The Royal Society of Victoria
Promoting science since 1854

SCIENCE VICTORIA

NEWS FROM THE ROYAL SOCIETY OF VICTORIA RSV.ORG.AU SEPTEMBER 2022

The Big Bang ... and All That Follows! 24

THE OFFICIAL NEWSLETTER OF RSV

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ON THE COVER: **Energy**. Photo: Damon Kowarsky & Hyunju Kim

Vale Queen Elizabeth II

The Council of the Royal Society of Victoria acknowledges the passing of Queen Elizabeth II and extends sympathies to her family and all who loved her. We acknowledge the service she has provided over seventy years as Sovereign of many members of the Commonwealth of Nations, including Australia.

INTERESTED IN SCIENCE? ENJOY WRITING? WE WELCOME LETTERS, ARTICLES AND IDEAS.

The submission deadline for content to be included in the October 2022 edition of Science Victoria is **5pm Wednesday September 28th 2022**.
Email **ceo@rsv.org.au**.

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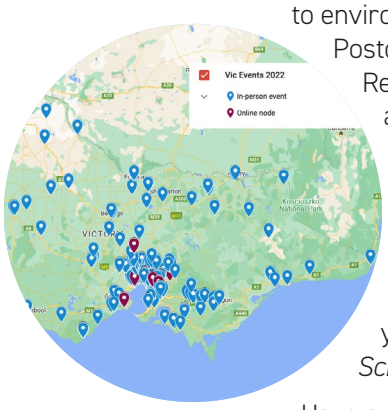
FROM THE CEO

The Remains of the Year

Spring is sprung, and not a moment too soon! That was a ridiculously cold winter, or maybe I'm just getting old. But certainly, doses of COVID, flu and multiple seasonal maladies have not made for an easy midyear season in 2022. I hope you all came through the short, wet days and long, cold nights in one piece, and have begun to take small comfort, as I am, in the slow return of the sun.

I'm particularly grateful to everyone who came out in August to celebrate National Science Week. It was a thrill to gather with so many amazing champions of community science engagement for the launch, and to enjoy with genuine wonder and delight the many mysteries of our universe presented in so many different ways. I hope you managed to attend one of the 380 events held across the state this year (their locations marked on the map inset)! We'll have a fulsome report available in the coming months, once all the details and data have been collected from eventholders.



Sadly we were unable to run our Young Scientist Research Prizes during National Science Week, and have rescheduled the competition for 13 October. This month we seek your participation in September's symposium on **Next-Generation Biocontrol of Invasive Vertebrate Pests**.

There's a lot to pack into the remains of the year, with a further symposium coming up in late October on the contribution of Victoria's northern rivers to environmental flows, our Research Medallist, Postdoctoral Award Winner and Young Scientist Research Prize contenders to celebrate, and a position on biodiversity conservation and recovery to publish, all ahead of us.

More on that in the October edition! For now, we have feature articles and letters from our colleagues to enjoy, a new edition of the *Proceedings* to read, and as always we seek your contributions to future editions of both *Science Victoria* and the *Proceedings*.

Have a great month.

Mike Flattley
CEO, The Royal Society of Victoria

SCIENCE VICTORIA, VOLUME 2, NUMBER 8, SEPTEMBER 2022

The Monthly Publication of the Royal Society of Victoria – established 1854 for the promotion and advancement of science.

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Associate Editor Dr Catriona Nguyen-Robertson
Layout Green Scribble

Contributors
Dr Catriona Nguyen-Robertson, Ms Priya Mohandoss, Mr Scott Reddiex, Prof. Ian Rutherfurd, Prof. Alan Duffy, Mr Damon Kowarsky

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

Letters
Rob Gell
president@rsv.org.au
Please note that letters may be edited for length and clarity

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

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

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Acknowledgement of Country:

The Royal Society of Victoria acknowledges the many First Peoples of our continent, their vast history and connection to the lands and waters within and beyond the State of Victoria, and the valuable cultural and scientific knowledge held by 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 Peoples and seeks to support and celebrate their continued contributions to scientific knowledge.

FROM THE PRESIDENT

Anyone Seen an *Opodiphthera eucalypti?*

Both the moth and caterpillar of the Emperor Gum Moth[1] are magnificent. They're native to Australia and were plentiful in our parks and gardens when I was young, but I haven't seen one for decades. Where have they gone? Widespread pesticide use may be an issue; invasive birds? Perhaps we now have expanded populations of large honeyeaters with our suburban gardens offering large flowering hybrid native species as 'McDonald's for honeyeaters'?

I asked this question at the closing event for *National Science Week*, 'STEM and Society: Caring for the Rare', a panel session held in the Legislative Assembly of the Victorian parliament.

The panel, John Arnott and Megan Hirst from the Royal Botanic Gardens, Joanna Summers from Museums Victoria and Marissa Parrot and Darren Grover from Zoos Victoria gave a large online and live audience a wonderful insight into their own work in the conservation of rare species and the multiple challenges we face in the immediate future, but they couldn't tell me where the Emperor Gum Moths have gone! Can you?

There is no doubt that we face significant challenges in the future management of our unique ecosystems, the recently released **Australia State of the Environment Report 2021** has confirmed that.

The 'Care for the Rare' session did reveal some positives. The discovery of a Broad-toothed Rat, or Tooarrana at Wilsons Promontory National Park (a species not seen at the Prom for thirty-two years[2]) and the successful recovery and re-establishment of Eastern Barred Bandicoot populations to the extent that the species has been taken off the 'Extinct in the Wild' list to now be reclassified as Endangered[3]. A successful captive-breeding programme involving a partnership of eight organisations has seen 650 animals successfully reintroduced to Phillip, French and Churchill Islands in Westernport Bay.

Thanks to the team at the Parliament of Victoria, and to the Victorian Parliamentarians for STEM led by Dr Tien Kieu MP, for all their recent help during *National Science Week*.

1 **https://en.wikipedia.org/wiki/Opodiphthera_eucalypti**
2 **https://www.abc.net.au/news/2022-08-06/broad-toothed-rat-resdiscovered/101307344**
3 **https://www.zoo.org.au/fighting-extinction/local-threatened-species/eastern-barred-bandicoot-mainland-population/**

More on moths: there is a very important tool available that enables everyone to contribute to the tracking of Bogong Moths, the primary food source for Mountain Pygmy-possums in Spring. Recently numbers of Bogong Moth migrating from their winter breeding grounds in Queensland to the southeastern Alps have been significantly reduced. **Moth Tracker** enables us all to record your Bogong Moth sightings and help critically endangered Mountain Pygmy-possums.

Another great tool for citizen scientists and professionals alike is the **FrogID** app developed for the Australian Museum. You can record frog calls you hear and submit the call and your location for inclusion in Australia's national frog count. This data will help provide our scientists with valuable data for the protection and conservation of frogs. The FrogID app is available on **Google Play** and in the Apple **App Store**.

IN REPLY TO PROFESSOR BRUCE THOM AM, FTSE

In the August issue of *Science Victoria*, Professor Bruce Thom, focused our attention on the condition of the Gippsland Lakes in his article, *Time for Real Action* on the *Gippsland Lakes*. In particular, Bruce highlighted a major blue green algae bloom in the lakes in May making prawns and other species, both inside the lakes and in Bass Strait not suitable for human consumption.

The management of our coastal estuaries is a critical issue and there is considerable amount of science available that attests to the fact that the Gippsland Lakes are now under significant pressure from nutrient inputs, increased salinity because of deeper dredging of the artificial entrance.

I can report that Bruce is part of a small group of scientists that is working with the preparing to hold a major Royal Society of Victoria symposium in early 2023 based on the proposition that the Ramsar status of the Gippsland Lakes is at risk in a warming climate if current management and governance arrangements continue.

The group's current operate proposition is:

> ***The Gippsland Lakes has changed under a range of pressures from society and on account of climate variability. These have driven it to states that are not recorded in the long-term past, e.g. Synechococcus blooms. The system also will be subjected to changing conditions in the future on account of local (irrigation development), regional (water abstraction) and international (sea level rise, drying and warming climate) drivers.***
>
> ***The RSV is seeking to evaluate the pathways available for a sustainable future, taking into account the present state relative to the past, but principally assessing future risks and the nature and timing of measures that need to be implemented to retain the identity of the Lakes' ecosystems. It aims to explore scenarios of the future state of the Lakes given international obligations (e.g. Ramsar) and the governance structures needed to achieve a desired state.***

As Bruce notes in his article, there are no established processes for the recovery of our coastal estuaries, although some are being explored. We are hoping that the Society's proposed symposium next year will be a strong first step towards improved arrangements.

ORGANISATION MEMBERSHIP.

The Society is endeavouring to step up strongly to give science a louder voice in decision-making. We are now actively engaging with the corporate sector to substantially increase our Organisation memberships. This membership category is open to any organisation interested in science, its beneficial applications and supporting its promotion for the benefit of the community.

Organisations claim membership of the Royal Society of Victoria as a method for general sponsorship of the RSV's science engagement programs along with discounted rates for accts to RSV facilities throughout the year.

We invite you to complete the online membership application here and look forward to welcoming your organisation to the Royal Society of Victoria.

We also welcome your thoughts and ideas on how members can become more involved in this effort. Please write to me at **president@rsv.org.au** to continue this dialogue; we'd like to publish your letters and engage as many members as possible in future editions of *Science Victoria*.

Rob Gell AM MRSV
President

LETTERS

Learning and Vocation

Red Symons, MRSV

10.01021

The number was written on a t-shirt underneath a cute cartoon of an alien. The wearer was a mathematics academic in for a radio chat. It was a puzzle.

I started looking for more data and noticed that the alien had three fingers – puzzle solved.

"Pi", I offered.

"Correct", he replied.

Since the number has only 0s, 1s and 2s, it may well be to the base 3 rather than our familiar base 10. Hence what appears as a ten is, in fact, a three. If we had three digits instead of five, then that's how we would count.

Like a jackdaw, what I have treasured in the 50 years after tertiary mathematics, is a collection of baubles.

∫ 1/(cabin) d(cabin) = log(cabin) + C
= houseboat

Curiously, Pure Mathematics was a subject in the Arts faculty. The progenitor of all disciplines?

Eschewing the vocational areas of physics and chemistry, the closest I got to something of practical use in the outside world was "Theory of Statistics" as it announced itself to the students. With this subject I could have become enthroned as an actuary – a bookmaker employed by an insurance company to bet on failure.

"I bet robbers burn your house down." A lose/lose seems to be a win/win.

Nevertheless, mathematics has never left me.

I was interested to learn, many years later, that the hammer of the piano strikes the string at such a point as to suppress the discordant 7th harmonic.

Thank you, Herman Helmholtz.

There was a game of 50 levels on a Gameboy that, at each level, gave you a code to unlock the next level. I completed the first half dozen and then, with the deployment of higher mathematics, I reverse engineered the code to take a shortcut directly to the 50th level.

Since chords on a guitar are merely mathematical arrays, I discovered utility for myself in the pursuit of music. I can play chords on a left-handed guitar – a trivial mirror image. I have many softwares which think through the many rules of music. It's only a matter of time before a simple melody can be articulated and embellished by simply pressing the JSBach button.

There was a game of 50 levels on a Gameboy that, at each level, gave you a code to unlock the next level. I completed the first half dozen and then, with the deployment of higher mathematics, I reverse engineered the code to take a shortcut directly to the 50th level.

I have some skill at Mahjong, Go, Nine Man's Morris, Bezique and Forty Thieves. Poker is less interesting to me since it conflates money and psychoanalysis.

As for jokes, I once corrected a joke teller in regard to the mathematics of jokes.

"Three horses walk into a bar....."

Since I anticipated the punchline, I helpfully suggested that there were only two horses.

They sit down, order a drink from the greyhound behind the bar, and start to reminisce about winning races. The greyhound chips in that he has done a bit of racing himself.

"Look at that! A talking dog!" says one of the horses.

Jokes can rework the Hegelian notion to become:

Thesis + Synthesis ===> Antithesis

My neighbour was an engineering lecturer. To his credit, he has two essential modes: certainty and no opinion.

Once upon a time much of tertiary education was less encumbered by notions of vocation and utility. Even today, the study of medicine is where you learn the labels in order to communicate with other officials. It's only when you are in the hospital, at the end of your training, that you need to know how the plumbing can be fixed – or can't.

He decided to build a second storey on his house during a year of sabbatical leave. The child young person from the council came around to innocently advise him as to why it was not possible.

Bruce authoritatively informed him exactly how he was going to proceed.

The house now has a second floor.

Once upon a time much of tertiary education was less encumbered by notions of vocation and utility. Even today, the study of medicine is where you learn the labels in order to communicate with other officials. It's only when you are in the hospital, at the end of your training, that you need to know how the plumbing can be fixed – or can't.

Ask a novelist what "schizophrenia" means, and they will offer a pinpoint. A psychiatrist will advise another psychiatrist that the patient's observable behaviours fall within the scope of the umbrella term "schizophrenia".

To be a specialist is to know more and more about less and less. Don't ask a renal specialist about your cataracts. They may not have the foggiest.

Whatever it is that you have learned will surprise you with its unforeseen applications.

Your vocation is simply what you are curious about.

Thoughtfully,

Red Symons,
MRSV

RSV NEWS AND NOTICES

New RSV Members

Mr Marc Niemes,
Executive Producer, KontentLabs

Mr Dermot Henry,
Head of Sciences, Museums Victoria

Mr Richard Dent,
CEO, Leading Progress

Mr Kostas Siourthas,
CEO, TomorrowX

Professor Ian Rutherfurd,
Consultant & Academic, Alluvium Pty Ltd

Mr Christopher Edwards,
Editor, Prime Creative Media

Colonel Robert Adams,
Clinical Dental Practitioner

Mr Daniel Urrutia Cabrera,
PhD Candidate, The University of Melbourne

Mr Samantha Ratnayake,
PhD Candidate, RMIT University

Mrs Atefah Namipashaki,
PhD Candidate, Monash University

Mr Zhong Yan Gan,
PhD Candidate, Walter & Eliza Hall Institute

Ms Linda Riquelme,
PhD Candidate, The University of Melbourne

Ms Michelle Xu,
PhD Candidate, RMIT University

Mr Billy Xynas,
PhD Candidate, The University of Melbourne

Mr Adrian Loy,
PhD Candidate, Monash University

Miss Cindy Pham,
PhD Candidate, The University of Melbourne

Ms Nadia Khan,
PhD Candidate, Monash University

Mr Samuel Cheeseman,
PhD Candidate, RMIT University

Mr Conor McCafferty,
PhD Candidate, The University of Melbourne

Mr Alam Md Jahangir,
PhD Candidate, Monash University

Ms Ayeshah Augusta Rosdah,
PhD Candidate, The University of Melbourne

Mr Seyedmojib Zahraee,
PhD Candidate, RMIT University

Mr Stuart Brown,
PhD Candidate, RMIT University

Ms Jane Tiller,
PhD Candidate, Monash University

Mr Hoseong Lim,
PhD Candidate, Monash University

Mr Juan Espejo Salcedo,
PhD Candidate, Swinburne University of Technology

Mr Zhuyuan Wang,
PhD Candidate, Monash University

Miss Sanduni Madawala,
PhD Candidate, Monash University

Mr Jack Chan,
PhD Candidate, Peter MacCallum Cancer Centre

Mrs Farnaz Tabatabaie,
PhD Candidate, RMIT University

Mr Liang Zie,
PhD Candidate, Monash University

Unless Members request a ballot, these will be considered by Council and, if elected, will be confirmed at the next Ordinary Meeting of the Royal Society of Victoria.

Vale

MR CHARLES CLARK MRSV
16 FEBRUARY 1923 – 5 AUGUST 2022

The Royal Society of Victoria records the passing and celebrates the long life of Mr Charles Clark MRSV.

Born and raised in Melbourne, Charles was accepted to a four-year degree in Mechanical Engineering at the University of Melbourne in 1941. It was still the early years of World War II, and in 1943 Charles deferred his studies for three years to work for the CSIRO and the Department of Ordnance, Torpedos and Mines, measuring the velocity of torpedoes for the war effort.

He returned to the University Melbourne in 1946, graduating at the end of 1948. Throughout his university years he spent most of his weekends in the mountains – either skiing in winter or building the first lodges at Mount Hotham in the summers. The summer of 1949 found him working with friends, blasting rock at the pimples at Hotham to build the University Ski Club.

Charles' love affair with the mountains continued throughout his whole life, joining the Alpine Club of Victoria in 1947 and remaining a member for over 70 years. He served as ACV President, Secretary and as the Mount Buller Sub-Committee Chairman; as an engineer, he was an invaluable club resource. He was the last of the club pioneers who skied before lifts were even installed at Mount Hotham.

Professionally, Charles worked at the Australian Paper Mills factory in Fairfield (now a new housing estate) before leaving Australia in 1951 to go and work in England – primarily in Bedford to work in the power station there.

He returned to Australia in 1954 to join the Gas and Fuel Corporation of Victoria, where he worked for the next 30 years. His first position was as a Mechanical Engineer in the project department responsible for the mechanical design and construction of the Lurgi Coal Gasification Plant at Morwell. By 1965 he had been appointed Chief Project Engineer with overall responsibility of managing the engineering for all capital works for the Corporation, including participating on the building committee for the construction of the (now demolished) Princes Gate Towers on Flinders Street.

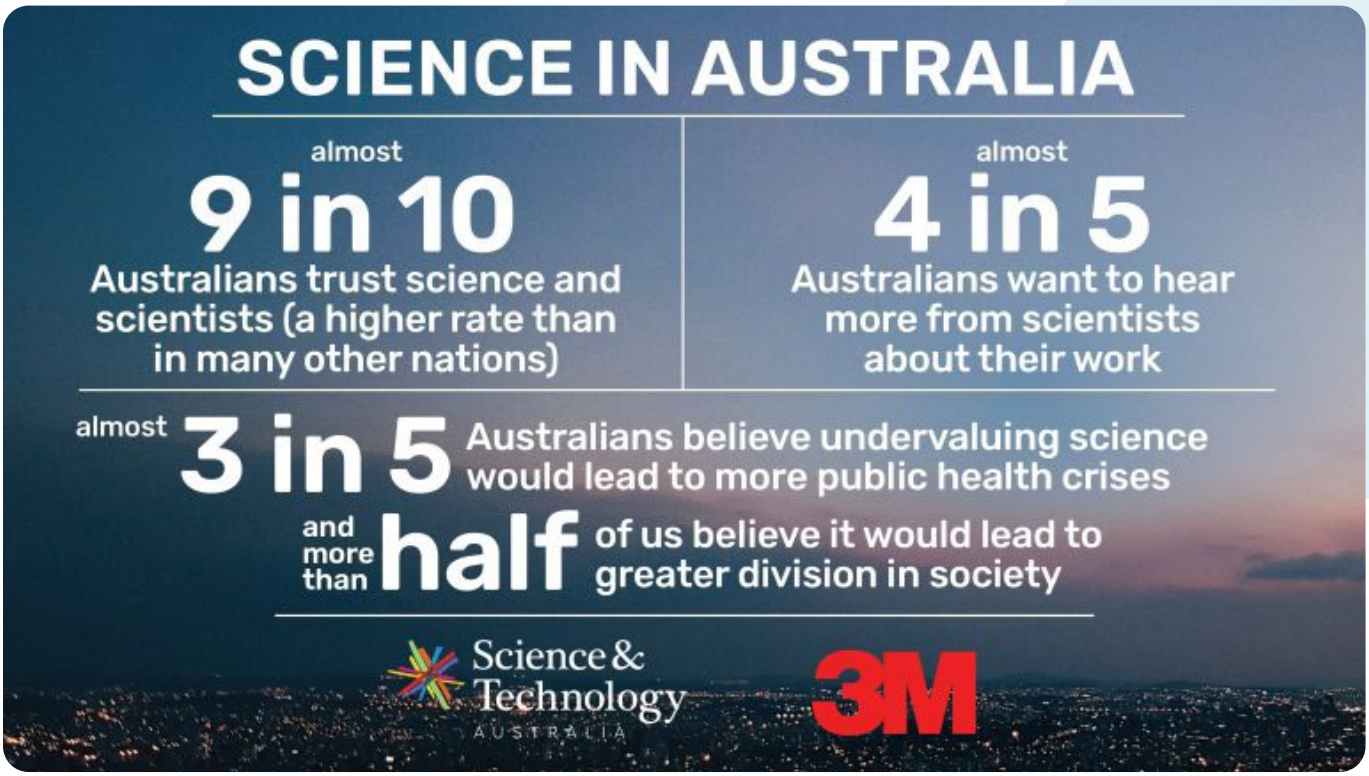
Charles was promoted to Chief Engineer of the Gas and Fuel Corporation of Victoria in the early 1970s, a position he held proudly until his retirement in 1984.

In 1956, Charles married Margaret Joan Sanders who died in January 2004. Together they had three children – Peter in 1957, Richard 1959 and Merial in 1961. After Margaret died, Charles occupied his time in a variety of ways. He was inducted into the Probus Club of Malvern in May 2006, taking on the role of President in 2017 at the age of 95.

The Council of the Royal Society of Victoria extends sad condolences to Peter, Richard, Merial and their families, and to Charles' steadfast friend Wendy.

From Science and Technology Australia

Australians Back Science to Stem the Tide of Misinformation



Australians overwhelmingly trust in science and scientists – and we strongly fear negative consequences for our society if people don't value science enough, new research finds.

But a rising tide of public wariness about social media misinformation risks fuelling scepticism in science, the new data released to launch **National Science Week** reveals.

A major new study published today finds Australians see science as indispensable, say it was our salvation in the pandemic and is the key to tackling existential threats such as climate change.

The **3M State of Science Index** measures public attitudes to science in 17 countries. More than 1000 Australians were surveyed for the global poll in early 2022.

Science & Technology Australia Chief Executive Officer Misha Schubert said: "Australians strongly value and trust science, and we see clearly how important science is to our safety and prosperity."

"Science has saved us time and again during the COVID-19 pandemic – and Australians appreciate science's key role to help us tackle major threats including climate change, which is causing more frequent terrifying extreme weather like floods, cyclones, megafires, droughts, and heatwaves."

The survey reveals Australians have very strong levels of trust in science – higher than in many other nations – with nine in ten of us saying we trust science and scientists.

Four in five Australians say they want to hear more from scientists about their work.

The survey highlighted Australians' fears about what might happen if people don't value science, with three in five believing it would lead to more public health crises and more than half believing it would lead to greater division in society.

The survey also shines a light on public fears around science misinformation and a growing scepticism about scientific information shared in the media and on social media platforms.

The Royal Society of Victoria is a proud member of Science and Technology Australia

Three in four Australians believe there is now widespread misinformation (on all topics – not specifically on science) in mainstream news, and nine in ten Australians think there is widespread misinformation on all topics on social media.

Against that backdrop, the public level of scepticism around science has risen slightly from 25 per cent in 2021 to 32 per cent in 2022.

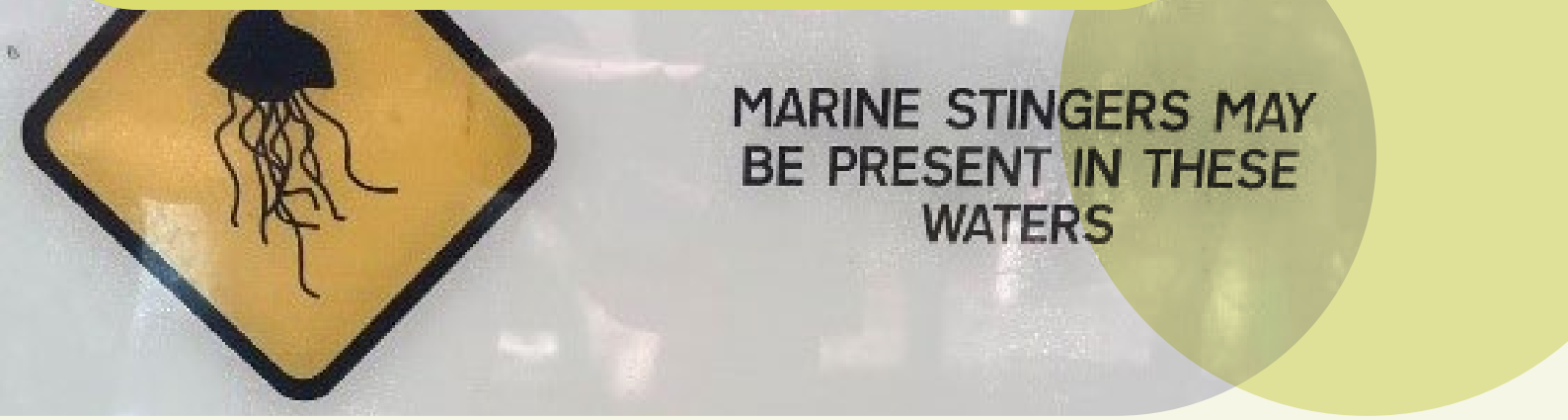
> ***"We live in an era of general wariness and distrust of information – especially on social media – which is feeding into a rising tide of concern about social media misinformation that risks fuelling public scepticism in science unless we all act to safeguard it," Ms Schubert said.***
>
> ***"It's more important than ever that we all help Australians to find credible, accurate and verified sources of scientific facts from reputable science experts, which highlights the hugely important role of trusted science organisations to share science with the public."***

Eleni Sideridis, Managing Director of 3M Australia and New Zealand, said science is viewed as essential to shaping, strengthening and improving Australia.

> ***"The last few years have shown Australians the true value of science. We have seen a global pandemic unfold, the impacts of climate change and increasing weather events firsthand. The people of Australia know that science holds the solutions to many of these issues," she said.***
>
> ***"The results of the 3M State of Science Index demonstrates how we as a nation recognise misinformation. It shows the importance of science communities, such as those within Science and Technology Australia and 3M, being present in the public eye to ensure transparency and clearly communicated solutions to Australia's biggest problems. Only then will we have a prosperous future for our country."***

WHAT I'VE BEEN READING

Thoughts and reflections from Members of the Royal Society of Victoria.



Confronting the Politics of Existential Risk

By Professor Alan Duffy
Swinburne University of Technology

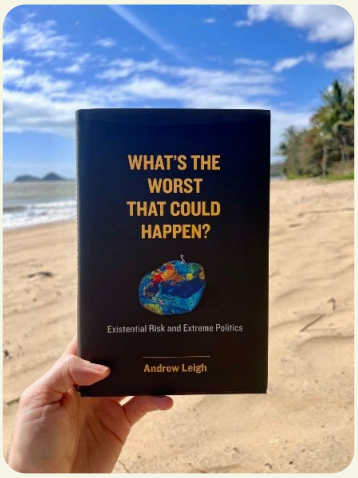
What's the Worst that Could Happen?
Existential Risk and Extreme Politics

Andrew Leigh
MIT Press, ISBN: 9780262046077

Sitting on the beautiful lands of the Yirrganydji people, here in Palm Cove, it's hard to worry about existential risk on a stunning day like today but that's Dr Andrew Leigh's point - it's something we need to consider now so we have that far off tomorrow. Like any insurance policy, a small investment now makes that catastrophic future event manageable - better yet, we might even entirely avoid it (like bioterrorism stopped in its tracks for example). That requires global governance and that means better, or at least longer-term, politics.

The risk of dying from poisonous or deadly creatures (thankfully I'm out of season for those up here!) might seem a major worry... but as Andrew points out dying from a catastrophic event (nuclear war, pandemic etc) by the end of the century is just one in six, that's 6,194 times more likely than the croc getting you..! I might quibble with the risk for extreme events but when you count the untold billions (trillions?) that could live on Earth in generations to come it's clear we need to safeguard and steward our planet better for all those yet unborn.

As populism is inherently short-term, focussed on real (or imagined) strifes in the present, Andrew argues we need to have a more stoic, logical form of politics that can take a long-term view of these risks and their solutions.

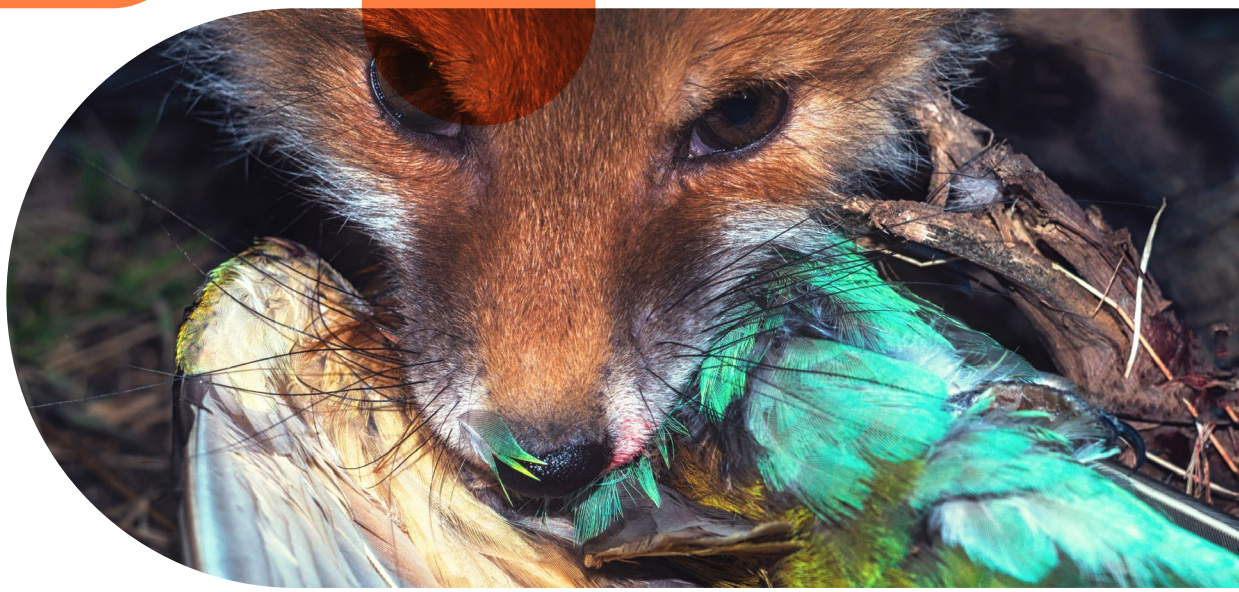


Suffice to say I'm a fan of "What's the worst that could happen? Existential risk and extreme politics" and I hope it can very much be a work of nonfiction where those solutions are concerned..!

Our book reader, Professor Alan Duffy, is an astrophysicist, Director of Swinburne University's Space Technology and Industry Institute, and one of Australia's most prolific and prominent science communicators.

Our book's author, Dr Andrew Leigh, is an Australian politician, lawyer and former professor of economics at the Australian National University. He has been a member of the Australian House of Representatives since 2010, representing the seat of Fraser until 2016 and Fenner thereafter. He is currently the Assistant Minister for Competition, Charities and Treasury.

EVENTS



RSV Symposium: Next-Generation Biocontrol of Invasive Vertebrate Pests

Friday 16th September, 2022 (8:30 for a 9:00am start – 3:30pm)

PRESENTING PARTNERS

*Convened in partnership with the **Invasive Species Council** and the Victorian **Department of Environment, Land, Water & Planning**, **Zoos Victoria**, **Rabbit-Free Australia**, the **Centre for Invasive Species Solutions** and the **Victorian National Parks Association**.*

A one-day symposium to canvass the impact of invasive vertebrate species on ecosystems and agricultural activities throughout Australia, explore new and emerging biological control strategies for invasive vertebrates, and consider the ethical, social, technological, and decision-making challenges posed by these technologies for governments, industries, and land managers.

WHO SHOULD ATTEND?

We welcome all audiences, including researchers, land managers, First Peoples, government policy leads, industry groups, conservation groups and any other parties with a stake in the challenges posed by invasive vertebrate species and an interest in emerging research that can offer new and effective tools for biocontrol in the years to come.

BENEFITS OF PARTICIPATION

The symposium presents an opportunity to share insights and access expertise in identifying and responding to some of the most pressing challenges facing the Australian continent's ecological health from the impacts of invasive vertebrate species.

PROGRAM:

Session 1: The Problem

- The necessity of the next generation of biocontrols and how to create a supportive operating environment.
  Mr Andrew Cox, CEO, Invasive Species Council
- Australia's invasive vertebrates: the extent of the problems and the need for integrated, community-based solutions
  Professor Euan Ritchie, Deakin University
- The On Farm Cost of Invasives
  Mr Gerald Leach, Victorian Farmers Federation
- The Impact of Invasive Species from a First Nations Perspective
  Ms Chelsea Cooke, South Central Conservation Officer, Trust for Nature & Graduate, Warreen Beek Trainee Rangers Program
- The Impact of Invasive Species on Native Species
  Ms Shalan Scholfield, Department of Agriculture, Fisheries & Forestry

Session 2: The Technologies

- Overview of national collaborative pest biocontrol
  Dr Andreas Glanznig, Centre for Invasive Species Solutions
- Immunocontraception for feral cat management
  Dr Ellen Cottingham, University of Melbourne
- Biological control pipeline strategies for sustainable control of rabbits in Australia
  Dr Tanja Strive, CSIRO
- Developing gene drive technology for invasive rodents
  Professor Paul Thomas, University of Adelaide
- Genetic biocontrol of invasive fish via self-stocking incompatible male system
  Dr Chandran Pfitzner, Macquarie University
- Fish viruses: friend or foe?
  Dr Agus Sunarto, CSIRO
- Genetic control of pest fish
- *Dr Jawahar Patil, University of Tasmania*
- Developing pipelines for genetic biocontrol of vertebrates
  Dr Stephen Frankenberg, University of Melbourne

Session 3: The Caveats

- A perspective on next-generation technology development from a conservation stakeholder
  Professor Dan Tompkins, Science Director, Predator Free 2050 (New Zealand)
- The ecology and evolution of suppression gene drives
  Professor Ben Phillips, The University of Melbourne
- What can we learn from theoretical models on gene drives?
  Dr Aysegul Birand, University of Adelaide
- Building social licence for pest animal control
  Mr James Trezise, Conservation Director, Invasive Species Council
- *Animal welfare – posing the hard questions*
  Ms Rita Hawkes, Research Officer, RSPCA

Tickets are available from **https://rsv.org.au/events/invasive-pests-biocontrol/** to either attend in person or participate in the webinar via Zoom. RSV Members are prompted to enter their "promo code" to access a member's ticket.

Young Scientist Research Prizes Competition: Presentations, Judging and Prize Ceremony

Thursday, 13th October 2022 (from 6:00pm)

To foster and recognise excellence in Victoria's early career scientists, the Royal Society of Victoria has established four prestigious competitive prizes open to Victorian students in their final year of doctoral candidature, in all areas of the Biomedical & Health Sciences, Biological Sciences (Non-human), Earth Sciences and Physical Sciences.

Following assessment of applications across the four categories, we will select **eight PhD finalists** to present their work. Join us to hear about the latest science from our emerging scientists, and to support and celebrate the achievements of Victoria's upcoming high achievers.

Registration is available from **https://rsv.org.au/events/ysrp-2022/** to join us for the competition and awards ceremony at the Royal Society of Victoria's historic Hall in the Melbourne CBD. Alternatively, you can watch along via our **YouTube channel** at the appointed time without needing to register.

Livestreamed as part of the Inspiring Victoria program in 2022.

Inspiring AUSTRALIA Victoria

AWARDS, PRIZES AND FELLOWSHIPS

ON Accelerate

ON Accelerate is a structured, full-time accelerator for research teams to validate and develop high potential innovative ventures.

APPLICATIONS TO PARTICIPATE IN ON ACCELERATE ARE NOW OPEN

Apply before midnight Friday 16 September 2022.

ON Accelerate is a free program that gives teams the skills and support to validate and develop a high potential innovative venture. The program focusses on business models, market validation, capital raising and storytelling.

All IP remains the property of the team or their sponsoring institute, participation is free and all participants are required to sign non-disclosure agreements for IP protection.

WHAT TEAMS WILL GET OUT OF ON ACCELERATE

ON Accelerate will provide you with information and experience in skills teams need to develop a high potential innovative venture.

You'll work with specialists in:

- media management
- performance coaching
- IP
- finance and contract management
- investor relations
- team building.

Which will help you develop skills to:

- evaluate term sheets
- pitch to VCs
- learn about prototyping
- build your business model
- connect with an amazing network around the country.

WHO CAN PARTICIPATE IN ON ACCELERATE

To participate in ON Accelerate, you must apply with a team of two to five people. All team members should be based in Australia for the duration of the program.

Your team must include:

- one person who is a researcher at an Australian research organisation

or

- a current or recently completed (<24 months) PhD students from an Australian university.

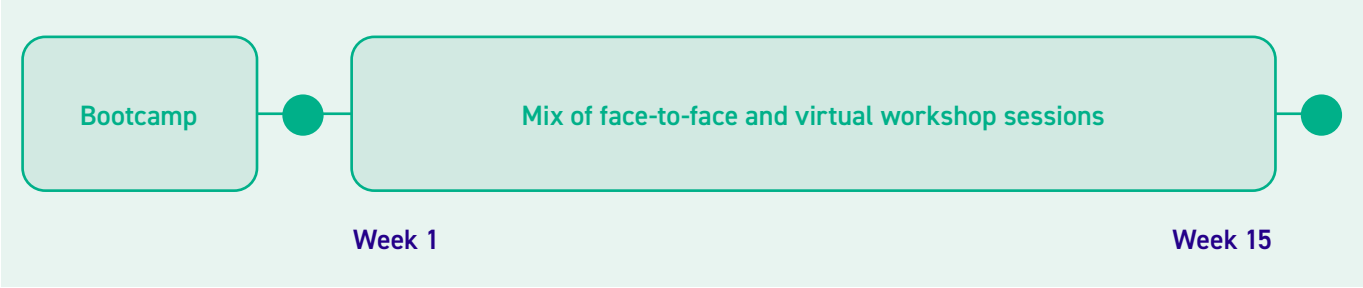
The rest of your team may include anyone else you think will add value to your team, for example:

- your colleagues
- people from other research organisations
- community representatives
- industry partners
- university students
- someone from your organisation involved in research services, tech transfer, communications.

Teams from an Australian startup or SME that has IP licenced or acquired from an Australian university or publicly funded research organisation may also be eligible.

HOW ON ACCELERATE IS DELIVERED

Up to 20 teams are selected from the online application process to participate in a two-day selection bootcamp, delivered face-to-face. ON Accelerate is delivered to the top 10 teams that are identified through the bootcamp process.



Overview of ON Accelerate delivery

Program participation involves a three-month commitment. The program kicks off with a full week delivered face-to-face. You'll then take part in five two-day level-up sessions every second week, meeting with your allocated innovation mentor in the weeks between. The program culminates with a publicly facing event where you will showcase your work and expand your ON network even further.

During ON Accelerate teams will have the opportunity to showcase their idea to multinational corporations, large Australian enterprises, SMEs, government, investors and universities.

WHAT TIME COMMITMENT IS REQUIRED

The program requires substantial effort and allocation from teams. All team members should be available to participate in the workshop sessions and at least one team member should focus full-time on the project for the duration of the program.

NEXT ROUND

We are currently accepting applications for ON Accelerate. This intake of ON Accelerate will commence with a bootcamp in late November 2022, with the program running from February to May 2023.

We anticipate opening another call for applications for ON Accelerate in mid-2023, for delivery late 2023 to mid-2024.

To be notified of upcoming rounds, subscribe to our mailing list.

HOW TO APPLY

Applying to participate in ON Accelerate is a multi-step process:

1. SUBMIT AN ONLINE APPLICATION

Each team is required to register via the online application portal then submit an application. Access to the portal will be made available when applications open.

2. APPLICATION REVIEW AND EVALUATION

At the closure of the application period, all applications will be reviewed by representatives of their lead organisation. This is to ensure that each team has engaged their sponsoring institute and has full support to participate in the program.

Each application is evaluated by multiple experts from our extended network. The highest rated applications will be invited to participate in the two-day selection bootcamp.

3. PARTICIPATE IN SELECTION BOOTCAMP

The top teams participate in a two-day selection bootcamp, after which a final cohort are selected for ON Accelerate.

Applications are evaluated against how clearly they have articulated the following points:

- the solution and value proposition for their product or service
- evidence of the problem that their solution addresses
- the identified target market and customer segments of their product or service
- strength and coverage of relevant skillsets within the team
- demonstration of commercially relevant traction or uptake of their technology
- alignment between the team goal and objectives of ON Accelerate
- evidence that a startup venture is the most appropriate pathway to impact.

PhD Scholarship Opportunity

Academic Freedom Supporting Science and the Public Good

The School of Humanities, Arts and Social Sciences at the University of New England, Armidale NSW, is offering a unique and exciting opportunity for a motivated Domestic PhD candidate.

The PhD scholar will initiate and conduct research into academic freedom and evaluation of university academic freedom policies for their capacity to support and promote academic freedom. The project will investigate whether academic freedom policies deliver their desired outcomes for researchers, research and - ultimately - for Australian society.

In particular, the successful candidate will focus their research on evaluating the ability of academic freedom and related policies to ensure that science is free from suppression, especially in relation to high profile and often also contentious environmental topics including climate change, biodiversity loss and natural resource management. The evaluation will be based on evidence-based criteria, empirical survey and comparative analysis, as well as review of documented instances of suppression internationally, and also take into account the operating and funding environment for research.

The position is an exciting opportunity to contribute to scholarship in a topical area of enduring concern. Academic freedom in science is essential for knowledge generation and communication, development of sound public policy, and achievement of public good outcomes.

The project is supported by the University of New England, in collaboration with the Ecological Society of Australia and Deakin University. The project is based at UNE in Armidale and includes a three-year targeted domestic stipend scholarship funded by the University of New England, with top-up funding from the Ecological Society of Australia. The project will be supervised by 'legal geographer' Professor Robyn Bartel at UNE, with co-supervision from ecologist Professor Don Driscoll at Deakin University.

The successful candidate will have (essential):

- First-class Honours or equivalent;
- Experience in conducting data collection and analysis;
- Capacity to work professionally, collaboratively and to meet deadlines;
- Strong written and oral communication skills;
- Be interested in natural history and conservation.

The successful candidate may have (desirable):

Strengths in one or more of the following fields would be an advantage but are not essential:

- One or more peer reviewed publications;
- Experience in social data collection and analysis;
- Knowledge of ecological, environmental, biodiversity and/or climate-change-related research, policy and/or management;
- Engagement with the media;
- Project management.

The successful candidate will have Professor Robyn Bartel (UNE) and Professor Don Driscoll (Deakin) as part of their supervision team.

SCHOLARSHIP INFORMATION

AU$30,000 per annum tax-free for full-time domestic students, paid in fortnightly instalments with an additional $5,000 top-up per annum scholarship provided by Ecological Society Australia (ESA). The top-up is paid yearly from commencement and conditional upon satisfactory progress as determined by the supervisors.

The scholarship is for three years full-time for a doctoral degree. The duration of an RTP stipend scholarship cannot be extended.

For more information regarding the Research Training Program (RTP) and the scholarship terms and conditions please visit the University's website.

HOW TO APPLY

To apply for this scholarship, applicants must complete and submit a candidature and scholarship application. All required supporting documentation as mentioned in the application form including the following:

- Include in your application a brief cover letter and a CV;
- Address the selection criteria above in no more than three pages;
- Write up to half an additional page (up to 300 words) describing your ideas for exploring the problem of suppression of academic freedom in ecological, environmental, biodiversity and/or climate-change-related research (any citations may be included in addition to the half page).

For more information on submitting a candidature application please see our web page on how to **apply/enrol for candidature**.

GENERAL ENQUIRIES

General enquiries should be directed to Professor Robyn Bartel:

School of Humanities, Arts and Social Sciences
Email: **rbartel@une.edu.au**

This scholarship closes 30 September 2022.

Scholarship ID: S22-06

DEAKIN UNIVERSITY

UNE UNIVERSITY OF NEW ENGLAND
INNOVATION FOR A HEALTHIER PLANET

ESA ECOLOGICAL SOCIETY OF AUSTRALIA

TRANSACTIONS

FEATURES AND ARTICLES

Pod containing wattleseeds from Acacia victoriae

Wattleseeds

by Priya Mohandoss

On September 1st, we celebrate Wattle Day and pay homage to all that represents our national floral emblem. Whether it be our history, being Australian, its link to the start of spring or its context to our natural environment, wattles play an important role in our lives.

Throughout time, wattles have been used for a wealth of purposes such as a source of fuel, medicines, perfume, feed for animals, woodcrafts and in particular, food. It is the pods of these species that contain wattleseeds, a native component that first originated as a bush food and then became a staple over 6,000 years ago as part of the traditional Indigenous Australian diet.

Mostly found growing wild in the arid regions of Central Australia, and in some inland and coastal areas, A.victoriae, (Elegant Wattle) is the most common edible species.

Being enclosed, these small, chocolate-coloured granules can survive in tough conditions, such as drought and overall, can last if left unopened on the ground for up to 20 years, only propagating once more after a bushfire. The pods can also protect the wattleseeds from dormancy if they happen to be left lying on the ground.

When obtaining wattleseeds, the pods are beaten so that they can fall from the branches and be collected. After this, the seeds within the pods are extracted and then used for culinary purposes. In some cases, the raw green seeds can also be consumed.

In order to provide a rich source of protein and carbohydrates to their diet, the Indigenous women of the tribe milled the wattleseeds in-between two flat grinding stones to produce flour, then kneaded this with water into dough to cook on fiery coals and create cakes or damper. However, these days, wattleseeds are more commonly used for their distinct aroma and nutty taste as a coffee or hazelnut substitute. Furthermore, in ground, extract or paste form, they can be a replacement for vanilla in baking or a thickening agent in sauces and casseroles.

As wattleseeds become more popular, it is encouraging to notice that ingredients such as these are being incorporated into our food intake yet again and more notably, that we are able to realise the benefits that they can offer.

Photo: Mark Marathon, via Wikimedia Commons (CC BY-SA 3.0)
Source: **https://upload.wikimedia.org/wikipedia/commons/0/0b/Acacia_victoriae_legumes.jpg**

Geography of the Yarra River

by Prof. Ian Rutherfurd MRSV
Professorial Fellow, The University of Melbourne
Research Director, Alluvium Consulting

Geography Victoria
Auspiced by The Royal Society OF VICTORIA

Did you know that basalt flows dammed the Yarra River right up to Doncaster in the recent geological past?

Did you know that the Merri Creek has one of the largest community river restoration groups in Australia, or that you can safely swim in the Yarra most of the time?

Did you know that there used to be a Royal Geographical Society of Victoria back in the 1800s, and that a group of enthusiastic Victorians are now re-establishing a similar body called Geography Victoria to celebrate all things geographical?

Well, you would have discovered all of these things, and much more, on the recent inaugural field trip of Geography Victoria, held under the auspices of Victoria's Royal Society.

On the first day of Science Week, about 30 RSV/Geography Victoria members and friends joined Rob Gell, the President of the Royal Society, and our tour guide Dr James Driscoll from Monash University, at the junction of Merri Creek and the Yarra River.

This is an exquisite geographical location. It is at the boundary between the basalts of the western suburbs of Melbourne and the Silurian sedimentary rocks of the eastern suburbs, it is rich in the history of contact between Indigenous and European peoples, and in the industrial history of Melbourne. James unravelled the complex geological story of lavas, and turbidities that underpin the geography of Melbourne.

We were fortunate to also have Julia Cirillo, the Waterwatch coordinator from the Merri Creek Management Committee, to tell us about the amazing work being done to restore Merri Creek. Participants inspected basalt rocks with a hand lens, measured turbidity in the river, and tried to determine which way was up in folded Silurian marine mudstones. Thanks to all our guides for the day, especially the amazing James Driscoll, with Rob Gell's valuable input, drawing on his knowledge from his tertiary and student days.

It was a fabulous field trip! The day truly epitomised what we believe is the essence of Geography Victoria - bringing people of all ages together, all with a love of Geography, to learn about, and enjoy, the world in which we live. It also reinforced the value of the relationship between Geog Vic with the Royal Society. Geography Victoria is planning to hold many more such trips and they will be advertised widely within the Royal Society. Please also keep an eye open for progress in establishing Geography Victoria so that you can get involved.

Ian Rutherfurd *is a fluvial geomorphologist with 20 years' experience working on the geomorphology and management of streams. Ian is presently working in the Department of Resource Management and Geography in the Melbourne School of Land and Environment at the University of Melbourne.*

Dr James Driscoll *is a geologist, Drone Pilot and an Outreach Developer & Coordinator with the School of Earth, Atmosphere & Environment at Monash University*

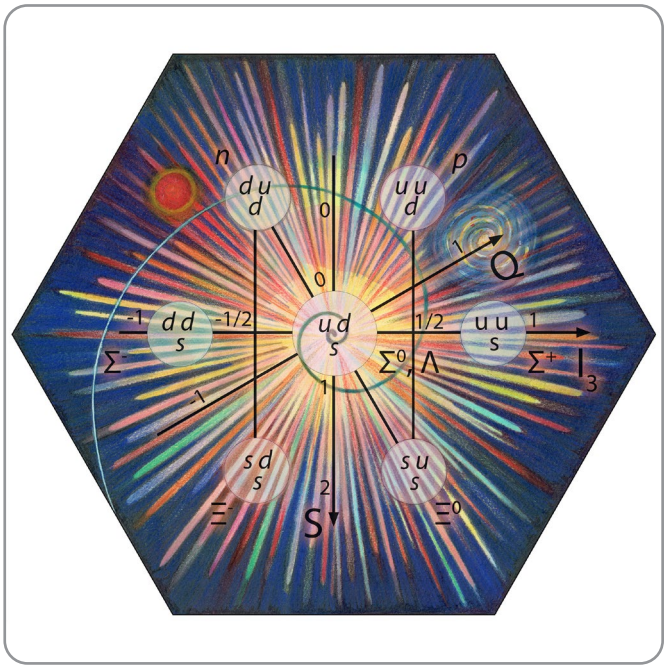
Rob Gell AM FRGS *is a coastal geomorphologist who taught Environmental Science and Physical Geography at tertiary level. Rob is a Fellow of the Royal Geographical Society and an Inaugural Fellow of the Environment Institute of Australia and New Zealand.*

Julia Cirillo *briefs the group on the Merri Creek Management Committee's Waterwatch program.*

Dr James Driscoll *testing soil properties.*

The Big Bang ...and All That Follows!

by Damon Kowarsky



In 2019, to celebrate International Year of the Periodic Table and the 150th anniversary of Dmitri Mendeleev's 1869 discovery, Melbourne artists Damon Kowarsky and Hyunju Kim were commissioned to design 51 images describing the birth of the universe through the creation of the elements of the Periodic Table by Soula Bennett, Director of Quantum Victoria, a specialist Science and Mathematics Centre established by the Victorian Department of Education and Training.

These 51 images were installed on hexagons in the gallery at Quantum Victoria and launched in July 2019. In 2020, as the first COVID restrictions took place, Damon Kowarsky was further commissioned to produce a series of essays exploring the images and their relations to science, history, culture, technology, and politics.

The first and last of the 51 images depict the Big Bang and Mendelevium and begin and conclude the broader narrative of the birth of the universe through the creation of the elements of the Periodic Table.

There are many problems in depicting the beginning of the universe. After all, it happened 13.8 billion years ago, and no one was there to watch. Indeed, what is known about the Big Bang has been extrapolated from observations of the current universe – its expansion, levels of background heat and radiation, the prevalence of the primordial isotopes of hydrogen, helium, and lithium.

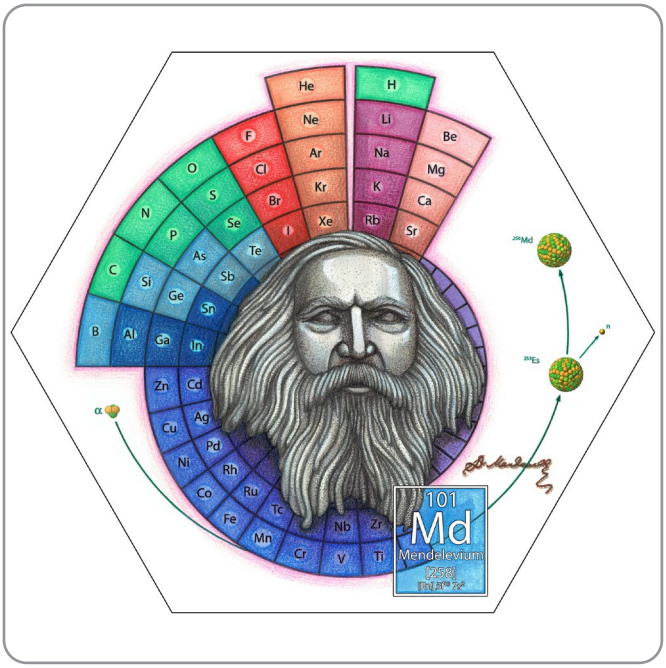
There is also the matter of conception. Although the word atom means indivisible, we have long understood them to be formed of smaller parts – protons, neutrons, and electrons. Now we realise these subatomic particles are only three kinds of baryons [subatomic particles that have a mass equal to or greater than that of a proton] and are themselves divisible into six types of quarks [subatomic particles that make up matter]. And all this, infinitely dense and infinitely hot, was condensed along with space and time into a single, infinitely small, point.

Most depictions of the Big Bang show an explosion, the moment when the universe expanded out from its initial singularity, but there's a problem here too. An explosion is best seen from somewhere else, and as the singularity contained not only all matter and energy but all space and time, there was no "outside" to witness it from. Literally, there was nowhere to rest that hypothetical camera.

As a visual artist, I have attempted to represent all these conceptually difficult concepts in a single image.

As a visual artist, I have attempted to represent all these conceptually difficult concepts in a single image. Also contained in this image is the elegant curve of the Fibonacci spiral, a spiral that increases in size by the numbers of the Fibonacci sequence [1, 1, 2, 3, 5, 8, 13, 21, etc.]. Along its length are significant events in the timeline of the universe. On the right, ten or so billion years ago, is the formation of the disk of the Milky Way. To the left, 4.6 billion years ago, is our Sun. Our species enters the scene just as the curve intersects the image's hexagonal border.

All the existing elements were formed following the Big Bang. Some in the early stages of the universe, others as stars burned fuel or exploded. Still others were discovered or created in the developments of the Nuclear Age. The 51 elements depicted at Quantum Victoria are important to us - not least because we wouldn't be here without them - because we use them, actually consume them, in some way or another. But for this essay, let's jump to the last element depicted - Mendelevium.



In 1848 Dmitri Mendeleev left his birthplace in Tobolsk in western Siberia and travelled with his mother 2,300 km to Moscow. They hoped to enrol him at Moscow University and improve the family situation. Mendeleev's schoolteacher father had gone blind, and the family business had burnt down.

It was not to be. Maria Dmitrievna Mendeleeva and her son travelled another 700 km to Saint Petersburg where he was accepted into the teachers' college at the Imperial University. After graduating Mendeleev taught in Simferopol on the Black Sea and studied liquids and spectroscopy in the German city of Heidelberg. In 1864 Mendeleev became a professor at Saint Petersburg Technological Institute and State University.

The question of how to arrange the elements had been around since at least 1789 when French chemist Antoine Lavoisier sought to classify them into metals and non-metals. In 1817 the German physicist Johann Wolfgang Döbereiner grouped the elements into triads including lithium, sodium, potassium, and calcium, strontium, barium.

By 1864 the English chemist John Newlands had grouped the elements according to intervals of eight. He was ridiculed by the Chemical Society of London for doing so.

In 1869 Mendeleev arranged the 63 known elements according to their atomic weights. In doing so he saw patterns. What we now call halogens were always followed by alkali metals, then alkaline earth metals. These patterns held up even after William Ramsay discovered noble gases in the 1890s.

As well as arranging the elements Mendeleev made two important breakthroughs. The first was to reverse the order of iodine and tellurium. While tellurium is heavier than iodine its properties are closer to selenium, and iodine's to bromine. It was not until 1932, and James Chadwick's discovery of the neutron, that the difference between atomic mass and atomic number was resolved.

The second was to leave space for elements unknown. Many of these Mendeleev predicted. Eka-aluminium became gallium, eka-silicon germanium. Although Mendeleev never received a Nobel Prize, in 1955 he became part of a much rarer group. The 101st element was named for him, making Mendeleev one of only 16 people to ever be honoured in this way.

An Elemental Journey Through the Periodic Table is on permanent public display at Quantum Victoria at Charles La Trobe College, Macleod West.

FROM THE ARCHIVES

Compiled by Scott Reddiex MRSV

1972

MV Nella Dan, the longest continuously serving Antarctic vessel, pictured on the Southern Ocean in 1984.

Photographer: Martin Betts
Source: **Australian Antarctic Program** *(reproduced with permission)*

COLD FEATS

On November 9th, 1972, glaciologist Dr. Ian Allison AO FAA presented recent work by ANARE (Australian National Antarctic Research Expeditions) on the Amery Ice Shelf and the Lambert Glacier.

At more than 400km long, 80km wide and 2.5km deep, the Lambert Glacier is one of the largest in the world, and one of several large glaciers in East Antarctica that reach the ocean via the Amery Ice Shelf. In turn, the Amery Ice Shelf is the third largest ice shelf in Antarctica, and contains an estimated 60,000 km2 of floating ice. It has been monitored through surveys over the past 60 years, measuring the thickness and structure for the impacts of ice flow and melting.

ANARE was established in August 1947 as a result of work by Sir Douglas Mawson, and was led by Dr Phillip Law – former President of the RSV (167-1968), and the namesake of the Phillip Law Postdoctoral Award. One of the specially designed icebreaker-class ships used by ANARE, the MV Nella Dan (pictured), was named in honour of Phillip's wife, Nel, who holds the distinction of being the first Australian woman to visit Antarctica.

1922

Photomicrograph of Gram-stained Clostridium botulinum, type-A.

Source: **CDC** *(Public Domain)*

TOXIC RELATIVES

On the 9th of November 1922, Professor Harold A. Woodruff communicated the paper, "The Specific Identity of *Bacillus parabotulinus*" by the veterinary scientist Herbert. R. Seddon, D.V.Sc.

The paper followed another by the same author earlier that year, in which Seddon had identified a previously uncharacterised '*anaerobic toxin-forming bacillius*'. The bacteria had been recovered from the bone of an animal that had died from '*Midland Cattle Disease*', and, with its similarity to another bacterial species 'Bacillus botulinus', it was named '*Bacillus parabotulinus*'.

From his work, Seddon drew three conclusions:

"(1) That *B. parabotulinus* produces a true toxin, i.e., a soluble exotoxin obtainable by filtration, producing symptoms only after a definite period of incubation, and capable of inducing the formation of an antitoxin.

(2) That though the toxins of *B. parabotulinus* and of *B. botulinus* are identical in their action, the antitoxin to the one does not protect against the other, and vice versa.

(3) it has been shown previously that *B. parabotulinus* differs from *B. botulinus* (Types A. and B.), both morphologically and culturally, and is now demonstrated by toxin-antitoxin tests to be distinct, the specific identity of *B. parabotulinus* is claimed."

In 1959, *Bacillus botulinus* was renamed '*Clostridium botulinum*', and all bacteria found to produce the various types of botulinum neurotoxins were reclassified as one heterogenous species comprising different phenotypic groups. Seddon's '*Bacillus parabotulinus*' is now known to be a member of Group I (proteolytic) *Clostridium botulinum*, and is still occasionally referred to as *C. parabotulinum*.

1872

The Great Melbourne Telescope, South Yarra, Victoria, c.1870

Photographer: Museums Victoria
Source: **Museums Victoria** *(Public Domain)*

THE DOG STAR'S PACKMATES

On the 10th of June 1872, Mr. Farie MacGeorge of the Melbourne Observatory read a paper to the RSV entitled '*On Sirius and his Companions*'. The paper documents the observations of the star *Sirius* A made by himself and his predecessor, Mr. Adolphus "Albert" Le Sueur, between 1869 and 1872. The observations were made using the 'Great Melbourne Telescope' at the Melbourne Observatory which, at the time, was the second largest telescope in the world.

This presentation followed one made the previous year, in which they had noted that '*some minute stars had been observed in the optical vicinity of Sirius*'. Their work on this **was published in *Nature***, and was (to no surprise) discussed at length by the ever-enthusiastic astronomer R.L.J. Ellery in his 1872 RSV Presidential Address.

Learn more about the storied history of the Great Melbourne Telescope, including the early controversies, its journey from inception in London, installation and discoveries in Melbourne, and its rebirth following the bushfires in its new home of Canberra, in Richard Gillespie's book *The Great Melbourne Telescope* (Museums Victoria, ISBN: 9781921833052).

INSPIRING VICTORIA

Launching Rockets at the Library

port phillip libraryservice

Local High School students have been invited to learn Rocket Science, from actual rocket scientists, at the Port Phillip Library Service.

Rocket Science at the Library

Our libraries are working with Inspiring Victoria to run science workshops at the library. Our plan is to have real life rocket scientists teach space science to 10 local high school students.

We will be using Kerbal Space Program, the only computer game approved by NASA for both workshops.

If you are a local high school student, aged 16+ with an interest in Space, Rockets and a career in STEM this is the perfect opportunity for you. It suits students with a reasonably high level of math/ science preferably.

Apollo Workshops

These workshops are called the Apollo Program and will be spread over four weekend sessions. During these workshops our students will be introduced to rocket design, engineering and the principles behind space flight such as orbital mechanics.

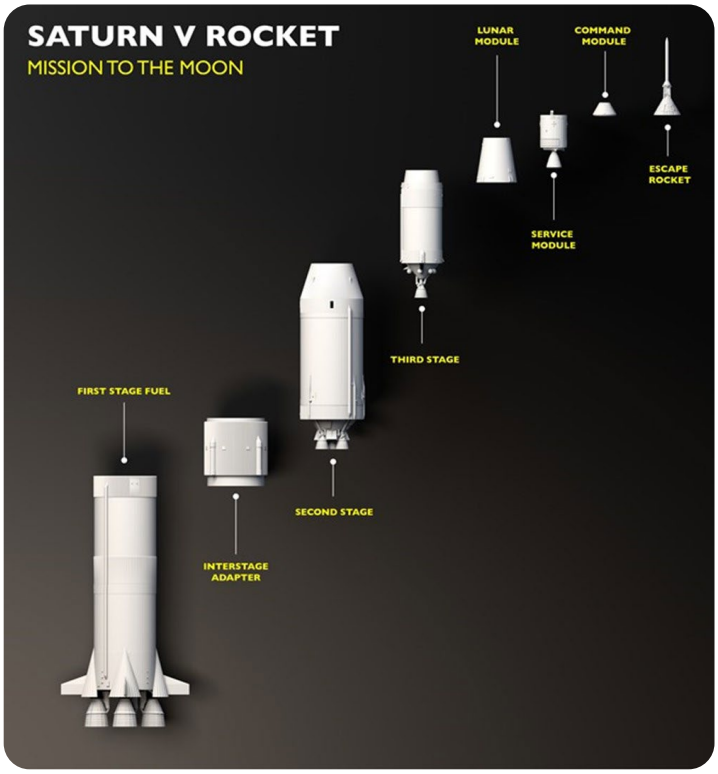
Each week, the students will build upon the knowledge of the week before and we are hoping by the end of the workshops students will feel confident to build and design a rocket program that can travel to the moon and back.

Laptops and everything needed will be supplied to the students.

WHEN AND WHERE

The four Apollo sessions will be held during September and October:

Date: Saturday Sep 10, 17, 24 and October 1
Time: 12pm to 2pm
Location: Emerald Hill Library



Our Partners

Australasian Youth Cubesat Initiative

Australasian Youth Cubesat Initiative Limited is a student-run charity working to inspire, support and empower the next generation through the facilitation of a student-led cubesat satellite development program.

Victorian Space Science Education Centre

VSSEC applies the latest educational research to develop effective programs for both students and teachers. To maintain the highest level of excellence in both pedagogy and science content, the Centre's Advisory Board is drawn from academia, education and government.

Inspiring Victoria encourages involvement in Science, Technology, Engineering, and Mathematics (STEM) through a statewide Partnership Network involving members of Public Libraries Victoria and Neighbourhood Houses Victoria.

The Royal Society of Victoria

The Royal Society of Victoria has been inspiring science here in Australia since 1854 and helped fund and create the grant program for this project.

Snap, CT Scan, Model, Predict

By Dr Catriona Nguyen-Robertson MRSV

This article follows a presentation on 17th August 2022 delivered by Juan Valbuena, Dr Rocio Aguilar and Rebecca Rose (Museums Victoria) as part of the RARE Program in National Science Week.

An icy beginning: Juan Valbuena introduces the Quaternary Period

'Australia is the land of lizards,' says herpetologist Rocio Aguilar. This country is home to over 800 lizard species differing in shape and size, each suited to their different habitats. Not to mention, there are also 280 species of snakes and another 280 species frogs.

How did all this diversity arise?

Juan, Rebecca and Rocio are part of a large team combining existing palaeontology research and collections with new technologies to uncover the distribution of animals. They are using innovative methods of fieldwork and analysis to map Australian reptiles and amphibians in space and time across 3000km of the eastern Australian coast.

They map fauna of the past to help anticipate the future.

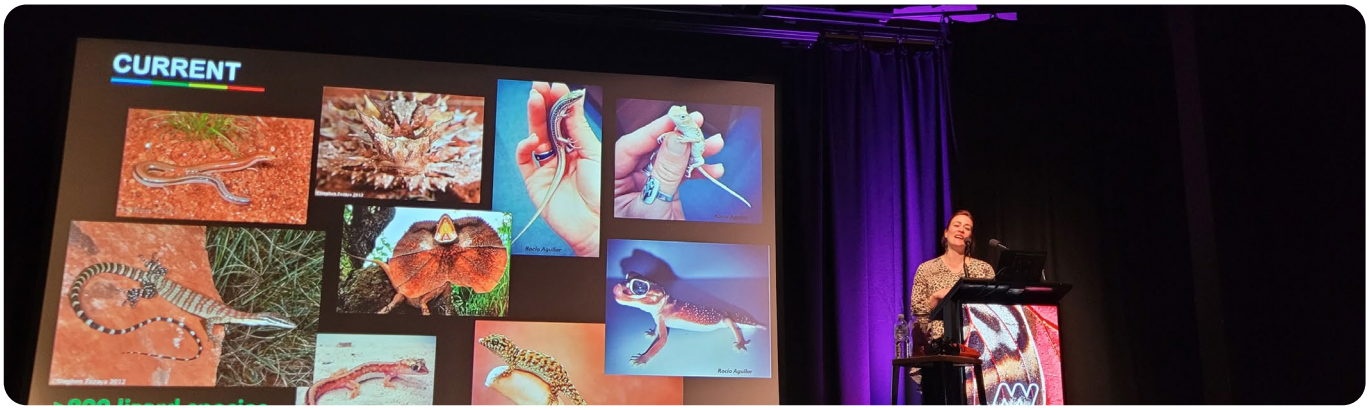
They are particularly interested in the Quaternary Period, a time of turbulent, dramatic changes in climate. Many of us are familiar with the beginning of the Quaternary Period by way the Pleistocene ice age (a setting for many a film), which began about 2.6 million years ago. Amounting to less than 0.1% of all geologic time, the Quaternary Period continues to this day.

While many studies (and movies) have focused on the frozen, ice worlds at the beginning of the Quaternary, Australia did not experience one climate: there was a change from cold to warm and back again. Scientists have evidence of more than 60 periods of glacial expansion with ice sheets engulfing entire land masses, interspersed with intervals of warmer temperatures.

While many studies (and movies) have focused on the frozen, ice worlds at the beginning of the Quaternary, Australia did not experience one climate: there was a change from cold to warm and back again.

The Quaternary has been a period of rapid evolution, giving rise to new species while others have faded out. With less control over their own body temperature, cold-blooded reptiles and amphibians are thought to react more strongly to changing climates than warm-blooded animals, but there is still so much to uncover about their past.

Quaternary fossils provide herpetologists a unique opportunity to understand how animals responded to dramatic environmental change millennia ago, and to predict how they will evolve in the future. This will help paint a picture of reptile and frog species in the landscape to predict and mitigate the impacts of climate change.



Dr Rocio Aguilar describes the large diversity among the 800+ lizard species in Australia

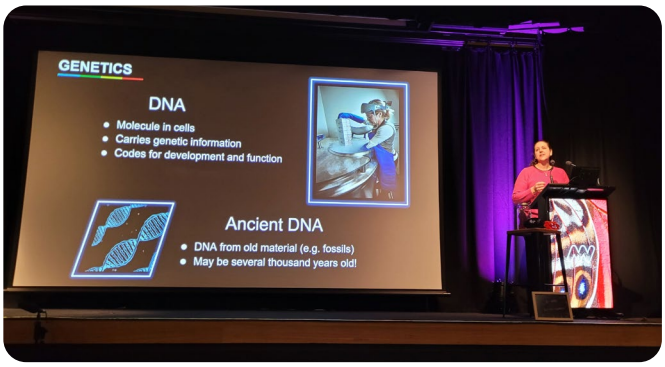
The environment of caves over millennia preserved fossils that herpetologists can now study. Rocio is interested in piecing together a picture by hunting for fossils and comparing them samples in Museum Victoria's Herpetology Collection. It is one of the oldest collections of reptiles and amphibians in Australia and contains over 78,000 specimens.

Rocio uses 3D printing to create models of the animals she studies

The emergence of non-destructive imaging techniques, such as CT scanning, allows scientists like Rocio to understand these animals from outside in. She looks at the size and shapes of animal specimens and their features. Comparing the size of features is relatively simple given that size is definitively quantitative, but comparison of shape is not so easy. She uses a new software can spit out a numerical value for the comparison of shapes of animal skulls and other features. Rocio also enjoys 3D-printing large scale models of the animals to zoom in to their intricate details.

Instead of studying whole specimens at a macro-level, Rebecca drills down to the molecular level. She extracts ancient DNA from fossils that can be up to several thousand years old. The DNA she finds often may be of poor quality and degraded, but she enjoys the challenge of piece the DNA code puzzle together.

Encoded within ancient DNA are all the instructions for an animal's development and function. It can tell her the story of species and its evolution, and how different species are related.



Rebecca Rose studies ancient DNA to understand the stories of animals that no longer walk the Earth

Juan collates all this information from scientists like Rocio and Rebecca to map animal species across space and time. His species distribution models match climate information to which animals are found where – now and in the past. This helps him understand what sorts of climates and environments particular animals will happily acclimatise to. His broader goal is to bring these ecological insights not only to the scientific community but also to policymakers to address the environmental challenges.

Rocio, Juan and Rebecca illustrate how museum-based research with large, data-rich collections and new non-invasive techniques can reveal more than ever before. Understanding reptiles' and amphibians during times of drastic environmental changes provides insight into the impacts of climate change on ecological communities. Historic collections are an irreplaceable resource for understanding the past, reflecting on the present, and looking into the future.

PROCEEDINGS

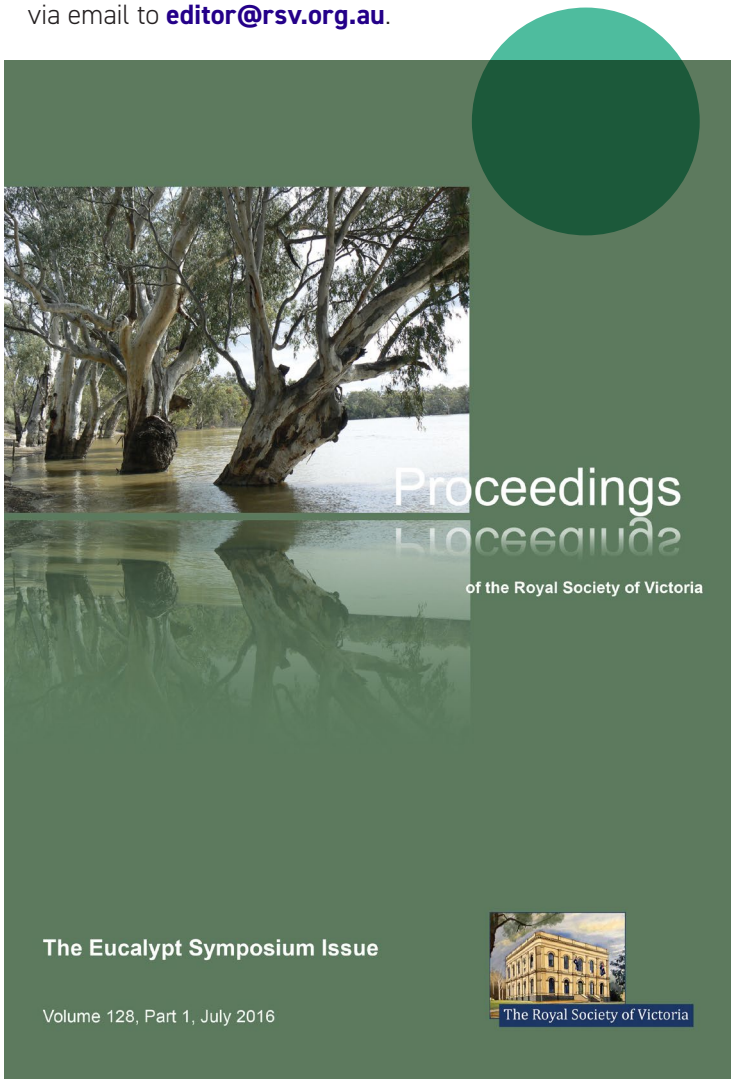
Call for Papers

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 http://www.publish.csiro.au/rs.

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. We are always interested in hearing from authors.

Papers, Reviews and Reports of experimental or descriptive research, submitted for publication by the Royal Society of Victoria, should not have been published hitherto, nor should they be under consideration for publication elsewhere. Published papers are typically concerned with natural history, encompassing the biological and earth sciences, in the Oceania region.

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



Proceedings of the Royal Society of Victoria Volume 134 (1)

The first 2022 edition of the Proceedings of the Royal Society of Victoria are now online, available as open access papers through CSIRO Publishing at **https://www.publish.csiro.au/rs**.

Featured Papers:

Something Went Missing

By Ian M. Mansergh MRSV, David C. Cheal MRSV, John W. Burch and Harry R. Allen

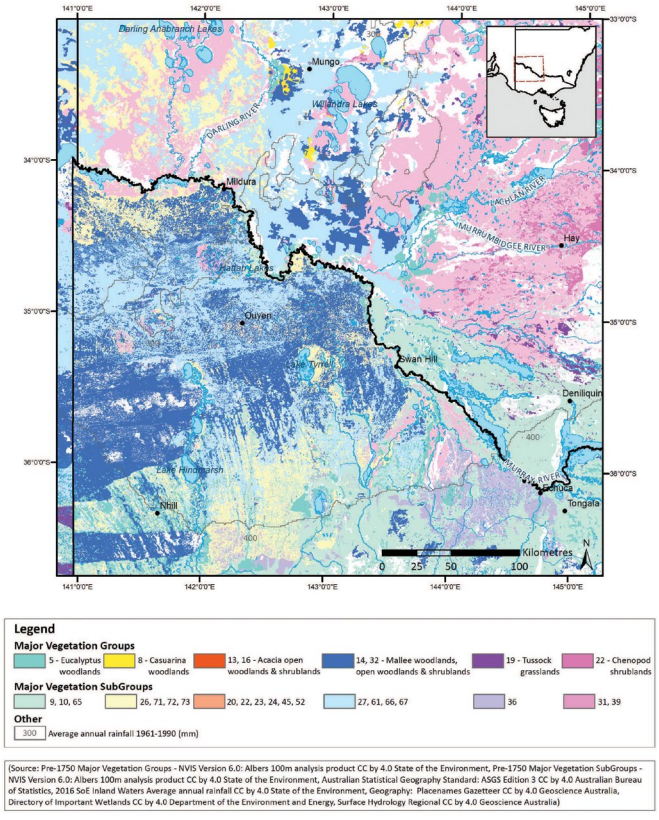
Cessation of traditional owner land management and rapid mammalian population collapses in the semi-arid region of the Murray–Darling Basin, south-eastern Australia

ABSTRACT

The nineteenth century mass mammal extinctions in the semi-arid zone of the Murray–Darling basin, south-eastern Australia, are examined in the context of prior traditional land management. A model of grassland dynamics reveals a multitrophic level productive pulse one to five years post-fire, followed by senescence and increasing flammability. Traditional Owner patch burning of grassland optimized human and mammalian food (including tubers, seeds and fungi) and decreased fire risk. Over at least 40 000 years, the persistence and abundance of fauna responded to this energetically closed self-reinforcing management.

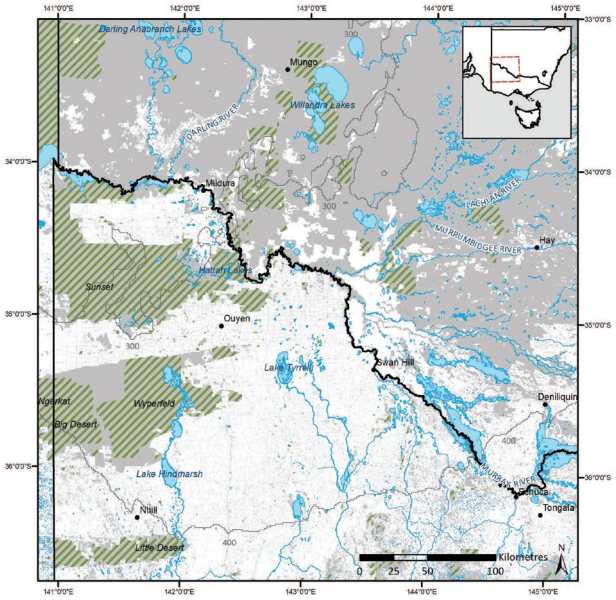
In 1830, depopulation (disease, massacres and displacement) effectively ended traditional management, an ecologically traumatic event that extinguished these productivity pulses. Associated mammal populations of c. 20 species collapsed, and all eco-engineering and mycophagous species, such as bilbies, bettongs and bandicoots, rapidly disappeared.

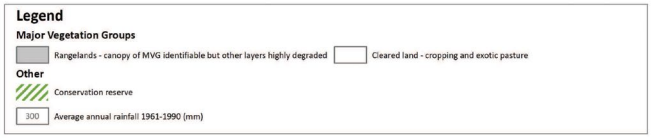
Pre-1750 Major Vegetation and Sub-Vegetation Coverage



(Source: Pre-1750 Major Vegetation Groups - NVIS Version 6.0: Albers 100m analysis product CC by 4.0 State of the Environment, Pre-1750 Major Vegetation SubGroups - NVIS Version 6.0: Albers 100m analysis product CC by 4.0 State of the Environment, Australian Statistical Geography Standard: ASGS Edition 3 CC by 4.0 Australian Bureau of Statistics, 2016 SoE Inland Waters Average annual rainfall CC by 4.0 State of the Environment, Geography: Placenames Gazetteer CC by 4.0 Geoscience Australia, Directory of Important Wetlands CC by 4.0 Department of the Environment and Energy, Surface Hydrology Regional CC by 4.0 Geoscience Australia)

Current Major Vegetation and Cleared Vegetation Coverage





(Source:Present Major Vegetation Groups - NVIS Version 6.0 Albers 100m analysis product CC by 4.0 State of the Environment, Australian Statistical Geography Standard: ASGS Edition 3 CC by 4.0 Australian Bureau of Statistics, 2016 SoE Inland Waters Average annual rainfall CC by 4.0 State of the Environment, Geography: Placenames Gazetteer CC by 4.0 Geoscience Australia, Directory of Important Wetlands CC by 4.0 Department of the Environment and Energy, Surface Hydrology Regional CC by 4.0, Collaborative Australian Protected Areas Database CAPAD 2020 CC by 4.0 Commonwealth of Australia 2021)

Traditional land management increased productivity, habitat heterogeneity and reduced wildfire risk, underpinning mammal abundance. This has remained unrecognized by most mammalogists and land managers. Blaming extinctions predominantly on the additions by Europeans (introduction of ungulates, feral grazers and predators etc.), disastrous as they were, fails to acknowledge the initial cause of rarity, i.e., loss of productivity, habitat and niches when traditional management was subtracted from country. As ecosystems continue to degrade, understanding the primary cause is fundamental to improved management. Although too late for extinct species, respect for, and inclusion of, traditional land management knowledge provides a direction for future land management.

The Port Phillip Company Mine in Clunes, Victoria, taken by Richard Daintree around 1861.

George Ulrich's Contributions in German on Victorian Geology, Mining and Mineralogy (1859–1864)

By Thomas A. Darragh FRSV

Translations of four German publications on Victorian geology, mining and mineralogy by George Ulrich are provided. The hitherto unknown 1859 publication is the earliest detailed account of central Victorian geology and includes descriptions of the techniques for separating gold from quartz and comments on the loss of gold in the tailings and the inefficient mining practices of the time. 3

Ulrich also discussed theories on the origin of auriferous quartz reefs and recorded 19 minerals occurring in the quartz reefs, as well as 14 in basalts with detailed descriptions of many of the minerals. The other three publications continue the geological and mineralogical topics raised in the first with new information gathered since the time of its publication.

A display representing a portion of the shallow alluvial sinkings of the Victorian goldfields as seen at Daisy Hill. The model was made by C. E. Nordstrom in 1857 and forms part of the Museums Victoria collection.

ENGAGE VICTORIA

Current Government Consultations of Interest to Victoria's Science Community

Advanced Recycling Victoria Pty Ltd (APP016941)

Advanced Recycling Victoria Pty Ltd has applied for a development licence.

Consultation closes 21 September.
https://engage.vic.gov.au/advanced-recycling-victoria

Reforming Victoria's biosecurity legislation

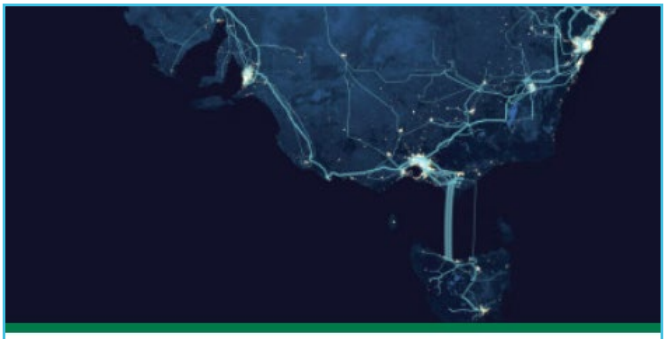
Help shape the reform of Victoria's biosecurity laws

Consultation closes 9 October.
https://engage.vic.gov.au/reforming-victorias-biosecurity-legislation

Falls to Hotham Alpine Crossing

Explore the draft designs for an extended Falls to Hotham Alpine Crossing, and give your feedback.

Consultation extended to 25 September.
https://engage.vic.gov.au/falls-to-hotham



Marinus Link Project EES Draft Scoping Requirements

Public comment is invited on the draft Scoping Requirements for the Marinus Link Project EES.

Consultation closes 19 September.
https://engage.vic.gov.au/marinus-link-project-environment-effects-statement-draft-scoping-requirements

Loch Sport Foreshore Coastal Erosion

We are seeking feedback to help inform erosion management actions and/or adaptation measures for the Loch Sport Foreshore.

Consultation closes 18 September.
https://engage.vic.gov.au/olinda-precinct-upgrades

Kitjarra-dja-bul Bullarto langi-ut masterplan

Help us develop a masterplan for the lower Moorabool and lower Barwon rivers stretching from near Meredith to the estuary at Barwon Heads.

Consultation closes 12 September.
https://engage.vic.gov.au/kitjarra-dja-bul-bullarto-langi-ut-masterplan

Olinda Precinct upgrades

Review options for the precinct and give us your feedback.

Consultation closes 14 September.
https://engage.vic.gov.au/olinda-precinct-upgrades

MacKenzie Falls Revitalisation

The Victorian Government is investing $7.76 million to revitalise the MacKenzie Falls area and surrounds, including the Zumsteins (Bun-nah) trail and day visitor area.

Consultation closes 12 September.
https://engage.vic.gov.au/mackenzie-falls-revitalisation

RSV Membership

Become a Member of The Royal Society of Victoria

OUR PURPOSE

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.

OUR WORK

- Fostering, recognising, and rewarding excellent Victorian scientists across their career trajectory through awards and prizes
- Promoting understanding of science in the community
- Promoting science literacy and education so that people of all ages discover and understand the value of science
- Assisting and lobbying governments on issues relating to science and evidence-based decision making

MEMBERSHIP BENEFITS

- Learn about developments in a wide range of science disciplines through our lecture program and symposia, and how this knowledge can be applied to issues confronting Victoria
- Connect and share knowledge with like-minded people, bringing together expertise and learnings from all backgrounds and fields.
- Collaborate with colleagues to deliver the Society's various programs and projects, using (and developing) your professional skills and experience
- Support the translation of science into action through development of policy and science education initiatives
- Access discounts to RSV events and forums, and car parking in the Melbourne CBD

MEMBERSHIP OPTIONS

Full Membership

Open to all adults (18+) with an interest in science! **$120/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) **$40/year**

Organisational Membership

For organisations to claim membership of the Royal Society of Victoria. Provides a method for general sponsorship of the RSV's programs, along with discounted rates for access to RSV facilities throughout the year. **$1000/year**

Contact us with any questions about membership
Email: **james.mcarthur@rsv.org.au**
Phone: **+61 3 9663 5259**
Or visit us at 8 La Trobe St, Melbourne VIC

RSV Services and Facilities

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!

We provide services in **event managemen**t, meeting **venues**, grants and awards **administration**, broadcasting and video **production**, social media c**ampaign management**, **recruitment** of scientific panels, and **convening** community engagement and deliberation processes where scientific work contributes to social, environmental, and economic impacts and benefits.

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

SERVICES AVAILABLE

The Burke and Wills Room
Multi-functional space with adjoining kitchen, suitable for: Workshops ‹*30 people; Dinners ‹60 people; Seminars, functions, catering, etc., ‹80 people.*

The Von Mueller Room
Seminar room for ‹*15 people.*

The Ellery Lecture Theatre
Raked seating for ‹*110 people.*

The Cudmore Library
Capacity for ‹*24 people*

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.

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 **https://rsv.org.au/support-the-rsv/**

RSV 2020 FUNDRAISING CAMPAIGN AMOUNT	*AMOUNT*
The Area of Greatest Need, as identified by the Society's Council	$
Inspiring Victoria – Community Science Engagement Program	$
Science Awards & Prizes	$
Science History & Heritage	$
Science for All - Citizen Science Programs	$
BioQuisitive Community Lab	$
The Phoenix School Program	$
The BrainSTEM Innovation Challenge	$
Australian Indigenous Astronomy	$
TOTAL	**$**

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☐ **Cheque or Money Order**

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

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The Royal Society of Victoria