estate. thefifthestate.com.au/columns/spinifex/where-has-all-the-wood-gone-rip-vicforests

3 The Future of Victoria's Native Forests – A Public Symposium. (2023, September 1). The Royal Society of Victoria. rsv.org.au/events/the-future-of-victorias-native-forests

4 Sessions from The Future of Victoria's Native Forests - A Public Symposium. youtube.com/playlist?list=PLy9vG53Si1DGIAXDTsS9b3QhWbRjmrLIh

5 Securing the Future of the Gippsland Lakes. (2024, February 19). The Royal Society of Victoria. rsv.org.au/gippsland-lakes

Smashing Barriers

Bridging Victoria's STEM Divide

BY SIDDHARTH VERMA
Founder & Executive Director, BrainSTEM

My experience running STEM mentoring programs for high school students has allowed me to see the significant disparities between Melbourne's western and eastern suburbs. These disparities, especially among students from underrepresented backgrounds and girls in STEM, reveal the contrasting worlds within one of the most liveable cities globally.

The importance of role-modelling cannot be understated. If "you can't be what you can't see", then it is important to consider: what are young people currently seeing? To help students better understand the world around them and the associated challenges, we introduce them to the concept of "personas".

The power of personas

"Personas" are a detailed character that students build, and represent someone facing the problem they aim to solve. This persona has a name, age, gender, family, and social and community presence, allowing students to connect with and identify with the individual they imagine.

During a recent STEM mentoring program, students from a government school in Melbourne's west came up with their persona. Named "Wazza", he was a knife-wielding 19-year-old, who faces socioeconomic challenges, lack of resources, and limited opportunities.

This was in contrast to the persona of students from a school in the eastern suburb: "Sophie". Also 19, she enjoys a more affluent and stable environment, and taking her golden retriever for a run in the park.

The two personas couldn't be further apart. They reflect the STEM divide, and highlight the different starting points from which these students approach STEM education and career aspirations. Wazza's challenges are rooted in socioeconomic hardship and a lack of positive role models, while Sophie's concerns revolve around the inconveniences of an otherwise privileged life.

Disparities between east and west

In my eight years of designing and delivering STEM mentoring programs through BrainSTEM, a non-profit organisation established to address the diversity and equity gap in STEM, I have witnessed firsthand how these disparities impact students' engagement with STEM. Students from Melbourne's western suburbs more often struggle with low confidence and limited exposure to STEM opportunities. This lack of engagement is compounded by external factors, such as family expectations, community norms, and the absence of relatable role models in STEM fields.

Conversely, students from the eastern suburbs generally have greater access to resources, supportive networks, and a conducive environment for academic success. Their challenges are less often about access, and more about navigating the multitude of opportunities available to them.

Tailored mentoring programs

Despite these differences, initiatives like BrainSTEM aim to bridge this gap by providing tailored mentoring programs that address the unique needs of each group. For students facing significant barriers, this means creating a supportive environment that fosters confidence and curiosity. In contrast, for more privileged students, it involves challenging them to think beyond their immediate surroundings and apply their skills to broader societal issues.

One success story that truly underscores the transformative potential of tailored STEM mentoring is that of Shania, a 15-year-old Year 9 student from the western suburbs. Shania participated in a recent BrainSTEM mentoring program, and proudly presented her STEM-based solution of using artificial intelligence to reinvent individual learning and assessment. Her vision was to free up teachers' time, so they can have a genuine impact on students like her.

Shania's story, and many others like it, serve as a beacon of hope, inspiring us to continue our efforts in bridging the STEM divide.

Addressing the STEM divide in Melbourne requires recognising and acting upon the disparities in resources, opportunities, and support between different communities in the city. By providing tailored mentoring programs and promoting diversity and inclusion, we can work towards creating a more equitable and diverse STEM workforce for the future.

Geographers being shown the huge electro-magnets that bend the beam. Photograph: Ian Rutherfurd.

Geography Victoria visits the Australian Synchrotron

BY PROFESSOR IAN RUTHERFURD
Geography Victoria

After a late night working on my PhD at Monash University, I would drive past the huge drive-in theatre screens just to the east of the campus. Today this site houses, not a window to Hollywood, but a window to the secrets of the universe: a synchrotron.

In May I joined 25 others on Geography Victoria's tour of this remarkable scientific facility. There are just sixty of these incredible machines in the world, and only two in the southern hemisphere. After the tour we realised how fortunate we are to have Australia's only synchrotron right here in Melbourne.

Our host for the visit was Dr Dale Christensen, an analytical chemist who works as an accelerator operator in the control room of the Australian Synchrotron. Dale was joined by beamline scientist Dr Eleanor Campbell – both of whom are great communicators, and really brought this complex machine alive for us.

The Australian Synchrotron is operated by the Australian Nuclear Science and Technology Organisation (ANSTO), who also run the Lucas

Heights nuclear facility in New South Wales. Dale wrote an extended article about the synchrotron for the March edition of *Science Victoria* (**rsv.org.au/australian-synchrotron**), where he provides great examples of the range of science it supports. You can read that to understand this amazing machine, but I will borrow a few descriptions from that article, then describe our tour.

At its simplest, a synchrotron is a light source – illuminating samples of scientific interest (whether a single molecule, a crystal, or a cancer cell) with x-ray and infrared radiation. This 'synchrotron radiation' is produced when electrons are accelerated close to the speed of light and forced by strong magnetic fields to travel in a circular orbit. The 'orbit' of the synchrotron is a huge, 216m-long ring that accelerates electrons to near the speed of light. These electrons are then 'diverted' into different 'beamlines' by other magnets. Each of these beamlines is like a 'station' where different science gets done.

We started the tour with a lecture in the impressive lecture theatre attached to the synchrotron. Dr Campbell described some of the research that gets done by the 5,000 researchers who use the facility each year. Examples include identifying hidden paintings by Edgar Degas, establishing that the racehorse Phar Lap was poisoned with arsenic, and mapping the 3D structure of proteins related to cancer to allow better targeting of drugs. It even allows scientists to observe individual molecules, and how they change in reactions. I found these chemical observations astonishing.

We then got to go into the machine itself and visit the main ring, as well as many of the beamlines. Engineers from the synchrotron team, as well as Scientists from PrimeSCI! (an education program from Swinburne University) took smaller groups to visit different parts of the machine.

We are fortunate indeed to have one of Australia's most important scientific machines right here in Melbourne – make sure you go on one of their free tours. Geography Victoria would like to thank ANSTO, Dr Dale Christensen, Dr Eleanor Campbell, and the team from PrimeSCI! for hosting such a wonderful and informative event.

Geography Victoria's website is now live at **geogvic.org.au**. You can view all upcoming events at **geogvic.org.au/events**. This month, Geography Victoria adds to the events on offer during National Science week with a coastal field trip, including field activities that show the real impacts of climate change.

Later this year, Geography Awareness Week will run from the 11th to the 15th of November. The formal launch of Geography Victoria will be held on November 10th, at a gala event at the Melbourne Town Hall. We hope to see you there!

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 until 15 November 2024 by emailing **editor@ScienceVictoria.org.au.**

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

Dr Ken Walker (Senior Curator of Entomology, Museums Victoria) teaching young visitors to Melbourne Museum about moths and butterflies during National Science Week 2022. Photograph: Rodney Start/Museums Victoria. Copyright Museums Victoria.

Participants of the Homeward Bound program for women and non-binary people in STEMM during their Antarctica Voyage. Photograph: Oli Sansom/Homeward Bound.

The Law Courts Building in Sydney CBD. Photo: Gary Yim, via Shutterstock

Science, Media and the Law: Lessons from the Kathleen Folbigg Case

Kathleen Megan Folbigg was arrested in 2001, accused of murdering her four infant children. She was convicted in 2003 and sentenced to 40 years imprisonment with a non-parole period of 25 years.

Scientific and medical research suggesting the children might have died of natural causes was rejected by a judicial inquiry in 2019. Subsequent research published in 2020 led ninety eminent Australian scientists and medical professionals (led by the Australian Academy of Science) to petition the NSW Governor to pardon Folbigg. The petition succinctly demonstrated that all four deaths could be explained as the effects of very rare genetic factors. In June 2023, Folbigg was unconditionally pardoned and released, after 20 years. Her convictions were overturned by the NSW Court of Criminal Appeal in December 2023.

Join key members of "Team Folbigg" to understand the barriers they experienced to considering complex genetic science as robust legal evidence in an Australian judicial system, and hear the case for change.

DATE/TIME:
Wednesday 14 August 2024, 6 - 7.15pm

PRICE:
$5 - $10

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

BOOKING LINK:
rsv.org.au/events/science-media-law

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

National Science Week 2024

There are many interesting and engaging events being held around Victoria this month as part of National Science Week (10 - 18 August).

Some of the events being held this month by *Inspiring Victoria* initiative partners, National Science Week grant recipients, and seed grant recipients can be found in the *Inspiring Victoria* section (page 26). To see all events happening around Victoria (both in-person and online), visit **scienceweek.net.au/your-state/vic**

national science week

RSV Events

The RSV hosts many STEMM-related events, public lectures, and meetings throughout the year. These are held at the RSV Building at 8 La Trobe St, Melbourne (unless otherwise indicated), and simulcast online.

Our public lectures comprise the "Scientists in Focus" component of the *Inspiring Victoria* program in 2024.

MISSED AN RSV EVENT?

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

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

youtu.be/JL6SiKT9jSI

Aiming Higher: Improving Science Education in Victorian Schools

youtu.be/_cWif2yGmH0

Space To The Rescue: Australia's Dependencies on Space Technology

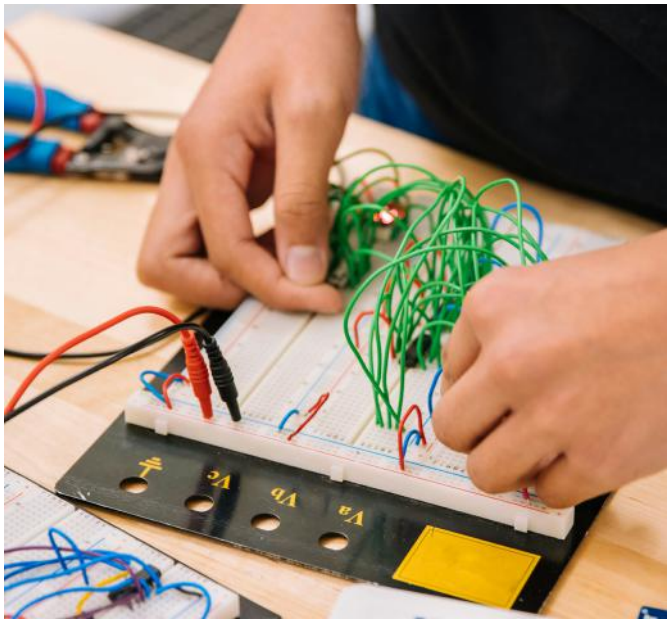
youtu.be/CDE446enrt0

Holocene Climatic Fluctuations in the Australian Region

youtu.be/OdSsdcSUO0o

Reimagining Humanity in the Age of Generative AI

Jeswin Thomas via Unsplash.



Awards & Prizes

Maker Projects – Community STEM Engagement Grants 2024

APPLICATIONS CLOSE *14 August 2024*

The opportunity provides grants up to $100,000 to foster creativity and inquiry-based learning for the development of STEM skills in students and youth in design, engineering and programming through hands-on learning.

This grant is for organisations that deliver maker projects to students and youth under 18 years.

- For more information, and to apply, visit **business.gov.au/grants-and-programs/maker-projects-community-stem-engagement-grants-2024**

James Baltz via Unsplash.

MRFF Research Data Infrastructure Grants

APPLICATIONS CLOSE *28 October 2024*

The opportunity provides funding for researchers to support projects using existing data infrastructure types to create or apply new approaches for an unmet medical need.

Grants of up to $2.5 million are available, to cover up to 100% of eligible project costs.

This grant is for eligible organisations seeking to develop better data health intelligence to improve health care delivery.

- For more information, and to apply, visit **business.gov.au/grants-and-programs/mrff-2024-research-data-infrastructure**

Agtech Grants Program

APPLICATIONS CLOSE *30 June 2025*

This program provides funding to support Victorian AgTech founders.

Funding of up to $50,000 is available to help early-stage AgTech startups build capability and move to the next stage of growth quickly.

Eligible expenditure includes operating costs, and accessing business development services.

- For more information, and to apply, visit **business.gov.au/grants-and-programs/agtech-grants-program-vic**

What's the Point of National Science Week?

BY A/PROF DJUKE VELDHUIS
Chair, Inspiring Victoria

If someone had told me even ten years ago that I would be working full-time at a university in a faculty of science, I would have laughed. Science week? I didn't know it existed until I was 14.

A/Prof Djuke Veldhuis hosting the FameLab meet and greet at Cheltenham Science Festival in 2013. Photograph: Anna Lythgoe.

It wasn't until my 20s, working in school outreach programs, that I truly understood its value. Don't get me wrong, I've always *enjoyed* science, particularly when it comes to biology and anything to do with the natural world, but I didn't *thrive* in science educationally.

Growing up in the Netherlands, as a young child I joined my father, a biologist, in his lab filled with rats. He was working to understand how corticosteroids affect behaviour and brain function. Impressive as that work came to be in the development of antidepressants, I just remember the rats. I figured such cute creatures must be awesome to work with every day (much later I would understand the reality). My mother, with a degree in the history of philosophy, fostered my creativity and independence. She taught me to read when I was three, and from then on, the magical world of stories led the way. I struggled in maths, found chemistry hard to visualise (though the explosions were cool), loved biology, but did not excel in the same way I did in languages, philosophy and literature.

As a teenager in the USA, I viewed science weeks as events for 'nerds.' I certainly wasn't anti-science. Both my parents instilled the importance of evidence and reasoning, however science week, that was a bit 'fringe' for me. At this point, I imagine you might have an eyebrow raised pondering, "What on earth are you doing as the Chair of *Inspiring Victoria*? A program with the slogan *Science is for Everyone,* which sits at the heart of involvement in Science, Technology, Engineering, and Mathematics (STEM) through initiatives like National Science Week in Victoria?!".[1,2,3]

Great question! Let me explain.

While completing a degree in archaeology and anthropology I was drawn to the world of public engagement with science. Based in the UK at the time, the country was still reeling from the MMR (measles-mumps-rubella) vaccine controversy in the late 1990s,[4] not to mention a visceral debate around badger culling,[5] and by the 2000s climate misinformation was ripe. As part of my work in outreach programs with schools in deprived areas I began to notice a commonality between the arts and science. Just as the world of arts had and still has (inadvertent?) barriers that make it inaccessible to the 'working class', so too, the righteousness of scientists in their (perceived) ivory towers was creating a schism.

A common retort to UK scientists' reluctance and delay in responding to misinformation around vaccines or climate change was, "well, we let the evidence do the talking". But therein lay the core of the problem. By the early 2000s let alone 2024, the pace of scientific development and the continued explosion in jargon and technicality was alienating people. Even if they had an interest in science, the accessibility of science to anything other than 'experts' was limited. Some have drawn the same comparisons in the world of art.

Whether real or imagined, that inaccessibility to science encouraged me to pivot drastically. After completing my PhD, squarely at the intersection of endocrinology and anthropology, I jumped into a Masters of Science Journalism. I could relate to that feeling of being an 'outsider' to science. That imposter voice in my head asking, 'Can I ask questions about this given I only did one science subject in my final year of high school? Am I worthy?' Where could everyday people like me go to engage with science and be excited and learn more despite not necessarily excelling at science in school?

Based in the UK at the time, the BBC provided a rich platform in scientific programming which certainly helped, but the true magic happened in science week and at science festivals. The combination of industry, not-for-profits, government and research organisations that showed they were real people using science (mostly) for good made it real, it made it fun and accessible. Most importantly it illustrates to people that science is all around us and does not work in isolation. You can have the most effective vaccine in the world, but if you cannot communicate why people should take it, if you cannot encourage behaviour change, then it is all for nought. Science does not, cannot and never will function in a vacuum.

Unfortunately, the association of science as something that you 'do at school' (and maybe continue 'at university') and that's 'the end' is a common fallacy. While working at the Cheltenham Science Festival,[6] we noticed that lots of parents held back their own (obvious) curiosity while their children interacted with a host of displays and exciting live experiments that made me jealous of not being a child again.

Surveying parents, we realised that many came for their kids, but were finding themselves engaged, but not feeling like they could ask questions. They were 'adults' after all and didn't do or failed science at school. We went on a hunch and created a 16+ only area. None of the exhibits, experiments or displays were significantly more complex than in the 'family zone', but the result was eye opening.

Thousands of adults streamed through the section telling us how surprised they were about the amount of time they spent talking and learning. This, they said, was not the science they experienced at school. If only it had been, they continued, "I might have considered a more science-focused career, but I never thought I was 'good enough' for that."

To solve the global challenges facing us we need curiosity and we need opportunities for lifelong learning. I work full time at a faculty of science and even I feel overwhelmed by the pace of development in science and technology. How are we going to make sure that we don't leave people behind? To solve global challenges, we need curiosity and opportunities for lifelong learning. National Science Week and initiatives by *Inspiring Victoria* partner organisations provide a superb platform for engagement with science.

One week won't solve all the issues, but it catalyses increased STEMM engagement. Science and society are forever entwined and we must ensure Australians have access to the world of STEMM.

▶ *Associate Professor Djuke Veldhuis is passionate about public engagement with science and empowering solutions to the global problems at the intersection of education, industry and government. She is Chair of* Inspiring Victoria*, a member of the RSV Council, and works at the Faculty of Science at Monash University where she is course director for the BSc Advanced - Global Challenges (Honours) degree. Global Challenges (Honours) degree.*

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3 National Science Week. scienceweek.net.au

4 Batty, D. (2004, February 24). Timeline: MMR row. The Guardian. theguardian.com/society/2004/feb/24/publichealth.uknews

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6 Cheltenham Science Festival. cheltenhamfestivals.org/festivals/science-festival

STEM Around the State

Tech Schools & Specialist Centres

Your experience with STEM topics at a school level can vary greatly across Victoria.

The opportunities vary between remote, rural, regional, and metropolitan areas, and even between the different suburbs of Melbourne. Additionally, within each of these areas, there is often a gap between opportunities available at public vs private schools.

With teachers and schools possessing limited resources, and faced with an ever growing population, it is vital that we support each student to have greater access to learning about STEM topics. This is for the benefit of the individual, their communities, and the workforce of the future.

Two initiatives that support Victorian students and teachers are the ten Tech Schools (with plans for six more), and six Science and Mathematics Specialist Centres, spread across the state.

The current iteration of Tech Schools are different to the tech schools of old. The current Tech Schools have a focus on building the skills of students in STEM areas, as well as with critical and creative thinking. Teachers bring groups of students to their nearest Tech School, where they work on real-world problems using things like robotics, virtual reality, and 3D printing.

The six Science and Mathematics Specialist Centres are more specialised learning centres, each focusing on a different topic area. They run programs for student groups both in-person and online, and are for all students from Prep to Year 12.

As part of this edition of *Science Victoria* on "STEMM Throughout Victoria", we asked some of these Tech Schools and Specialist Centres for their thoughts and reflections on how these initiatives are going.

Our thanks to Ballarat Tech School, Science Gallery Melbourne, Gippsland Tech School, and the Gene Technology Access Centre (GTAC).

For more information on Tech Schools, visit **vic.gov.au/tech-schools**. For Science and Mathematics Specialist Centres, visit **schools.vic.gov.au/science-and-mathematics-specialist-centres.**

Students at Ballarat Tech School performing flame tests of different substances. Photograph: Demi Gerardi/Ballarat Tech School.

Ballarat Tech School

BY DAMON MINOTTI
Associate Director, Ballarat Tech School

Which school communities do you serve? How does your School/Centre seek to engage students?

The Ballarat Tech School partners all secondary and P-12 schools within the City of Ballarat Local Government area, but we also partner with Daylesford, Beaufort and Lake Bolac Colleges.

In addition, we provide some program access on-site, virtually, and remotely, to schools from Ararat, Maryborough, Hamilton, Horsham, and the Wimmera.

We have a broad range of programs that aim to engage students in all STEM domains, offering a "Go Wide, Go Deep, Go Career" model that engages students at different complexities as they move through the year levels.

How do you support local teachers?

We try to work closely with teachers to tailor programs and Professional Learning to suit their unique situations, but it is an ongoing challenge to meet teachers at their point of need with their many time demands and a crowded curriculum. We have had more success when we can take a program or piece of technology to the school, provide initial training, and then leave it with them for a period of time.

To increase our reach, we also try to provide the opportunity to attend more general workshops, such as our upcoming collaborations with Earth Ed, Ecolinc, and the Regional Victorian Academy of Teaching and Leadership (VATL) co-hosting sessions on Artificial Intelligence.

We also have a focus on Pre-Service Teachers, in partnership with other Tech Schools, to help them hit the classrooms armed with knowledge and culture of familiarity and collaboration with Tech Schools from their first day of teaching.

What stands out as a success?

Without doubt, our flagship program is our Girls in STEM! It has transformed in different ways each year, and its current form brings together 60 students from up to 15 different schools to share in 2 days per term, 4 terms per year of networking, mentoring and exploration of different STEM themes and content. Each term is linked with a different industry experience or engagement and over the last 2 years, we have had alumni return as student leaders to help deliver the program in a relatable and meaningful way.

Along the journey we have recognised that while males still dominate the STEM workforce, there is declining interest and opportunity for them at a school level, so in 2024 we are running a Boys in STEM program in parallel with the girls using exactly the same format.

What were some unexpected challenges?

We are lucky to have a staff that are totally invested in providing the most meaningful, engaging and innovative learning experiences we can come up with as a team. Our structures afford us the luxury of prototyping and iterating our programs with much more regularity than you can in a

Students at Gippsland Tech School pair art, design, and science as they upcycle e-waste. Photograph: Gippsland Tech School.

Science Gallery Melbourne. Photograph: Jacinta Keefe Photography.

traditional school environment, but that still takes time and intensive resources.

At times we have missed the mark in different ways, be it over investing in resources to deliver great levels of engagement but not quite hitting the curriculum outcomes we hoped for, or vice versa, but I'd say our biggest challenge continues to be narrowing down our ideas and programs under development to achievable numbers and timelines, especially those tied to grants and external funding.

What have you learned about the impact your School/ Centre has on students and the broader community?

It can take years for the statistical impact of initiatives such as Tech Schools to become obviously measurable, however we believe that we do make a significant difference to the aspirations of our local and regional communities. Like anything in life we won't reach and influence everyone, but for the many that do want to engage, whether they are young people and their families, members or industry or our community leaders, they all see the benefits of a modern learning environment with state of the art technology that not only develops work ready skills in STEM, but creates opportunities to make us all a little more world ready too.

In the regions that Federation University and TAFE operate with Tech Schools, we see ourselves as forerunners to their cooperative education model, as more and more industries see the value of engaging with young people during their education, not just afterwards. We have numerous examples of these connections inspiring career pathways into STEM that may not have been obvious or available before.

What do you think are the biggest challenges to engaging your local community in STEMM

The world continues to evolve in complex and complicated ways. At times it can feel as though the divisions that exist in our regional, national and global communities can be simultaneously caused and potential solved by the same STEMM knowledge and applications, so as time, resources and the varied ways in which we interact and communicate with each become more competitive, ensuring that we are seen as a trusted, safe and accessible learning environment will be a critical element of our communities resilience and success.

Science Gallery Melbourne

BY JESSE CHAMBERS
Deputy Head, Learning Programs, Science Gallery Melbourne

And **DR VHAIRI MACKINTOSH**
Learning & Outreach Manager, Science Gallery Melbourne

Which school communities do you serve? How does your School/Centre seek to engage students?

Science Gallery Melbourne engages in deep partnerships with 25 local schools through the STEM Centre of Excellence, as well as over 200 schools from Victoria and beyond. Learning Experiences are interdisciplinary and showcase the relevance of STEM to all learning areas, including the arts.

How do you support local teachers?

Through the STEM Centre of Excellence, we co-design with partner schools to deliver programs that meet them at their point of need. Our learning experiences also provide teachers with a model of how to innovate with new and emerging Pedagogies.

What stands out as a success?

Our most successful initiatives are where we have co-designed with our partner schools and the outcome has resulted in schools embedding our content into their teaching and learning.

What were some unexpected challenges?

Some unexpected challenges have included balancing bespoke programming for diverse school settings with scalability.

What have you learned about the impact your School/Centre has on students and the broader community?

We have identified that our centre has enabled the university to reach audiences that they have not engaged with before, and provided a space for young people to showcase their learning with their own communities.

What do you think are the biggest challenges to engaging your local community in STEMM

One of our biggest challenges is providing access to as many schools as possible who can benefit from our facilities and learning experiences. Another is justifying the value of informal learning for time-poor schools in a way that complements their learning at school.

Gippsland Tech School

BY PAUL BOYS
Director, Gippsland Tech School and Mobile Tech School

Which school communities do you serve? How does your School/Centre seek to engage students?

The Gippsland Tech School is hosted and managed by TAFE Gippsland, co-located at their Morwell Campus. The Tech School supports eighteen secondary schools in Latrobe City and South Gippsland Shire to attend the facility, where they work on STEAM learning programs aligned with curriculum from years 7 to VCE. We also have a Mobile Tech School, which supports 16 secondary schools across Wellington and east Gippsland shires.

How do you support local teachers?

Professional Learning programs are co-designed in partnership with Gippsland schools, and these range across a number of areas including design thinking, coding, robotics, innovation, and program design. We are fortunate to work with a number of passionate Gippsland teachers who work hard to provide their students with the best education and industry immersive experiences, to expose students to careers and pathways in their local communities.

What stands out as a success?

One of our most successful initiatives has been the implementation of our "A Renewable Future" program (**gippslandtechschool.vic.edu.au/programs/renewable-energy**), which introduces students in years 7 and 8 to the advantages and disadvantages of the transition to renewable energy and the impacts on our climate and lifestyle needs. The program sees students work in teams to explore how renewable energy is created, stored, and distributed with specific reference to the economic and social considerations of the transition.

The program has evolved over the past 4 years to include hydrogen, battery storage and transmission to support students to see how industry is implementing new and emerging technologies in the roll-out of clean energy across Victoria.

What were some unexpected challenges?

One challenge that we have faced over the past 2 years has involved the roll-out of a Mobile Tech School, which works with Schools in Wellington and East Gippsland shires to facilitate STEAM programs in schools. The Mobile facility replicates programs which are based at our Morwell facility, and two team members travel to schools to facilitate programs as diverse as robotics, 3D design, sports science, physics, music, and film production.

We have worked hard to overcome the barrier of distance and equity to provide a regular service which sees the Mobile Tech School visit 14-16 schools each term with over 4,000 hours facilitated across 2023. The catchment area of the 2 LGA's is equivalent to the size of Austria, with 1% of the population, and we are very proud of how we have worked to support communities across Gippsland to experience opportunities which are often unavailable to them.

What have you learned about the impact your School/Centre has on students and the broader community?

The best feedback that we receive from students and parents often occurs informally when we are in our local communities wearing our Tech School branded uniform. We regularly receive positive comments relating to how much students enjoyed their experiences at the Tech School. This is further validated by our industry partners who appreciate the co-design and collaborative experiences that they can share with students through Tech School curriculum.

What do you think are the biggest challenges to engaging your local community in STEMM

Keeping STEAM relevant and engaging is an ongoing challenge for us as we support such a large geographic area which encompasses a significant number of communities which vary in their size and demographics. This is where local community partners including TAFE Gippsland, Federation University, LLENs (Local Learning and Employment Networks) and industry are critical to work collaboratively in support of young people in our region.

A Scientist Mentor guides students as they teach an artificial intelligence algorithm in a camera to distinguish between bees and veromite as part of the *Tackling the Pollination Problem* program. Photo: GTAC.

Gene Technology Access Centre (GTAC)

BY JACINTA DUNCAN
Director, GTAC

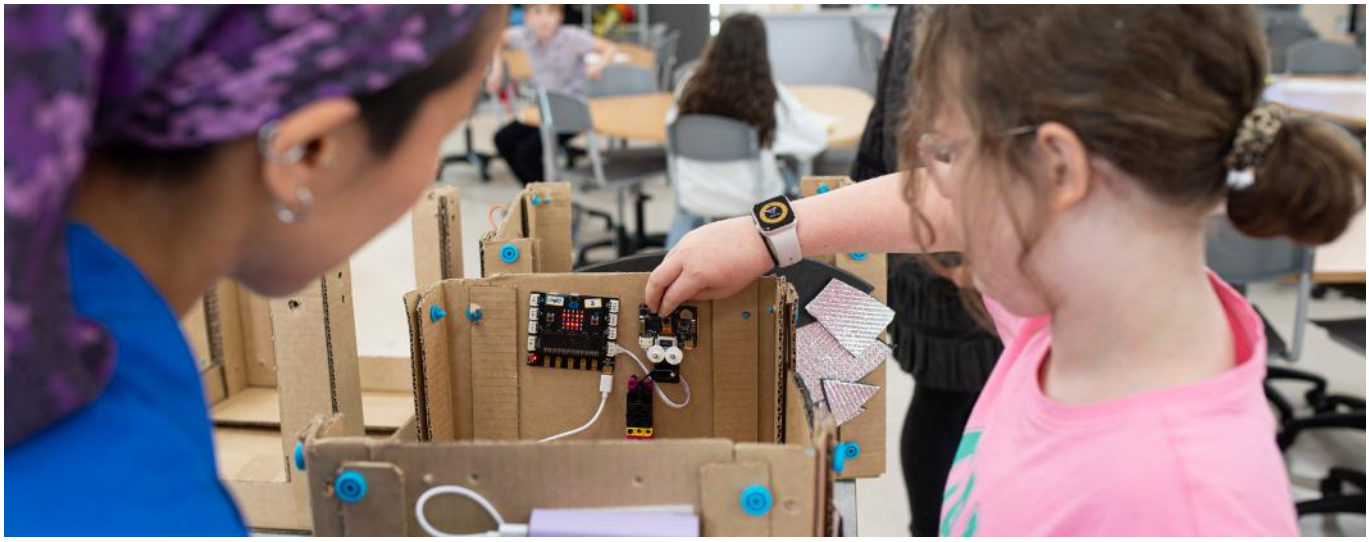
And **DR TONY CHIOVITTI**
Deputy Director, GTAC

Which school communities do you serve? How does your School/Centre seek to engage students?

GTAC is a Science and Mathematics Specialist Centre located on the grounds of the University High School. Surrounded by the Melbourne Biomedical Precinct (Parkville) and collaborating with the nearby Walter and Eliza Hall Institute of Medical Research and the University of Melbourne, GTAC has a unique partnership between students, teachers and research scientists.

GTAC delivers STEM programs with a focus on the Life Sciences for 15,000 Victorian school students in levels 5 to 12 annually. We inspire students to pursue studies and careers in STEM by applying three central tenets. First, practising scientists collaborate with students to explore contemporary STEM. Second, students apply cutting edge technologies in their investigations. And third, our programs showcase innovative pedagogical approaches to delivering the Victorian STEM curriculum.

Students who attend GTAC programs have the opportunity to work closely with postgraduate students from research institutes across Melbourne as Scientist Mentors. Classes



Years 5 & 6 students use technology to build environmental sensors for "smart bee hives" as part of the *Tackling the Pollination Problem* program. Photograph: GTAC.

are divided into small groups (usually of around six) so that each student is able to be more hands-on with the activities, and can ask their Scientist Mentor questions about studying in high school, university, and the Mentor's research. This provides students with a great chance to ask for advice and explore certain aspects of biology in greater depth. The Scientist Mentors also gain a lot from these sessions as they are encouraged to think outside the box as they adapt their teaching to different groups of students, and practise how they communicate about their own research and biology in general.

How do you support local teachers?

GTAC also has an impact on how teachers deliver curriculum in their schools through offering professional learning and a suite of online resources and students courses. The diversity of delivery modes in our programs, the connections with STEM research institutions and industry, the relational trust we have with schools across Victoria, and an agile education team are key to keeping GTAC at the forefront of STEM education in Victoria.

What stands out as a success? What were some unexpected challenges?

We continue to evolve to meet the needs of Victorian students, which is how we address the greatest challenge of ensuring that we remain up-to-date and impactful for students and teachers. A paradigm shift has led to using student voice to design programs that activate student agency. What does this look like? Students are resourced to direct their own learning supported by GTAC Education Officers and Scientist Mentors.

As part of a forensics program, Years 9 & 10 students are presented with evidence to solve an environmental crime. They decide on experiments to perform with the evidence they collect and use AI to interview suspects to solve the crime. In *Tackling the Pollination Problem*, Years 5 & 6 students select from a range of approaches, including emerging technologies, to design solutions to support bees to pollinate flowers.

In June this year, GTAC was the first educational setting in Australia to use Nanopore technology with students. 60 students participated in our annual four-day Science Immersion Research Experience program to gain insights into a career in biomedical research. They worked alongside veterinary scientists from the University of Melbourne to help identify parasitic cattle ticks by sequencing the DNA of microorganisms found on cattle as a step towards controlling cattle ticks. The data produced by students informed the collaborating scientists' research.

What have you learned about the impact your School/Centre has on students and the broader community?

Over 20 years, a strength of GTAC has been our commitment to equity, prioritising access for students in the state's most disadvantaged schools. In 2023, 15,737 students from 368 Victorian schools participated in GTAC onsite and outreach programs. Of these, 46% came from rural government schools and 30% from disadvantaged metropolitan government schools.

A new approach to outreach has been to develop STEM kits that we send to schools. They provide students with hands-on experiences using STEM technologies in their own classroom. *Micro and Nano World* Explorers is a STEM kit delivered through a collaboration with Inspire STEM Education. Schools are provided with imaging microscopes, including a scanning electron microscope, that they use to carry out an inquiry investigation of their choice.

What do you think are the biggest challenges to engaging your local community in STEMM?

It is becoming increasingly difficult for students to come to the Centre due to teacher shortages and costs of transport. Our new approach to outreach has been to develop STEM kits that we send to schools. These kits provide students with hands-on experiences using STEM technologies (including a scanning electron microscope and other microscopes) in their own classroom to carry out an inquiry investigation of their choice.

GTAC also sends teams of Education Officers and Scientist Mentors to regional locations across Victoria (e.g. Mildura and Daylesford). The team runs different programs for multiple year levels at different schools in the area over several days, often travelling to multiple locations in a day to have as great a reach as possible.

Ballarat and the Chocolate Factory

Design thinking projects at Ballarat Tech School

DR CATRIONA NGUYEN-ROBERTSON
Senior Editor, Science Victoria

Chocolate is one of the most popular sweets around the world – 8.13 million tonnes of it are consumed annually.[1] The global chocolate industry is worth over $177 billion AUD,[2] but we don't often think about the cost of our favourite treat beyond its price in a shop.

Thousands of local students have participated in variations of the Ballarat Tech School's Chocolate programs. The students goal in the program is to develop more innovative and sustainable chocolate product alternatives. The program has evolved since the Tech School opened in 2018, and more recent iterations combine indigenous bushfoods and chocolate to create a more sustainable and uniquely Australian alternative.

The bitter taste of the chocolate industry

With so many people consuming chocolate around the world, "Big Chocolate" makes big money…while failing to pay a living income to cocoa farmers.[3,4]

Raw cocoa is derived from the seed pod of the cocoa tree, grown mostly in tropical areas of Africa (70%) and South America. Cocoa farmers in those areas do physical labour in harsh heat and humidity with no shade. They are also exposed to high levels of toxic chemicals in pesticides due to overuse on crops, which can sometimes be old and diseased. Yet their compensation is, on average, less than $2 per day.[3] Farmers only receive about 6% of each chocolate bar's sale price, while manufacturers and retailers keep 80%.[4]

Photograph: Tetiana Bykovets

Additionally, despite calls for change, child labour remains prevalent in the industry: over 1.5 million children still work on cocoa plantations, where they are vulnerable to trafficking, slavery and other violent labour practices.[5] Many of these children do not receive an education while they work.[6] Without an education, these children have little hope of breaking the cycle of poverty.

Deforestation is occurring at a rapid rate as farmers clear forests to make room for cacao plantations. In West Africa, where two-thirds of the world's cocoa is produced, the illegal clearing of tropical rainforests has accelerated in the past decade. West Africa has lost more than 85% of its forest in the past 60 years, mostly due to cocoa farming.[7] Soil erosion, caused as a direct result of deforestation, renders the land less fertile for cacao plants, creating a vicious cycle of more land clearing for minimal return.

In addition to the environmental problems caused by the farming of cocoa, single use plastic packaging in the food industry creates a great pollution problem. Most chocolate products are packaged in some form of plastic, and while there are biodegradable alternative packaging products being developed, companies are slow to take them up as they are more expensive.

Chocolate manufacturers are beginning to make changes to their cocoa purchasing requirements, which are designed to support producers to grow more sustainably and reduce child labour. Consumer demand for more ethical and sustainable chocolate products can influence the manufacturing company's raw material choices.

As part of the Bushfood Chocolate program at Ballarat Tech School, students work in teams to design and produce their own chocolate alternative. Photograph: Ballarat Tech School.

Cocoa beans – the seeds from the cacao tree (*Theobroma cacao*) – encased in the pulp of a freshly-cut pod. Photograph: Rodrigo Flores via Unsplash.

80% cocoa, 100% design thinking

Local secondary school students come year after year to participate in a program at Ballarat Tech School, where they design and produce their own local, sustainable, and ethical chocolate.

Student teams produce and market their own chocolate product. In the program's initial run, students were assigned roles within their teams as tech specialists, food specialists, and materials specialists. While each of the specialists worked on individual tasks throughout the day, they had numerous team meetings to discuss their progress and research findings to make collaborative decisions.

The tech specialists designed and engineered chocolate moulds from scratch using 3D-printing. The food specialists learned about the chocolate production process and used Thermomixers to make chocolate from its constituent parts, including mixing in their flavours of choice. Meanwhile, the materials specialists investigated types of packaging materials, and made and tested the quality of different bioplastics to produce a biodegradable chocolate box prototype.

More recent iterations of the program include an opportunity to explore indigenous ingredients (such as Lemon Myrtle, Pepper Berry, and Wattleseed). The Ballarat Tech School is located on the lands of the Wadawurrung People, and the program pays homage to their rich history and knowledge of native botanicals and their use in food. To celebrate NAIDOC Week recently, the Tech School teamed up with Wadawurrung's Aunty Deb Rose, Gunditjmara woman, Renee Bosworth, and two local businesses to run "The Great Bushfood Brownie Bake-off".

Incorporating native plant-based foods and traditional food practices into current foods has the potential to be more sustainable and reduce instances of diet-related chronic health conditions like obesity.[8] They have a high nutrient content and high tolerance to environmental stress compared to Western food, and First Peoples have used sustainable approaches to grow and prepare food for millenia.[8]

Throughout the program, the students drive the project and take leadership of their work, while the Ballarat Tech School staff provide support. The focus of the program is teamwork, as one person would not be able to complete the task alone. Students are also encouraged to create designed solutions, evaluate ethical issues, and use logical, strategic, flexible and adventurous thinking together.

The Bushfood Chocolate Program at Ballarat Tech School provides an "applied taste test" of the technologies and processes behind producing chocolate commercially. Students are challenged to identify their strengths, take on new technical skills, and collaborate to bring the project all together. "Chocolate is really a vehicle to do all this with," says Kirstyn Hall, who developed the program.

Chocolate does not have to come at a steep human and environmental cost. Students are encouraged to consider and even promote the importance of buying ethically produced chocolate that does not exploit cocoa farmers or support child labour. They are also encouraged to think about the sustainability of all food packaging, and how they can incorporate unique Australian flavours into food. They then apply the technical skills they learn to design, produce and market a sustainable, ethical product – and have a chocolatey treat to munch on at the end of the day.

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Defining the Divide

The Impacts of Geographical and Socioeconomic Gaps in STEM Education

SCOTT REDDIEX MRSV
Editor-in-Chief, Science Victoria

While online learning and regional training options continue to improve, your experience engaging with STEM education will be different depending on your location in Victoria. It might seem an obvious statement to make, but what does it actually mean for students? How does it relate to skills and jobs around our state?

Geographic, economic, and cultural divides

Students from schools in rural and regional Victoria, and low-SES (socioeconomic status) areas of metropolitan Melbourne, have significantly lower education-related engagement and outcomes compared to students in high-SES schools in metro Melbourne.[1,2,3] Put simply, it means less schooling, and lower scores.

These students are less likely to complete year 12, and those who do are one-third as likely to enrol at a university.[1,4]

You might have heard the idea that 'a smart and/or rich child will do well at any school'. While it ignores the impact of schools and caregivers, it also doesn't reflect the reality: students from high-SES backgrounds who attend low-SES schools have poorer educational outcomes compared to those attending high-SES schools.[4,5]

A student's aspirations to engage with higher education are shaped by their access to economic and cultural resources, as well as previous experiences of success in education.[5,6] Additionally, students attending high-SES schools have greater access to economic and cultural resources than those in low-SES schools.[6,7]

These 'economic' resources are self-explanatory: more money, and everything that comes with it. However, the 'cultural' resources in the home and in the classroom are more complex. They include factors like whether a family member previously engaged with higher education, whether students have a template for success (like a role model) with a particular pathway, and even how knowledge is valued in a home or a community.[6]

The combination of economic and cultural resources at schools can mean more extra-curricular opportunities relating to particular career pathways and interest areas, and engagement of alumni as role models. At home, it also means understanding the relevance of education, and having the ability to give it the time needed.

Implications for jobs of the future

The National Skills Commission has highlighted the importance of tertiary education and STEM skills, reporting that more than 90% of new jobs will require post-high school qualifications.[8] Additionally, the number of jobs that utilise STEM skills is projected to grow more than twice as fast as non-STEM occupations.

In other words, jobs will increasingly require more than just high school completion, and more jobs will need workers to use STEM skills.[8,9,10]

As such, students afforded fewer opportunities to engage with and understand STEM skills are at a disadvantage compared to those with a solid foundation in this area.[9,10]

Together, these data highlight the difficulties that these students face with engagement with and success in both secondary and tertiary education, and the value of providing these cohorts with opportunities. Investing in schools, teachers, and communities. Ensuring education is accessible, affordable, and meaningful for all students. Reducing the gaps between outcomes based on geography and socio-economic status. Showing young people the many different educational and employment pathways that they can follow.

You don't get a choice on where you are born. But that shouldn't mean that STEM education is also not a choice.

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Photograph: Jeswin Thomas via Unsplash.

1875

Introducing the Calculator

SCOTT REDDIEX MRSV
Editor-in-Chief, Science Victoria

In 2024, you're rarely without a digital calculator of some form.

There's a calculator app on your phone, on your tablet, on your computer. There might also be a couple of calculators still lying around your house – possibly the $250 graphing calculator that was bought for high school maths, whose AAA batteries now look concerningly corroded.

In 1875, the availability of a reliable calculator was (unsurprisingly) a very different story. The first all-electric calculator wasn't invented until the 1950s,[1] and so your arithmetic tool of choice depended on your profession. Mental maths, logarithmic tables, slide rules, and abacuses were all well-established options, however they meant that performing extensive calculations with large numbers took up a significant amount of time in some occupations.

The 17th, 18th, and early 19th centuries had seen the invention of various mechanical calculators, which operated through different mechanisms and methods. While there were many ingenious ideas, none reached the point of being suitable for widespread, everyday office use.

This changed with Thomas de Colmar's invention of the arithmometer.[2] Although first built in 1820, de Colmar didn't commercialise his device until 1852, as he was too busy with his career in insurance. When he returned his attention to it, the arithmometer quickly became the first mass-produced calculator in history.

On the 6th of September 1875, William Charles Kernot presented the device and his paper to the Society, simply titled *'The Arithmometer'*.

He informed those present that *"the first machine that reached this colony, as far as I am aware, was imported by J. M. Templeton, Esq., F.I.A., about three years ago"*. Kernot had promptly inspected Templeton's machine, and *"became convinced of its utility, and immediately ordered one, which you now see before you. This instrument I have had in constant use for more than two years, with the most satisfactory results"*.

Kernot provides two pages of detail about exactly how the device is assembled and operates, before noting that *"it is impossible to convey by a mere verbal description, unaided by detailed diagrams, an adequate idea of the numerous and ingenious mechanical contrivances with which this instrument abounds"*.

The machine's hardiness was perfectly suited to routine use: *"In spite of this apparent complexity, the machine has never yet got out of order, has never made a mistake; while of the springs, which are regarded by the makers as the weak point of the whole affair, not one has given way"*.

A strong and accurate calculator is all well and good, but it means nothing if it is too difficult or time consuming to use. Fortunately, this was not one of those calculators. Kernot next provided some sample equations, and explained how they could be quickly solved.

For Kernot, who was a civil engineer by trade,[3] the value of the arithmometer was significant: *"My own experience is, that I perform my work in less than half the time that I previously required, and with not a tithe of the fatigue. Indeed, I calculate that the saving of time and labour, consequent upon its use during the past two years, has repaid its original cost several times over."*

FROM:
Transactions and Proceedings of the Royal Society of Victoria, Volume XII, 1875.

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OPPOSITE:
A twenty-digit arithmometer, built around 1875. Photograph: Ezrdr via Wikimedia Commons (Public Domain).

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

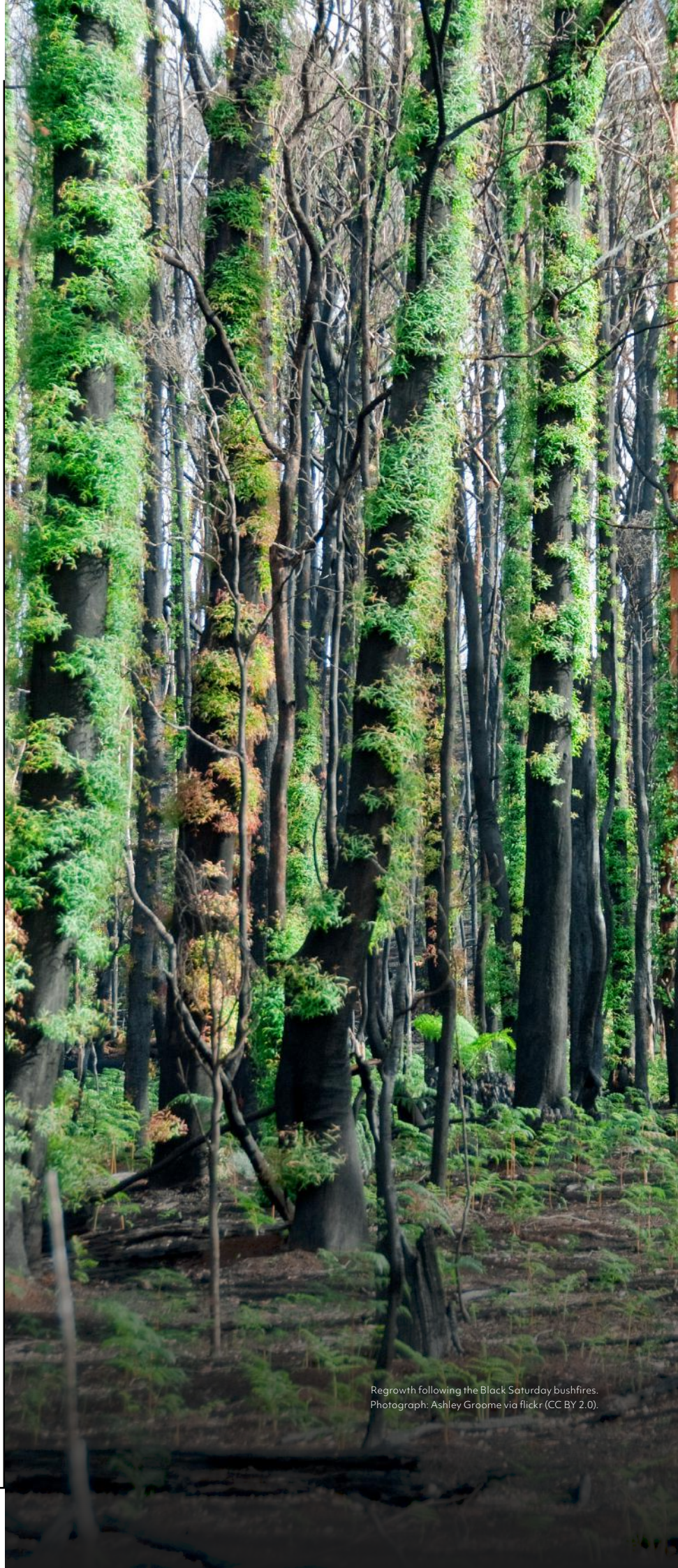
MUSEUMS VICTORIA
museumsvictoria.com.au

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



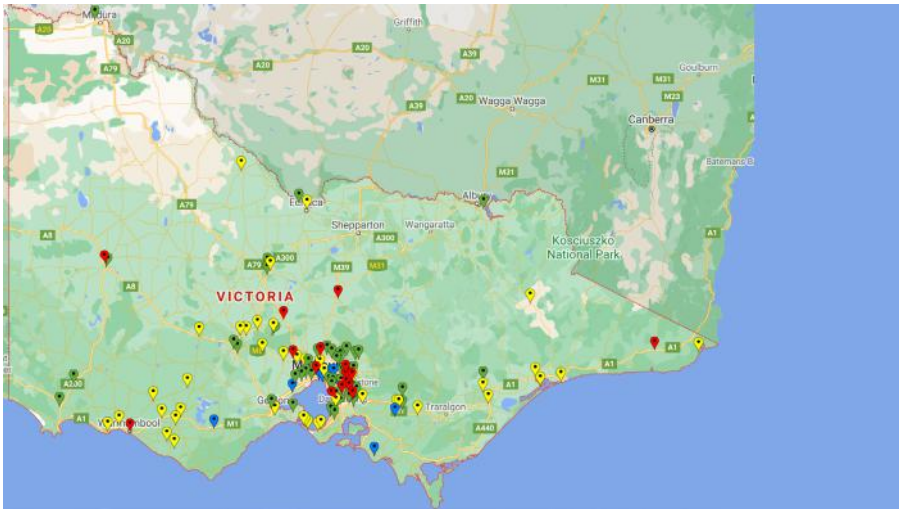
Regrowth following the Black Saturday bushfires. Photograph: Ashley Groome via flickr (CC BY 2.0).

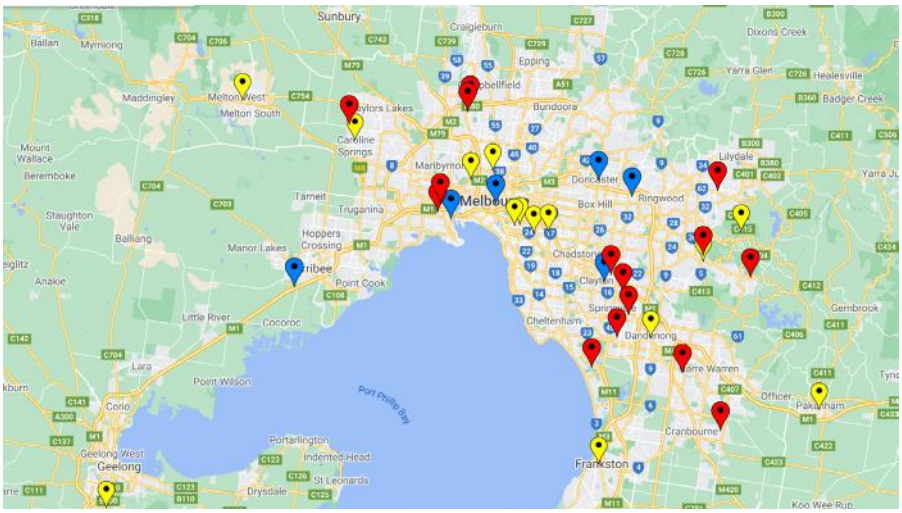
National Science Week 2024

National Science Week is upon us!

National Science Week is Australia's annual celebration of science and technology. Every August, more than 1000 events are held around Australia, delivered by community groups, libraries, museums, universities, schools, research institutions, and science centres.

In Victoria, National Science Week is supported by the *Inspiring Victoria* initiative, led by the Royal Society of Victoria. In this edition of *Science Victoria*, we are listing some of the many events supported by *Inspiring Victoria* partners, and those supported by funding from National Science Week grants or Seed Grants.





Library and community grant recipients (yellow), National grant recipients (blue), Neighbourhood Houses Victoria grant recipients (red), and School grant recipients (green).

With a range of in-person and online events hosted by community groups, libraries, schools, and Inspiring Victoria partners, there's something for everyone in National Science Week.

Survive and Thrive

National Science Week events held by the Inspiring Victoria Major Program partners

Inspiring Victoria presents its major program for National Science Week 2024: *Survive and Thrive*. Museums Victoria, Zoos Victoria and Royal Botanic Gardens Victoria will highlight conservation efforts, habitat restoration, and efforts to adapt to new environments. Experts in conservation and nature recovery will share their insights to help us address the challenges facing thousands of Australia's native plants and animals. Scientists will also share their work towards growing thriving ecosystems in the harsh environment of space.

Explore the diverse ways that lifeforms can adapt, persevere, and flourish (with a little help from us all). *Survive and Thrive* will demonstrate the power of collective action across Victoria, from public libraries sharing scientific knowledge with local communities, to neighbourhood houses and community groups conducting citizen science activities.

Learn how you can help knowledge, ecosystems, and people *Survive and Thrive* into the future at **inspiringvictoria.org.au/survive-thrive**.

Survive and Thrive is a series of community-focused events presented in collaboration between Museums Victoria, Royal Botanical Gardens Victoria, Zoos Victoria, Public Libraries Victoria and the Royal Society of Victoria for National Science Week, supported by the Inspiring Victoria program.

MUSEUMS VICTORIA

The Inspiring Victoria program is providing free admission to Scienceworks (11 Aug) and Melbourne Museum (18 Aug) to attend Journey Beyond and Science on Show. For access to free admission, please book via the links provided at **inspiringvictoria.org.au/survive-thrive.*

MUSEUMS VICTORIA

Journey Beyond: A Morning with Astronaut Katherine Bennell-Pegg

Katherine Bennell-Pegg will be touching down at Scienceworks to kick off National Science Week! Join us first thing to hear her interview, watch her launch a rocket, and then get an autograph from Australia's first astronaut.

DATE/TIME:

Sunday 11 Aug, 10:30AM-12:00PM

PRICE:

Free with Scienceworks admission*

LOCATION:

Scienceworks, 2 Booker Street, Spotswood

MUSEUMS VICTORIA

Science on Show

Science on Show showcases some of the rarest and most fascinating species displayed at Melbourne Museum. Join scientists who specialise in ancient fossils and underwater marvels. Discover rare collections, learn about endangered species and create something special to take home.

DATE/TIME:

Saturday 10 Aug & Sunday 18 Aug, 10:00AM-2:00PM

PRICE:

Free with Melbourne Museum admission*

LOCATION:

Melbourne Museum, 11 Nicholson Street, Carlton

ARC CENTRE OF EXCELLENCE IN PLANTS FOR SPACE

The Martian Garden

In the next 30 years, missions to the Moon and Mars will explore habitation in new and extreme environments. Discover how we can create sustainable new ecosystems off-world (and on Earth). Uncover the challenges and innovative solutions for growing plants in extreme environments, and find out how we can provide a nutritious, varied food supply to people living beyond Earth.

DATE/TIME:

Saturday 10 Aug – Sunday 18 Aug, 10:30AM-3:30PM

PRICE:

Free with Scienceworks admission*

LOCATION:

Scienceworks, 2 Booker Street, Carlton

ALSO FROM MUSEUMS VICTORIA THIS NATIONAL SCIENCE WEEK:

MUSEUMS VICTORIA

Climate Cafe

From Triceratops to a world of bugs, Melbourne Museum is an amazing source of inspiration. Discover the wonders of digital drawing in this art and science focused workshop. This class uses fascinating source materials that tell the stories behind the museum's collection, from the unlimited natural textures and colours and forms of fossils and minerals, to feathers, insects and more.

DATE/TIME:

Tuesday 13 Aug, 4:00PM-5:30PM / 6:30PM-8:00PM

PRICE:

Free

LOCATION:

Melbourne Museum, 11 Nicholson Street, Carlton

Melbourne Museum. Photograph: Francisco Anzola via flickr (CC BY 2.0).

MUSEUMS VICTORIA

From Melbourne to Mars: The Hunt for Life in Space

Hear Dr Tanya Hill in conversation with NASA Scientist Dr Adrian Brown, Deputy Program Scientist on NASA's Perseverance Mission. Dr Brown will update us on NASA's search for signs of ancient life on Mars in Martian rocks and soil.

DATE/TIME:

Saturday 17 Aug, 12:00PM-12:45PM

PRICE:

$8 Member/$10 Children/$20 Senior/$35 Adult

LOCATION:

Melbourne Planetarium, Scienceworks, 2 Booker Street, Spotswood

ROYAL BOTANIC GARDENS VICTORIA

James Austin via Unsplash (CC BY-ND 2.0).

ROYAL BOTANIC GARDENS VICTORIA

Raising Rarity Revealed

Help conserve threatened Victorian plants. With over a third of Victorian plants listed as threatened, Royal Botanic Gardens Victoria needs the help of the wider community to join their conservation efforts. Take a peek behind their Raising Rarity program, be guided through their nursery, research plots and living collection, and pot your own threatened plant species to take home.

DATE/TIME:

Saturday 17 Aug

PRICE:

Free

LOCATION:

Royal Botanic Gardens Cranbourne Ballarto Road and Botanic Drive, Cranbourne

ROYAL BOTANIC GARDENS VICTORIA

Botanical Time Capsules

Royal Botanic Gardens Melbourne is widely admired as one of the world's most beautiful botanic gardens. Within the Gardens are specially curated Living Collections that are home to documented and labelled plants for conservation, display, education, interpretation, and research. Learn about the important role of the Gardens' collections and research, and of biological diversity in maintaining ecosystem health.

DATE/TIME:

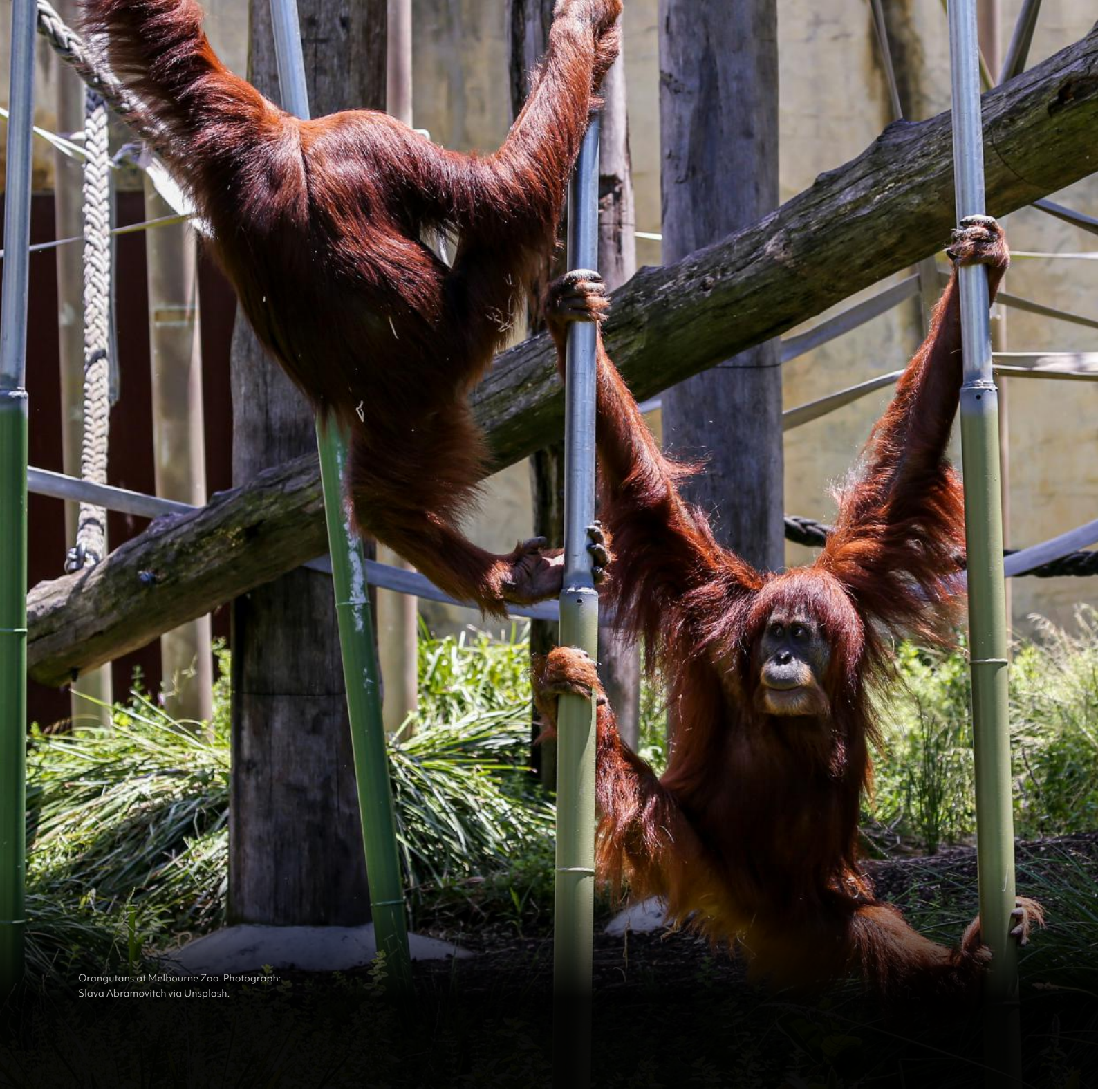
Thursday 15 Aug, 6:30PM-7:30PM

PRICE:

Free

LOCATION:

Royal Botanic Gardens Melbourne Birdwood Avenue, Melbourne



Orangutans at Melbourne Zoo. Photograph: Slava Abramovitch via Unsplash.

ZOOS VICTORIA

ZOOS VICTORIA

Species Survival Day at Kyabram Fauna Park

Zoos Victoria is committed to fighting wildlife extinction. They run conservation programs dedicated to the recovery of 27 threatened native species. Hear about Zoos Victoria's efforts to protect native animals and learn what you can do to help, through talks from zoo keepers, interactive workshops, and crafting.

DATE/TIME:
Saturday 17 Aug

PRICE:
Free

LOCATION:
Kyabram Fauna Park, 75 Lake Rd, Kyabram

Events supported by National Science Week Grants

The diversity of Australian science is reflected in the array of events on offer during National Science Week.

The diversity of Australian science is reflected in the array of events on offer during National Science Week. The full announcement, including details of events funded in other states, can be viewed at **scienceweek.net.au/national-grant-round-recipients-for-2024**

Please congratulate the following grant recipients, who will be delivering these programs during National Science Week (10 – 18 August) this year, and consider attending an event near you. To see all events happening around Victoria (both in-person and online), **visit scienceweek.net.au/your-state/vic**.

Photograph: Museums Victoria via Unsplash.

WHITEHORSE MANNINGHAM LIBRARIES MAKERSPACE

From Craft to Code

Did weaving give us the first computer code? Can circuit boards make music? How does clothes mending teach us geometric patterns? How can modern electronics be sewn into clothing? This week-long program explores and celebrates the origins of modern computing, digital media and coding across a range of artistic disciplines.

DATE/TIME:

Saturday 10 Aug – Friday 16 Aug, 10:00AM-6:00PM

PRICE:

Free

LOCATION:

Box Hill Library, Doncaster Library, and Nunawading Library

LINK:

scienceweek.net.au/event/from-craft-to-code/nunawading

Photograph: Zoe Schaeffer via Unsplash.

LARDNER PARK

The STEM Zone Experiment

Explore interactive exhibits, workshops, and dazzling demonstrations that will unleash your inner scientist and ignite your passion for STEM. Prepare to be amazed by mind-bending VR experiences, chemical reactions, and light-bending photography. Challenge yourself with brain-teasing engineering tasks, robotics, and defy gravity with physics experiments. Learn about Earth-saving solutions, and so much more!

DATE/TIME:

Saturday 10 Aug, 9:00AM-12:00PM and 12:30PM-3:30PM

PRICE:

Free (infants and adults)/$11.50 (Youth – ages 4-15)

LOCATION:

Lardner Park

LINK:

scienceweek.net.au/event/the-stem-zone-experiment/lardner

MY LIBRARY COMMUNITY

MYLI STEM Zone

Join us to explore Species Survival. Perform an experiment to investigate animal adaptations. Discover how environmental changes influence food sources. Learn about the importance of insects with our creepy crawly touch tank. Find out how to rehabilitate an environment with an interactive display. Investigate how we can monitor the animals' health. Learn how to help a snake bite victim.

DATE/TIME:

Monday 12 Aug, Wednesday 14 Aug and Friday 16 Aug, 4:00PM-5:00PM

PRICE:

Free

LOCATION:

Drouin Library, Warragul Library, Baw Baw Mobile – Trafalgar Community Centre

LINK:

scienceweek.net.au/event/myli-presents-stem-zone-5/drouin

scienceweek.net.au/event/myli-presents-stem-zone-5/warragul

scienceweek.net.au/event/myli-presents-stem-zone-5/trafalgar

EAST GIPPSLAND SHIRE LIBRARIES

Greenhouse Gardening

Come along to our gardening and sustainability workshop and build your very own greenhouse, complete some science experiments and take part in our quiz. Learn more about why gardening plays an important role in science and gain a better understanding of how plants grow and survive. Take your greenhouse home and grow your vegetables and your knowledge.

DATE/TIME:

Monday 12 Aug - Friday 16 Aug

PRICE:

Free

LOCATION:

Bairnsdale Library, Omeo Service Centre, Lakes Entrance Service Centre, Paynesville Service Centre, Orbost Service Centre, and Mallacoota Service Centre.

LINK:

scienceweek.net.au/event/greenhouse-gardening-at-east-gippsland-shire-libraries

CORANGAMITE MOYNE LIBRARY SERVICE

DIY Greenhouse Gardening for Kids

Create your own mini greenhouse while reusing materials to promote sustainability and minimise waste. With just a little water, sunlight, and patience, fresh alfalfa will be ready to harvest in no time.

DATE/TIME:

Monday 12 Aug-Saturday 17 Aug

PRICE:

Free

LOCATION:

Timboon Library, Camperdown Library, Terang Library, Koroit Library, Port Fairy Library, Mortlake Library, Derrinallum Library, and Cobden Library

LINK:

events.humanitix.com/host/corangamite-moyne-library-service

Photograph: CDC via Unsplash.

CONSERVATION ECOLOGY CENTRE

Otways Ecological Research Forum

Science needs to be collaborative and in ecology, we take our lead from the ecosystem we study. Ecological and conservation research are key to mitigating Australia's biodiversity crisis. We'll only do it by taking the whole community with us. The Otway Ecological Research Forum brings all the eco-activity together to be digested, discussed and celebrated.

DATE/TIME:

Tuesday 13 Aug, 9:00AM-5:00PM

PRICE:

Free

LOCATION:

Colac Otway Performing Arts and Cultural Centre

LINK:

scienceweek.net.au/event/2024-otways-ecological-research-forum-ecology-the-collaborative-science-we-must-get-right/colac

MYLI

Coding Craze Hits Pakenham

Explore coding and robotics in a fun, hands-on workshop. Children will dive into the world of coding and robotics, learning to build and program robots using Lego and many other robotics kits. Our expert guides will be there every step of the way. Spark curiosity, ignite creativity and enhance problem-solving skills. There are sessions for children ages 5-12, and ages 10-17.

DATE/TIME:

Wednesday 14 Aug, 4:00PM-5:30PM/6:00PM-7:30PM

PRICE:

Free

LOCATION:

Pakenham Library

LINK:

scienceweek.net.au/event/coding-craze-hits-pakenham-science-week-pakenham-library-session-1/pakenham

scienceweek.net.au/event/coding-craze-hits-pakenham-ages-10-to-17/pakenham

Photograph: gryffyn m via Unsplash.

Photograph: Howard County Library System via flickr (CC BY-NC-ND 2.0).

MOONEE VALLEY LIBRARIES

Celebrating Science – STEM Story Time, Science Showcase, & Family Science Trivia

It's storytime but with a science twist. Get hands-on with STEM activities based on our favourite picture books. Stick around for a science showcase and family science trivia. Try out a range of science, technology, engineering, and maths challenges, and test whether you know your meteoroids from your meteorites.

DATE/TIME:

Saturday 17 Aug, 10:30AM-11:15AM/11:30AM-1:30PM/2:00PM-3:00PM

PRICE:

Free

LOCATION:

Flemington Library

LINK:

scienceweek.net.au/event/celebrating-science-stem-storytime/flemington

scienceweek.net.au/event/celebrating-science-science-showcase/flemington

scienceweek.net.au/event/celebrating-science-family-science-trivia/flemington

FRANKSTON LIBRARY AND GREATER DANDENONG LIBRARIES

Get Scientwisted Science Show

TwistED Science is visiting for 60 minutes of fun, laughter and a little bit of learning. Dive into the world of science with experiments about air pressure, chemical reactions, vacuums and forces. Audience participation is a must!

DATE/TIME:

Saturday 17 Aug, 12:30PM-1:30PM/3:00PM-4:00PM

PRICE:

Free

LOCATION:

Frankston Library and Dandenong Library

LINK:

scienceweek.net.au/event/get-scientwisted-science-show-4/frankston

scienceweek.net.au/event/get-scientwisted-science-show-3/dandenong

NEIGHBOURHOOD HOUSES VICTORIA

Neighbourhood Houses are places of connection, belonging, participation, and inclusion. With over 400 locations across Victoria, many of these community-led & place-based centres are holding events as part of National Science Week 2024. Neighbourhood Houses Victoria are proud to be an *Inspiring Victoria* program partner.

Photograph: Brad Weaver via Unsplash.

SELBY COMMUNITY HOUSE

Nature Walk & Exploration of Minak Reserve

Be immersed in the rich biodiversity and conservation efforts of Minak Reserve. This guided nature walk will highlight the reserve's unique ecosystem and the critical work being done by 'Friends of Minak Reserve.' The event will include hands-on STEM activities, re-vegetation efforts, and opportunities for participants to learn from local experts.

DATE/TIME:
Sunday 11 Aug

PRICE:
Free

LOCATION:
Selby Community House/Minak Reserve, Selby

LINK:
selbyhouse.org.au

FRASER RISE CHILDREN'S AND COMMUNITY CENTRE

Bee Hive Science

Children will have the opportunity to observe a live honeybee colony in action to learn about bee behaviour and hive dynamics. Children will also dress in beekeeping suits to try their hands at beekeeping. Plus, no exploration of bees is complete without tasting honey!

DATE/TIME:
Monday 12 Aug

PRICE:
Free

LOCATION:
Fraser Rise Children's and Community Centre, Fraser Rise

LINK:
meltonlearning.com.au/locations/fraser-rise-childrens-community-centre

HORSHAM NEIGHBOURHOOD HOUSE

Science Week Celebration

Learn about volcanoes and why they are essential to our ecosystem. Then create and detonate your own volcano in the sand pit with bi-carb soda and vinegar. Then make elephant toothpaste and homemade slushies to discover chemical reactions. There will also be a human-powered blender to think about where energy comes from as you blend a smoothie for yourself.

DATE/TIME:
Tuesday 13 Aug

PRICE:
Free

LOCATION:
Horsham Neighbourhood House, Horsham

LINK:
horshamnh.com.au

SEYMOUR & DISTRICT COMMUNITY HOUSE INC.

Kids Science Week

The World Day will provide children the opportunity to dive into nature and its creatures through experimentation and local Indigenous knowledge. The Basics of Math Day will help children understand counting, colours, and shapes. The Sensory Play Day will encourage children to dive into many messy play experiences including potion making, using natural materials to create artwork and experiment.

DATE/TIME:
Tuesday 13 Aug-Friday 16 August

PRICE:
Free

LOCATION:
Seymour & District Community House, Seymour

LINK:
mitchellshire.vic.gov.au/community/community-directory/seymour-and-district-community-house-inc

KYNETON COMMUNITY HOUSE

Digging With Dinosaurs

Explore extinction events of the past and link them to the current need for climate action to mitigate future extinction events. Children will dig for dinosaurs, build fossils, create artwork, and learn about current endangered species and what communities can do to help prevent loss.

DATE/TIME:
Wednesday 14 Aug

PRICE:
Free

LOCATION:
Kyneton Community House, Kyneton

LINK:
kynetoncommunityhouse.org.au

JAPARA NEIGHBOURHOOD HOUSE

Circuits of Fun

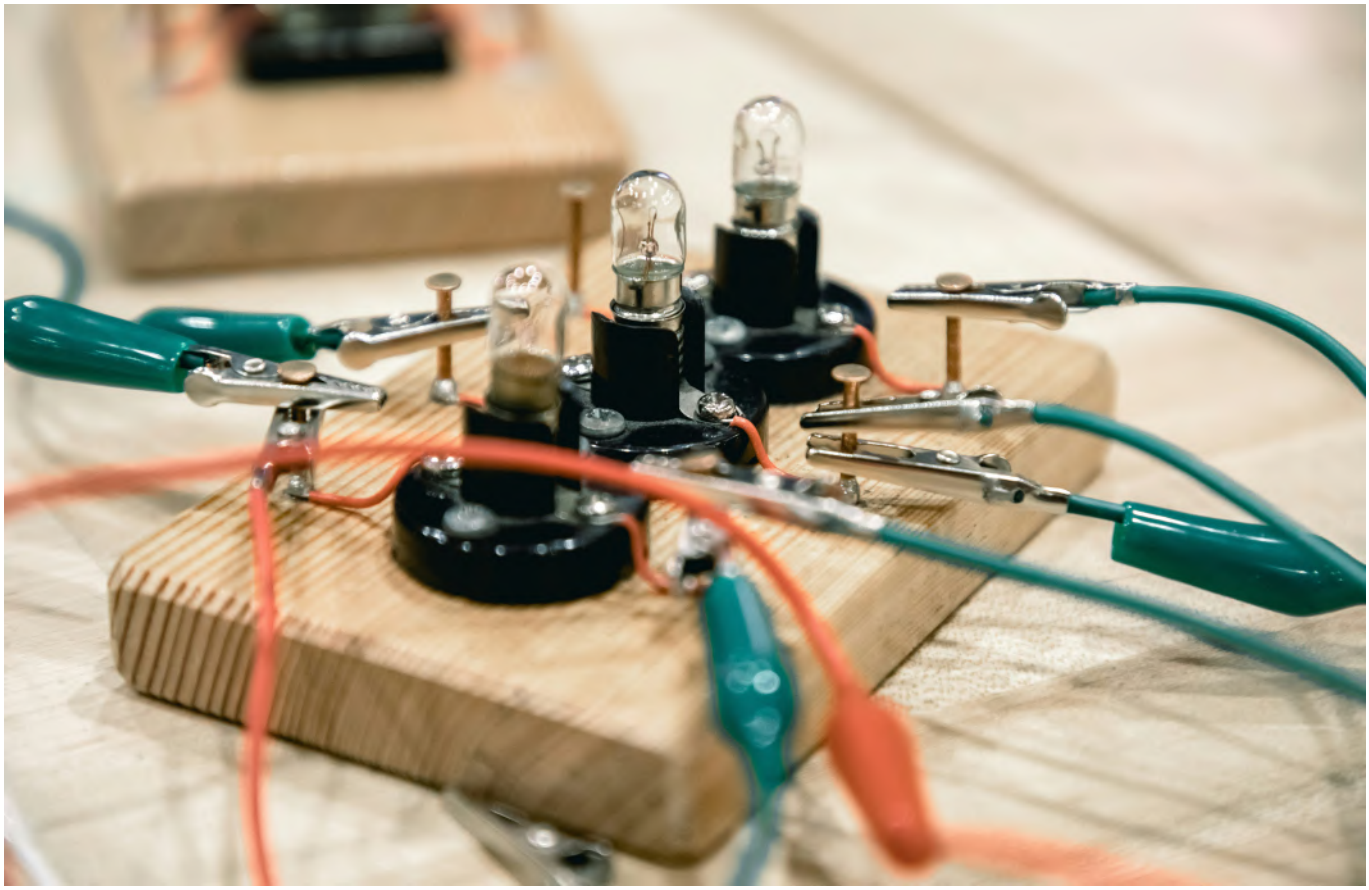
Join us for a fun and interactive program to explore and experiment with electricity! In this hands-on session explore how electricity works, different sources of energy, experiment with circuits and switches, and see if you can get the bulb to light up, or sounds to play! This family-friendly afternoon will have experiments and activities for the whole family.

DATE/TIME:
Wednesday 14 Aug

PRICE:
Free

LOCATION:
Japara Neighbourhood House, Kilsyth

LINK:
japarahouse.com.au



Photograph: Jarvik Joshi via Unsplash.

A 3D-printed dinosaur skull. Photograph: Osman Talha Dikyar via Unsplash.

KEYSBOROUGH LEARNING CENTRE

Technology for All – Robotics and 3D Designing Workshop

Bring STEM disciplines together in two workshops about Coding and Robotics, and 3D design and 3D printing.

DATE/TIME:
Wednesday 14 Aug

PRICE:
Free

LOCATION:
Keysborough Learning Centre, Keysborough

LINK:
klckeys.com.au

CANN RIVER COMMUNITY CENTRE

Cann Go Green

The Community Centre will have presentation talks from Landcare about composting, & worm farm gardening, and enriching both adults and children on how to grow their own vegetables. Each participant will participate in a hands-on session on how to propagate vegetables and other seedlings - and take a seedling home.

DATE/TIME:
Thursday 15 Aug

PRICE:
Free

LOCATION:
Cann River Community Centre, Cann River

LINK:
facebook.com/groups/1727578500791337

MOUNTAIN DISTRICT LEARNING CENTRE

Robotics

Build robots and learn how to conduct basic coding to program them. Install the solar panel on top of the robot so they do not require batteries, then race your robots around the custom track designed by participants.

DATE/TIME:
Thursday 15 Aug

PRICE:
Free

LOCATION:
Mountain District Learning Centre, Ferntree Gully

LINK:
mdlc.org.au

Photograph: Narciso Arellano via Unsplash.

YARRAVILLE COMMUNITY CENTRE

Science Adventure: Hands-On Discovery Day

The workshop includes acid-based chemical reactions, exploring gravity and impact through engineering challenges, constructing simple circuits, and understanding plant biology. This fun and educational event aims to foster your love for STEM while providing valuable knowledge and encouragement.

DATE/TIME:
Sunday 18 Aug

PRICE:
Free

LOCATION:
Yarraville Community Centre, Yarraville

LINK:
ycc.net.au

MACKIE RD NEIGHBOURHOOD HOUSE

Science is Fun

Kids will have a roaring great time as they learn about dinosaurs in a Digging Dinosaurs workshop and dig for fossils as palaeontologists. Check out the life-size replica of the Velociraptor dinosaur skull and come face to face with T-Rex! Or, investigate and separate marvellous mixtures using chemistry and physics.

DATE/TIME:
Wednesday 21 Aug

PRICE:
Free

LOCATION:
Mackie Rd Neighbourhood House, Mulgrave

LINK:
mackierdnh.org.au

BALLA BALLA COMMUNITY CENTRE

Species Survival - Beyond Sustainability

Mad About Science will facilitate a Species Survival - Beyond Sustainability presentation. There will be 6 workstations with activities and experiments for children to explore and celebrate innovative ways that real life scientists are tackling problems leading to species decline.

DATE/TIME:
Friday 23 Aug

PRICE:
Free

LOCATION:
Balla Balla Community Centre, Clyde North

LINK:
ballaballa.com.au

Call for Scientific Papers

AVAILABLE ONLINE AT PUBLISH.CSIRO.AU/RS

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

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

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

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

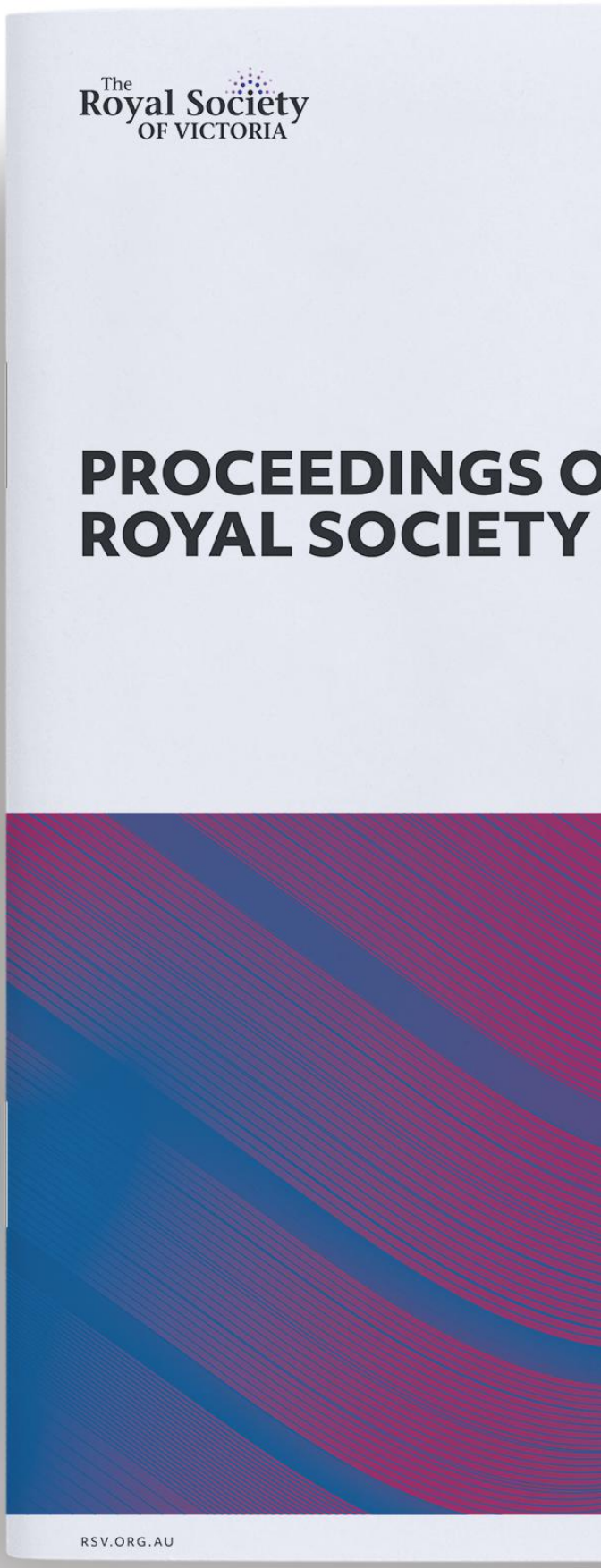
The journal began in 1855 as an irregular publication under the title *Transactions of the Philosophical Society of Victoria,* with the present name adopted in 1889. Since then, volumes of the journal have been published annually, often across one or more parts.

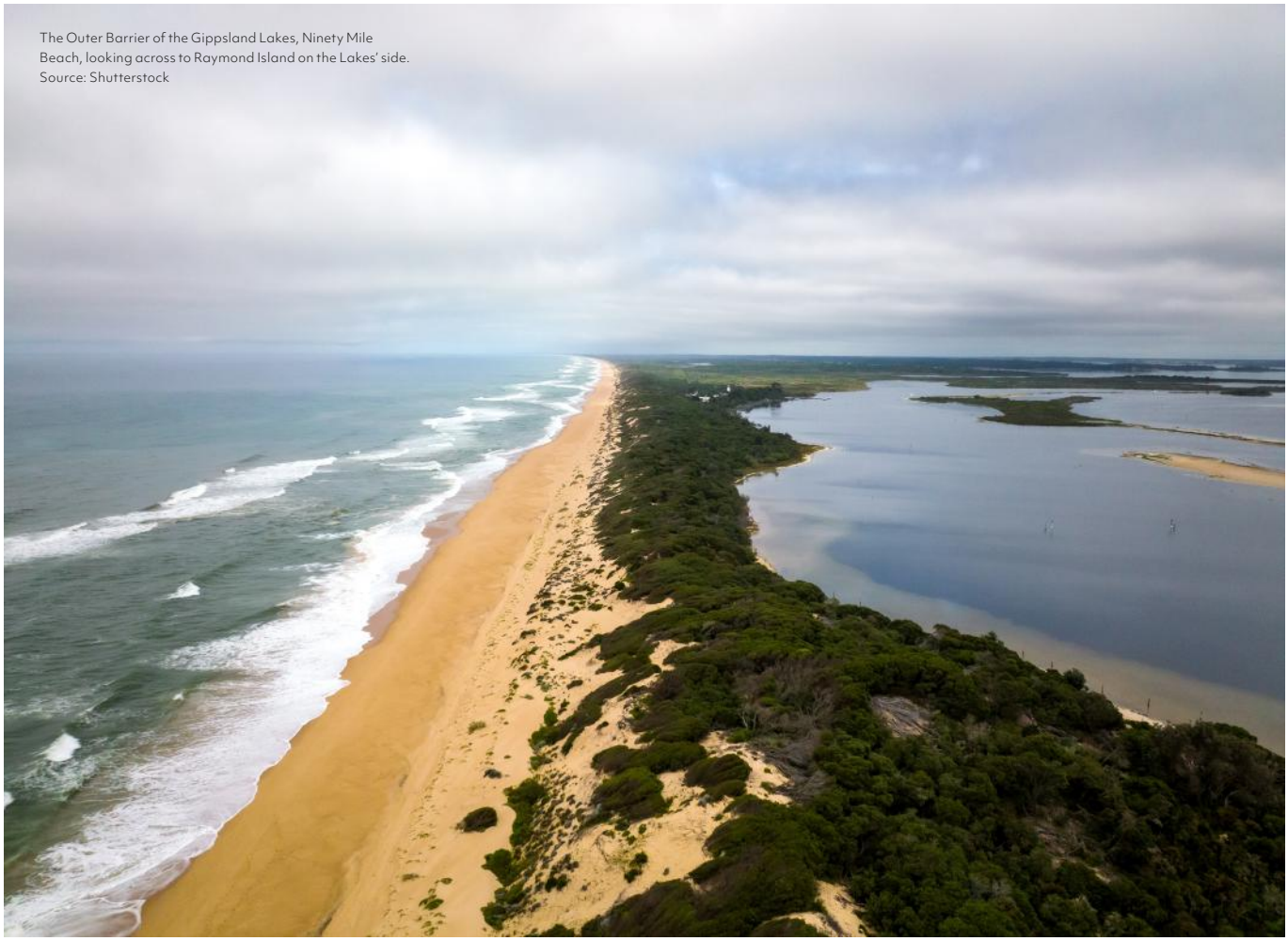
The online content published by CSIRO Publishing extends back to Volume 118, 2006, and is available at **publish.csiro.au/rs**.

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

Submissions

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





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

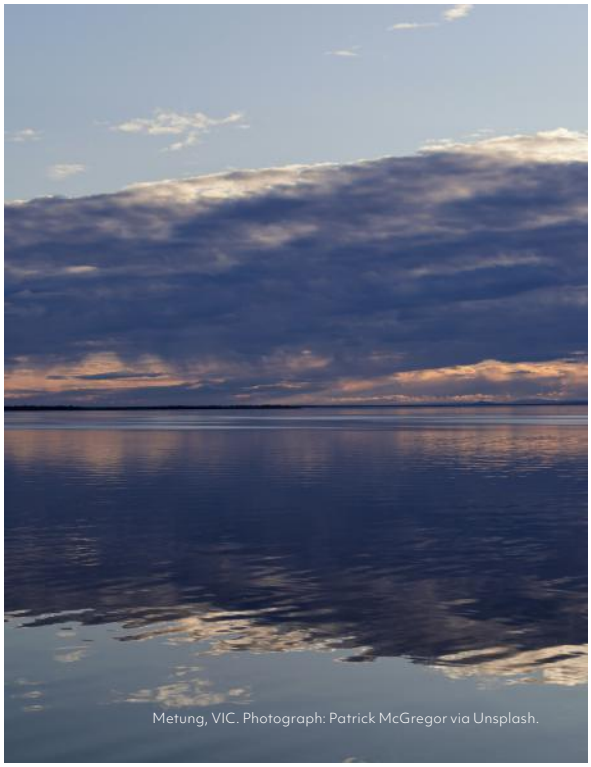
The Future of the Gippsland Lakes

PROCEEDINGS OF THE ROYAL SOCIETY OF VICTORIA, VOLUME 136

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

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

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



Metung, VIC. Photograph: Patrick McGregor via Unsplash.

Papers from Volume 136

Waterbird and migratory shorebird monitoring in the Gippsland Lakes

BY BIRGITA D. HANSEN, CHRIS HEALEY, DEB SULLIVAN, AND DAN R. WELLER

The Gippsland Lakes is 1 of 12 wetland systems in Victoria listed under the Ramsar Convention on Wetlands, with waterbird abundance and species diversity being major contributing factors toward the nomination (Criteria 5 and 6).

Waterbird monitoring in the Gippsland Lakes region has been running since the 1980s. The key programs are BirdLife Australia's Beach-nesting Birds program and Australian Shorebird Monitoring Program, the Gippsland Lakes Important Bird Area monitoring program and the Latham's Snipe Project.

Overall, these programs have revealed variable patterns in abundances across species, with some appearing to decline and others likely to be moving out of the Gippsland Lakes system in wet years. Apparent population decreases may reflect changes in foraging habitat suitability but gaps in survey coverage mean that some birds are almost certainly being missed during monitoring.

Photograph: Zoe Askew via Unsplash

Investment to support a comprehensive assessment of all data sources to determine the specific nature of apparent species' trends is urgently required.

► You can read this open access paper in the *Proceedings of the Royal Society of Victoria* via CSIRO Publishing at **publish.csiro.au/rs/pdf/RS23030**.

Climate change, sea-level rise and the Gippsland shoreline

BY KATHLEEN L. MCINNES

Global warming due to the accumulation of heat-trapping greenhouse gases in the atmosphere is driving changes in the climate system that will have serious implications for global coastlines. Sea-level rise is a major concern for low-lying coastal communities.

Oceans and ice caps have long response times to global warming, and coastal environments are increasingly likely to experience hazards such as coastal inundation and erosion over the coming decades. Sea levels will not increase uniformly due to a range of physical processes.

In the vicinity of the Gippsland coastline, sea-level rise will be slightly higher than the global-averaged sea-level rise because of the influence of the East Australian Current on regional sea levels. Global warming is also driving tropical expansion and a southward shift in the major climate and weather systems of the planet.

Associated with these changes is an enhancement of wind speeds in the westerly wind belt which is causing changes in the wave climate of the Southern Ocean. This, in turn, may influence the coastline of southern Australia. The warming of the oceans and atmosphere is intensifying severe weather systems through greater wind speeds and rainfall totals.

These various factors will cause global to local scale changes, with a potentially compounding effect on coastal hazards as a result of changes in local sea levels, wind and wave climate, severe weather systems and extreme sea levels in the Gippsland Lakes region.

► You can read this open access paper in the *Proceedings of the Royal Society of Victoria* via CSIRO Publishing at **publish.csiro.au/RS/pdf/RS24001**.

Panorama of the Gippsland Lakes. Photograph: Fir0002/Flagstaffotos via Wikimedia Commons (CC BY-NC 3.0)

Current Government Consultations of Interest to Victoria's Science Community

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

Gary Chan via Unsplash

Dmitry Osipenko via Unsplash

CONSULTATION CLOSES 14 AUGUST 2024

Household Waste and Recycling

Have your say on the proposed regulations and service standard for household waste and recycling services

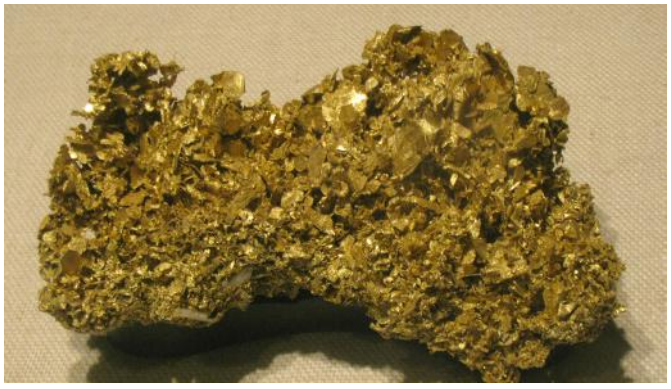
engage.vic.gov.au/setting-the-standard-for-better-recycling-at-home

CONSULTATION CLOSES 30 AUGUST 2024

Help us Shape the Future for Victoria

Victorians have suggested big ideas relating to housing, public transport, parks, community spaces, jobs, and more. We need your feedback on the best way to deliver them.

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



Eden, Janine and Jim via flickr (CC BY 2.0)

Caz Hayek via Unsplash

CONSULTATION CLOSES 30 AUGUST 2024

Fosterville Gold Mine Sustained Operations Project Inquiry

An Inquiry is collecting submissions to consider the environmental effects of the proposed Fosterville Gold Mine Sustained Operations Project.

engage.vic.gov.au/Fosterville-Gold-Mine-SOP-Inquiry

CONSULTATION CLOSES 31 AUGUST 2024

Adapt West - Shaping our Shores

Have your say on how we manage coastal hazards and build resilience for the Port Phillip Bay western shoreline.

engage.vic.gov.au/adapt-west

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*

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

WHO WE ARE

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

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

WHAT WE DO

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

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

WHERE YOUR DONATIONS GO

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

HOW TO SUPPORT

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

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

Become a Member of the RSV

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

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

PhD Candidates

CENTRE FOR EYE RESEARCH
Mr Satheesh Kumar

LA TROBE UNIVERSITY
Miss Buddhila Wickramasinghe
Mr Dimuthu Harshana Yasakeerthi Angage
Ms Liana Theodoridis

LIMS
Mr Sean Cutter

MONASH UNIVERSITY
Miss Fiona Harshini Roy Desmond Godfrey
Mr Bennet Sam Thomas
Mr Luis Fernando Sousa Filho

OLIVIA NEWTON-JOHN CANCER RESEARCH INSTITUTE
Ms Pavitha Parathan

PETER DOHERTY INSTITUTE
Mr Leo Featherstone

PETER MACCALLUM CANCER CENTRE
Mr Jinyun Zou
Miss Kah Min Yap
Mr Priyank Rawat

RMIT UNIVERSITY
Mr Suraj Loomba
Ms Sue Lyn Yap
Mr Jiasheng Zhu

SWINBURNE UNIVERSITY
Ms Brooke Manning
Ms Meysam Firoozbahr

THE FLOREY
Ms Eva Marina Guerrero Hreins
Mr Xavier James Maddern
Miss Elizabeth Anna Kleeman

THE UNIVERSITY OF MELBOURNE
Ms Calla Gould-Whaley
Miss Limin Xu
Mr Imadh Abdul Azeez
Ms Saini Samim
Ms Olivia Lee
Ms Chloe Anne Stringer
Miss Mahsa Alidoostsalimi
Ms Josephin Wong
Ms Thi Lan Dao
Dr Jessica Louis Fairley
Ms Hannah Morgan
Mr Justin Jiashu Ren
Ms Yu-Wen Huang
Ms Saini Samim
Mr Vinícius Werneck Salazar
Dr Ouli Xie

WEHI
Ms Tianwei Chen
Mr Kaiming Li
Miss Leesa Lertsumitkul
Miss Jiyi Pang

Individual Members

DR SRINIVAS GULLAPALLI
Medical Scientist

How to Join

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

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


CENTRAL COUNTY

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

View the Digital Edition
Scan the QR Code or go to:
rsv.org.au/news/science-victoria

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