

The Royal Society of Victoria

Promoting science since 1854

SCIENCE VICTORIA

NEWS FROM THE ROYAL SOCIETY OF VICTORIA

FEBRUARY 2022



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A pollution
solution 31



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THE OFFICIAL
NEWSLETTER OF
RSV

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News and notices



New RSV Members

Mr. Justin di Giulio,
Senior Place Planner, Department of Transport

Dr. Ray Boyapati
Gastroenterologist - Monash University

Mr. Ahmed Al-Qatatsheh,
Doctoral Candidate
Swinburne University of Technology

Mr Richard Pennington
Orthopaedic and Upper Limb Surgeon, RP Orthopaedics, Eastern Health, Northern Health

Mr Robert Haigh,
PhD Candidate, Victoria University

Ms Talia Langton,
Secondary Student, Blackburn High School

Miss Christal Xie,
Masters Student, The University of Melbourne

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.



From the President- Repositioning the RSV

Welcome to 2022. Like most Australians, the Royal Society of Victoria's Council has been hoping that this year might bring an opportunity to resume 'business as usual', to visit the Society, to meet and attend lectures 'IRL' (In Real Life), participate in events, make our facilities available for workshops and seminars, and welcome new members. Alas, the continued COVIDSafe restrictions mean we will be limited in that capacity for some time to come.

Indeed, it is likely that our members have become used to the status quo of online lectures and limited engagement. It is our intention to engage more with members in new programs where they can assist in taking science 'out' to the community.

OUR PUBLIC POSITION

Members will have received an email from our CEO Mike Flattley on 10th December with the subject: RSV Public Positions - which issues should we address? The email included a link to a survey, the results of which are shared in this edition of *Science Victoria*. We'd like our members to contribute to a process which will determine consensus positions on issues confronting Victoria, particularly those where scientific and related expertise can inform more robust decision making by those with power and influence in various domains and sectors.

We have received eighty responses to date, which is a decent participation rate. Thanks to all for taking the time. It seems that our members are most concerned about recovery and protection of our state's biodiversity in a changing climate. Biodiversity will almost certainly feature as one of our forum topics this year and no doubt investment in biodiversity should be a focus more widely following outcomes from both the biodiversity COP in Kunming and the climate COP 26 in Glasgow last year.

Our members also considered Victoria's 'carrying capacity', our human population an important issue together with the impact



SCIENCE VICTORIA

Monthly newsletter of the RSV

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of invasive pest species and the viability of Carbon Capture and Storage technologies to mitigate global warming.

The management of Ramsar wetlands such as the Gippsland Lakes is an emerging issue and would offer an opportunity for the Society to establish a strong position as would a forum on energy futures, which we have not formally addressed since our 2013 Symposium.

OUR VALUE PROPOSITION

Our focus at present is promoting the Society and its capacities to a wide audience in order to generate new revenue streams, and design new approaches to funding through properly valuing our ability to support science-based decision-making through the energies and expertise resident in our membership.

We are currently designing the Inspiring Victoria program for 2022. Its cornerstone, National Science Week, will run from the 13th to the 21st August this year. Our analysis of the last four years of the program have shown us that the reach and

value of the program is considerable and the return on investment by the Society and our partners, the Federal and State governments, has been substantial.

As we move to repositioning the organisation, we are encouraging new partnerships and alliances in all sectors of the community so that we can continue to expand our capacity to deliver against our strategy to 'elevate Victoria's scientific and leadership capability to purposefully contribute to the positive transformation of our global civilisation in the 21st century'.

Rob Gell, President

RSV Priorities for Formal Positions

My thanks to all RSV Members who took the time to complete our short survey, prioritising questions we might address through our 2022 Member Forums, public symposia and lecture series. The Members Forum in particular will help us to adopt formal positions on matters where a scientific knowledge base can contribute to beneficial outcomes for Victoria's environment, economy and society in general. We received 80 responses through the survey instrument – a

decent response – plus a couple of unchanneled responses via email which I've attempted to integrate into the structure of the survey to inform this aggregated outcome and reflection.

First, here are the rankings (perhaps counter-intuitively, the shorter bars, or lower numbers, reflect the higher ranking, as this is an aggregated return on a ranking from 1 (first) to 9 (ninth):

Letters to the President

SCIENCE VS. BELIEF

The current COVID 19 pandemic has brought forth the "science vs belief" dichotomy in many quarters. This phenomenon is nothing new; there have always been differences in the frames of reference that people use to base their decisions. What is new, however, is the fervour with which some of these beliefs are held and used to debate scientific evidence. The root cause of this fervour has, in my modest opinion, much less obvious origins.

Science tells us what the world is like. It tells us what the world is made of, and what something is or isn't. Science allows us to explore the questions and hypotheses we design by continuous questioning of the universe and everything in it. In its very essence, importantly, science is an impersonal, amoral process where only the method and the evidence reign supreme, and often against the people's and the researchers' morals, feelings and desires. Science is, therefore - philosophically speaking - about an is and not about an ought. There is no way of deriving an ought from an is, and to do so people must engage their own set of morals and values first; set which is often hidden away, subconscious, especially to those who claim that it is possible to derive an ought from an is.

In the context of the pandemic, by way of an example, science can tell us how the virus replicates and what is the level of effectiveness of certain measures to stop contagion.

Science does not tell us, however, to what degree those measures should be put in place, often in contradiction with one another and sometimes in direct opposition to some moral values societies hold sacred. Science can tell us how to minimise the number of lives lost due to the virus, but it does not tell us what the value of human life is in the complex context of modern human life, or how we should weigh the value of human life with, for example, the value of personal freedoms, or with the value of being able to see your dying parents, or to worship in your church and practice a religion in community. These and many others are moral questions, and people hiding behind data, scientific consensus and health advice to make policy decisions are guilty of framing a moral question as a scientific one.

This is where the problem begins. Motivated by fear and anxiety - and maybe even by political expediency and hunger for power - people have turned a blind eye to how science works. In a desperate attempt to curb public opinion to act on these pressing matters, people have made science a belief in itself; a religion in which scientific data, consensus and other forms of knowledge of how things "are" are held as holy scriptures beyond questioning and dissent. This belief, unironically called

"The Science™" in some internet circles, demands submission and following, rather than questioning and dissent.

A belief, no matter the foundations, is commonly fought against with another belief, especially when the former is used as a scapegoat to impose mandates and do away with the perceived sacredness of other frames of reference, such as the civil rights of people in modern liberal democracies, or as an excuse to justify that certain people need to lose their jobs, businesses, income, profits and other forms of livelihood in the name of progress, health, the planet or some other "greater good". This new "religion of science" that demands subordination to the scientific consensus in the name of the greater good, sometimes espoused by scientists themselves, just adds to the ongoing problem of political polarisation where people are unable to find common ground and compromise on the problems of modern societies, and this inability often devolves into displays of power and authoritarianism, now being "backed up" by the work scientists around the world do on many fronts of inquiry.

But this is not how science works; or at least not how it should work. Science asserts itself from the authority of the evidence, not from the authoritarianism of those wielding the evidence - often incomplete and out of context. Science welcomes dissent, questions, scrutiny and concerns, rather than pushing them away or dismissing them out of hand with vulgar displays of intellectual classism, common of the tribal human brain. Science should be open, transparent, welcoming of dissenters and their questions,

rather than being held as a collection of sacred writings and dogmas to be used to “educate” the minds of those who hold often valid concerns and alternative hypotheses, solutions or morals. Science is a process of discovering truth that overwrites itself over and over the more we develop technologies and expand our horizons, not a system to produce ironclad pieces of information used to justify moral decisions or to keep thinking minds in line. And the more people hold science as a religion – with scientific journals as their holy scriptures – rather than as the ongoing, transparent and evolving process of truth-seeking that science is, the more we invariably ask others to oppose this “belief in science” with a belief of their own, unfounded as it may be, because that is the very nature of human beings: we are not rational beings; we are not, in the immortal words of Fyodor Dostoevsky, “piano keys” to be played by the rules of mathematics, science, policy, or any “greater good”.

It would be preposterous of me to say that I hold the answer to this problem, which rather than being one of a scientific nature is one of a bread-breaking and authoritarian nature. Thus, I offer my humble opinion only as a first step for engagement and further discussion by way of a diagnosis.

The problem in my view is not one of evidence, data, or even of beliefs, but one of tribalism and an incapacity to communicate, compromise and find common-ground solutions between people. On the one side, those who weaponise science and its authority to further their political causes; on the other, people who, overwhelmed by the authority that science carries with it, turn to their own confirmation biases and supply them with the dissenting voices in science that will never cease to exist, and point to the inconsistencies and issues that science, by virtue

of its nature, will always carry. However, I would dare say that those in the latter group do not turn to their confirmation biases, beliefs and dissenting voices by virtue of an oft-alleged incapacity to understand science, reasoning and logic – these are people as smart as any other – but by simple reaction and resistance to the science-backed mandates that others impose on them; mandates that tell them how they should live their lives and what decisions they should make to be as morally righteous as those who hide their morals behind the banner and authority of scientific endeavour.

People of all walks of life, no matter how dissenting or uninformed their opinions are, need to be listened to, not dismissed or censored. They need to be accounted for politically, not ignored or demonised. They need to be held in intellectual respect, not in intellectual contempt. And we need to recognise that science is not a moral guide to make decisions, but rather a system to evaluate the outcome of our decisions. Only then, maybe, we will be able to sit together and find common-ground solutions to the most pressing issues we all face as a society. We need as many on board as possible, after all. And we need people to trust science, not hold it in the justified doubt that grows out of using it as an authoritarian, rule-making playbook to try to solve complex, often unsolvable problems. More transparency, communication, responding to concerns, and complex intellectual and moral conversations rather than fearmongering, authoritarianism, slogans, and moral and intellectual dismissal. This, I believe, is the core of the problem, and the main roadblock to build the trust that science needs to work effectively at a social level.

Dr. Sebastian A. Quezada Rojas
MRSV

THE NUCLEAR OPTION

I would like to make a proposal for a topic that would act to address the problem of greenhouse gas emissions in the short to medium term.

Renewable energy sources, power storage schemes and reductions in domestic power requirements are going to take a long time to fully implement. For a substantial length of time, with current projections, we will be relying on fossil fuels with consequent considerable release of greenhouse gases.

We need an energy source that can come on stream fairly quickly and that doesn't produce carbon dioxide.

About 60 years ago it was proposed that a nuclear power plant could be installed on French Island in Westernport Bay. The main reason that this proposal was rejected at the time was that Victoria had huge brown coal resources that would last us for centuries. However, brown coal is being phased out as a very dirty fuel and natural gas is used instead, despite substantial quantities of CO₂ still being emitted from the burning of methane. This will continue, as solar and wind power are, by nature, intermittent.

Australia has already committed to deploying nuclear powered submarines and the South Australian government commissioned a very comprehensive report examining all aspects of the setting up of a “womb to tomb” nuclear industry within Australia.

Clearly, we need to examine the pros and cons of integrating nuclear power into our domestic and industrial power supplies.

Recent advances in fission reactors have been towards smaller, mass-produced modular units, which could be rapidly built and commissioned into the power grid. I am proposing that an RSV focus group should examine the possibility of setting up one, or a bank of these power supplies on French island to supply the needs of the rapidly growing Melbourne metropolitan area. As a secondary goal, the focus group

should look at the feasibility of a reactor at Portland to support the aluminium smelting industry and one in the La Trobe Valley to take advantage of the existing infrastructure.

I'd like to emphasise that I see it as our only medium-term solution to the problem of greenhouse gas (carbon dioxide) emission. Long term, of course, renewable energy sources are the only way to go.

Dr Martin Harris FRSV

WHAT DO YOU THINK?

We welcome responses and new "Letters to the President" for publication in future editions of *Science Victoria* – you can send these through to me at president@rsv.org.au. While there is no assurance that we will publish everything received, and we reserve the right to edit letters on points of grammar or for concision, we'll certainly publish anything that stimulates and progresses a reasoned, fruitful discussion.

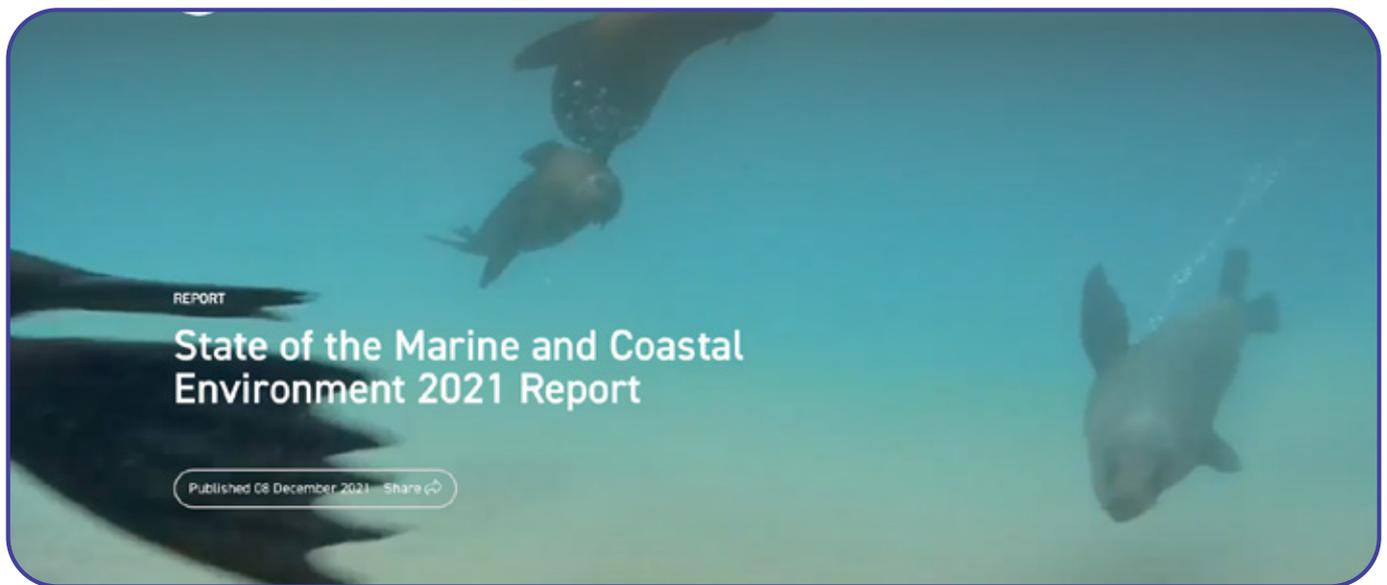
RSV Members Recognised in the 2022 Australia Day Honours

The Council of the Royal Society of Victoria congratulates all who awarded an honour within the Order of Australia on 26 January this year, particularly the following Members:

Dr Alan Finkel AC FAA FTSE FAHMS MRSV, for eminent service to science, to national energy innovation and research infrastructure capability, to climate change and COVID-19 response initiatives, and to science and engineering education.

Distinguished Professor Jenny Graves AC FAA FRSV, for eminent service to science, particularly through leadership and research in evolutionary genetics, to international and national professional societies, for science education in schools, and as a mentor and role model for women.

Dr Tom Beer AO FRSV, for distinguished service to science, particularly environmental risk, climate processes and sustainability, through research organisations.

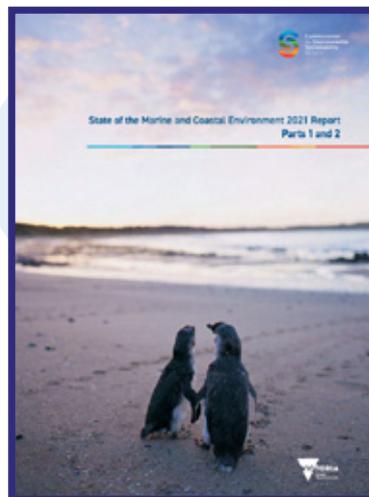


Inaugural *State of the Marine and Coastal Environment 2021 Report* for Victoria

Dr Gillian Sparkes AM, Commissioner for Environmental Sustainability released the inaugural State of the Marine and Coastal Environment 2021 Report for Victoria on Wednesday, 8 December 2021.

The Report is prepared according to Victoria's landmark *Marine and Coastal Act 2018*, which commits the Commissioner to issuing a five-yearly State of the Marine and Coastal Environment Report. The Commissioner's report released is the first under the Act and builds on the 2016 State of the Bays Report.

Dr Sparkes stated *"This report shines a light on the health of our marine and coastal environments to inform investment in marine and coastal science. It reinforces the need for a catchment to reefs approach to our policy and program interventions to protect and improve Victoria's coastal and marine environments."*



Based on existing marine and coastal science, this historic baseline study reports on the health of five Victorian marine and coastal environments: Port Phillip Bay, Western Port, Corner Inlet and Nooramunga, Gippsland Lakes and Victoria's System of Marine National Parks and Sanctuaries.

The Report presents 215 assessments of 82 indicators of

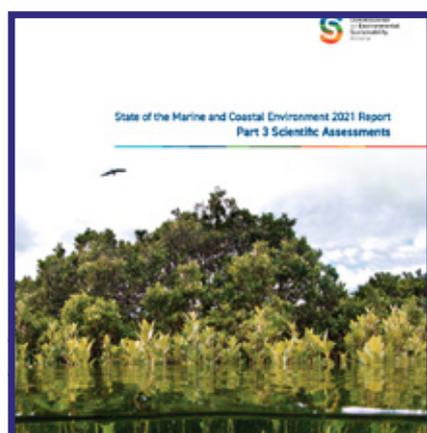
ecosystem health and social science.

Dr Sparkes stated *"Five future priorities are proposed for marine and coastal management and reporting. A high priority is to optimise the possibilities of spatial information to identify and protect Victoria's marine assets."*

Dr Sparkes said *"I am encouraged by the promising statistics we report regarding the engagement of community members in coastal and marine volunteering, Coastcare and citizen science activities."*

The report release is proudly recognised as an action as part of the United Nations Decade of Ocean Science for Sustainable Development (2021-2030), this is one very important decade ahead.

View the Report and visit the interpretive website at www.ces.vic.gov.au/smce-2021.



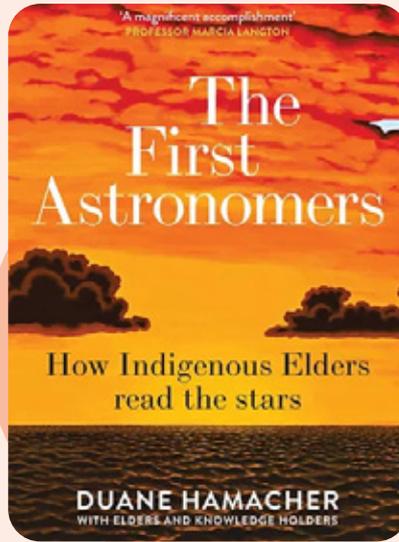
Release of *The First Astronomers: How Indigenous Elders read the stars*

A new book by A/ Professor Duane Hamacher, compiled in collaboration with six Aboriginal and Torres Strait Elders.



"Between the covers of this extraordinary book is a detailed account of the science behind Indigenous star knowledge. Rarely is a book of such importance published. When profound ideas are introduced to the world for the first time, our world is fundamentally changed and the previous understandings consigned to history. There are those who continue to deny the intelligence and scientific traditions of Indigenous people. The idea that the only true science is that of Western thinking must be consigned to history. Those who read this book will understand why."

***Distinguished Professor
Marcia Langton AO***



ABOUT THE BOOK

Our eyes have been drawn away from the heavens to our screens. We no longer look to the sky to forecast the weather, predict the seasons or plant our gardens. Most of us cannot even see the Milky Way. But First Nations Elders of the world still maintain this knowledge, and there is much we can learn from them.

These Elders are expert observers of the stars. They teach that everything on the land is reflected in the sky, and everything in the sky is reflected on the land. How does this work, and how can we better understand our place in the universe?

Guided by six Aboriginal and Torres Strait Islander Elders, Duane Hamacher takes us on a journey across space and time to reveal the wisdom of the first astronomers. These living systems of knowledge challenge conventional ideas about the nature of science and the longevity of oral tradition. Indigenous science is dynamic, adapting to changes in the skies and on earth, pointing the way for a world facing the profound disruptions of climate change.

The *First Astronomers* shows us how respectful collaborations can drive exciting and innovative solutions to global challenges that impact us all.

THE ELDERS & KNOWLEDGE HOLDERS



Ghillar Michael Anderson

Uncle Ghillar Michael Anderson (b. 1951) is an Aboriginal rights activist, Senior Law Man, and leader of the Euahlayi Nation in north-western New South Wales, Australia. He was taught Euahlayi customs and traditions through his people's sacred ceremonies. Uncle Ghillar was a co-founder of the Aboriginal Tent Embassy in 1972 and remains the only surviving member. In 1979 was appointed to the Office of the Public Prosecutions in criminal law as an instructing officer in the state of New South Wales. Uncle Ghillar has been sharing traditional star knowledge for years, publishing several academic papers on Euahlayi astronomy.

John Barsa

John Barsa (1965-2018) was a Magaram man and Knowledge Holder from Mer in the eastern Torres Strait of Australia. He was a successful artist, master craftsman, weaver, carver, dhoeri maker, and traditional astronomy expert. Projects he has collaborated on include the research papers *Dancing with the Stars – Astronomy and Music in the Torres Strait*, *Death and Maier: Meteors and Mortuary Rites in the eastern Torres Strait*, and *Indigenous use of Stellar Scintillation to Predict Weather and Seasonal Change*. He designed traditional Meriam costumes with Aickey Day for Bangarra Dance Theatre's Emeret Lu (*Very Old things*) in their production of *True Stories*.



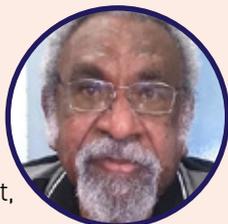
David Bosun

David Bosun (b. 1973) is a Mualgal man, senior artist at Moa Arts and one of the founders of the printmaking tradition in Zenadh Kes (the Torres Strait). He has worked in printmaking, drawing and painting for over 20 years. His work aims to educate future generations in Zenadh Kes (as well as the rest of the world) about the rich cultural heritage and distinctiveness of Mualgal culture. David Brings the aesthetic and personal qualities of the artwork together with his ancestral beliefs and Mualgal cultural traditions. David has a degree in communications from James Cook University and a Diploma of Visual Art from Cairns TAFE.



Ron Day

Father Ron Day (b. 1953) is a Komet man, priest, and Elder from Mer in the eastern Torres Strait. He is a holder of highly respected traditional knowledge and culture and is fluent in Meriam Mir. Uncle Ron served as Chairman of the Mer Island Council for over 15 years. In 2007 he successfully worked to repatriate ancestral remains back to Australia from Glasgow and has been instrumental in re-claiming land and sea rights for the Meriam people. He has shared a great deal of traditional Meriam star knowledge and has co-authored several academic papers on Indigenous astronomy.



Segar Passi

Segar Passi (b. 1942) is a Dauareb man, artist, and Senior Elder



on Mer. He is fluent in Meriam Mir and is an award-winning painter, self-trained since the 1960s by meticulously observing marine and bird species, weather conditions, and painting portraits, images of daily life, and scenes from Creation narratives. His work focuses on the natural world to encourage people to be mindful and respectful of their environment, and to record important social and cultural practices and knowledge. He holds deep levels of traditional star knowledge and has co-authored several academic papers on Indigenous astronomy. His artwork graces the cover of this book.

Alo Tapim OAM

Alo Tapim OAM (b. 1946) is a Dauareb man, Elder, and linguist on Mer.

He is fluent in Meriam Mir. He grew up on Mer (Murray) Island when Aboriginal and Torres Strait Islander people were under the control of the Director of Native Affairs. After finishing school Townsville, Uncle Alo worked as a government clerk on Thursday Island before moving back to the Townsville area to work on the railways. He studied linguistics at the Batchelor Institute and returned to Mer in to work with the Torres Strait Regional Authority and Queensland Health.



THE AUTHOR

Duane Hamacher

Duane Hamacher is Associate Professor of Cultural Astronomy in the ASTRO-3D Centre of Excellence and the School of Physics at the University of



Melbourne. A former ARC Discovery Early Career Research Fellow, he has worked for Meriam elders since 2014 to document the astronomical knowledge and traditions of the eastern Torres Strait Islanders, and with other First Nations communities internationally.

Born and raised in the United States, Duane earned a Bachelors degree in physics from the University of Missouri, a Masters degree in observational astronomy from the University of New South Wales with a thesis on extrasolar planets, and a PhD in Indigenous Studies from Macquarie University with a dissertation on Australian Aboriginal astronomy. He is an experienced public communicator, having given hundreds of public and keynote talks. Duane spoke at TEDx @ Northern Sydney Institute (2014), appeared on the National Geographic documentary series The Story of God with Morgan Freeman (2016) and the Warwick Thornton film We Don't Need a Map (2017), and consulted on the Werner Herzog and Clive Oppenheimer film Fireball: Visitors from Darker Worlds (2020).

Coming March 1st, 2022
PRE-ORDER NOW! Royalties go to a charity, auspiced by the *Royal Society of Victoria for scholarships, community projects and educational programs for First Nations Peoples.*

www.thefirstastronomers.com

Vale - Dr Bernie Joyce MRSV

Emeritus Professor Edmund Bernard (Bernie) Joyce MRSV, 1934 – 2022

We are most saddened to advise that Bernie Joyce passed away on Sunday, 30 January 2022, aged 87.



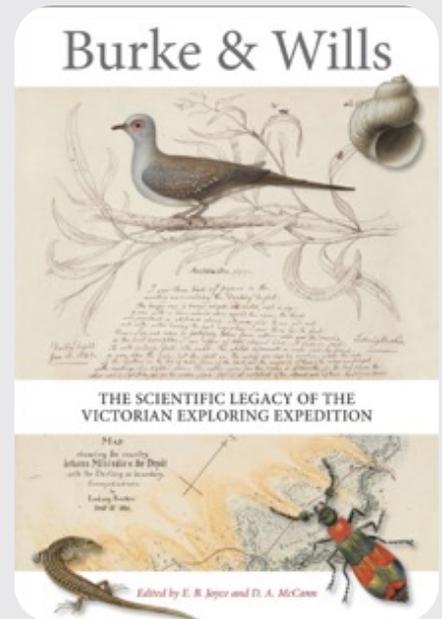
Bernie was a geologist and geomorphologist specialising in landslides and volcanism, especially in the Newer Volcanics Province of Western Victoria, where he worked to map the regolith landforms that tell the story of Victoria's past while determining future volcanic risk. He applied his expertise to the neotectonics of South-Eastern Australia, the recently active and active volcanoes of the Pacific region, and the morphotectonics of the Central Victorian Highlands.

Bernie maintained a vigorous commitment to the preservation of Victoria's geological heritage, evidenced by his leadership of the national Standing Committee for Geological Heritage of the Geological Society of Australia, chairing the Australian Heritage Commission Natural Evaluation Panel (Victoria) and membership of the National Trust (Victoria) Landscape Committee.

Following Bernie's advocacy in 2004, the United Nations Educational, Scientific and Cultural Organisation (UNESCO) in 2008 declared the Kanawinka Geopark, an area with hundreds of volcanic and other geological sites spanning the southern extent of Victoria and South Australia along a structurally controlling geological fault of the same name (pictured, above). It was the first and only geopark in Australia. Sadly, the Kanawinka Geopark was deregistered in 2012 following a lack of support from the Commonwealth, South Australian and Victorian governments.

• In 2009, Bernie was awarded the *Selwyn Medal* by the Geological Society of Australia, Victoria Division (pictured, top, with GSAV President Professor David Cantrill).

Bernie is recognised as one of the longest serving members of the University of Melbourne's School of Geography, Earth and Atmospheric Sciences and its antecedents. Head of School, Professor Todd Lane notes Bernie's affiliation with the University of Melbourne spanned 70 years as a student, academic staff member, and an honorary member of staff. Bernie was made a Life Member of the Royal Society of Victoria in 2012, recognising in particular his contribution to the Society's sesquicentenary celebrations of the Burke and Wills Expedition from 2010 to 2012, in particular as co-editor and contributing author of *Burke and Wills: The Scientific Legacy of the Victorian Exploring Expedition* with friend, colleague and fellow RSV Life Member Dr Doug McCann.



Bernie has been a fond and familiar member of the geoscience community and a most valued member of the Royal Society of Victoria since 1963. He has made an outstanding contribution to the life and work of the Society, and we are the poorer for his passing. The Council of the Royal Society of Victoria extends its sad condolences to all who knew Bernie and valued the constancy of his friendship.



2022-3 Appointment to RSV Council – Dr Jane Canestra MRSV

As we have received one excellent nomination for the five available positions for ordinary members of Council, an election will not need to be held. Please congratulate the following RSV member on her two-year appointment to Council from the forthcoming Annual General Meeting:



Dr Jane Canestra FACEM MRSV

*Medical Practitioner and
Emergency Physician (retired)*

Dr Jane Canestra has had a life-long passion for science, particularly science education. With a career in emergency medicine, public health and emergency management, she regards effective science communication and evidence-based public policy as crucial to

community well-being. Jane has expertise in risk management; executive experience in hospital management; considerable experience in state, national and international liaison representing government agencies; and is a member of the Radiation Health and Safety Advisory Council of the Australian Radiation Protection and Nuclear Safety Agency.

Jane joined the RSV Council in 2020 to contribute to the fundamental role of the Society in the promotion of science, science education and raising public awareness of the contribution of science to daily life and future development of community welfare. She considers the Royal Society of Victoria should be a key influencer in the promotion of evidence-based understanding of science in public policy.

2021 RSV Fellows Appointed

We are delighted to announce the 2021 Fellows of the Royal Society of Victoria. Fellowship is the highest membership honour the Society can bestow on a person and entitles the Fellow to use of the postnominals 'FRSV.' Please join us in congratulating our colleagues on this recognition of their work in furthering the goals of the Society, contributions to their fields of research and education and commitment to an enhanced public appreciation of science. The four new Fellows (in reverse alphabetical order) are:



Mrs Nicola Williams FRACI FRSV

Having spent 40 years teaching science, mainly chemistry, at secondary and then tertiary level, Mrs Nicola Williams is now retired from teaching in the School of Chemistry at Monash but remains an Adjunct Senior Lecturer. She is Curator of the Faculty of Science Instrument Collection and continues research in antique scales and balances, especially those made by the London firm of L. Oertling.

A Member of the RSV since 2007, Nick has been a passionate advocate and contributor to the Society's efforts to communicate science intelligibly to the general community. She has served with dedication on the Society's Council for many years, serving as Honorary Secretary from 2015 before assuming the role of Vice-President from 2017 to October 2020, stepping down to focus on a new role as President of the Australasian Mining History Association. Nick finished her tenure on the RSV's Council in May 2021.



Professor Rachel Webster AO FAA FRSV

A Member of the RSV since 2008, Rachel is an astrophysicist and international leader in the field of gravitational lensing.

She is a Chief Investigator at the Melbourne node of the national ARC Centre of Excellence for Astrophysics in 3D (ASTRO-3D) and a Board member of Australian Astronomy Limited (AAL). She is appointed as a Redmond Barry Distinguished Professor at the University of Melbourne's School of Physics, where her varied and diverse research group covers both observational and theoretical research areas. Her observational program utilises world class equipment such as the Australia Telescope Compact Array, the Gemini Telescopes, the Hubble Space Telescope and the Chandra X-ray Observatory amongst other instruments.

She is a key member of an international consortium involving Australian and American astrophysicists who have designed and built a new low frequency radio telescope at Boolardy in Western Australia, known as the Murchison Widefield Array (MWA), which aims to detect the first sources in the universe. Such information is gleaned from her theoretical studies and detection of reionised hydrogen

atoms and the structural analysis of neutral hydrogen clouds.

Professor Webster's other research interests include quasar emission regions, gravitational lensing and cosmology. She has a keen interest in issues around sustainability and climate change, with a side interest in the physics of geothermal energy. Rachel was appointed as an Officer of the Order of Australia for her service to education in the field of astrophysics and astronomical research, and for her dedication to young women scientists.



Dr William Birch AM FRSV

A Member of the RSV since 1974, the same year he joined Museums Victoria as Curator of Minerals, Bill's main roles were to grow and improve the Melbourne Museum's collections of minerals, rocks and meteorites for use in research projects and exhibitions, and to engage with the wider community across many topics of interest within the vast field of geology. His personal research interests are in the analysis of minerals, especially unusual species, documentation of mineral assemblages, and historical mineralogy.

Travelling widely to collect minerals and rocks from Russia, Greenland, Northern Pakistan and Canada, as well as places throughout Australia, Bill has worked with other experts to describe over 50 minerals new to science. Publishing over 200 research papers and notes, he has

also published books on Victorian zeolites, phosphate minerals and gemstones, and edited the 2003 volume *Geology of Victoria* for the Victorian Division of Geological Society of Australia (GSA). His contributions to the geological sciences were recognised through the award of the GSA's Selwyn Medal in 1999, and he was appointed as a Member of the Order of Australia for service to geological science, particularly through the study and documentation of the geology of Victoria, and to a range of professional organisations.

Now Curator Emeritus with the Museum, Bill served the Society with dedication and distinction first as a Councillor, then President from 2013 to 2017, and continues to serve as Editor in Chief of the Society's Proceedings.



Dr Peter Baines FRSV

Dr Peter Baines is a geophysicist whose major research interests have included climate dynamics on the decadal time scale, volcano dynamics and Rossby wave hydraulics. He spent thirty years as a Research Scientist at CSIRO Atmospheric Research, reaching the rank of Chief Research Scientist, in the areas of dynamical meteorology and oceanography.

Peter served as the inaugural President of the Australian Meteorological and Oceanographic Society in 1988 and was awarded AMOS' Priestley Medal in 1998. He

currently holds an honorary position as Senior Fellow in the Department of Infrastructure Engineering at the University of Melbourne, engaged in research in aspects of climate, stratified flow dynamics and the dynamics of volcanic plumes.

A Member of the RSV since 1996, Peter has earlier served as an RSV Councillor from 1999 - 2004 and is committed to its continued progress through effective administration, the promotion of science and sound financial management in delivering prizes, lectures and building improvements. His most recent term on Council began in 2014 - he was elected Honorary Secretary in 2017 and served with dedication until completing his tenure on Council in May 2021. He was also the Chair of the Society's Policy and Advocacy Committee.

Our four new Fellows will be formally inducted following the Society's Annual General Meeting, which will be held on Thursday 26 May from 5pm. Members will receive an invitation with full details in late March; meanwhile, please hold this date in your diary.

On behalf of your Council, please join me in congratulating our four new Fellows.

Rob Gell AM
President, RSV





CALD Women in STEM – Media Training

An entertaining and informative workshop on media skills for women in STEM from Culturally and Linguistically Diverse (CALD) backgrounds.

The Australian Science Media Centre in collaboration with STEM Sisters and the Victorian Lead Scientist's Office are hosting a special series of workshops for women in STEM from culturally and linguistically diverse backgrounds. The workshops will cover a range of topics including how to work effectively with the Australian media, develop your online profile and protect yourself from cyber bullies. You will also get top tips from journalists and media savvy STEM researchers from CALD backgrounds. Numbers are limited so register

as soon as possible! The first two workshops are in February and will focus on understanding the media and preparing for an interview and will involve journalists and researchers from CALD backgrounds who will offer their top tips. The workshops are suitable for CALD women who are post PhD and are at the early to mid career stage of their research. The workshops are not intended for women outside of the STEM research community.

Part 1 - Understanding the Media

Thu, 17 Feb 2022 4:30-6 PM (AEDT)

[REGISTER YOUR INTEREST](#)

Part 2 - Preparing for interview

Thu, 24 Feb 2022 4:30-6 PM (AEDT)

[REGISTER YOUR INTEREST](#)

After you register you will be sent a Zoom link just prior to the event so you can access the training online. If you have any questions email info@smc.org.au



Innovation Challenge- Call for STEM Mentors

We are excited to be back for 2022 & first up is the 14th BrainSTEM Innovation Challenge! We are currently looking for STEM mentors based in Victoria for the Challenge, which will run from March to June.



The challenge will be divided into 3 streams - Health, Technology and Community. We know from past challenges that what you can provide to these students as a STEM mentor is very valuable and can impact the future of STEM.

If you are interested in becoming a BrainSTEM mentor visit <https://brainstem.org.au/mentor-registration.html> to register today!

Women in STEM and Entrepreneurship Round 4

Women in STEM and Entrepreneurship grants encourage participation of girls and women in science, technology, engineering and mathematics leading to STEM education and careers.

Status:

OPEN (Closes in 20 Days)

Closing date:

02 Mar 2022 05:00 PM AEDT

What do you get?

Grants between \$500,000 and \$1,000,000 for projects that increase women's and girls' participation in STEM and entrepreneurship.

Who is this for?

This grant opportunity provides funding to grow and expand existing projects that support women and girls, regardless of

their background, to build STEM skills and succeed in high growth employment areas.

OVERVIEW

The Women in STEM and Entrepreneurship program supports investment in gender equity initiatives that aim for lasting systemic change by eliminating barriers for women's participation in STEM education and careers, and entrepreneurship.

The program objectives are to:

- increase awareness and participation of girls and women in STEM education and careers
- increase awareness and participation of girls and women in other parts of the innovation ecosystem including innovative businesses, start-ups and entrepreneurial activities and careers, stimulate an increase in the number of women in senior leadership and decision making positions in government, research organisations, industry and businesses.

The grant opportunity provides funding to grow and strengthen projects and organisations that have a track record of:

- reducing and/or mitigating systemic and cultural barriers to participation in STEM education, careers, innovation and entrepreneurship by girls and women
- reducing the multiplier effect of intersectional barriers to participation, development and leadership of girls and women in STEM education, careers, innovation and entrepreneurship
- increasing the participation, development and leadership of girls and women in STEM education and careers, innovation and entrepreneurship.
 - are an eligible entity
 - have an eligible project
 - have eligible expenditure.

To know more visit <https://business.gov.au/grants-and-programs/women-in-stem-and-entrepreneurship#how-to-apply>



Call for Nominations - BOARD DIRECTOR with Women in STEMM Australia



Women in STEMM Australia is a non-profit organisation founded in 2014 which has grown into a nationally and globally recognised association for women in science, technology, engineering, mathematics and medicine (STEMM).

- Our core purpose is to advocate for gender equity and equality throughout Australia's STEMM sector, and support initiatives that drive positive change in the workplace and learning space.
- Our role is to ensure that women in STEMM with the capacity and capability to contribute to the innovation agenda are equally included, recognized and rewarded for their experience and expertise.
- Our activities welcome and aim to benefit all women in STEMM regardless of their background, discipline or profession.

- Our philosophy is "Pay It Forward" and we uphold the core values of excellence, integrity and respect for all. Women in STEMM Australia has created a diverse, inclusive network of STEMM students and professionals at all levels of academia, industry, education, business and government.

Women in STEMM Australia is operated by a Board of Directors with three (3) co-chairs. The Board of Directors meets four (4) times each year. Director positions are currently vacant, and nominations are now open until 9am AEDT, Monday, 21 February 2022.

- Successful applicants will be appointed Directors on the Board of Women in STEMM Australia. Directors will work with the co-chairs to help the organisation to achieve its purpose:
- Undertake initiatives to advocate for and increase the representation of women and girls in STEMM.
- Identify unrecognised challenges and opportunities unique to women and girls in STEMM.

- Increase opportunities and access for women and girls with aspirations in STEMM to enable their growth and empowerment and build connections.
- Advocate best practice for inclusion and positive change throughout the STEMM sector.

Women in STEMM Australia invites nominations for the role of Board Director from across the STEMM sector. Multiple positions are available. This is a voluntary role with Board-related expenses included.

Applicants must be located in Australia and have knowledge, experience, and/or lived experience in diversity, inclusion and allyship. Applicants must be willing to welcome everyone and apply an intersectional lens to policy, practice, and activities that operate under the auspices of Women in STEMM Australia.

Read more here: [Board Director – Position Description](#) and nominate here: [Nomination form](#).

Please [contact us](#) for more information.

Final Call – National Science Week Victorian Seed Grants

Inspiring Victoria is again offering Seed Grants of amounts up to \$1000 (excluding GST) to assist Public Libraries, community organisations and individuals who would like to present a public event during National Science Week in August 2022. Applications opened 1 December 2021 and we've now extended the deadline for submissions to Friday 18 February 2022 at 5:00pm. Please get your best ideas into us as soon as you can!

[APPLY NOW](#)



Celebrating the International Day of Women and Girls in Science

The International Day of Women and Girls in Science is held on February 11 annually around the world as a global movement recognising women and girls in science as agents of change and celebrating leaders and inspiring role models in science.

In Victoria we are celebrating this important day through a suite of inspiring stories profiling some incredible women who have pursued careers in science. These stories explore the opportunities and challenges for girls and women in careers in science, technology, engineering, medicine and mathematics.

This year we celebrate the role of women and girls in science, not only as beneficiaries, but also as agents of change. We acknowledge this important day by profiling women who have pursued careers in science, to inspire Victoria's future female scientists. Read the stories we've collected with our partners at <https://www.ces.vic.gov.au/stories>, and share these widely to inspire the next generation of women to pursue careers in science and make a real difference!

Since 2015, the Commissioner for Environmental Sustainability, Victoria's Chief Environmental Scientist and Victoria's Lead Scientist have collaborated to

celebrate this important day. The Royal Society of Victoria and Inspiring Victoria have contributed to the celebration since 2018, and In2Science have collaborated since 2021. Thank you to our partners for contributing stories, and to the individuals profiled.

The Society has compiled the following two stories for the initiative, reproduced here thanks to the efforts of RSV Science Communications Officer, Catriona Nguyen-Robertson.

MEET MARINE SCIENTIST, DR REBECCA MCINTOSH

"Marine science is a ticket to travel the world" says Dr Rebecca McIntosh. For her, it was a way to combine her passions for the ocean, diving, nature, and travel. As a marine biologist who studies sea lions, penguins and fur seals, the seas are her workplace.

Born with a love of nature, Rebecca has been monitoring wildlife all

her life. She and her brother would perform capture-mark-recapture studies on cicadas; finding them and writing numbers on them to see whether they would return the next year. She spent much of her childhood hanging around the local vet surgery until they gave her a job. Her mother also passed on a passion for ocean conservation. One of Rebecca's earliest memories is of her mother planting jojoba beans to save whales (their oil is a substitute for sperm whale oil). Rebecca wanted to protect the oceans too.



Photos courtesy of Dr Rebecca McIntosh

At the age of 16, Rebecca also picked up diving. Wanting to keep up the hobby, she studied zoology and marine science at the University of Melbourne as it has a diving club. Then she volunteered and worked on projects around the world, including the Galapagos Islands and Macquarie Island. She has now settled back into Victoria, working with Phillip Island Nature Parks to protect the Australian fur seals and little penguins.

Rebecca's proudest achievement



in her career was during her PhD. She studied the Australian sea lion, which was not receiving much attention at the time. This beautiful, unique mammal was declining, and so she and her supervisor advocated for government funding to monitor them. While they have since been listed as threatened and endangered, some populations have seen a bounce back due to fishery exclusion zones and conservation efforts.

Rebecca also leads the annual SealSpotter Challenge, a project involving citizen scientists from every continent. She uses drones to capture footage flying over Seal Rocks, and participants count the number of seal pups in the footage. This project allows everyone to be involved in cutting-edge research and allows her to analyse seal population data faster and more accurately so that she can see how the population is fairing over time.

Marine research is a very male-dominated field as it often involves physical, dirty, adrenaline-pumping work. Diversity in any team brings diverse ways of approaching problems. Rebecca sometimes needs to come up with a creative solution instead of relying on physical strength when working with animals, and this often leads to an approach better for both her and the animals. Teamwork is also critical and working alongside others is important for great field work and science.

When capturing seals, "you run over rocks, and if you fall, you just have to get up" says Rebecca. And this is the approach she has taken to life. "If you're passionate and really want to do it, don't let anything get in your way."

Having been told that she wasn't strong enough to work with seals as a young woman, Rebecca is now a leader in her field.

"I don't want to be a successful female scientist" she says. "I want to be a successful scientist."

MEET DR GAIL ILES, THE SCIENTIST STUDYING WATER EXTRACTION ON MARS

Dr Gail Iles is making the impossible, possible. Her work will ensure that people can travel to the Moon and Mars – and stay there.

She has always wanted to be an astronaut herself. She doesn't even remember a time when she didn't want to be one. While she hasn't been to space (yet!), she has trained many astronauts and sent many experiments into space on rockets.



Photo courtesy of Dr Gail Iles

Gail was drawn to physics because she wanted to delve deep into the miniscule atomic level of matter, while also studying gigantic things such as the entire Cosmos. She loves science because scientists don't have all the answers, but they are certainly searching for them.

"There is an element of the unknown in everything we do" she says. "There's no right or wrong, just new."

Juggling studies, part-time jobs and raising two small children alone, Gail completed a Bachelor of Sciences with The Open University from home. It was the most



Photo courtesy of Dr Gail Iles

Now, Gail works in Australia at RMIT University, collaborating with people across the globe. NASA scientists have long been looking for water on Mars, and Gail is working with them to create a device that can extract water from minerals on Mars. Our bodies depend on water to survive, but it expensive to ship water (or any additional weight) in a rocket; when the Mars Curiosity Rover was launched, it cost around 2.78 million USD per kilogram!

If humans are going to get to Mars, they are going to need a source of water. Gail's team simulated the rock and dust layer that covers Mars and experimented with how they could extract water. They are

now designing a water filter made of porous Martian rock minerals. Due to the arid nature of Mars, this work is also relevant to getting water in the dry, desert regions of Earth – just like the Australia outback.

One day, Gail hopes that she will venture out into space herself. She has forged a career by looking at the CVs of astronauts and following in their footsteps, and encourages others to follow their role models.

"Space has a power to inspire - it's that fascination that gets everybody" she says.

Perhaps it has even got you. You could be among the first women to walk on the Moon – and even Mars.

DISCOVER MORE

You can discover more stories about women who have pursued careers in science to make a real difference at <https://www.ces.vic.gov.au/stories>

We invite you to read and share the stories and celebrate women in science to inspire our future female scientists to pursue their passion and make waves across all industries.

Dr Gillian Sparkes AM

Commissioner for Environmental Sustainability



**Inspiring
AUSTRALIA
Victoria**

4 Year Report
(2018-2021)



A Report on The Impact of Community Science Engagement, 2018 to 2021

I am pleased to advise the Society has now published its four-year report on the Inspiring Victoria initiative, looking back at the efforts undertaken by this ambitious partnership program and recording trends in audience engagement and other impact metrics. You can view the full report online from the *RSV's website*.

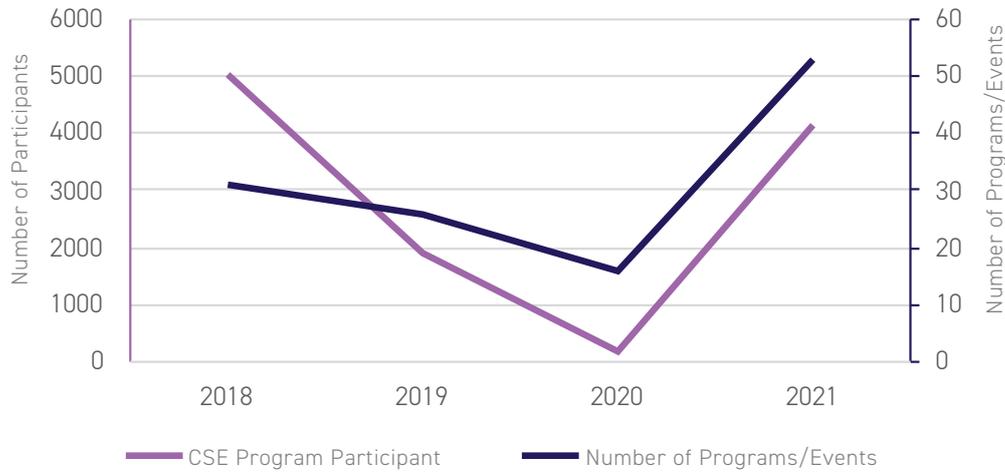
The program reflects a 2016 determination by the Council of the Royal Society of Victoria to act on the recommendation of our Outreach and Partnerships Committee, assigning a portion of our small pool of capital to establish an expanded, community-focused outreach and partnership program, with the aim to build the capacity of Victorians to access and translate robust scientific work for beneficial social, commercial and environmental outcomes, in line with the Society's mission to promote the sciences in our state.

This investment presented a measured risk; for many years, our

venerable yet under-resourced Society has been searching for ways to establish and sustain an impactful community science engagement program across the State of Victoria, while our financial capacities have remained stubbornly meagre. Rather than accept this was beyond our capacities, we sought to invest in our future success and value to the people of Victoria through this "open science" initiative. We embarked in a spirit of partnership with others committed to the same goals, seeking opportunities to build future financial support on the strength of our anticipated, positive impact.



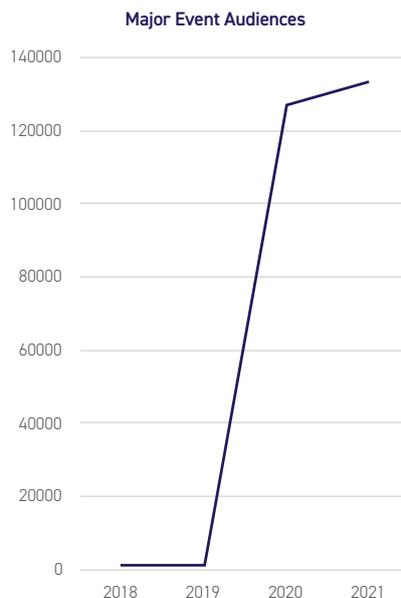
Community Science Engagement Program - Events & Participants



The opportunity to leverage program funds under the Inspiring Australia program was on offer from the Commonwealth of Australia, contingent on attaining the support and partnership of the Victorian State Government; indeed, Victoria was the last remaining state to enter the national initiative. So, throughout 2017, we met with the freshly appointed Lead Scientist for Victoria, Dr Amanda Caples, an accomplished state government leader appointed within the (then) Department of Economic Development, Jobs, Transport and Resources. Seeking further alignment with Dr Caples' goals to establish regional hubs for Science, Technology, Engineering and Mathematics, our cross-sector, intergovernmental partnership began with building partnerships across the science engagement ecosystem to populate a new Board for the Inspiring Victoria program and oversee its major initiatives, including National Science Week.

Here we are 2022, and I can look back on a remarkable journey, filled with dynamic partnerships, new programs, colourful events, interstate relationships, rapid learning curves and pandemic

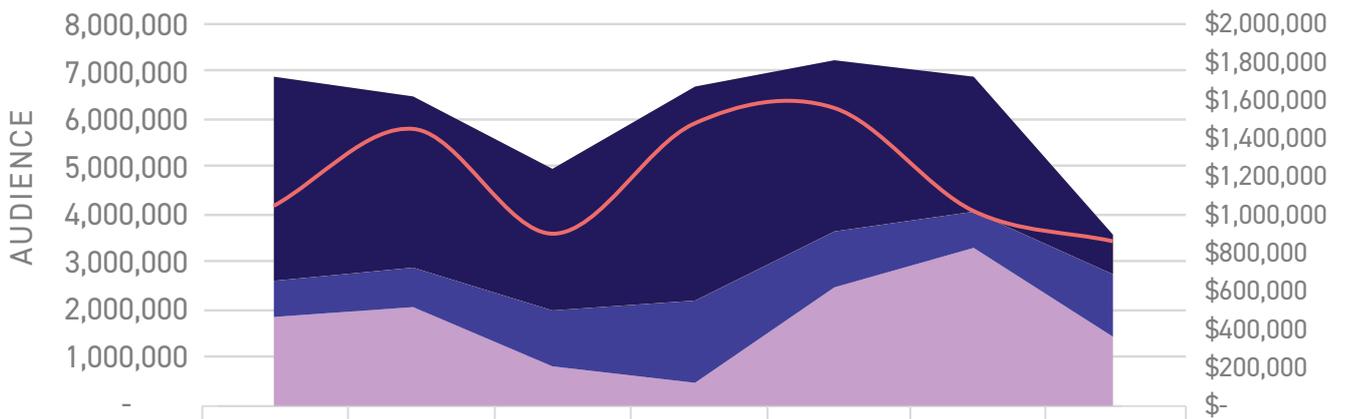
curveballs, and a scintillating network of community champions for STEM engagement and literacy across the State of Victoria. I could not be prouder of what we have achieved together, nor more grateful to the many colleagues and partners across academia, government, community and industry who have helped us to achieve it. Thank you all. It has been very challenging work, yet entirely commensurate with reward.



My thanks to Dr Caples and her team for their partnership and

support for our endeavours, without which we could not even begin. I must convey particular gratitude to the Council of the Royal Society of Victoria for committing our organisation's small but essential capital investment, which has sustained what amounts to millions of dollars of value in STEM promotion, largely derived from the kind bequest of Dr Phillip Garth Law. Our equivalent institution in New South Wales is the University of Sydney, operating on an annual budget of \$2.5 billion. The collective contributions of the RSV with its government partners - \$1.3 million over four years - has returned a benefit of \$14.7 million to the State of Victoria by the measure of promotional value alone. We have demonstrated what a small membership organisation with an expansive mission can achieve through an open partnership approach, brokering fruitful inter-agency collaborations and, through a genuine community development and engagement agenda, building localised capacity to deliver on shared goals in regional and metropolitan Victoria alike.

National Science Week Media Reach (Victoria), 2015-2021



	2015	2016	2017	2018	2019	2020	2021
Press	4,258,951	3,596,718	3,001,768	4,423,941	3,537,242	2,880,276	845,595
Television	761,000	852,000	1,170,000	1,736,000	1,185,336	767,000	1,287,000
Internet							57,733
Radio	1,861,000	2,012,000	772,000	472,600	2,470,000	3,251,000	1,397,000
Promotional Value	\$1,041,56	\$1,446,15	\$894,940	\$1,472,50	\$1,558,31	\$1,015,47	\$855,121

In these increasingly uncertain times, it is our aim to further align this excellent initiative with the major challenges of our era, enabling Victorians to adapt and prosper through fruitful relationships with our state's

remarkable and generous pool of expertise. I hope you can participate and help support our continued efforts – we are seeking industry sponsorship, renewed government partnerships and community participation across the program.

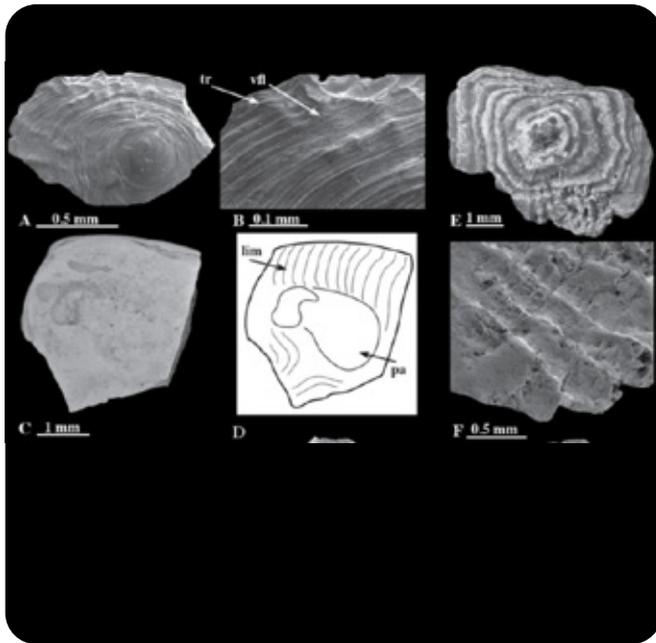
Please contact me at ceo@rsv.org.au to express interest in meeting your organisational or personal goals by collaborating with us.

Mike Flattley, CEO, The Royal Society of Victoria

You can view the full report online from the [RSV's website](#).



Proceedings



A–D. *Discradisca* sp., A–B. OU 45776a. A. Partial dorsal valve. B. Close-up of valve ornament. C–D. OU 45776b. C. Partial dorsal valve interior with posterior adductor muscle scar. D. Illustration of muscle scar and limbus. E–G. *Novocrania huttoni*. E. OU 45310a. Mostly complete (but worn) dorsal valve with concentric rings of colour and some radial ribs. F. OU 45310b. Partial dorsal valve with worn radial ribs.

A Late Oligocene brachiopod fauna from the rocky shore deposit at Cosy Dell farm, Southland, New Zealand

JEFFREY H. ROBINSON

The fauna in this location is shown to include six brachiopod genera and species and, for the first time, records the co-existence of a discinid, a craniid and a kraussinid in a paleoecological setting such as New Zealand. This study includes the first reported occurrence of *Discradisca* in New Zealand and extends the stratigraphic range of species *Megerlina miracula* Hiller, MacKinnon & Nielsen, 2008 back to the late Oligocene. In addition, this study confirms the occurrence of *M. miracula* in very shallow-water deposits.

Read this paper online at <https://www.publish.csiro.au/RS/pdf/RS21009>

Pioneering of numerical weather prediction in Australia: Dick Jenssen, Uwe Radok and CSIRAC

WILLIAM BOURKE

Pioneering calculations in atmospheric science were performed at the University of Melbourne in 1957–1959 by the Master of Science student Dick Jenssen under the supervision of Uwe Radok. These studies, using the University of Melbourne computer CSIRAC, were documented in the Jenssen thesis but without any further publication. The detail of the studies has largely been hidden and the aim of this essay is to present an account of these significant studies to a wider scientific community.

Read this paper online at <https://www.publish.csiro.au/RS/pdf/RS21010>



Dick Jenssen, at the reassembled CSIRAC computer in 1999, recapturing a photo published in a Melbourne newspaper in September 1958. (Photo courtesy of Peter Thorne.)

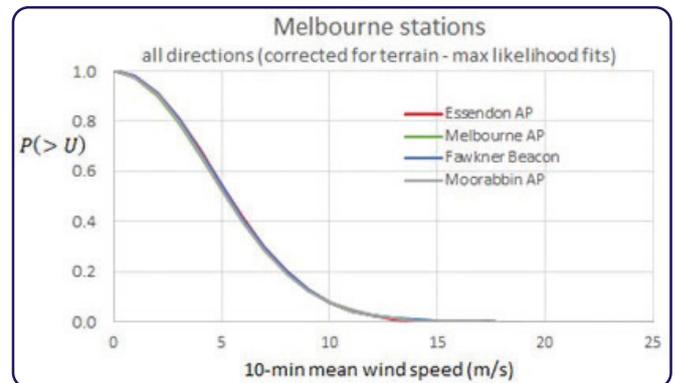


The Fawkner Beacon (the anemometer with direction vane is at the highest point on the tower — shown ringed in red).

Wind climate of the Melbourne metropolitan area

J. D. HOLMES

This paper describes a probabilistic analysis of data recorded by the Bureau of Meteorology (BoM) for the wind climate of the Melbourne metropolitan area. It is based on 10-minute average wind data from four automatic weather stations (AWS) – at Melbourne and Essendon airports, Fawkner Beacon in Port Phillip Bay, and Moorabbin Airport. Corrections to the data were made to adjust to standard terrain conditions and height. For the land stations, these were based on estimates of the surface roughness length at each site as a function of wind direction, making use of recorded gust factors. For the Fawkner Beacon, which is completely surrounded by open water, the surface roughness length is a function of mean wind speed, and the Charnock relationship was used in determining the corrections.



Weibull distributions fitted to data from four stations.

For each station the terrain-corrected wind data were fitted with Weibull probability distributions, as an all-direction group and for sixteen direction sectors. Directional probabilities were also determined. The parameters of the all-direction Weibull distributions are very similar for all four stations, but there are differences in directional probabilities for some directions, with a geographic trend from north to south in the region being apparent. Some possible explanations based on the general topography are given.

Read this paper online at <https://www.publish.csiro.au/rs/pdf/RS21011>

Call for expressions of interest Associate Editor – The Royal Society of Victoria

The Royal Society of Victoria seeks expressions of interest from its members in contributing as an Associate Editor to the publication of papers in our journal and the production of position papers reflecting the deliberations of our annual membership forums. This will be an honorary position.



JOURNAL EDITORIAL RESPONSIBILITIES: PROCEEDINGS OF THE ROYAL SOCIETY OF VICTORIA

Associate Editors have responsibility for handling manuscripts and advising the Editor-in-Chief of the suitability of manuscripts for publication. The role includes the selection of appropriate referees, reading reports, reaching a preliminary decision, reading a revised manuscript, overseeing possible further review and revision, and recommending a final decision (to the Editor-in-Chief).

Associate Editors also invite submissions to the Journal and/or facilitate Special Issues. Associate Editors correspond with the Editor-in-Chief and Journals Publisher about difficult decisions, while the Editor-in-Chief oversees adjudication.

Subject to needs, Associate Editors will receive editorial support from CSIRO PUBLISHING, including access to the web-based editorial management system and a dedicated Editorial Assistant based with CSIRO PUBLISHING.

Specific duties include:

- Managing timely, rigorous and constructive peer-review of articles by a broad range of appropriately chosen international referees while maintaining confidentiality
- Corresponding with referees, and authors, in a courteous and respectful manner
- Making comprehensive recommendations on manuscripts (i.e. acceptance or rejection) according to the editorial direction set by the Editor-in-Chief
- Representing the journal to the research community network as appropriate
- Commissioning content (in consultation with the Editor-in-Chief – propose and confirm topics, authors and timelines for commissioned works; once approved by the EiC, sending personal invitations to proposed authors; sending follow up invitations, reminders and any requested further information to potential authors; managing each manuscript through the peer-review process; maintaining regular consultation with the Editor-in-Chief and Publisher, who coordinate which articles and Research Fronts/Special Issues will appear in which issues).

POSITION PAPER RESPONSIBILITIES

Associate Editors will comprise membership of the Editorial Oversight Group under the direction of the Editor-in-Chief. This group will govern the process through which Society's membership forums move from receiving background issues papers through group exploration and consensus making to production of formal position papers.

A substantial component of the Group's duties will be management of a peer review process, through

Proposed RSV Position Papers Process



which draft position papers are tested for the robustness of their scientific content and conclusions, along with the production of related scientific papers by consulting experts and RSV Fellows.

We seek applications from colleagues with demonstrated disciplinary standing in any one of the following broad categories:

Category I: Biological Sciences (non-human)

Agriculture, Biochemistry, Botany, Cell Biology, Ecology, Forestry, Zoology, and related areas of non-human biological science.

Category II: Biomedical and Health Sciences

Genetics, Immunology, Human Physiology, Human Anatomy, Pathology, Neurology, Epidemiology, Endocrinology, Radiology, Microbiology, Medical Parasitology, Nuclear Medicine, and related human sciences

Category III: Earth Sciences

Atmospheric Chemistry, Geology, Geochemistry, Geochronology, Geophysics, Planetary Physics, Meteorology, Oceanography, Physical Geography, Palaeontology and related sciences

Category IV: Physical Sciences

Astronomy, Astrophysics, Chemistry, Engineering, Mathematics, Physics and related sciences.

Applications:

Please express your interest to the Editor in Chief care of editor@rsv.org.au, with a single page description of your background and experience in producing and/or editing scientific writing, along with a copy of your curriculum vitae.

While we are happy to hear from interested members at any time, we aim to appoint our Associate Editors in March, so would be grateful to receive submissions by no later than **Monday, 28 February 2022.**



Transactions



Improving Drug Discovery

by **Catriona Nguyen-Robertson**

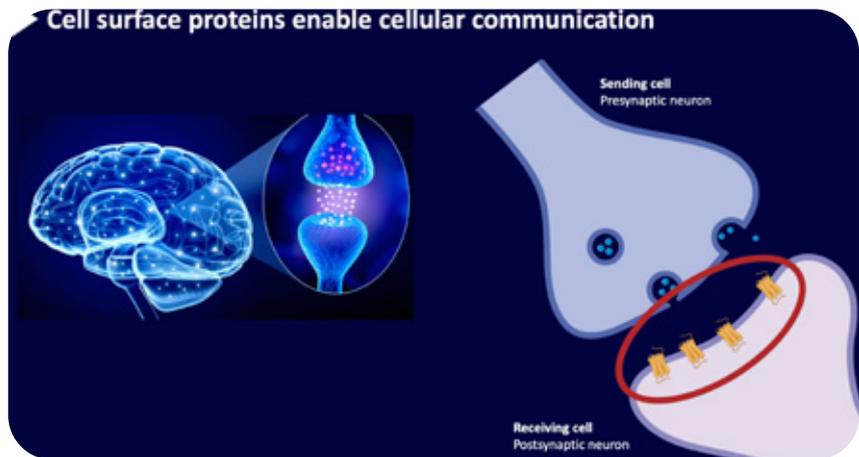
This article follows a presentation to the Royal Society of Victoria on 25th September 2021 titled "Improving Drug Discovery: a molecular understanding of cell surface receptors" delivered by Dr Christopher Draper-Joyce (Florey Institute of Neuroscience and Mental Health). Christopher was

the recipient of the 2021 Phillip Law Postdoctoral Award.



The human body is composed of trillions of cells. Each individual cell communicates with others and performs certain tasks within the collective to keep our bodies working. Their ability to send and receive signals is vital, and when communication is disrupted, disease ensues.

Many therapeutic drugs for a multitude of diseases target specific cell receptors – proteins on the cell surface that receive messages. Restore the communication, and you can restore normal function.

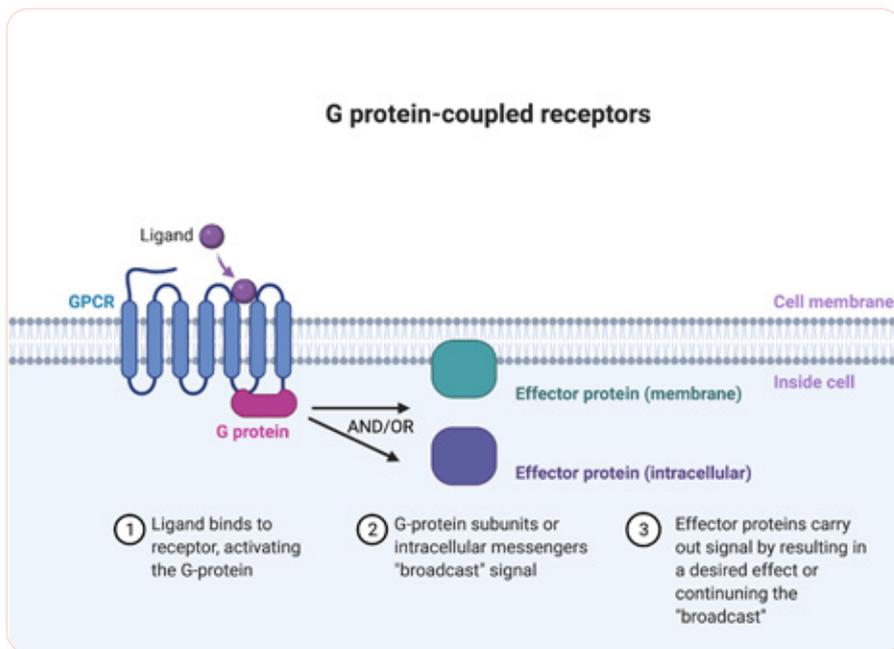


Using an interdisciplinary approach, Dr Christopher Draper-Joyce is exploring new, proof-of-concept approaches that promise the development of safer and much improved options for therapeutics. Based at the Florey Institute of Neuroscience and Mental Health, he collaborates with partners around the world to gain different perspectives and ways of tackling scientific problems.

"Dr Draper-Joyce is already making significant advances in our understanding of the molecular mechanisms involved in drug binding and action on membrane

receptors; this is a vital area of research."
– Professor Sandra Rees FRSV.

Numerous protein receptors in the body recognise a variety of signals to control cell behaviour. A message in the form of a ligand will bind to a receptor to elicit a response. The largest cell surface receptor family is G protein-coupled receptors (GPCRs). They respond to stimuli outside the cell including neurotransmitters, hormones, metabolites, and even photons of light, kicking off a cascade of molecular events within the cell by broadcasting the signal via effector proteins.



painkillers. With one third of health system expenditure focused on chronic pain, there is an urgent need for non-opioid painkillers. The adenosine A1 receptor protein (a GPCR) has long been recognised as a promising therapeutic target but because adenosine can bind to four different receptors to either enhance or inhibit pain, previous attempts to target the A1 receptor have failed due to undesirable adverse off-target effects.

Using a multidisciplinary approach with preclinical models and microscopy, Christopher and team

produced a detailed visualisation of the A1 receptor protein structure. They achieved the first atomic level snapshot of where drugs bind and could therefore design a drug that enhances the ability of adenosine to bind while avoiding binding to a region of the GPCR conserved across other adenosine receptors.

Christopher has taken a second approach to develop another drug targeting the A1 receptor to protect against cardiovascular disease. Manipulating adenosine signalling via the A1 receptor protects heart tissue but also slows heart rate. Christopher therefore worked with a team to design a drug that selectively chooses which signals to "broadcast" within heart cells. By designing a drug that binds to the receptor in a way that slightly alters the receptor's shape, it can engage the protective pathways without a drop in heart rate.

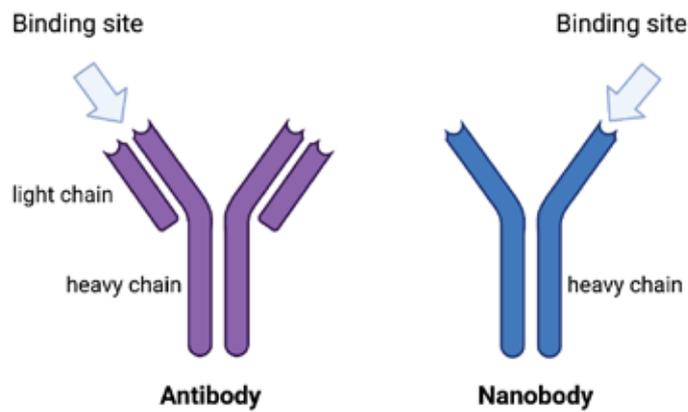
Importantly, because GPCRs are involved in so many cellular responses, they are excellent drug targets. GPCR targets comprise around 25% of all medicines currently approved by the USA's Food and Drug Administration, highlighting their importance.

Traditional drug discovery approaches focus on the primary site of ligand binding, either aiming to block or enhance signalling. The challenge with this approach, however, is designing a drug that selectively only targets a given GPCR without undesired side effects due to conservation between receptors. With some 1,000 different GPCR types on different cells of the body for different purposes that can be quite structurally similar, it is important that a drug only binds the specific GPCR of interest. For example, pocket of the receptor where ligands such as dopamine, serotonin, acetylcholine and adrenaline bind, all overlap in structure. If a drug binds to the pocket to prevent one of these ligands from interacting with the receptor, it is likely that it will prevent all of them, resulting in unwanted, off-target side effects.

Another challenge in drug discovery is that receptor signalling outputs are typically quite complicated. With each receptor potentially influencing multiple signal outputs, by simply fully blocking or activating GPCRs, drugs may negatively impact other signals in addition to achieving the desired outcome. An alternative approach is therefore to design a drug that modulates the signal rather than completely switching it on or off. Researchers like Christopher search for separate regions on the GPCRs (rather than directly where the normal ligand binds) to which drugs can bind and act as a dimmer switch without completely disrupting signals.

Christopher's team have recently unlocked the key that could lead to the development of alternative





While most traditional drugs are small molecules that somehow interfere with the ligand-receptor binding, Christopher is now also exploring the use of nanobodies in therapeutics. Antibodies are proteins that bind tightly and specifically to their target cells, and nanobodies are the camelid versions. Their binding sites are long loops, like fingers, that help them reach into the grooves of target receptors. The binding region of conventional antibodies sits between two separate protein chains (a heavy and light), whereas

camelids such as alpacas, llamas and camels produce nanobodies that only have a heavy chain. This makes them easier to produce cheaply in bulk and they are more stable than antibodies. Christopher is currently producing nanobodies in alpacas and hopes that nanobodies become viable therapies for cancer and other diseases.

Receptors, particularly GPCRs, are implicated in a plethora of diseases. Through a molecular understanding of the how ligands and receptors interact, and how a drug can modulate the interaction,

is greatly advancing drug discovery programs. These new protein visualisation technologies will pave the way for safer and more effective GPCR therapeutics. The Royal Society of Victoria is delighted to award Christopher the 2021 Phillip Law Postdoctoral Award.

The two diagrams: they are 'Author's own. Images created with Biorender'



Bioremediation: a pollution solution

by Catriona Nguyen-Robertson

This article follows a presentation to the Royal Society of Victoria on 9th December 2021 titled "Bioremediation: restoring contaminated ecosystems, naturally" delivered by Professor Andy Ball (RMIT University), awardee of the 2021 RSV Medal for Excellence in Scientific Research.

The environment is constantly being bombarded with an array of contaminants. Pollutants are everywhere on the planet. They are found in deepest oceans, high in the air, in urban areas and the most desolate places on Earth.

'Once compounds are in the environment, they are transported across vast distances,' Prof. Andy Ball says. 'This is a global problem.'

Over three million contaminated sites are scattered across the globe – a large underestimate – most of which remain untreated.

And pollutants are only becoming increasingly complex as humans develop new chemicals that leech into the environment. Andy is working towards a solution.

Andy leads bioremediation projects in contaminated sites all over the world. His contributions to the fields of microbiology and biotechnology were recognised as the recipient of the RSV 2021 Medal for Excellence in Scientific Research. His work ensures that we become 'better custodians of our environment,' as The Hon. Lily D'Ambrosio MP noted when presenting him with the award.



For decades, it was presumed that the environment was resilient and that "little spills" here and there would not greatly harm it. The 1989 Exxon Valdez oil spill was a turning point: 11 million gallons of crude oil spilled from an oil tanker, impacting

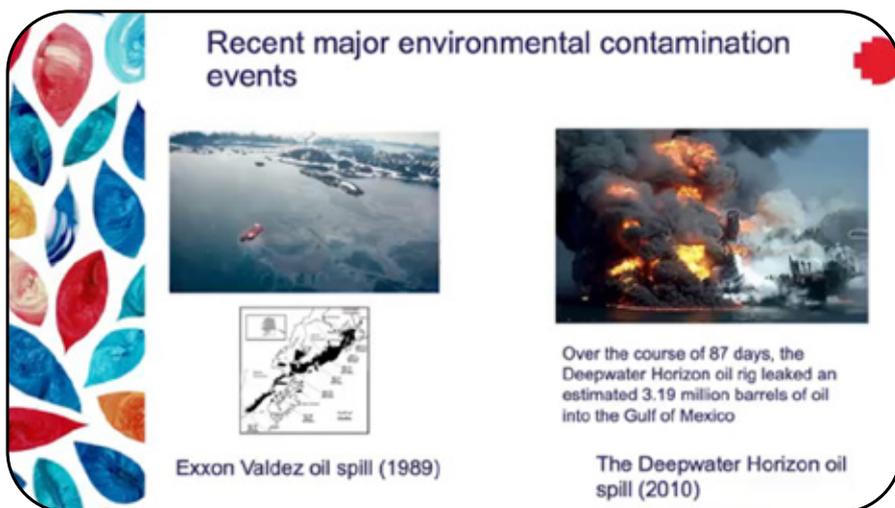
miles of Alaskan coastline. It was the worst oil spill in the U.S. until the Deepwater Horizon oil spill in 2010 dumped 3.19 million barrels of oil into the Gulf of Mexico over 87 days. On top of the constant waste from agricultural farms, textile factories, and even homes, it became clear that the environment would not simply bounce back from our waste.

The typical approach of dealing with waste was often to sweep it under the carpet – to literally bury it. While a cheap solution, it is unsustainable, especially as chemicals would inevitably eventually leech. Thermal desorption of chemicals by heating contaminated soil to high temperatures does remove contaminants, but is expensive and renders the soil useless. The best solution is bioremediation.

Bioremediation uses naturally occurring organisms (mainly bacteria) to break down contaminants into non-harmful products. Organisms that can work 24/7 for free.

An estimated five million trillion trillion bacteria live on the planet. Having evolved over billions of years, they have evolved to use everything at their disposal on Earth as nutrients to survive and thrive. Including our waste.

One third of current bioremediation projects currently target petroleum waste because microbes have lived side-by-side crude oil for so long. Using native microbes that already exist in the environment, some species can use carbon from oil to grow and often convert toxic pollutants to harmless things such as water and carbon dioxide.



Andy and his team have contributed to the clean-up of contaminated sites around the world. He has supervised over 80 research students, all of whom are committed to developing bioremediation solutions and putting them into practice. Their work often begins in a lab, identifying the microbes that can breakdown specific types of waste and the nutrients that help them do so faster, and then quickly moves into the field.

One student, for example, began their PhD by growing microorganisms in a flask with a bit of waste oil. By the end of her studies, she was spraying a solution of those microbes and all the nutrients they need onto contaminated soil. From those humble beginnings in a lab, 1000 m³ of contaminated soil eventually became clean enough for use in gardens.

At a petroleum facility on Jurong Island in Singapore, another of Andy's former students, Dr Greg Poi, has implemented a large-scale bioremediation project. Ground water at the site was contaminated with petroleum compounds (collectively known as total petroleum hydrocarbons). By incubating a cocktail of microbes with the contaminated ground water in a tank, and providing a fresh supply of microbes every month, Greg and Andy successfully treated 200,000 L of water. Once they had

demonstrated the effectiveness of bioremediation to the company, they asked whether it could treat their soil problem too – and now Greg has his own bioremediation company in Singapore built on that initial success.

Andy believes that it is important to commercialise and translate the findings of his team's laboratory research for use in the field. But the basic research never stops, especially given that increasingly complex compounds are being produced and released into the environment.

Chlorinated compounds, for example, have become ubiquitous in the environment and are difficult to treat. Chloroethene, used in dry cleaning and degreasing agents, is now common in ground water. Around 10 years ago, a bacterial species was discovered that could remove the chlorine groups from chloroethene from the environment. The bacteria, Dehalococcoides, are commercially available to buy and add to ground water, but Andy has shied away from using them

in Australia as they might not be indigenous to the environment. Instead, he focused on existing microbial communities rather than relying on a single species, and managed to manipulate existing microbe communities in ground water sampling sites across Victoria to do the same thing.

Plants can also be used in a process called phytoremediation to take up heavy metals in the soil. In this process, precious metals are taken up into plant roots and can be recycled. Waste plant matter such as mouldy straw can also be repurposed for bioremediation as they full of organisms like fungi that can break down pollutants.

Given that it is anthropogenic activity that pollutes the environment, it is only fitting that we turn to natural solutions to help restore it to how it used to be. As we continue to pollute the environment with emerging microplastics, pharmacological products, and other chemicals, we need new solutions for these newer pollutants. Synthetic biology (e.g. improving naturally-occurring enzymes) might be the answer, and Andy is excited to see how the field evolves.

'We are still polluting our environment – day in and day out – with new, emerging pollutants. Every individual needs to reflect on waste they are contributing and minimise their footprint,' says Andy.

The consequences of pollution go far, but with people like Andy Ball on the case, we might be able to clean up our mess.



