

SCIENCE VICTORIA

APRIL 2023



NEXT-GEN SOLAR PANELS

Powering Up Our Cities
pg 25

ENERGY TRANSITION

The Silver Buckshot Approach
pg 21

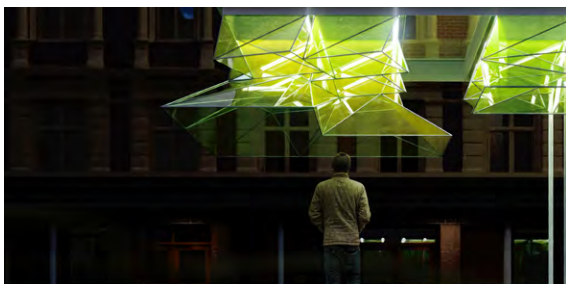
ECLIPSE CHASERS

What They Do in the Shadows
pg 23

PLUS

Snapshots of STEMM
Events & Opportunities
Awards, Prizes, & Fellowships





This Edition: Powering Victoria

The combined scientific, environmental, and economic evidence highlights the critical need to transition away from the use of fossil fuels for electricity production. In this edition, we feature some of the innovative scientific research that rethinks our electricity production, how students are creating models of renewable energy cities, and the multi-faceted approach required to transitioning our energy production, storage, and use.

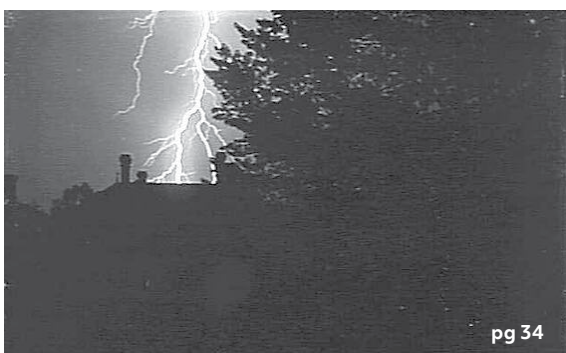
On the Cover: Flinders Street Urban Canopy – integrating luminescent solar concentrators (LSC) into a biophilic tram stop design. Credit: [Team MHP \(excitonscience.com/flinders-street-urban-canopy\)](http://TeamMHP.com)



pg 15



pg 21



pg 34

- 4 FROM THE CEO**
- 5 FROM THE PRESIDENT**
- 8 SNAPSHOTS OF STEMM**
- 10 RSV MEMBERS**
- 11 EVENTS AND OPPORTUNITIES**
11 Seminar: The Occupation of Qatar
- 16 AWARDS, PRIZES, AND FELLOWSHIPS**
- 21 FEATURES AND ARTICLES**
21 “Silver Buckshot” for Energy Transition
23 Eclipse Chasers
25 The Role of Next Generation Solar Panels
27 Building a Renewable Energy City
- 30 FROM THE ARCHIVES**
30 1973: Design and the Living Environment
32 1923: The Pan-Pacific Science Congress
34 1873: A Path of Least Resistance
- 37 INSPIRING VICTORIA**
37 National Science Week School Grants
- 38 PROCEEDINGS OF THE RSV**
38 Call for Scientific Papers
- 39 ENGAGE VICTORIA**
- 40 GUIDELINES FOR AUTHORS**
- 42 RSV SERVICES AND FACILITIES**
- 44 SUPPORT VICTORIA'S SCIENCE SOCIETY**

Please note that the submission deadline for content to be included in the May 2023 edition of *Science Victoria* is **5pm, Friday 14th of April 2023**.



THE STATE & THE NATION

Mike Flattley
CEO, The Royal Society of Victoria

It's been a month focused on national priorities at the Royal Society of Victoria, a strange place to be for a state-based organisation.

I've been learning from colleagues based in Tasmania, Queensland and New South Wales about truth-telling and reconciliation between Settler and Indigenous peoples in the Australian research community for the online, "part one" outing of **Science Meets Parliament**, forming submissions to the Commonwealth's consultation on Australia's Science and Research Priorities with my interstate counterparts managing the Inspiring Australia program, while reviewing the governance and scope of the program with these colleagues and officers from the Department of Industry, Science and Resources (DISR).

Closer to home, we continue our negotiations on 2023 funding agreements for Inspiring Victoria with DISR and the Victorian Department of Education, which in turn brings opportunities to address the status of science education in our State through new partnerships and collaborative projects. So, while I share the frustration of those awaiting word of small grant rounds for community-based Inspiring Victoria and National Science Week activities, I'm pleased to report we're nearly there with funding! I aim to have community grant opportunities to share with you from May onwards. Hang in there.

Meanwhile, the **small grants round** for our schools to conduct activities during National Science Week are currently open, so I urge all teachers and students in primary and secondary schools to start dreaming up something special for August! Details are in the Inspiring Victoria section of this edition of *Science Victoria*. It was a real shot in the arm to finally meet with STAV President Alexandra Abela and her team from the **Science Teachers Association of Victoria** last month. It's increasingly - and worryingly - apparent that we're failing to support the



RSV President Rob Gell AM and STAV President Alexandra Abela. Alexandra is currently based in regional Victoria, working as an Assistant Principal at the Marian College in Ararat.

foundation of Australia's much-discussed "STEM ecosystem," which is our teachers and the students they must engage and inspire to undertake the challenge of post-secondary STEM-based learning and skills acquisition. With the significant, growing number of science educators now teaching "out of field" – basically, without the benefit of tertiary qualifications in a STEM discipline – we confront a problem compounded by a high rate of departure from the profession by experienced practitioners due to the sustained adverse conditions brought about by the pandemic. I think it's time we spoke up as a community for our teachers and an egalitarian commitment to the quality of Victoria's public education system, and I hope you'll support that conviction as we seek a comprehensive investment by Australian governments in improving the conditions, cultural status and efficacy of the teaching profession generally, and science teachers in particular.

Lastly: nominations are open for the **2023 RSV Research Medal**, and also applications for our **Young Scientist Research Prizes (YSRP)**! As the Society welcomes more colleagues from science-based industries as members of our organisation, opportunities to introduce our early career scientists to exciting careers in the private sector are becoming clearer, and the YSRP process is a valuable platform to enable introductions. Be sure to alert the final year doctoral students in your circle to the opportunity; details are in the Awards section.

Mike Flattley
CEO, The Royal Society of Victoria

SCIENCE VICTORIA, VOLUME 3, NUMBER 3, APRIL 2023

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

President Mr Robert Gell AM
Hon. Secretary Mr Jeffrey Luckins
Vice-President Dr Catherine de Burgh-Day
Hon. Treasurer Mr Siddharth Verma
CEO Mr Mike Flattley
Membership, Business & Facilities
Mr James McArthur

Membership
James McArthur
james.mcarthur@rsv.org.au

Events and Commercial
Mike Flattley
ceo@rsv.org.au

Editorial
Editor Mr Scott Reddiex
Associate Editor Dr Catriona Nguyen-Robertson
Layout Design x Rosie

Contributors
Dr Catriona Nguyen-Robertson, Mr Scott Reddiex,
Mr Amit Kessel, Prof. Jacek Jasieniak,
Mr Paul Boys, Dr Warren Stannard

Letters
editor@sciencevictoria.org.au
Please note that letters may be edited for length and clarity

Contact Us
The Royal Society of Victoria
8 La Trobe Street, Melbourne,
VIC 3000
rsv@rsv.org.au
+61 3 9663 5259

Engage With Us Online
rsv.org.au
twitter.com/RoyalSocietyVic
youtube.com/@RoyalSocietyVic
facebook.com/RoyalSocietyVic
instagram.com/RoyalSocietyVic
linkedin.com/company/The-Royal-Society-of-Victoria

Acknowledgement of Country:

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



©2023 The Royal Society of Victoria Inc.



POWERING VICTORIA

Rob Gell AM MRSV
President, The Royal Society of Victoria

The Intergovernmental Panel on Climate Change’s (IPCC) Synthesis Report for the Sixth Assessment Report¹ has reiterated that we have little time to meet the Paris Agreement targets, and will need to significantly revise Nationally Determined Contributions

Currently, we’re heading for +3.2°C; if stated policies are fully implemented, we might be able to keep warming to +2.2°C. To keep to the Paris Agreement target of limiting warming to +1.5°C, we need to reduce emissions by 65% by 2035.

The Victorian Government’s Climate Change Strategy² in parallel with the state’s green energy programme, ‘Victoria’s Clean Energy Future’,³ are together the most ambitious legislated programme of any Australian state, and a leading example on a global scale. The plan includes a shift away from brown coal to ‘green’ energy, decarbonisation of the fossil gas sector, utilisation of Bass Strait wind resources and the revival of the State Electricity Commission (SEC) – the original version of which was disaggregated in 1993.

The Minister for Energy & Resources, Minister for Climate Action, and the Minister for the State Electricity Commission provided an extensive interview: ‘Transformed: Amping up - Victoria’s energy transition; a crucial 12 months ahead’ on the Energy Insiders podcast in February.⁴

“Bringing back the SEC; investing state-owned profits back into Victoria through ownership of some of our generation fleet is something Victorians are proud of and want us to do. The benefits can be shared: more jobs, more renewable energy projects, downward pressure on energy costs and decarbonisation of the electricity system.”

Hon. Lily D’Ambrosio MP, Minister for Climate Action
Energy Insiders, 1 February 2023

The high-level Victorian Government target is to achieve 95% renewable energy generation by 2035. This will include 17 GW of

Limiting warming to 1.5°C and 2°C involves rapid, deep and in most cases immediate greenhouse gas emission reductions

Net zero CO₂ and net zero GHG emissions can be achieved through strong reductions across all sectors

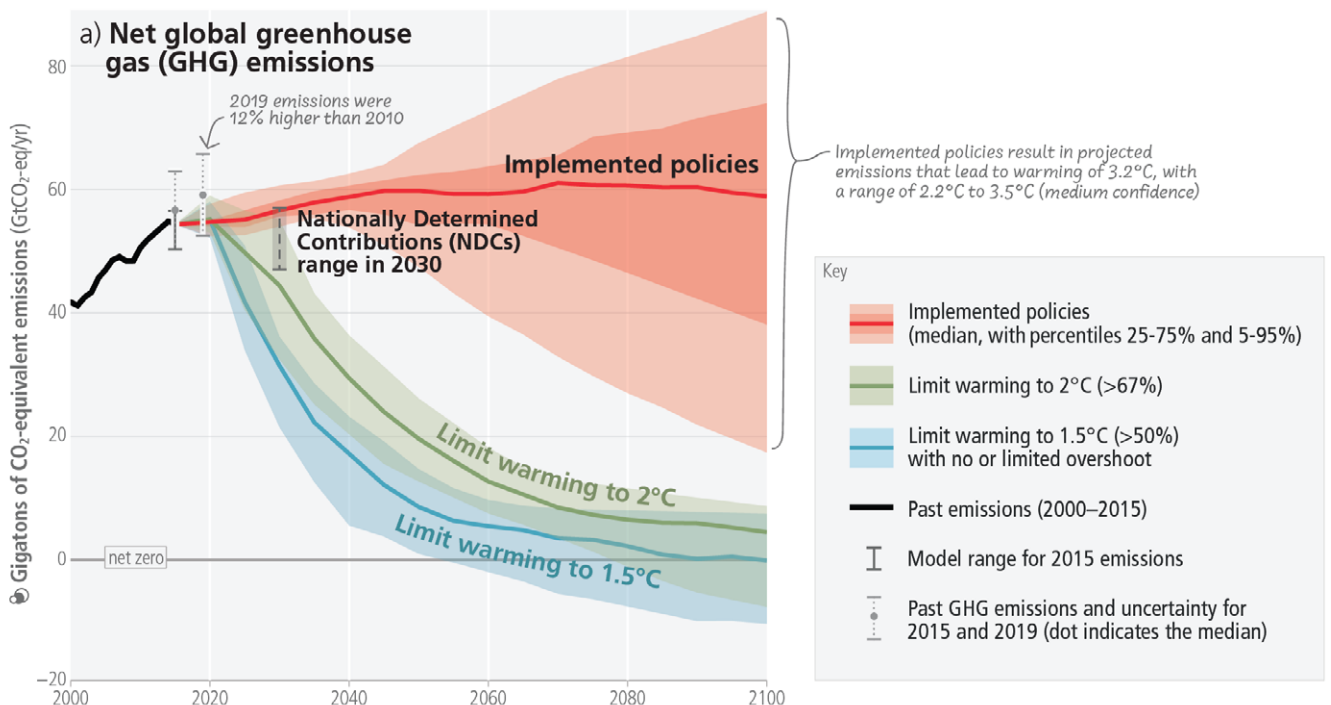
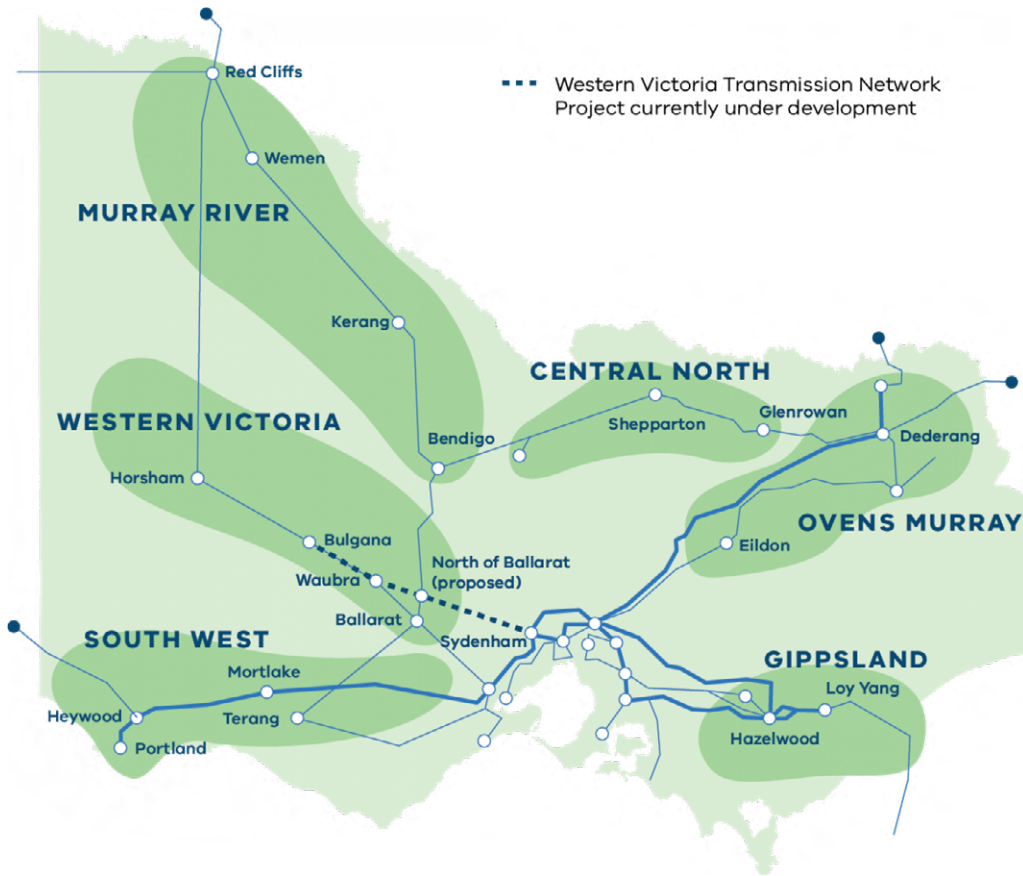


Figure 5a from the IPCC’s AR6 Synthesis Report. Global emissions pathways consistent with implemented policies and mitigation strategies.

FROM THE PRESIDENT



Victoria's Renewable Energy Zones, from: energy.vic.gov.au/renewable-energy/renewable-energy-zones

onshore wind and solar, and the establishment of an area designated an offshore windfarm zone, more than 10 kilometres offshore of Wilson's Promontory. This new generation will be coupled with 6.3 GW of energy storage, 2.3 GW of which will be installed by 2030 and significant transmission network upgrades. The delivery of these targets will require a doubling of Victoria's existing wind and large-scale solar resources in twelve years.

The reestablishment of the SEC is now protected through incorporation in the Victorian Constitution, and the energy transition programme is legislated in the Renewable Energy (Jobs and Investment) Act 2017. Collaboration with the Federal Government is expected to streamline approval for offshore wind projects. Further information can be found at REMPLAN, the Renewable Energy Transition Economic Modelling Tool⁵.

Recent data from the International Renewable Energy Agency (IRENA) shows that global renewable energy generation increased 9.6% in 2022 to 3372 GW accounting for 40% of installed power capacity - a record year for renewable additions despite the energy crisis⁶. The global energy transformation is moving apace, but it needs to increase threefold to stay on a +1.5°C pathway. It seems that the Victorian Government understands the science, and we hope that this continues for both the current and all future state and federal governments.

The Royal Society of Victoria continues to engage with organisations that are focussed on science-based outcomes and we encourage companies to join⁷ as Organisational Members, and other groups to consider affiliation with the RSV to promote science and enable science in Victoria to 'speak with one voice'.

As usual I encourage all readers to write to me (president@rsv.org.au) or our Editor Scott Reddiex (editor@ScienceVictoria.org.au) with your thoughts and ideas.

Rob Gell
President, The Royal Society of Victoria

References:

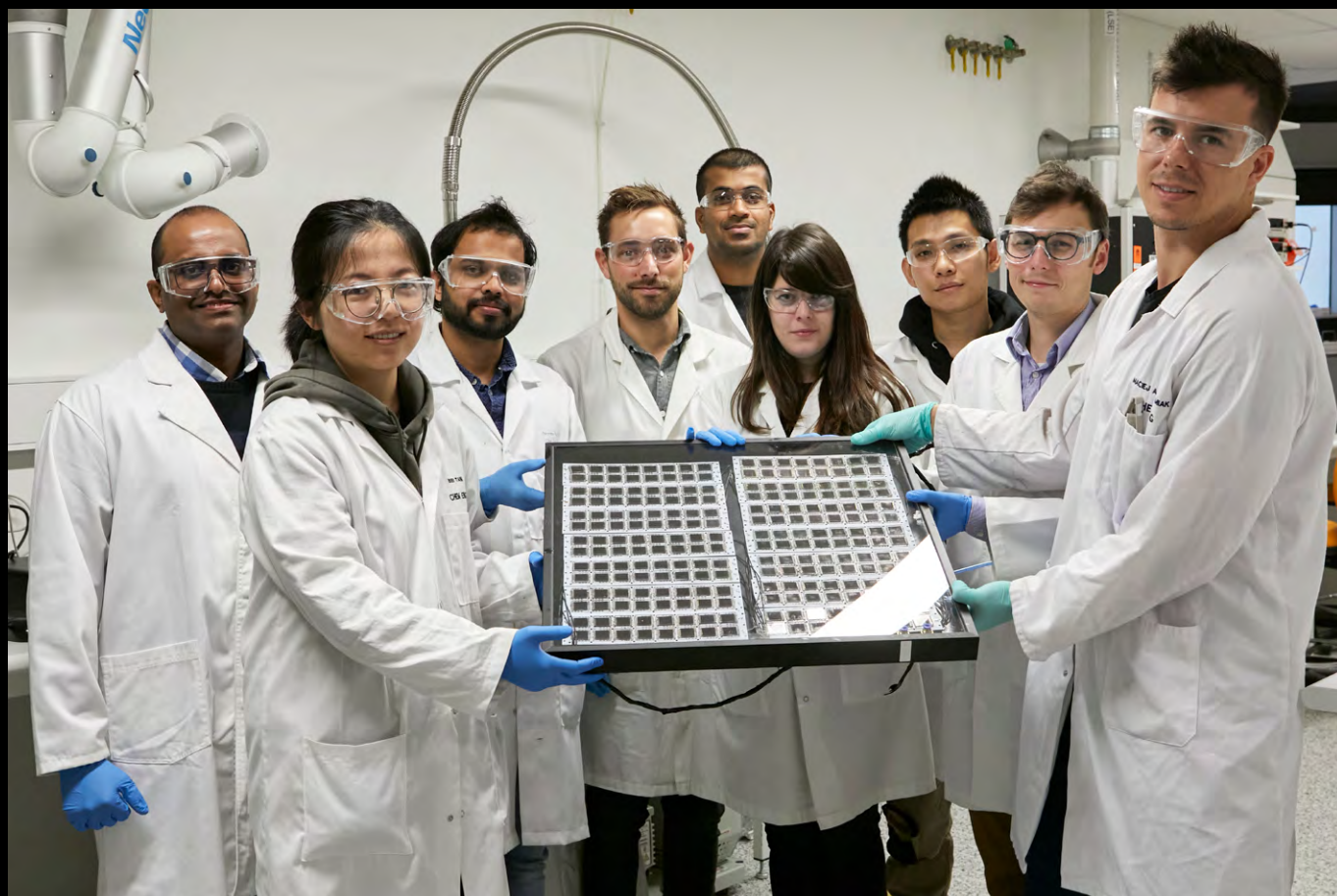
1. IPCC. (2019). AR6 Synthesis Report: Climate Change 2022 — IPCC. IPCC.ch; IPCC. <https://www.ipcc.ch/report/sixth-assessment-report-cycle/>
2. Climate Action, Victorian Dept of Energy, Environment, and Climate Action. <http://climatechange.vic.gov.au/>
3. Energy, Victorian Dept of Energy, Environment, and Climate Action. <http://energy.vic.gov.au/>
4. Energy Insiders Podcast, available from podcasts.apple.com/au/podcast/energy-insiders-a-reneweconomy-podcast/id1198375045?i=1000597469237
5. REMPLAN. <http://renewableenergy.com.au/>
6. IRENA: Renewable capacity statistics 2023. <https://www.irena.org/Publications/2023/Mar/Renewable-capacity-statistics-2023>
7. Become a Member of the RSV. <https://rsv.org.au/how-to-join/>





SNAPSHOTS OF STEMM

Images from everyday science



Members of Professor Udo Bach and Professor Jacek Jasieniak's Research Groups at Monash University and the ARC Centre for Excellence in Exciton Science.

Dr Nirmal Peiris, Dr Boer Tan, Dr Narendra Pai, Dr Sebastian Furer, Dr Gavesha-na Sepalage, Dr Monika Michalska, Jie Zhao, Dr David McMeekin, and Dr Adam Surmiak.



Kartini Béghin, a Learning Facilitator at Scienceworks, doing the Robo Boogie.

Source: Museums Victoria
Photographer: Rodney Start



Dr Jemma Cripps, Arthur Rylah Institute researcher, photographing Mallee birds.

Photographer: Phuong Tran

RSV MEMBERS

NEW RSV MEMBERS

INDIVIDUAL MEMBERS

Ms Mietta Mabets

Undergraduate Student
The University of Melbourne

Dr Patricia Rogers

Independent Consultant
Foodprint Evaluation

AFFILIATES



WESTERN PORT BIOSPHERE

Members of the Royal Society of Victoria are advised of our governing Council's intention to accept the Mornington Peninsula and **Western Port Biosphere** Reserve Foundation as an Affiliate of the Royal Society of Victoria, in accordance with Rule 8 (4) of our governing rules ([rsv.org.au/rules-bylaws](https://www.rsv.org.au/rules-bylaws)).

About the Foundation:

Since 2003, the Biosphere Foundation has worked with the community to create a sustainable future for Western Port – environmentally, socially and economically.

We do this through research, education, community engagement, partnerships and on-ground conservation efforts. The Foundation has tax-deductibility status as an environmental organisation.

The Biosphere Foundation is funded by donations and contributions from the five local governments of the Biosphere – Cities of Casey and Frankston and Shires of Bass Coast, Cardinia and Mornington Peninsula. It also receives grant funding for projects from a number of sources, including the State Government, Federal Government, Melbourne Water and philanthropists.

Further information on the Biosphere's aims and activities is available from www.biosphere.org.au.

BECOME A MEMBER OF THE RSV

The Royal Society of Victoria is the State's oldest scientific society, a part of Australia's intellectual life since 1854. We bring together an independent community of science practitioners, educators, industrialists, and enthusiasts to promote an understanding and utilisation of scientific knowledge for the benefit of the state of Victoria.



\$40/YEAR

Student Membership

For students enrolled full-time at a recognised Victorian education and/or research institution (proof of current, full-time enrolment required for Student Membership commencement/renewal)



\$120/YEAR

Full Membership

Open to all adults (18+) with an interest in science!
A current membership of the Royal Society of Victoria entitles the use of the professional postnominal 'MRSV'. Those elected as Fellows of the Society are entitled to the postnominal 'FRSV'.



\$1000/YEAR

Organisational Membership

For organisations to claim membership of the RSV. Provides a method for general sponsorship of the RSV's programs, along with discounted rates for access to RSV facilities throughout the year.



THE OCCUPATION OF QATAR - A LIVED EXPERIENCE OF CLIMATIC CHANGE

Presented in partnership with International Association of Hydrogeologists Australia, as part of the Inspiring Victoria program.

Central to understanding water in arid settings is the relationship between life on the land and the environment – why people live where they do. This is especially the case in Qatar, where low rainfall and high temperatures, coupled with low relief, result in the absence of fresh surface water – and a relatively hostile natural environment.

Join veteran hydrogeologist Dr Phillip Macumber to trace a 150,000 year history of human activity on the Qatar peninsula, a rich account brought together by geology, hydrology, climatology, regional mythology and archaeology.

ABOUT THE SPEAKER

Dr Phillip Macumber is a hydrogeologist, specialising in environmental hydrology and hydrogeology in Victoria. With qualifications in geology, geomorphology, Middle Eastern studies, and the history and philosophy of science, he completed his PhD in hydrogeology with the University of Melbourne.

In 2009, Phil went to Qatar to assist as a geomorphologist on excavations and investigations at Al Zubarah, which was declared a world heritage site in 2013.

While there, he investigated the nature of life in a country that was essentially a

hyper-arid waterless low-relief desert, where the higher buildings of Doha are three times taller than the highest point in the landscape.

PRICE

In-Person: \$12.90 (non-RSV members)/\$5 (RSV/IAH members)
Online: \$7.11 (non-RSV members)/Free for (RSV/IAH members)

DATE AND TIME

Thu, 27 Apr 2023
6:00 PM - 7:15 PM AEST

LOCATION

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

RESERVE YOUR SPOT AT:

rsv.org.au/events/occupation-of-qatar/



INTERNATIONAL SCIENCE SCHOOL 2023

The fully residential International Science School returns to the University of Sydney in July 2023.

Join top science students from across Australia and around the world for two weeks of inspiring talks by world-renowned scientists, amazing visits to cutting-edge research facilities, loads of hands-on experiments and activities, and a packed program of social events.

Beyond the science, the ISS gives you a chance to explore the university and the beautiful city of Sydney, with loads of new friends from all over the world. You'll stay in boarding accommodation, looked after and mentored by our team of amazing, dedicated staff.

Best of all, ISS2023 is entirely free, funded by the Physics Foundation at the

University of Sydney through support from the NSW DET, the Australian Federal Government, Mulpha Australia, and many generous private and industry donors.

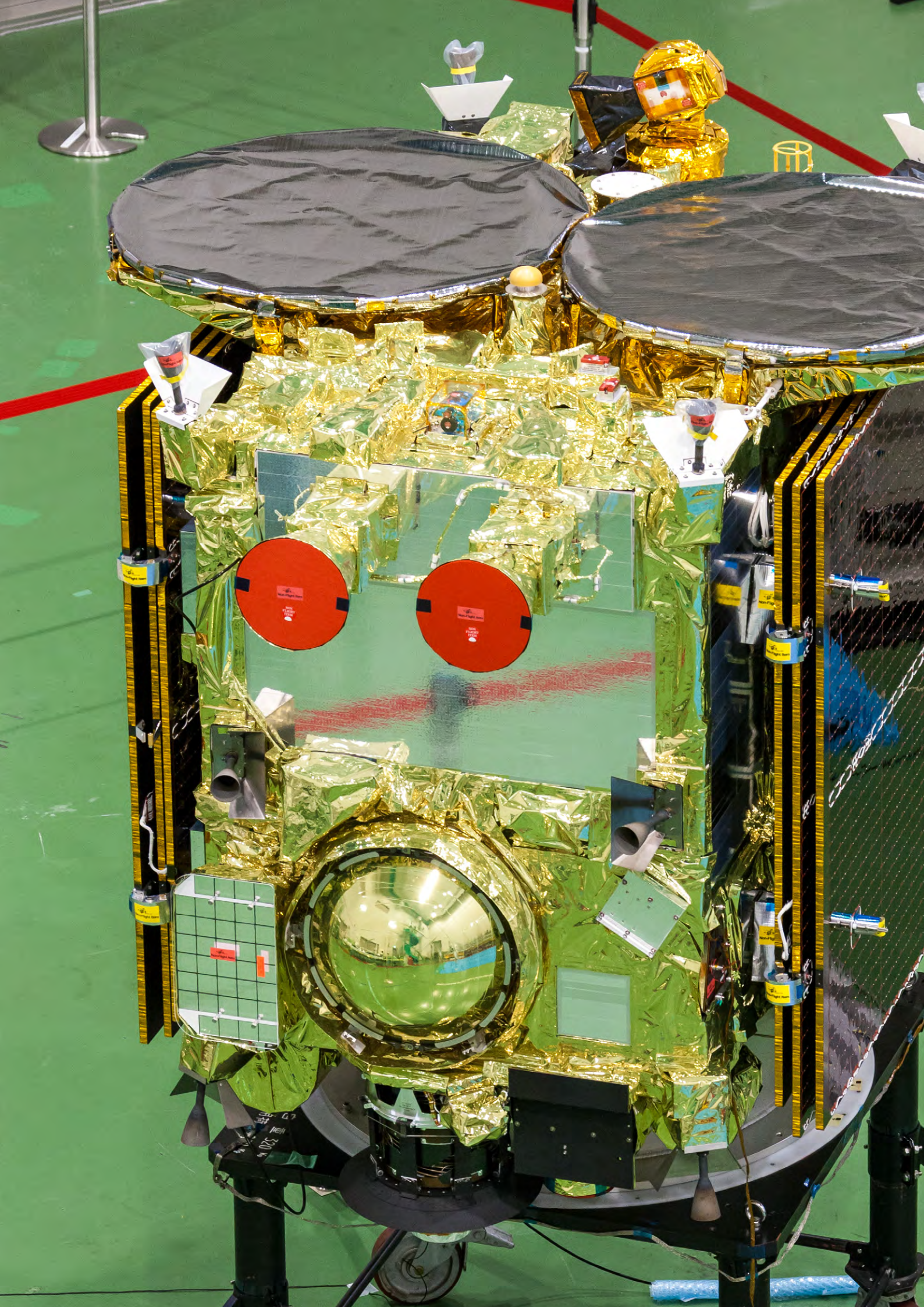
It's going to be fantastic; you don't want to miss this one.

ISS2023 will run from 2-15 July 2023 — science-mad students in years 11 and 12 in 2023 are encouraged to apply.

Applications close **6 April 2023**.

For more information, visit: sydney.edu.au/science/iss





SAMPLE RETURN MISSIONS FROM SMALL BODIES

Seminar:

Sample Return Missions from Small Bodies

Presented by:

Institute of Space and Astronautical Sciences of Japan Aerospace Exploration Agency (ISAS/JAXA)

Hosted by:

The University of Melbourne

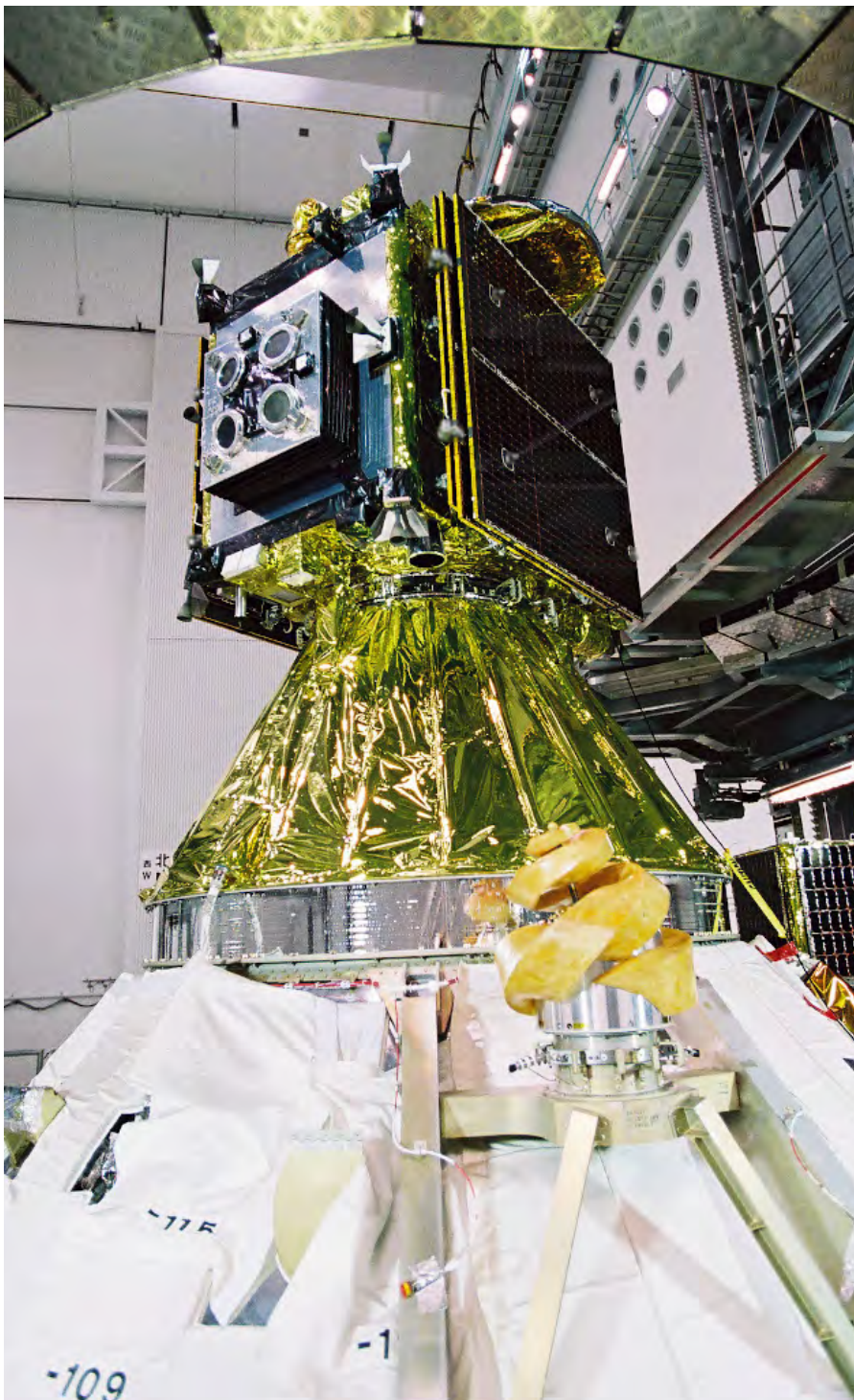
The University of Melbourne is pleased to be hosting a public seminar by Dr Masaki Fujimoto, Deputy Director General of the Institute of Space and Astronautical Sciences of Japan Aerospace Exploration Agency (ISAS/JAXA).

Dr Fujimoto will be discussing extraterrestrial sample return missions and the deepening of collaborations between Japan and Australia in the area of space research.

On December 6, 2020, the Hayabusa2 (<https://www.hayabusa2.jaxa.jp/en/>) sample return capsule landed safely in Woomera, Australia. The capsule was quickly transported to the JAXA curation facility to avoid terrestrial contamination, and revealed that the number of samples taken from the surface of a primordial asteroid named Ryugu was 50 times more than the minimum required.

It is not only the quantity but also the quality of the samples, originating from the very first age of the solar system, that allows Hayabusa2 to be classified as very successful. This success will be followed by MMX, JAXA's Martian Moons eXploration. Launching in 2024, MMX will take samples from the Martian moon Phobos in 2029, before returning to Earth and landing in Woomera, South Australia. MMX is not only a follow-up mission to Hayabusa2, but also the first step in JAXA's Mars exploration program.

Given the high expectations of MMX, and how well JAXA has been supported by Australians, MMX is expected to trigger deeper collaborations between Australian and Japanese science communities.



PRICE

Free

DATE AND TIME

Wed., 12 April 2023, 3:00 pm – 4:00 pm AEST

LOCATION

Fritz Loewe Theatre, McCoy Building, The University of Melbourne.

253-283 Elgin Street Carlton, VIC 3053

RESERVE YOUR SPOT AT:

www.eventbrite.com.au/e/seminar-sample-return-missions-from-small-bodies-jaxa-tickets-573435369627

Opposite: Hayabusa2 Probe
Source: JAXA Digital Archives
Image Credit: JAXA

Left: Hayabusa2 and small sub-payload at Tane-gashima Space Center.
Source: JAXA Digital Archives
Image Credit: JAXA



Australian Academy of Science

Applications close **1 June 2023**.

For more information on these funding opportunities, visit science.org.au/2024-awards-funding

AUSTRALIAN ACADEMY OF SCIENCE FUNDING OPPORTUNITIES 2024

Applications are currently open for research awards, travelling fellowships, and research conference funding from the Australian Academy of Science.

Research Awards

- Aboriginal and Torres Strait Islander Scientist Award
- Margaret Middleton Fund for Endangered Australian Native Vertebrate Animals
- Max Day Environmental Science Fellowship Award
- Thomas Davies Research Fund for Marine, Soil and Plant Biology

Travelling Fellowships

- Graeme James Caughley Travelling Fellowship for ecologists resident in Australia or New Zealand to travel to overseas scientific centres
- Rudi Lemberg Travelling Fellowship for Australians or overseas scientists to visit Australian scientific centres and to deliver lectures
- Selby Fellowship for overseas scientists to visit Australian scientific centres

Research Conference Funding

- Boden Research Conference in the Biological Sciences
- Elizabeth and Frederick White Research Conference in the Physical Sciences
- Fenner Conference on the Environment

UPCOMING RSV EVENTS

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

27 APRIL

THE OCCUPATION OF QATAR (DR PHILIP MACUMBER MRSV)

Joint Meeting and Public Lecture with the International Association of Hydrogeologists, Australia.

Tickets: rsv.org.au/events/occupation-of-qatar

18 MAY

RSV ANNUAL GENERAL MEETING (AGM)

The RSV AGM is the annual review of the Society's financial and programmatic performance. Members of the RSV can register to attend via Zoom or otherwise nominate a proxy.

More details: rsv.org.au/events/2022-annual-general-meeting

22 JUNE

A. W. HOWITT LECTURE

Joint Meeting and Public Lecture with the Geological Society of Australia, Victoria Division.

17 AUGUST

YOUNG SCIENTIST RESEARCH PRIZES

Finalists of the RSV's annual Young Scientist Research Prizes will present their work and the winners announced at this event in August.

More details: [Page 16](#) or rsv.org.au/awards-and-prizes/young-scientist-research-prizes

12 OCTOBER

RSV + AATE MEETING & PUBLIC LECTURE

Joint Meeting and Public Lecture with the Australian Academy of Technology and Engineering

23 NOVEMBER

PHILLIP LAW POSTDOCTORAL AWARD LECTURE

The winner of the RSV's Phillip Law Postdoctoral Award will present their work to a special meeting of the RSV at a public lecture scheduled for the evening of Thursday, 23 November 2023.

More details: rsv.org.au/awards-and-prizes/phillip-law-award/

7 DECEMBER

RSV RESEARCH MEDALLIST LECTURE

The winner of the annual RSV Medal for Excellence in Scientific Research will present a lecture to RSV members and guests on the evening of Thursday, 7th December 2023, at which the Medal will be presented.

More details: [Page 16](#) or rsv.org.au/awards-and-prizes/research-medal

EVENTS AND OPPORTUNITIES

IN LIEU OF LAUGHING GAS: STEMM COMEDY SHOWS

“Science is often thought of as the antithesis to a language-based art like comedy,” says physicist and comedian, Dr Jessamyn Fairfield. “But I think there’s a rich overlap between the two.”

Both science and comedy require a willingness to adapt and tinker with ideas until things work. And for the best results, people need to experiment and think outside of the box.

Science is embedded in our daily lives; from the electronic devices we rely on, to the ingenuity of our plumbing and the medicines we take. Scientific research is a largely publicly funded endeavour, yet it is often made less accessible with jargon, academic journal paywalls, and other forms of gatekeeping. Good communication of science is imperative for

evidence-based policy and a well-informed general public. Why not do it through comedy?

When conveying important messages about climate change, COVID-19, vaccination, and other global issues, simply stating facts does not always work. We all have our own views and biases. We can preach to the choir, but simply listing a longer list of facts will not necessarily help change minds. Another approach, however, might.

As you listen to a story told by a comedian, you wait for a punchline – something that will challenge your perspective or preconceived notion. A comedy show audience is already open to having their mind changed, even if in a subtle way. The malleability of the audience’s mindset in comedy is the reason Dr Jessamyn Fairfield believes that comedy can be a powerful tool for science communication.

Get ready to laugh, let loose, and learn some science with three science comedy shows coming up in April. We could finish up with a good science joke...but all the good ones Argon.



SCI FIGHT scifight.com.au/upcoming-fights

Scientists and comedians will debate whether we are on the brink of the AI-pocalypse, as Sci Fight returns to The Howler on 13 April. A hot topic is artificial intelligence (AI) and ChatGPT: AI seems to be ‘all up in [our] business’ as it becomes increasingly sophisticated and advanced. Designed as a tool to make our lives easier (tailoring a selection of songs

& movies, navigating through traffic, or even writing things on our behalf), it may also pose threats to humanity and society that we have not yet considered. AI ethics student, Joshua Hatherlay, and academic Dr Freda Werdiger, will be up against the likes of writers and performers Elizabeth Flux, Vidya Rajan and Rob Caruana. Join for a raucous night of debate adjudicated by comedian and science communicator, Alanta Colley.



THE SCIENTWITS comedyfestival.com.au/2023/shows/more-wrong-experiments

Science experiments will go awry with The Scientwits’ More Wrong Experiments! After their breakout success last year, The Scientwits return to the Melbourne International Comedy Festival from 12-23 April, performing shows at Albert Park’s Gasworks Theatre. Scientist Sam (Sammy Harrison), a science teacher by

day and stand-up comedian by night, simply wants to conduct experiments in his lab. However, Sam’s assistant, Captain Chaos (John Burgos), constantly – ‘accidentally’ – derails them, making them bigger, messier...and far more exciting! This one-of-a-kind, high-energy, and interactive sketch comedy show for kids (big and small) is not to be missed – you might learn some science too.



THE STEAM ROOM comedyfestival.com.au/2023/shows/the-steam-room

Putting an A (arts) into STEM, The STEAM Room is open for business on 18 & 19 April. The STEAM Room began when PhD researcher and Sydney stand-up, Luke Steller, proposed to teach scientists how to perform comedy. Comedians convey their material in an entertaining and effective way, and Luke wanted to

help people in STEM do the same. A team of scientists have been in comedy training over the past months to turn their research about psychedelics and the chemistry of tyres into stand-up sets. The show will also be headlined by Dr Karl, astrophysicist Kirsten Banks, and science drag queen extraordinaire, Diva Attenbra.

AWARDS, PRIZES, AND FELLOWSHIPS

RSV Young Scientist Research Prizes

Applications are now open for the 2023 RSV Young Scientist Research Prizes.

Four prizes are awarded annually to final year PhD students, one each for Biomedical & Health Sciences, Biological Sciences (Non-human), Earth Sciences, and Physical Sciences.

The Society is grateful for the generosity of our members, past and present, in supporting these prizes. The Biological Sciences (Non-human) prize and Earth Sciences Prize are supported by the legacy of previous Presidents, Edmund D. Gill and Neil Archbold respectively.

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

The category of Biological Sciences (Non-human) includes

the fields of Agriculture, Biochemistry, Botany, Cell Biology, Ecology, Evolutionary Biology, Forestry, Zoology, and related non-human science.

The category of Earth Sciences includes the fields of Geochemistry, Geochronology, Geology, Geophysics, Planetary Physics, Meteorology, Oceanography, Palaeontology, Physical Geography, and related sciences.

The category of Physical Sciences includes the fields of Astronomy, Astrophysics, Chemistry, Mathematics, Physics, all branches of Engineering, and related sciences.

Applications close **31 May 2023**

For more information, including eligibility criteria and application details, visit rsv.org.au/awards-and-prizes/young-scientist-research-prizes



RSV Medal for Excellence in Scientific Research 2023

Nominations are invited for the RSV Medal for Excellence in Scientific Research. In 2023, this award will recognise excellence in Category III: Earth Sciences.

The Earth Science Category includes research undertaken in the disciplines of Geology, Geochemistry, Geochronology, Geophysics, Planetary Physics, Meteorology, Oceanography, Physical Geography, Palaeontology and related sciences.

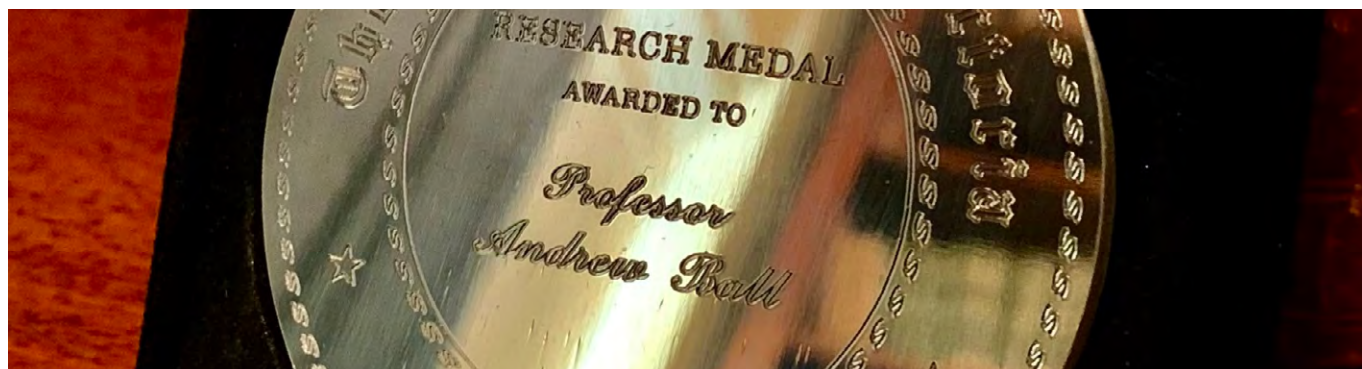
In its centenary year (1959), the Royal Society of Victoria instituted a Medal for Excellence in Scientific Research. The Award consists of a Silver Medal, which is awarded annually for scientific research in one of four categories (rotating each year).

The award of the Medal is based on demonstration of the

candidate's excellence and leadership in scientific research. The candidate's research work shall have been carried out in or on Australia (including its territories), with preference for work done in or on Victoria.

Nominations close **31 July 2023**

For more information, including criteria and details on how to nominate, visit rsv.org.au/awards-and-prizes/research-medal/



AWARDS, PRIZES, AND FELLOWSHIPS



On behalf of the Australia Academy of Science

Australian Academy of Science Awards 2024

Nominations are currently open for the Australian Academy of Science's 2024 Honorary Awards for Science Excellence.

PREMIER AWARDS

- Macfarlane Burnet Medal and Lecture (biological sciences)
- Ruby Payne-Scott Medal (any branch of the physical and biological sciences)

CAREER AWARDS

- David Craig Medal and Lecture (chemistry)
- Haddon Forrester King Medal sponsored by Rio Tinto (mineral exploration)
- Ian Wark Medal and Lecture (applied sciences)
- Mawson Medal and Lecture (Earth sciences)
- Suzanne Cory Medal (biomedical sciences)

MID-CAREER AWARDS

Mid-career awards are for researchers 8 to 15 years post-PhD in the calendar year of nomination.

- Gustav Nossal Medal (global health)
- Nancy Millis Medal for Women in Science (any branch of the physical and biological sciences)

EARLY-CAREER AWARDS

Early-career awards are for researchers no more than 10 years post-PhD in the calendar year of nomination.

- Anton Hales Medal (Earth sciences)
- Christopher Heyde Medal (pure mathematics, applied, computational and financial mathematics)
- Dorothy Hill Medal (Earth sciences)
- Fenner Medal (biology, excluding biomedical sciences)
- Frederick White Medal (physical, terrestrial, and planetary sciences)
- Gottschalk Medal (medical sciences)
- John Booker Medal (engineering sciences)
- Le Fèvre Medal (chemistry)
- Pawsey Medal (physics)
- Ruth Stephens Gani Medal (human genetics, including clinical, molecular, population, and epidemiological genetics and cytogenetics)

Nominations for all awards close **1 May 2023**.

For more information, and to view previous winners, visit science.org.au/2024-awards-funding



On behalf of the Foundation for the WA Museum

FameLab Australia

Applications are currently open for the FameLab Australia competition.

FameLab is the largest, public-facing science communication competition and training program in the world. FameLab Australia is proudly produced by the Foundation for the WA Museum in partnership with Cheltenham Festivals UK.

This year, applicants will be selected to compete in four regional semi-finals across Australia. 12 of the semi-finalists will be chosen and will be flown at FameLab's expense to Perth for the Australian final on 21 September 2023. Our FameLab winner will then go on to represent Australia at the FameLab International Finals in November 2023 in front of a global audience, and will win a trip to the world-famous Cheltenham Science Festival in June 2024.

To start, qualified applicants will attend a science communication training workshop to help them prepare their first presentation – a 3-minute video submission. The applicants chosen for the semi-finals will receive additional science communication training provided by subject matter experts. The finalists who are selected from the semi-finals will receive additional Masterclass training as well as a free, immersive, 3-night SciComm experience in Perth in September where they will compete live on stage for the title of Australian FameLab Winner.

Applications close **15 April 2023**.

For more information, including previous winners and how to apply, visit support.fwam.com.au/famelab or contact FameLab Project Manager Wayne Lubbe at wlubbe@fwam.com.au.

MORE ABOUT FAMELAB AND THE SCIENCE COMMUNICATION GENERATION

In recent years, the importance of high-quality science communication has been increasingly recognized as an essential skill for researchers. Communicating research findings to different audiences in a clear and engaging way is crucial for creating understanding and interest in science. Fortunately, there are many opportunities for scientists to test and develop their science communication skills, including science communication competitions.

One such competition is FameLab, an international science communication competition that originated in the UK in 2005. The competition was created by the Cheltenham Science Festival in partnership with the British Council, with the aim of discovering and supporting young scientists to communicate their research to a general-public audience.

In 2014, the FameLab competition arrived in Australia, thanks to the efforts of WA Museum CEO Alec Coles and Professor Lyn

AWARDS, PRIZES, AND FELLOWSHIPS

Beazley, a previous Chief Scientist for Western Australia. Since then, it has grown to become an annual highlight on the science communication calendar.

The format is straightforward: contestants have just three minutes to present their research in an original, engaging way, while following the two cardinal rules of FameLab: no jargon, and no PowerPoint. Presentations are judged on content, clarity, and charisma.

The format is simple, yet challenging. Contestants have just three minutes to present their research in an original, engaging way, while following two cardinal rules: no jargon and no PowerPoint. Presentations are judged on content, clarity, and charisma.

It provides an opportunity for early career researchers to bring fame to their lab, showcase their research projects, represent their field of expertise, and raise the profile of the organisations at the forefront of science and research in Australia.

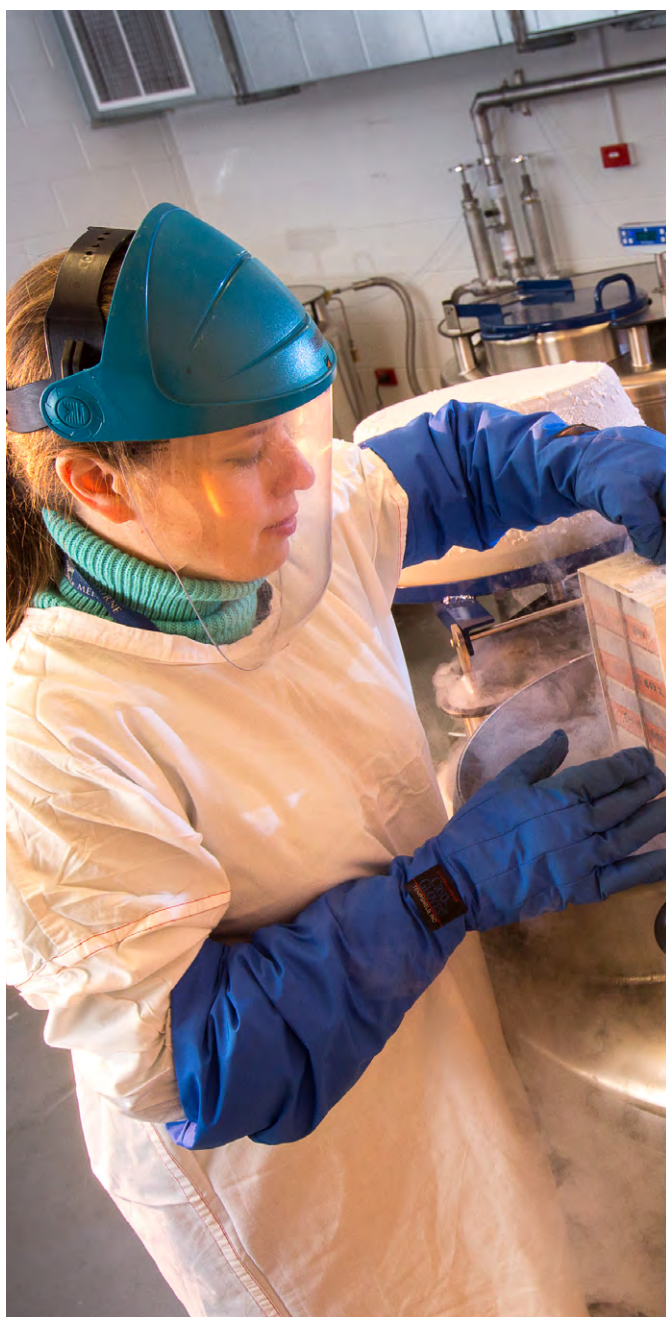
FameLab Australia also provides participants with training and development opportunities, such as workshops on public speaking, media training, and science communication.

Australia has produced some outstanding science communicators, who have gone on to achieve great things. Many previous winners and participants have given TEDx talks, written books, and become media go-to people for interviews on their area of expertise. These achievements highlight the value of FameLab in supporting and promoting young scientists with a passion for science communication.

As the competition continues to grow and evolve, we can expect to see even more talented scientists using their communication skills to inspire and engage the public.

About the author:

Wayne Lubbe is the Project Manager for FameLab Australia, on behalf of the Foundation for the WA Museum.



Applications for the Australian Academy of Technological Sciences & Engineering's Elevate: Boosting Women in STEM Program commencing in 2024 are currently open.

The Elevate: Boosting Women in STEM program will award up to 500 undergraduate and postgraduate scholarships to women in STEM. The program aims to address gender inequities in STEM through fostering more women-led industry-academia collaborations in applied research and business, growing professional skills of women in STEM, and propelling women into leadership.

The Elevate program provides:

- A scholarship
- Access to events and networking
- Mentoring
- Ongoing support during scholars' university studies

Applicants are required to meet three eligibility criteria:

- Identify as a woman or non-binary person
- Be enrolling as a domestic student
- Be planning to undertake a STEM degree or higher studies to improve business acumen at an Australian university, commencing in 2024

For more information, including application and eligibility guidelines, visit atse.org.au/career-pathways/elevate/

Left: Lyudmila Kostenko, at the Peter Doherty Institute for Infection and Immunity

AWARDS, PRIZES, AND FELLOWSHIPS



On behalf of the Field Naturalists Club of Victoria Inc

Australian Natural History Medallion

Nominations for the 2023 Australian Natural History Medallion are now open.

The Australian Natural History Medallion is awarded annually in recognition of services to Australian natural history, and is administered by the Field Naturalists Club of Victoria Inc. Previous medallion winners include mycologist Dr Genevieve Gates (2022), botanist Peter Latz (2021), and ornithologist Craig Morley (2020).

Eligibility:

Nominations are open for anyone who has increased popular and/or scientific knowledge of Australian natural history (biological or physical) in the preceding 10 years.

Nominees may have:

- Assisted notably in the protection and understanding of Australian native flora and/or fauna;

- Discovered and and/or described new Australian species of plants or animals; or
- Devoted considerable time and care to the study of any branch of Australian natural history, including palaeontology and geology, and the dissemination of knowledge through the publication of articles or books or by photography or pictorial art or any other means accepted by the Award Committee.

NB. Information pertaining to the nominee's activities prior to the preceding ten years may be included in the nomination if the nominating Society judge it to be pertinent.

If you would like to nominate a candidate for the Australian Natural History Medallion, please contact Maxwell Campbell, Secretary of the Field Naturalists Club of Victoria, for more information on **0409 143 538** or by email at mcam7307@bigpond.net.au. Nominations must be received by **1 May 2023**.



On behalf of the Australian Institute of Policy and Science

Young Tall Poppy Awards 2023 Prize

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

The Tall Poppy Campaign was created in 1998 by the Australian Institute of Policy and Science (AIPS) to recognise and celebrate Australian intellectual and scientific excellence and to encourage younger Australians to follow in the footsteps of our outstanding achievers. It has made significant achievements towards building a more publicly engaged scientific leadership in Australia.

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

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

All applications should be made via the online application form, which will be available from **14 February 2023**.

All applicants will be advised of the outcome of the respective State Selection Panels, which generally meet between June and September as arranged.

For further information, and to apply, go to the Tall Poppy Campaign website: aips.net.au/tall-poppy-campaign





“SILVER BUCKSHOT” FOR ENERGY TRANSITION

by Dr. Catriona Nguyen-Robertson MRSV

This article revisits Simon Holmes à Court’s presentation to the Royal Society of Victoria and the Australian Academy of Technology and Engineering (Victorian Division) in July 2021, and discusses where we are two years on.

Climate change is widespread, rapid, and intensifying. In 2022, the global mean surface temperature was around 1.15°C warmer than the pre-industrial baseline¹.

We are already beginning to experience the drastic impacts of climate change, and it will be the only reality that our children, and their children, ever know. Every child will inherit a planet with more frequent extreme weather events than ever before. It is they who will be saddled with the consequences of our decisions, and our actions (or rather, our inaction).

Multiple estimates strongly suggest that we will cross the alarming global warming level line of 1.5°C in the 2030s^{2,3}. Unless there are immediate, rapid, and large-scale reductions in greenhouse gas emissions, limiting warming to 1.5°C – or even 2°C – will be beyond our reach.

As we endeavour to become more sustainable, energy transition towards more renewable sources is accelerating. Solar and wind energy are replacing coal. Australia had installed more renewable generation infrastructure in the three years leading up to 2020 than the thirty years prior. While these are positive steps, Australia also has the highest per-capita greenhouse gas emissions of any other advanced economy, and is nowhere near close to reaching its Paris Agreement goals.

Global greenhouse gas emissions continued to increase in 2022¹. In Victoria alone, over 2 million people use gas in their homes and businesses – more than any other state or territory⁴. The Victorian gas sector contributes to around 17% of our state’s net greenhouse gas emissions and must play its part in reducing emissions over time⁴.

HOW CAN WE TURN THIS AROUND?

For political activist Simon Holmes à Court, it began with a house he built in Daylesford. Off the main power grid, it was powered by a solar battery. While the battery would be fully charged by early morning during summer, he found that had to rely heavily on his diesel backup in winter – not ideal from a renewable energy point of view. He wanted to use wind power instead.

Simon and others in the local community formed a cooperative, Hepburn Wind, with the goal of powering the area with wind energy. Somehow, Simon accidentally became the Founding Chair at their first meeting. Within 24 months, they had raised \$10 million for two wind turbines called Gale and Gusto. In 2011, Gale and Gusto were connected to the grid as Australia’s first community-owned wind farm, producing enough clean energy for over 2000 homes. At the centre of the project, Simon became determined to see renewable energy projects being rolled out across Victoria and the rest of the country.

The Victorian government’s Gas Substitution Roadmap, released in July 2022, is a step in the right direction⁴. By removing

outdated laws that forced new homes to connect to gas, and increasing thermal efficiency standards, our homes will be easier to heat and cool without heavily relying on gas. However, this roadmap should have also included more urgent investment in electrification across Victoria to support our state’s transition away from gas. If we are to move away from gas, we need alternate options.

“There is no silver bullet for carbon change”

With buildings switching from gas to electricity, it becomes increasingly imperative that our electricity comes from sustainable sources. The 2017 Finkel Report determined that the electricity sector was Australia’s largest source of pollution, accounting for 35% of our greenhouse gas emissions⁵. The Report also acts as a blueprint to take us in a different direction by ramping up renewables and energy storage uptake. Simon was heartened that it showed coal rapidly being phased out as Australia transitioned to other sources of energy, with wind and solar becoming the champions.

But for times when ‘the wind doesn’t blow and the sun don’t shine’, we will still need to rely on dispatchable generation to keep the lights on. Just like food, energy can come in “fresh” or “frozen” forms – either being fed directly into the grid and used as it is produced, or being stored in power systems that can be turned on and off. Moving forward, Simon hopes that we will rely on solar batteries and hydro power as clean forms of “frozen” energy.

Australia has three pumped storage hydro schemes that can provide several days to a week’s worth of energy in a pinch. But we have so few as the infrastructure to support hydropower needs to be bespoke, and placed where it has access to the grid but in an area that is not environmentally sensitive. Instead, it is easier and cheaper to produce solar panels as they are simply copies of each other. Australia now has the highest adoption of rooftop solar per capita, plus they are highly effective here. According to Simon, even if a solar panel is placed on the wrong (south-facing) side of an Australian house, it will still generate more electricity than one in Germany. It therefore makes both environmental and economic sense for us to shift to solar energy.

With a shift to solar and wind energy and decrease in coal usage, the electricity sector is reducing carbon emissions. However, the gains in this sector are being overwhelmed by emissions from others. Simon therefore advocates for a reduction across the whole economy: ‘we should electrify everything and move to 100% renewables,’ he says.

The transport industry is a major contributor to greenhouse gas emissions. Compared to other developed nations, Australia’s standards for fuel quality, efficiency, and emissions are well be-

hind. With population growth, more people are using cars with poor standards – it is unsurprising that emissions are on the rise.

Australians want to change, but it is difficult without legislative support. More than half of Australians consider an electric vehicle as their next car⁶, but there simply are not enough in the country to sell. Although there is high demand, electric vehicle sales represented only 3.2% of new car sales last year⁷. Manufacturers prioritise countries that will penalise them if their product does not meet certain fuel efficiency standards – and that's not Australia. Setting fuel efficiency standards would help drive a push towards electric transport.

Public transport is also a sustainable way to get around Victoria, and transitioning its energy source will mean that they are even more environmentally friendly. Last year, the Victorian Government flicked on the switch of 200 solar panels in the Southbank depot to power the Yarra Trams network. New solar panels across seven depots are expected to cut carbon emissions by up to 350 tonnes and excess power will be fed back into the network.

We have much to learn from other countries that have spent the past decade, not thinking about *whether* they should transition, but *how* they could.

But we cannot stop there: we need to approach reducing our carbon emissions from every angle possible. 'There is no silver bullet for carbon change,' says Simon, quoting Bill McKibben. 'Only silver buckshot – we need a combination of many transitions, not in the electricity sector alone.'

Simon believes that we have much to learn from other countries that have much more advanced thinking in this space as they have spent the past decade, not thinking about whether they should transition, but how they could.

Emerging Australian projects demonstrate that we, too, can be leaders in energy transition. The Tasmanian Government's Renewable Hydrogen Industry Development Funding program envisages the construction of one of the world's largest green hydrogen plants. Hydrogen is a budding fuel choice for countries seeking to decarbonise their economies, and Tasmania is on track to be a global leader in green hydrogen production by 2030. At the end of February 2022, the Tasmanian Government proposed a legislative change to enable Tasmanian irrigation to supply bulk raw water to the Tasmanian Green Hydrogen Hub. With farmers and green hydrogen working together, Tasmania could produce renewable hydrogen for domestic use and for export around the world.

A second project that Simon was excited for in 2021 was the Sun Cable Australia-Asia PowerLink project that aims to build the largest solar energy infrastructure network in the world. The company's existing plans are to build a solar farm and battery storage facility in one of the most reliably sunny places on the planet in the Northern Territory by the end of the decade. The original goal was to supply Darwin and Singapore with reliable renewable energy via a 4,500km transmission system (including 3,750km of sub-sea cable). However, at the beginning of this year, Sun Cable was placed into voluntary administration after a falling-out between its two financial backers. The Chair of Sun Cable is adamant that the project will still go ahead, however its vision no longer includes funnelling renewable energy all the way to Singapore via a cable that would cost about \$35 billion.

The news is a blow to global decarbonisation efforts given that Singapore is extremely land-constrained and would not be able to house a 12,000-hectare network of solar arrays itself. Nonetheless, the project will hopefully still deliver reliable, 24/7 renewable energy to the Northern Territory.

Victoria is taking promising steps forward too, having started the formal re-establishment of the State Energy Commission (SEC), decades after the privatisation of state-owned electricity assets. An initial investment of \$1 billion will be spent to deliver 4.5GW of power through renewable energy projects so that 95% of Victoria's electricity can be sourced from renewable energy by 2035.

As Australia becomes a renewable energy superpower with these projects and more, the cost of energy will fall. As Simon points out, the plans and technologies exist, but if we are to reach our Paris Agreement targets, we need the political and financial support as well as coordination between sectors and governments. We have so much potential to be world leaders in energy transition as we fire "silver buckshot" to hit net zero.

Simon Holmes à Court's presentation 'Decarbonising Energy: At the Tipping Point' is available to watch now on the RSV's YouTube channel: in brief at youtu.be/5-JZDBAGXO4 or in full at youtu.be/qtpHVBgozA8.

References:

1. World Meteorological Organization (WMO), 'Provisional State of the Global Climate in 2022', 2022, storymaps.arcgis.com/stories/5417cd9148c248c0985a5b6d028b0277
2. Climate Council, 'Aim High, Go Fast: why emissions need to plummet this decade', 2021, climatecouncil.org.au/wp-content/uploads/2021/04/aim-high-go-fast-why-emissions-must-plummet-climate-council-report.pdf
3. The Intergovernmental Panel on Climate Change (IPCC), 'Assessment Report 6 Synthesis Report', 2023, ipcc.ch/report/ar6/syr/
4. Department of Energy, Environment and Climate Action, 'Victoria's Gas Substitution Roadmap', 2022, energy.vic.gov.au/renewable-energy/victorias-gas-substitution-roadmap
5. Finkel A et al., 'Independent Review into the Future Security of the National Electricity Market - Blueprint for the Future', Commonwealth of Australia, June 2017, energy.gov.au/publications/independent-review-future-security-national-electricity-market-blueprint-future
6. Electric Vehicle Council, 'Consumer Attitudes Survey 2021' 2021, electricvehiclecouncil.com.au/reports/consumer-attitudes-survey-2021/
7. Federal Chamber of Automotive Industries (FCAI), 'FCAI releases 2022 new car sales data', 2023, fcai.com.au/news/index/view/news/787



Simon Holmes à Court. Image credit: Kristoffer Paulsen.

ECLIPSE CHASERS



by Dr. Catriona Nguyen-Robertson MRSV

This article follows Eclipse Chasers book launch, hosted by the Royal Society of Victoria (RSV), the Astronomical Society of Victoria (ASV), and CSIRO Publishing on 14 March 2023.

Joining the authors, historian Dr Toner Stevenson and astrophysicist Prof Nick Lomb, were Dr Tanya Hill (Senior Curator in Astronomy at Museums Victoria), Mark Iscaro (ASV President) and Dr Robin Hirst (formerly Director Collections Research and Exhibitions at Museums Victoria) for a discussion facilitated by Mike Flattley (RSV CEO).

'Witnessing a total solar eclipse is a wondrous and unforgettable event,' – so says the blurb of Dr Nick Tomb and Dr Toner Stevenson's latest book, *Eclipse Chasers*.

If you ever get the chance to see a total solar eclipse, Dr Robin Hirst, who was Director of Collections, Research and Exhibitions for Museums Victoria for almost two decades, recommends standing high up and looking down below. The shadow of the Moon races across the Earth at around 1 km/s. Then, a 'diamond ring' of the Sun's crown shines once the rest is blocked out. Even if you do not observe the eclipse itself through the clouds, it is magical. Dr Toner Stevenson recalls hearing birds stop chirping, seeing horses huddle together, and flowers close up as the Sun disappeared.

Eclipse Chasers showcases the drama and beauty of total solar eclipses and is essential reading for anyone fascinated by these amazing events. The book, written by Dr Toner Stevenson from the University of Sydney and Professor Nick Lomb from the University of Southern Queensland, unveils First Nations knowledge, previously hidden contributions from women, and past expeditions to chase eclipses. It also looks forward, so that you can prepare your celestial view for the next two decades of Australian eclipses.

WHAT IS AN ECLIPSE?

'Eclipses are all about shadows,' says Dr Tanya Hill, Senior Curator, Astronomy at Museums Victoria. Whether it is the Earth's shadow on the Moon for a lunar eclipse, or the Moon's shadow on Earth for a solar eclipse. When the Moon passes between Earth and the Sun, thereby totally or partially obscuring our view of the Sun, we witness a solar eclipse. It happens due to 'crazy coincidence: the Moon is 400 times smaller than the Sun, but it's also 400 times closer'. This means that, from Earth, the Moon and Sun appear to be roughly the same size in the sky, and the Moon appears large enough to block our view of the Sun. The Moon does not cast a shadow over the entire Earth at once, but rather, is seen over a particular spot.

The Sun is enveloped by a corona, or crown, which is its outermost atmosphere. The corona is usually hidden – or rather drowned out – by the bright light of the Sun's surface, but it can be seen during a total eclipse. A view of totality from Australia is rare, having occurred only five times last century. However it is predicted to occur more frequently in this century – five times in the next 17 years alone. Nick and Toner have travelled the world chasing eclipses, and their book outlines how we can too.





Dr Toner Stevenson and Prof Nick Lomb signing copies of *Eclipse Chasers*.

Tanya remembers staring at her feet in the school yard for assembly during the 1984 solar eclipse. The students were somewhat ominously told that something was happening to the Sun, but they were not allowed to look. Similarly, RSV CEO Mike Flattley's parents had drawn all the blinds in the house in preparation for an eclipse and encouraged him to hide under the bed. But when you do look at a solar eclipse – with all the proper safety precautions – they are incredible. Mike is now out from underneath the bed, and excited to learn how to witness an eclipse thanks to *Eclipse Chasers*, and share this experience with his children.

A LEGACY OF ECLIPSE CHASERS

With continuous observations of the sky over tens of thousands of years, the First Peoples were the first astronomers of these lands. The rare, brief total solar eclipses are well known in the knowledge systems of Aboriginal and Torres Strait Islanders, who have witnessed them hundreds of times over millennia. They knew that it was the Moon that blocked the Sun – and that this would only ever happen during a New Moon. A/Prof Duane Hamacher and Uncle Ghillar Michael Anderson, Senior Law Man, Elder, and leader of the Euahlayi Nation, contributed a chapter to the book, detailing the eclipses embedded within First Peoples' knowledge and traditions.

The total solar eclipse of December 1871 was the first eclipse Nick researched and remains his favourite. The RSV President at the time, Robert L. J. Ellery, led an expedition of astronomers from Melbourne and Sydney to Cape York to view it. While the overcast weather meant that they were unsuccessful in observing the eclipse, it is an important event in Australia's scientific history (and the party at least returned with botanical specimens and meteorological observations to show for the journey).

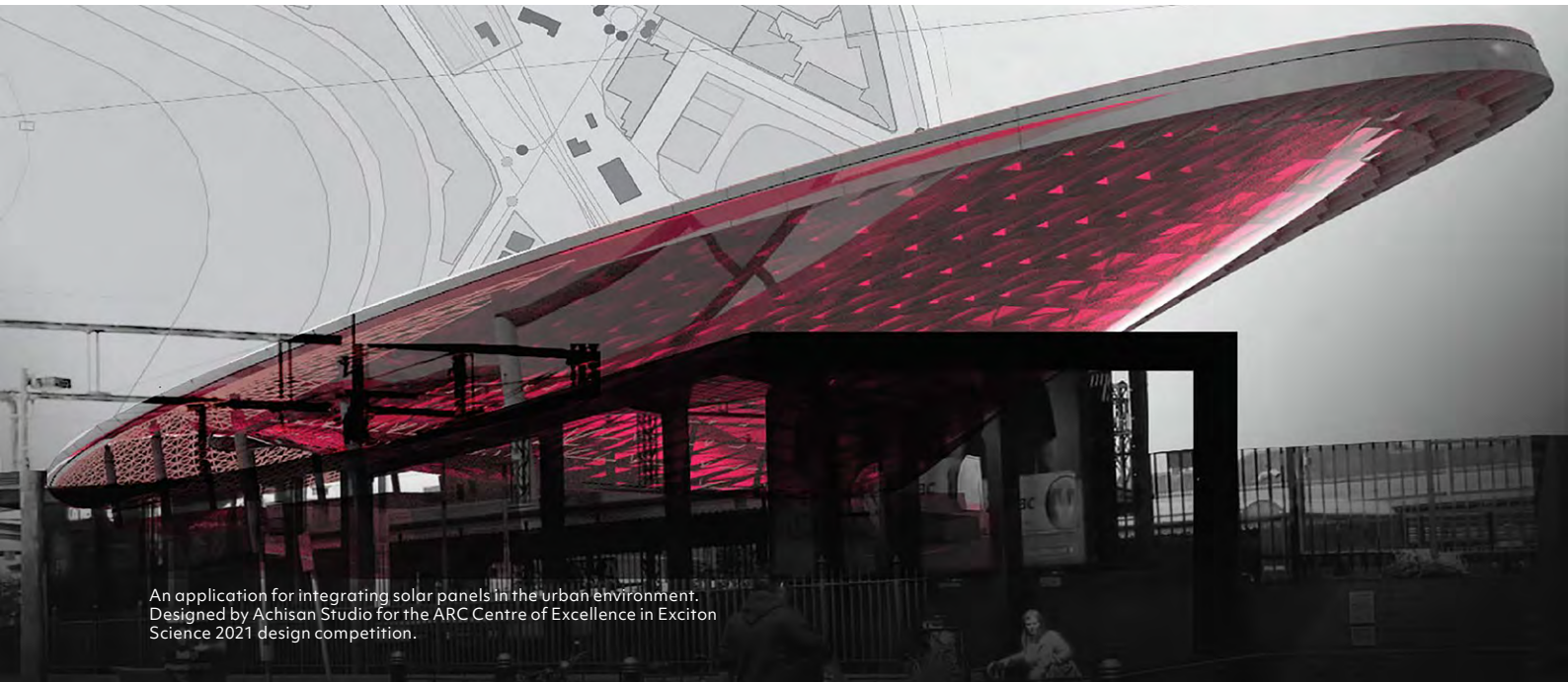
As a woman who has experienced six (and hopefully soon, seven) total solar eclipses, Toner has been inspired by women who have come before her. Women would accompany eclipse expeditions, and they were certainly not merely along for the ride. The trips were long and gruelling, and the women who went

(often wives, daughters, or friends of the other expeditioners) brought their own expertise and skill sets. Annie Dodwall measured the drastic change in temperature during the 1910 eclipse, Miriam Chisholm and Freda Tindell wrote detailed reports, and Elizabeth Campbell operated the camera and spectrographs in 1922. Toner tells the adventures and contributions of these often overlooked women in the book.

The Astronomical Society of Victoria encourages everyone to observe the sky. Its president Mark Iscaro images the sky with his phone attached to a standard backyard telescope to prove that we can capture good photos without tens of thousands of dollars' worth of equipment. However, highlighting our disconnect with the sky (compared to First Peoples who are keen observers of the sky and have detailed knowledge systems built around the Sun and Moon), he notes the stark contrast between star gazing in the city and "dark sky sites" away from light pollution. He encourages us to reignite our enthusiasm for the stars in the sky as a society.

It is difficult to capture the beauty and emotion of watching an eclipse in a book. Even in the Melbourne Planetarium, located at Scienceworks, Tanya can show an audience an eclipse in the 360° dome, with music to evoke emotion. However, having witnessed one in real life, she knows that it is not quite the same. Over a period of 17 years, solar eclipse fans can view five more eclipses under Australian skies. Enthusiasts worldwide will flock to Exmouth in Western Australia on 20 April this year to catch the best view of a total solar eclipse. After reading *Eclipse Chasers*, you too could catch, to quote Science Programs Manager at Museums Victoria, Kate Barnard, 'the dance of these celestial bodies'.

Eclipse Chasers by Nick Lomb and Toner Stevenson (CSIRO Publishing, ISBN: 9781486317073) is available now in paperback and eBook versions. Details at publish.csiro.au/book/8098/



An application for integrating solar panels in the urban environment. Designed by Achisan Studio for the ARC Centre of Excellence in Exciton Science 2021 design competition.

THE ROLE OF NEXT GENERATION SOLAR PANELS IN POWERING UP OUR CITIES

by Mr. Amit Kessel and Prof. Jacek Jasieniak, Exciton Science

In a rapidly changing world with growing energy demands, achieving a sustainable future requires scientific and technological innovations. Recent developments in novel solar cell materials will potentially allow us to use any surface that the sunlight touches to generate electricity, thus expanding our renewable energy capacity and overall energy resilience.

The sun is our most abundant renewable energy resource. With global efforts to transition away from fossil fuels, photovoltaic (PV) solar energy serves as a key technology for alternative, mobile power generation. PV deployment is growing, largely through residential rooftop installations and large-scale power plants. Over the past five years, the number of annual PV installations has tripled. Notably, Australia is the world leader in solar output per capita, having over 3.3 million total installations¹.

As mass urbanisation unfolds, population densities are set to increase. In response, cities are evolving through the construction of taller buildings, which brings about a major growth in local energy demand, as taller buildings consume up to twice the energy per square metre compared to smaller buildings².

Conventionally, urban PV deployments focus on rooftop installations, however, building facades also provide an opportunity for PV energy given that they also receive large amounts of sunlight. The vertical placement of PV (e.g. vertically up buildings) has been largely hampered by various challenges including higher installation costs, and incompatibility of standard commercial panels and with the architectural structure. This holds particularly true for modern buildings with highly glazed or curved facades.

Australia could still optimise its PV deployment. If the City of Melbourne, for example, generated 12% of electricity directly from the walls and windows of buildings, 76% of our city's electricity demands could be met by PV technologies alone³. Fulfilling this solar energy generation potential requires the development of PV technologies that can be practically integrated both into and onto traditionally overlooked surfaces.

PHOTOVOLTAIC (PV) SOLAR CELL TECHNOLOGIES

A solar cell is a device that uses the photovoltaic effect, a process in which the energy from photons in sunlight is transferred to electrons. The solar cell contains an absorber material, to absorb light and conduct electrons to an external circuit, resulting in build-up of voltage to generate an electrical current. The efficiency of a PV solar cell is the amount of electrical power coming out of the cell compared to the energy from the light shining on it, which indicates how effective it is at converting energy from one form to the other.

The first commercially viable PV panel made of silicon was introduced in 1954 by Bell Labs researchers. Since then, silicon solar cells remain the most dominant PV technology due to their low cost, long lifetime, and relatively high conversion ef-



L-R: Dr Naimeh Mozaffari, Dr Gaveshana Sepalage, and Dr Wenxin Mao at Monash University/ARC Centre for Excellence in Exciton Science.

iciency. However, their rigid and opaque structure limits their use. Second generation thin-film solar cells were subsequently developed to reduce the amount of material needed. As their thickness is only about 1 μ m, they are flexible and can be integrated in curved surfaces. Cells with alternative absorber materials have been developed, but their use has been limited due to their lower power conversion efficiency and/or high cost compared to silicon.

EMERGENCE OF PRINTABLE SOLAR MATERIALS

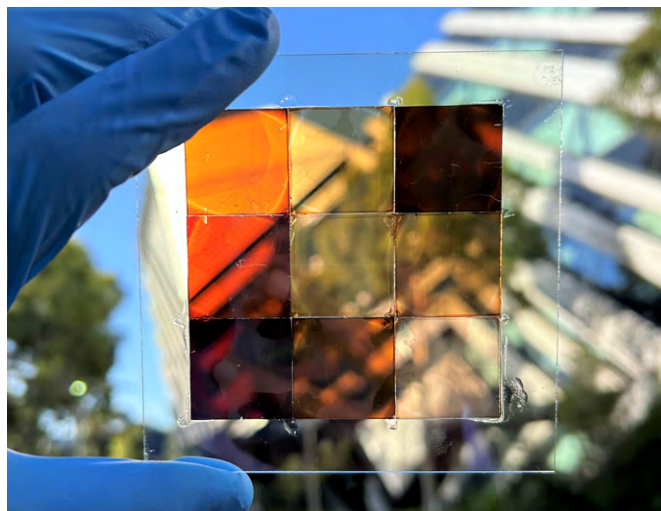
There has been a surge in the research and development of novel, low-cost printable solar materials. These materials are compatible with existing industrial processes, such as roll-to-roll printing, which can be used to fabricate flexible solar panels, and control solar cell colour and transparency. This makes them suitable for various building-integrated photovoltaics applications.

Perovskite solar cells (PSC), specifically, show great promise as they have power conversion efficiencies as high as the best silicon-based lab-scale devices⁴. Moreover, their superior performance in low light is especially useful for vertical placement (given that walls typically receive less sunlight than roofs) and they can even be used as a two-way solar panel that harvests both indoor light and outdoor sunlight.

In our group at Monash University and as part of the ARC Centre of Excellence in Exciton Science, we study and develop PSC. Our research is focused on developing transparent solar cells that could be integrated in windows and other surfaces that require some degree of transparency.

PEROVSKITE SOLAR CELLS

Perovskites are a class of materials comprised of organic, metallic and halide ions. They share a common crystalline structure that equips them with strong absorption of ultraviolet and visible light, where most of the available energy from sunlight lies. Modifying the molecular structure changes the wavelengths of light absorbed and in turn, the perceived colour of the material. For solar window applications, often a colour-neutral appearance is preferable, similar to a tinted glass window, while the solar cells can be coloured if inside the walls. Typically, a perovskite film with a thickness of no more than 600 nm is sufficient to achieve maximal light absorption. Reducing thickness is a simple way to ensure transparency, however, reducing thickness also reduces the potential power conversion efficiency.



Perovskite thin-films with varied transparencies and colours. The darker films absorb more light and therefore can generate more power.

Therefore, it is crucial to obtain as much energy as possible from the limited amount of photons absorbed in order to make a meaningful contribution to electricity consumption. One of our research goals is to create transparent solar cells with a natural appearance so that they can be used as windows that generate solar power.

POTENTIAL AND OUTLOOK

The modern urban area has many sunlit surfaces that could be exploited for solar energy harvesting. Recent advancements in printable solar materials pave the way to support our ever-growing power demand. By integrating PV in the architecture and design of buildings, we can optimise the way we generate solar power. The outside of a building could one day be fully covered in solar panels, with completely opaque and semi-transparent cells integrated into the walls and windows respectively. These panels could also improve thermal insulation of buildings by preventing heat from entering on a hot day or leaving the building on a cool one. It is estimated that for glazed buildings, a 40% reduction of the yearly energy consumption can be reached with the use of PV windows⁵.

The use of flexible solar panels could also turn bridges, bus stops or any other shelter structure into power generators with an aesthetically appealing design. Importantly, the need for next generation PV goes beyond urban construction, with promising applications in areas such as agriculture and self-powered vehicles. While some companies are beginning to introduce PV into the market, improved scalability and stability, and cost reductions are necessary to realise their commercial success⁶. With all the opportunities at hand, this is an area that is expected to demonstrate significant growth.

Mr. Amit Kessel and Professor Jacek Jasieniak are researchers in the Department of Materials Science and Engineering at Monash University and the ARC Centre of Excellence in Exciton Science.

References:

1. APVI. (2022). Australian PV market since April 2001.
2. Godoy-Shimizu, D., et al. (2018). Energy use and height in office buildings. *Building Research & Information*, 46(8), 845–863. doi.org/10.1080/09613218.2018.1479927
3. Panagiotidou, M., et al. (2021). Prospects of photovoltaic rooftops, walls and windows at a city to building scale. *Solar Energy*, 230, 675–687. doi.org/10.1016/j.solener.2021.10.060
4. NREL. (2022). Best Research-Cell Efficiencies Chart.
5. Wheeler, V. M., et al. (2022). Photovoltaic windows cut energy use and CO₂ emissions by 40% in highly glazed buildings. *One Earth*, 5(11), 1271–1285. doi.org/10.1016/j.oneear.2022.10.014
6. Burgués-Ceballos, I., et al. (2021). Transparent organic photovoltaics: A strategic niche to advance commercialization. In *Joule* (Vol. 5, Issue 9, pp. 2261–2272). Cell Press. doi.org/10.1016/j.joule.2021.07.004

BUILDING A RENEWABLE ENERGY CITY

by Dr. Catriona Nguyen-Robertson MRSV, with Mr. Paul Boys and Dr. Warren Standard of the Gippsland Tech School

The burning of fossil fuels releases large amounts of carbon dioxide, and this greenhouse gas traps heat in our atmosphere. According to the International Energy Agency, coal is the ‘dirtiest’ fossil fuel, and has contributed over 0.3°C of the 1°C increase in global average temperatures above pre-industrial levels, making it the single largest source of global temperature rise¹.

The Intergovernmental Panel on Climate Change (IPCC) warns that warming above 1.5°C risks further sea level rise, extreme weather events, loss of biodiversity, food scarcity, and worsening health and poverty worldwide².

There is worldwide pressure to reduce carbon emissions and move towards a greener future. In 2020, Victoria still relied on coal for 69% of all electricity generation³, however the Victorian government has set a target of 40% renewable energy production by 2025 and 60% by 2030⁴. In contrast, countries like Scotland, Iceland, Costa Rica, and Uruguay have already achieved over 90%⁵. Australia, the sun-burnt country, has plenty of sunshine, as well as an abundance of wind and land. If we harness these resources, we could be leading the charge in renewables.

Over the course of two days, secondary school students can rise to the challenge of powering an entire city with renewable energy in a program that has been run by the Gippsland Tech School for several years.

As part of the program, students are challenged to draft a proposal for how they might convert a city to run solely on renewable energy. The goal is to have the entire city – homes, streetlights, public utilities, etc. – powered by renewables like hydrogen, solar, and wind energy.

Students have to keep in mind that the city will always require power: night or day, rain or shine. Like most places, Gippsland’s Latrobe Valley experiences changes in the amount of sunlight that reaches it, and the wind frequently changes direction and velocity. The students are introduced to the science of re-

newable energy sources, and discuss the advantages and disadvantages of each to ensure that the city has enough back-up power for when the sun is not shining or the wind is not blowing.

Working with models, students conduct experiments around each energy type.

They test the energy output of solar panels, adjust wind turbine blades to harness optimal amounts of wind, and make group decisions on how to power the city based on their data. The students investigate ways of storing any excess renewable energy so that there is enough available at any given time.

Another renewable energy source that students explore is the production of hydrogen and the use of a hydrogen fuel cell. Hydrogen gas has the largest energy content of any fuel type, and its stability allows for longer-term storage, making it ideal for energy storage and distribution. Students learn that hydrogen fuel cells are a good way to store excess energy for when it is needed, but this energy must first be generated some other way. They are given a budget to work with and decide on how they might use a single power source or use multiple together, so that their city can generate enough energy while staying within budget.

On the second day of the program, students plan, design, build, and test a city powered completely by renewable energy. They use 3D-design and laser cut cardboard to build a model city fitted with lights that are connected to their power source(s) of choice. Finally, students present their simulated city powered by renewable energy to an industry member from the energy sector for feedback.



This project is particularly topical as the chimneys of the defunct, brown coal-fired Hazelwood power station were demolished on the 25th of May 2020. The chimneys operated for more than half a century before Hazelwood was shut down in March 2017. For some time, this power station was producing up to 25% of Victoria's electricity.

Now the Latrobe Valley is home to a world-first hydrogen project: the Hydrogen Energy Supply Chain at the AGL Loy Yang Complex. Hydrogen gas has been successfully produced in a pilot phase and the facility is now in a care and maintenance phase. Hydrogen gas can be produced from Loy Yang coal mine by reacting hydrogen with oxygen under high pressures and temperatures to form synthesis gas (syngas). This syngas consists primarily of hydrogen and carbon monoxide, and is later converted to carbon dioxide and additional hydrogen. Moving forward, this may be a cleaner way to use our brown coal – so long as the carbon dioxide that is produced is captured and reused or sequestered, and not released into the atmosphere.

Working in close partnership with local energy providers, the Gippsland Tech School has offered students the chance to put themselves in the shoes of machinery operators, electricians, architects, product testers and designers. Additionally, the Tech School is now looking at expanding the program with new partners in the energy sector.

By rapidly prototyping and building model cities that run solely on renewable energy, students are encouraged to think about the cities of the future. They also work collaboratively to develop solutions that we, as a community, need now.

References:

1. International Energy Agency (IEA), 'Global Energy & CO2 Status Report 2019', 2019, <https://www.iea.org/reports/global-energy-co2-status-report-2019>
2. The Intergovernmental Panel on Climate Change (IPCC), 'Global Warming of 1.5°C', 2018, <https://www.ipcc.ch/sr15/>
3. Department of Environment, Land, Water and Planning, 'Victorian Greenhouse Gas Emissions Report 2020', 2020 https://www.climatechange.vic.gov.au/_data/assets/pdf_file/0036/598257/Victorian-Greenhouse-Gas-Emissions-Report-2020.pdf
4. Department of Environment, Land, Water and Planning, 'Victorian renewable energy and storage targets', accessed on 18/03/23 <https://www.energy.vic.gov.au/renewable-energy/victorian-renewable-energy-and-storage-targets>
5. Climate Council, '11 countries leading the charge on renewable energy', 15 August 2022 <https://www.climatecouncil.org.au/11-countries-leading-the-charge-on-renewable-energy/>



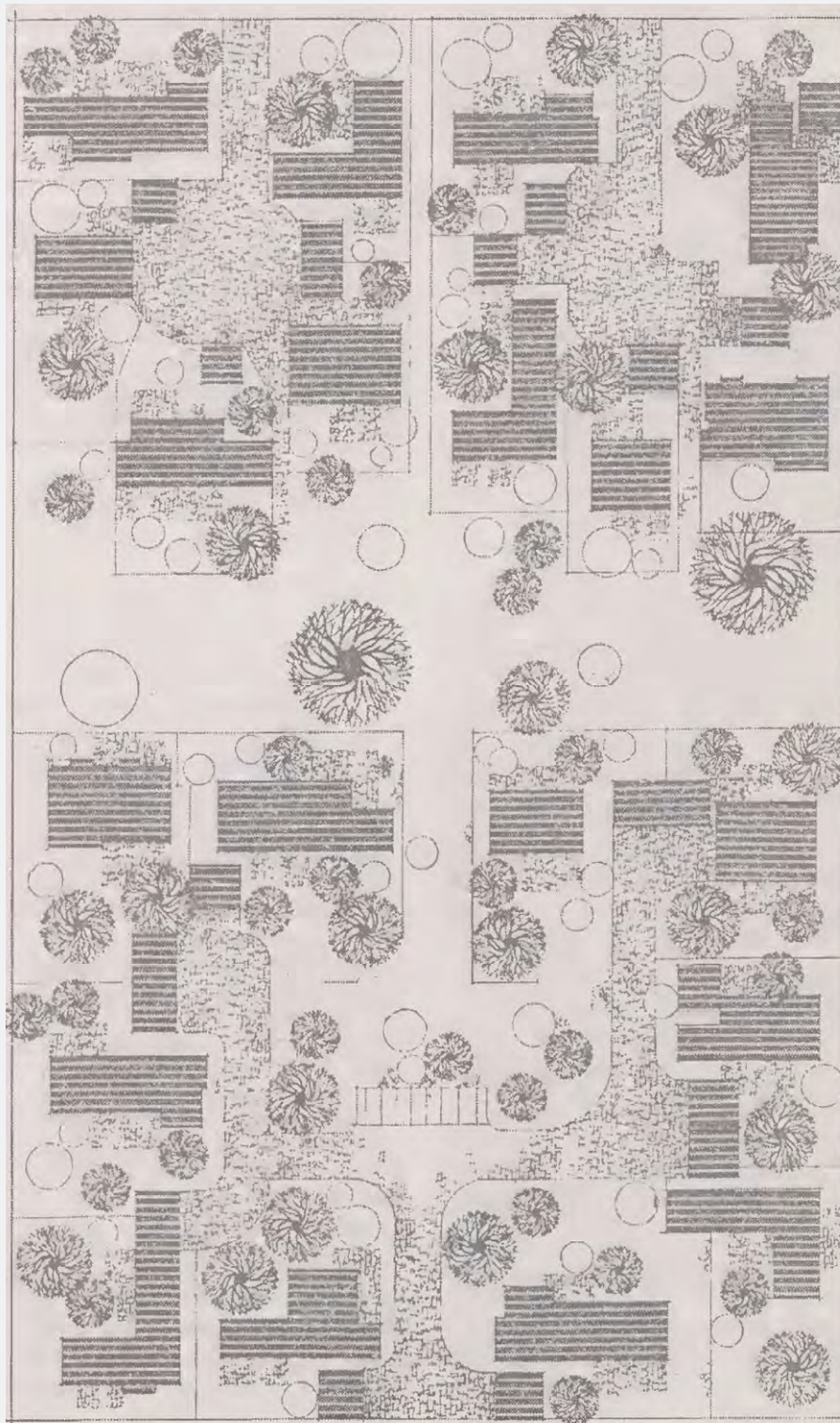
Students laser cut cardboard to build their model city.

Wind. Water. Solar. Hydrogen. Sounds like the introduction to Captain Planet! Students test and set up functioning cities using these energy sources. Images provided by the Gippsland Tech School.





In 2012 Sweden reached their target of 50% renewable energy 8 years ahead of schedule. This puts them right on track to reach their 2040 goal of 100% renewable electricity production.



The layout of Winter Park, Doncaster, Victoria: a 'cluster plan', with "20 houses on 4.3 acres".

Source: *Proceedings of the Royal Society of Victoria*, Volume 86 (New Series), 1974. *Design and the Living Environment*, by D. G. D. Yencken

1973

DESIGN AND THE LIVING ENVIRONMENT

By Scott Reddiex MRSV

As part of the RSV's 1973 symposium, 'The Urban Environment and Life', Professor David G. D. Yencken AO delivered a paper on 'Design and the Living Environment'.

Yencken was an entrepreneur, who co-founded the 'project home' company, Merchant Builders Pty Ltd, with John Ridge. Working with architect Graeme Gunn and landscape architect Ellis Stones, their aim had been to design residential properties that were in harmony with their environment.

At the time of the symposium, Yencken was in the middle of construction for the Merchant Builders-designed 'Winter Park' cluster housing project in Doncaster, Victoria. Instead of dividing the 4.3 acres into traditional rectangular blocks of land, they had instead designed the space for 20 detached houses that shared communal space, while maintaining privacy, views, and sunlight amongst the gardens.

Yencken advocated for designs and designers to identify and consider the requirements of all aspects of the living environment in which a residence was to be built. In this piece, he focused on user needs and preferences, and "how this diversity of environmental reaction can be identified and with some of the ways different users' requirements can be most satisfactorily met."

"...it is possible to state two important principles for the design of any living environment. The first principle is that

the greatest range of environmental choice should be available in the society. The second is that within that wide range the greatest opportunity for personal selection and self expression should be available to all members of the society."

He also describes the problems facing the effective design of public housing, "How is it possible to introduce greater respect for user needs and preferences? One way is to improve the planning process by bringing in sociologists and other professionals, by using better planning procedures, and by other public participation exercises.

But this process has also all the defects I have described. The planning will be done by the professionals, a wider range of professionals to be sure, and using methods, good methods, to create good interactions among the professionals, but it is likely to be an exercise by the professionals only and very often fails to involve the users themselves.

The users in public authority housing are poor, come from different backgrounds from the professionals, feel insecure with them, are unaccustomed to dealing in concepts or reading plans, and are usually unable or unwilling to be interested in the process.

The planners are still in that unhappy situation of planning for other people and particularly planning for other people of entirely different backgrounds and cultural values."

The solution proposed by Yencken is simple: effective consultation with all stakeholders.

"Somehow authorities must be taught to look for improvements and innovation and to be ready to assist their progress. The most effective way of achieving such a change of emphasis would seem to be to create machinery for social experiments. The machinery must involve ideas which can be collected from the whole community, not just the ideas which are generated within a bureaucratic institution, public or private."

Winter Park was influential in the introduction of the Victorian Government's Cluster Titles Act 1974, and went on to be awarded a citation from the Royal Australian Institute of Architects in 1974.

To learn more about the truly amazing life and achievements of David Yencken, Prof Alan Pert and Graeme Davison co-authored the following piece, published by Architecture Media:

Vale David Yencken, a Modern-Day Polymath, architectureau.com/articles/david-yencken-a-modern-day-polymath

From: *Proceedings of the Royal Society of Victoria*, Volume 86 (New Series), 1974. Design and the Living Environment, by D. G. D. Yencken

PAN-PACIFIC SCIENCE CONGRESS.

Great Opening Meeting.

A NOTABLE GATHERING.

MANY NATIONS REPRESENTED.

**INTERNATIONAL PROBLEMS
DISCUSSED.**

Page 9 of Melbourne's *The Age* newspaper, Tuesday 14 August 1923. The Pan-Pacific Science Congress of 1923 was held in Melbourne and Sydney, and was covered by the major newspapers of the day.

Source: *The Age*, 14 August 1923, via Trove (trove.nla.gov.au/newspaper/article/203637127)

1923

THE PAN-PACIFIC SCIENCE CONGRESS

By Scott Reddiex MRSV

The Annual Report of the RSV for 1923 records the details of the second Pan-Pacific Science Congress:

"A notable event of interest to scientists generally was the meeting in Melbourne and Sydney of the Pan-Pacific Science Congress. This was the most important scientific gathering held in Australia since the meeting of the British Association for the Advancement of Science in 1914. Delegates from all parts of the world attended and represented most branches of science. The Melbourne meeting was held from the 13th August to the 21st August [1923], and was highly successful. Such opportunities of meeting scientific workers from other parts, and exchanging ideas on matters of mutual interest are so rare that the time available proved altogether too short."

Following the success of the first Pan-Pacific Science Congress of 1920 held in Honolulu, Hawaii, it had been decided to hold the congress every three years. Australia was successful in its application to host the 1923 event, auspiced by the Australian National Research Council, with its President, Sir David Orme Masson, presiding over events. The Congress drew scientists from around the world to Melbourne and

Sydney, with delegates hailing from the United Kingdom, the United States, Japan, New Zealand, The Netherlands, and The Philippines. In a time before international commercial flights, this was no quick and easy feat, and could have easily minimised the attendance in what was then a far-flung corner of the world. To prevent this from occurring, the Australian National Research Council reportedly provided many "assisted passages" to "distinguished scientists in over-seas Pacific countries, and to this inducement were added free railway transportation and housing while in Australia".¹

The event combined sessions discussing papers of general scientific interest with those in specialised topic areas of agriculture, anthropology, botany, entomology, forestry, geodesy and geophysics, geography and oceanography, geology, hygiene, veterinary science, and zoology.

Some of the proposed scientific solutions to problems being addressed aren't surprising for the time, such as combating the invasive prickly pear by introducing even more species, noting that "numerous kinds of insects have been imported from various parts of America, and it is hoped that some of these, combined with

*destructive fungi, may prove effective."*²

However, there are plenty of suggestions that sound much more agreeable to the modern reader, including the need to 'reafforest' areas, creating reserves in Victoria for the protection of eucalypts, and protection of "native fauna from the extermination which is threatening many of [the] most interesting species."

Even alternative, more sustainable fuel sources were discussed as early as at this 1923 conference: "The conversion of waste timber into alcohol was regarded by Mr. I. H. Boas as of the most fundamental importance for Australia, as alcohol must become the fuel of the future, and it was the only known fuel which did not draw on the stored energy in the earth."²

From: Proceedings of the Royal Society of Victoria, Volume XXXVI (New Series), 1924. Annual Report.

References:

1. Hobbs, W. H. (1923). The Second Pan-Pacific Science Congress. *Science*, 58(1505), 342–343. doi.org/10.1126/science.58.1505.342
2. Haddon, A. C. (1924). The Pan-Pacific Science Congress, Australia, 1923. *Nature*, 113(2827), 28–29. doi.org/10.1038/113028a0



Glass Negatives - Lightning, by Hugh Conran, Australia, circa 1910s. Among the earliest photographs of lightning taken in Australia.

Source: Museums Victoria Collections, items MM 40010 and MM 40028 (Public Domain)

1873

A PATH OF LEAST RESISTANCE

By Scott Reddiex MRSV

On Monday the 15th of September 1873, RSV President and Government Astronomer Robert L. J. Ellery presented the article, *Suggestions for the Construction and Erection of Lightning Conductors*.

For more than a century, lightning rods on tall buildings have been a widespread and important protective feature.

Recognising the immense amount of electrical energy in every lightning strike, lightning rods provide a safe path for the electric current from the highest point on the building down to the ground.

While lightning predates life on Earth, our understanding of its electrical nature is relatively recent, dating back to the work of people like Thomas Jefferson in the 1700s. As follows many scientific discoveries, its subsequent translation into practical applications and general acceptance didn't happen overnight. This was something that the Italian physicist and Catholic priest Giuseppe Toaldo (1719-1797) found first-hand when he sought to add lightning rods to church steeples and bell towers, prompting him to write the 1772 treatise *"Della maniera di difendere gli edifici dal fulmine"* ("On the manner of defending buildings from lightning") and the 1774 pamphlet *"Dell'uso de' conduttori metallici a preservazione degli edificii contro de' fulmini"* ("Of the use of metallic conductors to preserve buildings against lightning").

Fortunately for Ellery, in 1873 he found himself in a much better time and place to communicate to a receptive audience how to effectively install lightning rods on Melbourne's buildings.

"The very essence of a lightning conductor is to afford an easy and wide way for the electricity to reach the earth, for it is only when such way is not present that mischief is done."

In his article, he provides quite specific instructions for the materials to use, the location for installation, and the extent of protection afforded by the location chosen for a lightning rod:

"A thoroughly good and extensive connection with the earth should be the first consideration, for without it all lightning-conductors rather add to than diminish the danger. ... From the earth to the higher parts of the building the conductor may assume almost any form of a continuous metallic path. Iron rod, wire rope, sheet metal, pipes, or anything of the kind so long as it be large enough and metallically continuous..."

"From experiments conducted by the French Academy of Sciences it is considered that the area protected by a single lightning conductor is about equal to twice the radius of its height; therefore if a conductor were a hundred feet high, it would protect a building covering an area of 100 feet radius; but half this is now generally taken as the safest proportion,

and, therefore, a conductor 100 feet high would protect a building of fifty feet radius."

Ever the pragmatist, Ellery ended his piece by acknowledging that while lightning rods aren't the most visually pleasing additions to a building, installation doesn't have to be entirely unsightly:

"Lightning conductors, as commonly arranged, are in most cases very far from ornamental additions to the buildings which they protect; the use of vanes, pinnacles, ridging, and other external metallic details of a building to form portion of the conducting system has the recommendation of being less objectionable in an aesthetical sense than the form of lightning-rods wholly [sic] extrinsic to the design..."

From:
Transactions and Proceedings of the Royal Society of Victoria, Volume XI, 1874. Article IV - Suggestions for the Construction and Erection of Lightning Conductors, by R. L. J. Ellery, Esq.



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

Inspiring Victoria encourages involvement in STEM through initiatives (such as **National Science Week Victoria**) that are delivered by the RSV's program partners:

- Public Libraries Victoria
- Neighbourhood Houses Victoria
- Parliament of Victoria
- Museums Victoria
- Royal Botanic Gardens Victoria
- The Commissioner for Environmental Sustainability
- Qwestacon
- The Arthur Rylah Institute for Environmental Research.



national science week

National Science Week School Grants 2023

Applications are now open.

The theme of this year's National Science week is Innovation: Powering Future Industries.

The Australian Science Teachers Association (ASTA), with funding assistance from the Australian Government's Inspiring Australia program, provides grants up to \$500 for school-initiated National Science Week activities.

These grants are available to ALL Australian schools (preschools to senior secondary) who complete a valid application. All applications and the amounts awarded are judged by their comparative merit.

The grants are designed to support teachers and schools to deliver engaging STEM events and activities that align with the National Science Week vision. They are intended to be a contribution to the running of a National Science Week activity or event in a school, but not the sole means of support.

Applications close **24 April 2023**.

For more information about grant eligibility and the application process, visit asta.edu.au/programs/national-programs/national-science-week/school-grants/



CALL FOR SCIENTIFIC PAPERS

The Proceedings of the Royal Society of Victoria is our refereed journal, published twice annually by CSIRO Publishing. Current and recent editions are available online in open access format from publish.csiro.au/rs.

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, the present name being adopted in 1889.

The journal began in 1855 as an irregular publication under the title Transactions of the Philosophical Society of Victoria, the present name being adopted in 1889. Since then, the journal has appeared on a regular basis, at first annually but varying from one, two or four parts per year. Since 1889, the parts issued each year were deemed to make up a volume. The online content extends back to Volume 118, Number 1, 2006.

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

Please note copies of the Proceedings 1854 to 2006 are freely available online at the State Library of Victoria website in their 'Digitised Collections.'

SOCIAL MEDIA

Follow the journal on social media using the hashtag *#ProceedingsRSV*



CURRENT GOVERNMENT CONSULTATIONS OF INTEREST TO VICTORIA'S SCIENCE COMMUNITY

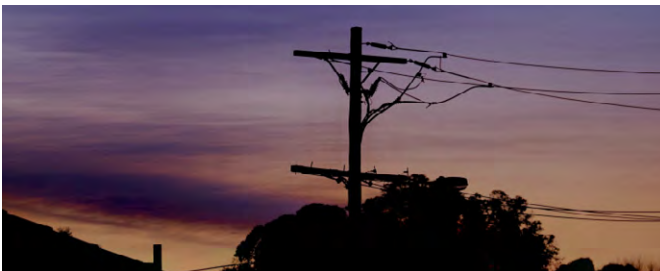
Projects open for consultation from engage.vic.gov.au/project



Victorian Murray Floodplain Restoration Inquiry and Advisory Committee.

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

Ongoing:
engage.vic.gov.au/VMFRP-SIAC



Remaking the Electricity Safety (Bushfire Mitigation) Regulations 2013

Input is being sought on a Regulatory Impact Statement to remake the Electricity Safety (Bushfire Mitigation) Regulations 2013.

Consultation closes 3 April 2023:
engage.vic.gov.au/bushfire-mitigation-regulations



Portland Cliffs Adaptation Plan

Ideas and thoughts are sought to improve public safety between Nun's Beach and Anderson Point.

Consultation closes 8 April 2023:
engage.vic.gov.au/portland-cliffs-adaptation-plan



Victorian Default Offer Review 2023-24

The Essential Services Commission is setting prices for the 2023-24 Victorian Default Offer for electricity and would like to hear from you.

Consultation closes 11 April 2023:
engage.vic.gov.au/victorian-default-offer-review-202324



Victoria's 30-year Infrastructure Strategy

Have your say on Victoria's 30-year infrastructure strategy which makes recommendations to Parliament on how to get the best use from our existing and new infrastructure.

Consultation closes 28 May 2023:
engage.vic.gov.au/victorias30yearinfrastructurestrategy



Government Land Standing Advisory Committee

Have your say on changes to planning provisions for surplus government land to be sold or land proposed to be acquired for priority projects by the Victorian Government.

Ongoing:
engage.vic.gov.au/glsac

PITCHING AND WRITING FOR SCIENCE VICTORIA

Science Victoria seeks the discussion and promotion of scientific topics of relevance to people living in the State of Victoria. We are particularly interested in new research, in-depth articles, or exploration of subjects where scientific work and thinking can directly address or deepen our understanding of environmental and socioeconomic challenges.

We welcome your pitches and pieces for news, features, opinion, and analysis articles on current scientific research in Victoria, recent scientific discoveries, related social and policy issues, technical innovations, and overviews of impactful research. We cover a broad range of topics around Science, Technology, Engineering, Mathematics, Medicine/health (STEMM) under an overarching theme of “science and society.”

Science Victoria’s articles are written in plain, non-academic language, pitched at an intelligent and naturally curious audience that does not necessarily hold subject-matter expertise. This is not a platform for scientific journal articles nor media pieces. For more information on what we’re looking for, please read our article submission guidelines below.

HAVE AN IDEA FOR AN ARTICLE? PITCH YOUR IDEA TO US!

Send your idea to editor@sciencevictoria.org.au, along with any questions you have regarding your pitch.

In your email, please outline:

- In one sentence, what is your key message? (No more than 50 words)
- Why should this key message be shared with the readers of Science Victoria? (No more than 100 words)
- Which style of article are you proposing to write? (See below for a guide to article types)

Article pitches can be submitted at any time, but please keep in mind the article submission deadlines for the next month’s issue. Note that we may accept your pitch, but suggest it is more suitable for another style of article.

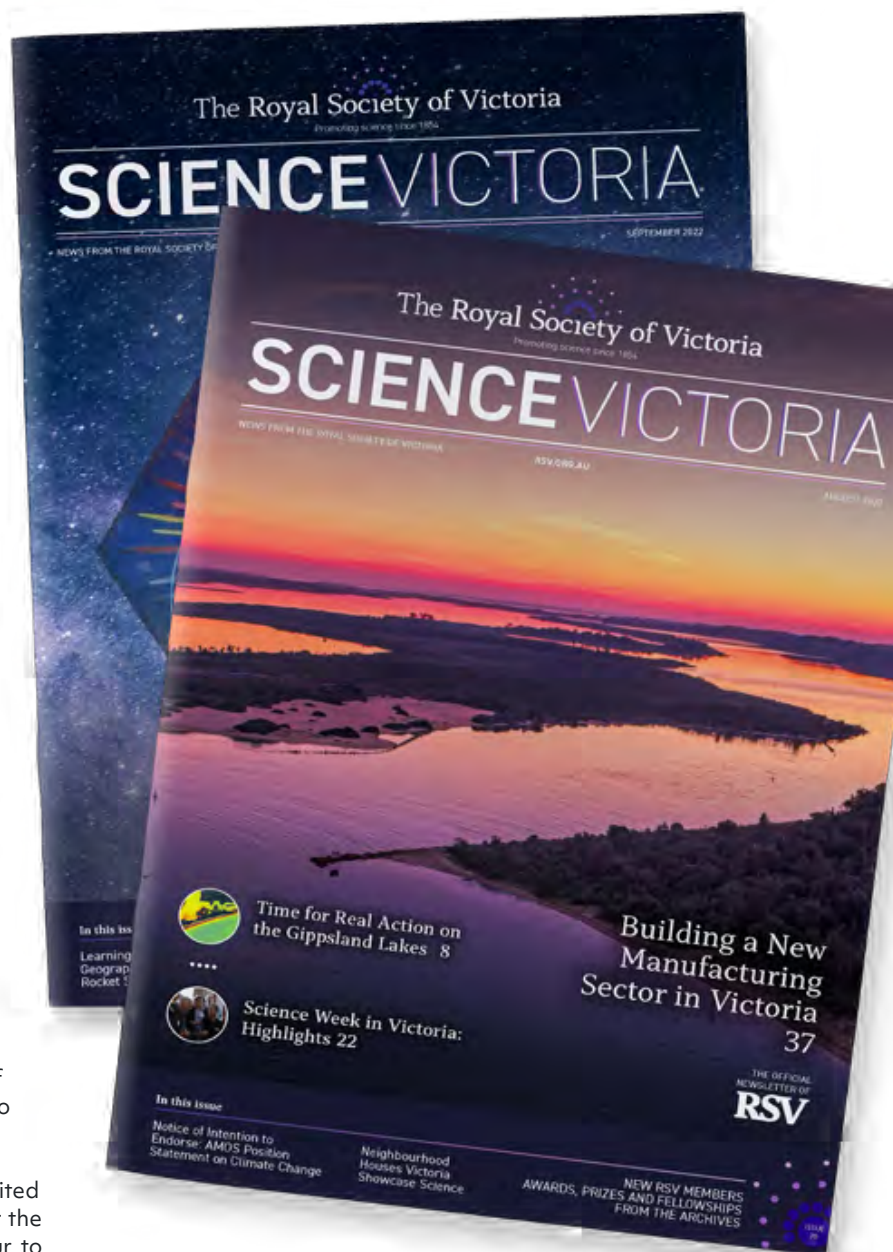
ARTICLE SUBMISSION

Once your pitch has been accepted, you can submit completed pieces that comply with the style guide below. Completed articles to be published in the next issue of Science Victoria must typically be submitted 2 weeks prior to the beginning of the next month.

All pieces will be reviewed prior to publishing and may be edited for length and clarity (although we will be sure not to alter the message or context of your work). We will also endeavour to fact-check and confirm any grey areas with you ahead of publishing in the interests of accuracy.

All published pieces will be accompanied by a by-line, and a short (<50 word) biography of the author (title, institution, qualifications, current projects, contact email) to be submitted with your piece.

Images and figures to accompany your piece are strongly encouraged, however please ensure that you only provide original images produced by yourself or those that already exist in the Public Domain.



Images must include details of the source and any relevant descriptions. If you do not provide any images, and any relevant descriptions. If you do not provide any images, we may include Public Domain or stock images that we deem suitable for visual communication of your content.

REFERENCES

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, or contact editor@ScienceVictoria.org.au.

WRITING FOR SCIENCE VICTORIA: ARTICLE FORMATS

STYLE GUIDE

To successfully engage the largest audience, all pieces should have readability in mind.

Readability can be determined using a Flesch-Kincaid readability test, aiming for a score between 50-60. This score means that your piece should be easily understood by an educated 16-year-old (a year 10 student).

If drafting your piece in Microsoft Word, **you can easily view your document's readability statistics** at Home>Editor>Document Stats. Alternatively, you can use one of the many free online calculators.

FEATURE ARTICLES

Recommended word count (600 - 1,800)

Feature articles are more in-depth pieces on a specific topic related to STEM. 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.

Your audience is intelligent members of the general public, who share an enthusiasm for scientific topics, or who are members of the scientific community outside of your particular field.

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

Please reference primary sources/journal articles for any non-trivial scientific claims, or for publications that prompted your writing of the article.

Feature articles typically run between 600 and 1,800 words (including references). Use of sub-headings and figures to break up longer pieces is strongly encouraged.

Not quite sure about the tone for your piece? Have a look at articles published in previous editions of Science Victoria, or in other scientific magazines for a general audience, like The Conversation, Cosmos, New Scientist or Scientific American. A good litmus test is knowing that most of us have read a piece or been to a presentation that managed to make the most interesting topics incredibly boring. This is what you want to avoid.

LETTERS AND ARTICLES

Recommended word count (400 - 1,000)

Letters have minimal restrictions on style, structure, or subject matter. You are encouraged to submit your thoughts/questions/comments that broadly relate to STEM in Victoria and/or the Royal Society of 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.

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

WHAT I'VE BEEN READING

Recommended word count (400 - 1,000)

This is a column for you to tell us about a book broadly relating to science that you've read. These pieces are typically between 400 – 1,000 words and include a summary of the book and its ideas, as well as your interpretations or conclusions.

Possible questions to consider when writing this column:

- Do you think the author was correct in any assumptions?
- Was the author's style of writing approachable?
- Did they do the subject matter justice?
- Who would you recommend this particular book to?
- What did it mean to you?
- What did you learn?

OPINION ARTICLES

Recommended word count (600 - 1,000)

In contrast to an unbiased news or feature article, an opinion piece conveys your informed opinion on, or experiences with a particular topic. This is where your expertise on a subject can shine. 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 STEM-related fields in Victoria. Examples of possible topics include:

- how to address a climate-change related problem in Victoria, successes and failures common to STEM engagement initiatives,
- changes in your particular field of expertise
- your experiences of a career in STEM and thoughts on how to better support the next generation of researchers,
- existing STEM-related studies or approaches that you believe could be applied in Victoria,
- ethical problems related to scientific projects or careers in STEM.

Please reference primary sources/journal articles for any non-trivial scientific claims, or for publications that prompted your writing of the article.

Opinion pieces should aim to be 600-1000 words. For anything shorter, consider submitting it as a Letter instead. We welcome well-informed opinion articles from all authors, particularly from those with significant expertise in a given area. Articles may reference your own work; however these are not promotional fluff pieces.

NEWS AND ARTICLES

Recommended word count (400 - 1,000)

News Articles are for the discussion of current or recent news relating to science, with an emphasis on science in Victoria or news that impacts Victoria's scientific community.

These articles should be concise, avoid use of jargon and personal opinion, and be referenced as appropriate. News pieces should be between 400-1,000 words in length.

Reports could relate to funding announcements/grant outcomes, new STEM-related projects, high-impact publications relevant to Victoria, successes of Victorian scientists, or relevant STEM-related policy news.



THE ROYAL SOCIETY OF VICTORIA

Promotion and Advancement of Science



RSV SERVICES AND FACILITIES

HOLD YOUR NEXT EVENT AT THE ROYAL SOCIETY OF VICTORIA

The RSV engages communities with scientific knowledge through aligned partnerships, special events, festivals, conferences, and education programs. Email rsv@rsv.org.au to discuss your needs and ideas!

FACILITIES FOR HIRE

The Royal Society of Victoria's facilities are available for hire to organisations, companies, or private groups. This heritage-listed building opposite the Carlton Gardens is suitable for a wide range of events, including conferences, seminars, meetings, and private functions.

Limited parking is available on-site and a commercial parking operator is adjacent on La Trobe Street.

The RSV has audio visual and seminar equipment available for use, including videoconferencing facilities. There is a commercial kitchen on the ground floor, suitable for your own use or by a caterer.



SERVICES AVAILABLE

We 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
- Campaign management
- Recruitment of scientific panels
- Convening community engagement and deliberation processes where scientific work contributes to social, environmental, and economic impacts and benefits.

The Burke and Wills Room

Multi-functional space with adjoining kitchen.

| | |
|------------------------------------|------------|
| Capacity: | |
| Workshops | ≤30 people |
| Dinners | ≤60 people |
| Seminars, functions, catering, etc | ≤80 people |



The Von Mueller Room

Seminar room great for smaller meetings and seminars.

| | |
|-------------------------|------------|
| Capacity: | |
| Meetings, seminars, etc | ≤15 people |



The Ellery Lecture Theatre

Raked seating great for lectures, presentations, and conferences.

| | |
|------------------|--------------|
| Capacity: | |
| Raked seating | ≤110 people. |



The Cudmore Library

A picturesque room great for larger meetings and seminars.

| | |
|-------------------------|------------|
| Capacity: | |
| Meetings, seminars, etc | ≤24 people |



We are registered as a Certified Social Trader working for the benefit of Victorian communities, which makes our services eligible under the Victorian Government's Social Procurement Framework, as well as the social procurement guidelines of the governments of New South Wales and Queensland. Our certification also assures industries of our authenticity in building social procurement into services and supply chains. For more information and bookings please contact our Business Manager at james@rsv.org.au or on +61 3 9663 5259

SUPPORT VICTORIA'S SCIENCE SOCIETY

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



RSV 2023 FUNDRAISING CAMPAIGNS RSV 2023 FUNDRAISING

| | |
|-------------------------------------------------------------------|-----------|
| The Area of Greatest Need, as identified by the Society's Council | \$ |
| Inspiring Victoria – Community Science Engagement Program | \$ |
| Science Awards & Prizes | \$ |
| Science History & Heritage | \$ |
| The Australian Science & Engineering Fair (AUSSEF) | \$ |
| Science for All - Citizen Science Programs | \$ |
| BioQuisitive Community Lab | \$ |
| The Phoenix School Program | \$ |
| The BrainSTEM Innovation Challenge | \$ |
| Australian Indigenous Astronomy | \$ |
| Science Victoria - Magazine and Web Content Production | \$ |
| TOTAL | \$ |

Personal Details

Title: (Circle One) Prof Dr Mr Mrs Ms Miss Other **Family Name:** _____
Given Names: (In Full) _____

Method of Payment (Select one below)

By submitting this form I acknowledge that the amount entered against 'TOTAL' donations above will be charged to my credit card.

Credit Card **VISA** **Mastercard**

Card No. _____ **Expiry Date** ____ / ____

Name on Card: _____ **Signature:** _____

Cheque or Money Order

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

Electronic Funds Transfer (EFT)

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

BSB: 083-019

Account No: 51-515-2492

Account Name: The Royal Society of Victoria

Reference: Your Surname and "donation"



FLIND

Science Victoria

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



Science Victoria is printed by Adams Print on FSC-certified 100% recycled paper (FSC-C102086), using compostable HP Indigo ElectroInks (EN-13432). ecoStar+ 100% Recycled Paper is made from 100% recycled post-consumer waste, in an elemental chlorine free environment, under the ISO 14001 environmental management system.